

With 900 types of unmanned aircraft systems (UAS) worldwide and a legislative mandate to speed UAS integration into the national airspace, the U.S. Federal Aviation Administration (FAA) is poised to propose rules later this year to regulate some aspects of UAS operations.¹

Although proposed regulations have been under development for months, the legislation, signed into law by President Obama on Feb. 14, specifies that unmanned aircraft (UAs) — sometimes called unmanned aerial vehicles, drones or radio-controlled

aircraft — must be safely integrated into the system no later than Sept. 30, 2015, and that a comprehensive plan for accomplishing the integration must be developed within nine months. That plan should provide not only a timeline but also a definition of “acceptable standards for operation and certification of civil unmanned aircraft systems,” requirements for operators and pilots, and a designation of airspace for “cooperative manned and unmanned flight operations,” the law says.

The new law also dictates that the first phase of the effort — the designation of six test ranges in which UAs

will be flown in the same airspace as traditional aircraft — should be accomplished within six months of the bill-signing date, in cooperation with the National Aeronautics and Space Administration and the Department of Defense, which already operate their own test sites.

“Technology is advancing to the point where we now know these systems can reliably fly,” said Michael Toscano, president and CEO of the Association for Unmanned Vehicle Systems International (AUVSI). “The next step is to work on the regulations that govern the rules of the sky to

A new law sets a timetable for incorporating unmanned aircraft into U.S. airspace.

Joining In

BY LINDA WERFELMAN



The U.S. National Aeronautics and Space Administration has flown Northrop Grumman's Global Hawk to study hurricane development.

ensure that unmanned aircraft do no harm to ... manned aircraft or to people or property on the ground.”

The Air Line Pilots Association, International (ALPA) has been cautious about the idea of sharing airspace with an increasing number of unmanned aircraft.

“No UAS should be allowed unrestricted access to public airspace unless it meets all the high standards currently required for every other airspace user,” ALPA said in a UAS white paper.² “The aircraft must be designed to have the same types of safety features; reliable, redundant systems; and maneuverability as the other airspace users. UAS operators must meet all the certification and fitness requirements of air carriers, and the ‘pilots’ flying the UAS aircraft must meet equivalent training qualification and licensing requirements as pilots of aircraft in the same airspace.”

The FAA asked in early March for public comments on the process to be used in selecting the six test sites, which Transportation Secretary Ray LaHood said would “help us ensure that our high safety standards are maintained as the use of these aircraft becomes more widespread.”

The agency said it was especially interested in comments on whether the sites should be

managed by government or a private company, what research activities should be undertaken and what geographic and climate factors should influence the site selection. The FAA plans to accept comments through early May and then to develop test site requirements, designation standards and oversight.

Under the new law, some of the smallest UAs could be in the air very soon. The law says that, within 90 days of its Feb. 14 enactment, plans should be in place for a simplified process to allow government public safety agencies to operate UAs that weigh 4.4 lb (2.0 kg) or less, provided the UAs are operated during daylight, within the operator’s line of sight at less than 400 ft above ground level (AGL), in uncontrolled airspace and at least 5 mi (8 km) from any airport “or other location with aviation activities.”

The goal, according to AUVSI and other supporters, is to “get law enforcement and fire fighters immediate access to start flying small systems to save lives and increase public safety.” Detractors, including the American Civil Liberties Union (ACLU), worry less about aviation safety than they do about fears that these smallest UAs represent an assault on privacy, “bringing us a large step closer to a





Bell Helicopter's Eagle Eye originally was intended for use in surveillance and reconnaissance work.

surveillance society in which our every move is monitored, tracked, recorded and scrutinized by the authorities.”³

Other provisions of the new law call for the development within six months of plans that will allow “small” UAs — those weighing less than 55 lb (25 kg) — to operate “for research and commercial purposes” in the U.S. Arctic, day and night, beyond lines of sight. The law is intended to designate permanent areas for the these UAS operations and to “enable overwater flights from the surface to at least 2,000 ft in altitude, with ingress and egress routes from selected coastal launch sites.” A notice of proposed rulemaking (NPRM) is expected later this year to propose regulations dealing specifically with small UAs.

The law also will require the FAA to create and update annually a five-year “roadmap” for introducing UAS into the National Airspace System (NAS). Under the legislative timetable, the first version of the roadmap is due to be approved early in 2013.

