



# Federal Aviation Administration

By Stephen A. Glowacki

## Breaking New Ground?

Unmanned aircraft are often viewed as the newest entry into aviation. However, prior to the Wright Brothers' famous flight on December 17, 1903, "models" were used for years as part of their development effort. Since that time, both manned and unmanned aviation have moved forward - with one major difference: required regulatory compliance and oversight.

Despite sharing the same physics, unmanned aviation has not had to exist under the same degree of scrutiny and oversight from the regulatory authorities as traditional aviation.

Where 'mandatory compliance' is a common theme in manned aviation, it has not been so in the unmanned environment where equipment is uncertified or 'experimental' reproductions of manned technologies.

## The Challenge

Today's unmanned aircraft systems (UAS) have largely grown from the recreational and government communities where operations and equipment are not required to comply with traditional civil regulations and standards or where operations are conducted in restricted airspace away from civil operations.

The manned aviation community has its foundations in formal processes based on regulations, standards, and risk assessment, along with having a shared expectation of what is considered safe and how it is derived.

Because of these histories, one of the key challenges to regulating small UAS is integrating not just new technologies but a new user 'community' into a more structured and formal environment than previously required to participate.

A challenge for the entire community is to treat UAS as an inherently 'aviation' topic. Ironically, experienced operators, pilots, and regulators alike have at times hesitated to apply basic aviation tenets or have stated, "There are no regulations for unmanned aircraft." The reality is, of course, that a majority of current regulations and standards do translate generically to aviation in any form, including unmanned.

While this does not necessarily mean that unmanned aviation has been unsafe, it suggests more, that operations have been conducted under something less formal than the rigors imposed by a mandatory compliance environment.

## The First Regulation

U.S. Aviation regulations are traditionally organized in each of three separate areas: aircraft certification, air traffic and operating rules, and airman certification - where meeting or surpassing the required minimums in one area can not be used to compensate for the failure to meet minimums in another area.

Aircraft of unique design or operation that are unable to meet any standard or regulation can apply for a Special Airworthiness

Certificate (SAC). This process often results in operational restrictions or personnel requirements being imposed to offset the additional risks resulting from this inability.

This same approach is used in the assessment of applications for Certificates of Waiver or Authorization (COA). However, despite the success of these processes on a case-by-case basis, they are insufficient in addressing our strategic needs.

In late 2007, the FAA initiated the Small Unmanned Aircraft (sUAS) Special Federal Aviation Regulation (SFAR) rulemaking project to propose enabling some UAS to operate in limited portions of the NAS beginning in the 2013 timeframe.

Similar to the SAC and COA processes, this regulation may propose to impose operational limitations to mitigate the additional risks presented by UAS.

This proposed rule will be the FAA's 'first step' toward routine operations and will focus on gathering data while enabling limited safe operations to the maximum extent possible. Based on any information gathered pursuant to implementation of our first sUAS rule, further actions may be taken toward permanent integration of UAS.

## Details, Details...

The first question most often asked is, "What is a small UAS?" Although most expect a physical description, the full answer is wider in scope. Not only are weight, speed, and construction important, but equally so, are the location (airspace), altitude, and purpose of flight.

Although legal constraints prevent a discussion of specific details prior to the planned publication in mid-2011, we can highlight some of the recommendations developed by the sUAS Aviation Rulemaking Committee (ARC) which may be incorporated for the FAA's sUAS rulemaking.

Many recommendations, in addition to those provided by the sUAS ARC, were based on having additional operational limitations imposed for aircraft that fly faster, higher, or use more complex technologies. Likewise, fewer restrictions have been suggested for those that operate at slower speeds, closer to the ground, and that are less complex.

Airframe materials and construction techniques have also been closely considered with recommendations suggesting benefit to aircraft that are 'frangible'. This new term, if incorporated, would need to be adequately defined so that an accurate safety assessment could be accomplished.

Training and certification for pilots and other airmen has been and continues to be treated very much the same for both manned and unmanned operations regarding Aeronautical Knowledge and Proficiency Training, as well as, Examinations and Certification.

Some recommendations have included a reduced level of

training and certification for airmen conducting operations in low risk environments. In extreme situations, some have suggested eliminating these requirements completely. No decision has been made and we continue to consider all recommendations.

Aside from the regulation language, the FAA is considering options regarding the application and approval process, including using a web-based approach that would also support the collection of safety data from the flying community.

Approvals are envisioned to be limited to a period of time, possible one to two years, with renewals contingent on a history of safe operations and regular submission of operational and safety data.

Recreational-only activities will likely not have to comply with most of the regulations, including not having to submit an application, obtain certifications, or receive approvals from the FAA. However, these operations would still need to comply with minimum levels of safety.

In preparation for an eventual Final Rule, we have been assisting the recreational community since early 2010 in their development of standards that could be acceptable to the FAA and used in lieu of specific regulations. Until standards are accepted, any minimum operational limitations in the regulations would still need to be followed.

### **Lessons Learned**

Throughout recent years, some distinctions have emerged.

As obvious as it may seem, treating UAS in the same manner as we do manned aviation is not always easy. Even the most experienced occasionally fall victim to referring to UAS as a 'vehicle' or to the pilot as an 'operator'. The fact of the matter is, just like manned aviation, UAS are 'aircraft' that have a 'pilot-in-command' responsible for the operations.

Advanced technologies being developed for UAS are often proposed as a potential substitute for the pilot-in-command responsibilities. Despite any automation capabilities, the discussion to 'not have a human be responsible' is beyond the scope of this initial regulatory effort and will probably have to be addressed separately at the technical, policy, and legal levels in the future.

While risk assessment is not an exact science; the process of applying current or new regulations and standards for UAS sometimes requires 'qualified' assessments to be made in areas that are traditionally 'quantified'. This has presented some unique challenges for those with traditional engineering versus operational backgrounds. An example of this can be found in the 'see and avoid' requirement levied on the pilot-in-command. UAS proponents have been seeking to substitute or compliment this functional requirement with technological solutions. Identifying or 'quantifying' this for equipment designers and manufacturers has been elusive.

Compulsory compliance with regulations through a formal government review and approval process is new for the UAS industry and community at large. Prior to 2005, some manufacturers were largely unaware or indifferent to traditional certification requirements, and many entrepreneurs designing, building, and selling unmanned "aircraft" were oblivious to the regulatory and legal ramifications. Socializing regulatory compliance has sometimes been as difficult as defining the regulation itself.

In summary, the simple phrase "UAS are aircraft flown by pilots" reminds us how far we've come... and how far we have to go. If this phrase challenges us to think beyond traditional aviation, then this regulation will be a first step in that direction.

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