The FAA also will be required to study UAS human factors and the causes of UAS accidents.

Several occurrences — most of them involving military UAs — already have been reported, including the Aug. 2, 2010,

temporary loss of control of a U.S. Navy MQ-8B Fire Scout, an unmanned helicopter manufactured by Northrop Grumman, that strayed into restricted airspace around the U.S. Capitol. News reports at the time quoted military officials as saying that they considered sending fighter jets to shoot it down.

The reports said that the aircraft had taken off from the Navy's Patuxent

River test facility in southern Maryland on a routine test flight. About 75 minutes later, it lost its control link with Navy operators on the ground. The aircraft then flew about 23 nm (43 km) northwest and into the restricted Air Defense Identification Zone around Washington.^{4,5}

A report in the *Navy Times* said that Navy operators switched to a different ground control station to restore the control link and direct the aircraft to return to the Navy airfield, where it landed. No one was injured and the aircraft was not damaged in the incident, which officials attributed to “a software anomaly that allowed the aircraft not to follow its pre-programmed flight procedures.” The software subsequently was modified, they said.

In another incident, an Air Force Lockheed C-130 cargo plane and an AAI Corp. RQ-7 Shadow UA collided over Afghanistan on Aug. 15, 2011. Preliminary reports said no one was injured in the incident and that the C-130 received minor damage but was landed safely.⁶

An earlier accident — the April 25, 2006, crash of a General Atomics Aeronautical Systems Predator B near Nogales, Arizona, U.S.

— prompted the U.S. National Transportation Safety Board (NTSB) to issue its first report on a UA crash, as well as 22 safety recommendations, many of which involved the integration of UAS into the NAS, and to voice its concerns about differing standards for UAs and traditional, manned aircraft (ASW, 12/07, p. 42).⁷

“This investigation has raised questions about the different standards for manned and unmanned aircraft and the safety implications of this discrepancy,” said Mark V. Rosenker, who at the time was the chairman of the NTSB. Noting the need for rigorous pilot training, regardless of whether the trainee handles a manned aircraft or a UAS, he added, “The pilot is still the pilot, whether he [or she] is at a remote console or on the flight deck.”

‘Inherent Differences’

The FAA has echoed that sentiment, although the agency says that “the inherent differences from manned aircraft, such as the pilot removed from the aircraft and the need for ‘sense and avoid,’ [mean that the] introduction of UAS into the NAS is challenging for both the FAA and aviation community.”⁸

Those challenges have prompted a re-examination of some of the most fundamental aspects of aviation safety, the agency said in its *FAA Safety Briefing* magazine, which quoted UAS Program Policy and Regulatory Lead Stephen Glowacki as saying, “What we’ve experienced with UAS is almost a retrograde action in terms of trying to understand aviation. In many ways, we’re forced to re-evaluate the same things we thought we understood.”⁹

As an example, he cited the new concept of having a cockpit on the

ground, perhaps many miles away from the aircraft, and some related questions, including whether a UAS cockpit should be required to have the same door security system as the flight deck of a commercial airliner and whether a UAS pilot should be required to wear a seatbelt.

Military Roots

Historically, UAS have been flown in support of military and security operations, and the U.S. military currently has about 7,500 UAS in service, many of them in Afghanistan. In recent years, UAS use has spread to public use aircraft — those operated by law enforcement and government agencies — which fly them on operations including search and rescue, border patrol, fire fighting, environmental monitoring and disaster relief. Other flights involve research by public universities.

AUVSI’s Toscano said future uses of the “revolutionary-type

technology” are likely to include oil and pipeline monitoring, crop dusting and other civil and commercial operations. Those commercial operations are likely to include photography, aerial mapping, monitoring crops, advertising, communications and broadcasting.

“A whole new industry will emerge, inventing products and accomplishing tasks we haven’t even thought of yet,” Toscano said.

Under existing procedures, the FAA issues certificates of authorization (COAs) that permit flights of public use UAS. The FAA says that, in issuing a COA, which usually is effective for a specified length of time — typically one year — and with specified requirements, it may limit operations in some way, such as by including a requirement to operate only under visual flight rules or only during daylight. Under a COA, an operator may be required to coordinate flights with air traffic



The SIERRA, designed by the U.S. Naval Research Laboratory and developed by the U.S. National Aeronautics and Space Administration, has been used in air sampling and low-altitude surveys of remote areas.

control and to equip its UAS with a transponder before operating in some types of airspace. In addition, because a UAS cannot “see and avoid” other aircraft, it must be accompanied by an observer or a chase aircraft that stays in contact with the UAS during operations outside of restricted airspace.¹⁰

The number of COAs being issued has soared in the last few years, from 146 in 2009 to 298 in 2010. Through June 2011, 251 COAs were issued.

Existing policies also permit private recreational operators to operate model aircraft under terms discussed in FAA Advisory Circular 91-57. Operations typically are restricted to below 400 ft AGL and away from airports and air traffic.

Civilian Operations

The NPRM will include new policies, procedures and approval processes aimed at allowing civilian operators to launch UAS commercial ventures.

With the NPRM, the FAA will be “laying the path forward for safe integration of civil UAS into the NAS,” the agency said. “An evolved transition will occur, with access increasing from accommodation to integration into today’s NAS, and ultimately into the future NAS as it evolves over time.”¹¹

According to FAA projections, the greatest near-term growth in civil and commercial operations will be with small UAS because their size makes them adaptable for many uses and should keep initial costs and operating costs relatively low.

The FAA says it already has received public comments on the use of small UAS, from their supporters, who believe that, because of their size, they should be subject to minimal

regulation, and from critics who view them as a threat to manned general aviation aircraft as well as to people and property on the ground.

Critical Issues

The FAA has faced a number of key issues in drafting the NPRM, including the need for UAS, whose pilots are not in a position to actually see other air traffic, to instead be equipped to sense and avoid potential conflicts.

An Army official has been quoted as saying, for example, that if the RQ-7 involved in the Afghanistan midair collision had been equipped with a sense-and-avoid system, the accident could have been avoided.¹²

Other issues include the lack of UAS regulations, including regulations regarding pilot and crew qualifications, medical certification, aircraft certification and the layout and certification of ground control stations; and the increasing demand for the FAA to process more and more applications from UAS operators for COAs or special airworthiness certificates, which are issued for experimental category aircraft.

As the number of UAS in the skies has grown, so has the realization of related risks, such as the reliability of the control link between a UA and its pilot and what procedures should be followed in case the link is lost, the FAA said.

Among the other issues under consideration is what level of risk will be considered acceptable as UAS become more established and their numbers continue to increase.

“The FAA’s main concern about UAS operations in the NAS is safety,” the agency said. “It is critical that UAS do not endanger current users of the NAS, including manned and other

unmanned aircraft, or compromise the safety of persons or property on the ground.”

Notes

1. A UAS includes not only a UA but also the supporting system, typically consisting of a ground control station and command and control links, that enables its flight.
2. ALPA. *ALPA White Paper: Unmanned Aircraft Systems — Challenges for Safely Operating in the National Airspace System*.
3. Stanley, Jay; Crump, Catherine. *Protecting Privacy From Aerial Surveillance*. ACLU, December 2011.
4. Cavas, Christopher P. “Lost Navy UAV Enters Washington Airspace.” *Navy Times*. Aug. 25, 2010. <navytimes.com/news/2010/08/navy-uav-enters-dc-082510>.
5. Associated Press. “Errant Drone Near D.C. Almost Shot Down.” <cbsnews.com/2100-201_162-6854119.html>.
6. Hodge, Nathan. “U.S. Says Drone, Cargo Plane Collide Over Afghanistan.” *Wall Street Journal*. Aug. 17, 2011.
7. No one on the ground was injured in the crash, but the Predator B — owned by U.S. Customs and Border Protection and operated as a public use aircraft — was substantially damaged. The NTSB said the probable cause of the accident was “the pilot’s failure to use checklist procedures” while switching operational control from one console to another at the ground control station.
8. FAA. *Fact Sheet: Unmanned Aircraft Systems*. July 2011.
9. Hoffmann, Tom. “Eye in the Sky.” *FAA Safety Briefing Volume 49* (May/June 2010): 20–23.
10. FAA.
11. Ibid.
12. Warwick, Graham. “UAV Collision Bolsters Sense-and-Avoid.” *Aviation Week & Space Technology*. Aug. 18, 2011.