

5 Major Obstacles For Unmanned Aircraft Systems

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From May 8 through May 11, the Association for Unmanned Vehicle Systems International (AUVSI) held its annual XPONENTIAL conference, bringing together unmanned systems innovators, enthusiasts and regulators. During the conference, certain major problems emerged again and again – problems with the power to impede, slow or even halt the widespread integration of unmanned aircraft systems (UAS) into the U.S. national airspace. The following five problems will need to be resolved in the near future to unleash the economic and technological benefits of UAS.

1. Lack of Access to Spectrum

The majority of small UAS operations are currently flying within visual line of sight, and are controlled using unlicensed spectrum. This won't be the case for long. The coming expansion of UAS activities to beyond visual line of sight (BVLOS) flight will require both access to appropriate spectrum and infrastructure to transmit command signals to the aircraft. Solutions to these problems exist, but in order to avoid a bottleneck down the road, industry and regulatory agencies must act now to clear the way for BVLOS operations.

Aeronautical radionavigation spectrum near 1,000 MHz and 5 GHz has been identified for UAS command communications links. Use of these spectrum options, however, is now frustrated by the lack of any U.S. licensing scheme or operational and technical rules to permit UAS operators to access these frequencies. Further, developing such rules will not be a trivial matter and will require three regulatory bodies – the Federal Communications Commission, the National

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Telecommunications and Information Administration, and the Federal Aviation Administration – to design a complex management program to administer and assign frequencies in a fair and efficient manner co-equally to both government and commercial users. As FAA UAS Integration Office Director Earl Lawrence noted in one of the conference sessions, “Spectrum is a huge problem for us.”

The three agencies are going to have to come together to determine how to manage the spectrum, and how to do so in a dynamic way that will permit the number of operations expected in the years to come. Although that process will take years to complete, none of the agencies has begun the regulatory processes required to permit commercial use of spectrum for BVLOS flights. The Radio Technical Commission for Aeronautics (RTCA) will complete its Minimum Operational Performance Standards (MOPS) this summer, which is helpful in pushing the discussion forward, but addressing these issues seriatim may delay commercial availability by years.

In addition to designing a regulatory model for UAS frequency assignments, the industry will need to settle on a way to deliver these command signals to the aircraft. International standards work has been initiated to develop protocols for allowing commercial fixed satellite systems to provide these services. But new ground-based facilities may also be needed to provide sufficient bandwidth and coverage. Building out this physical infrastructure will take both resources and time.

One way to ease this burden is to utilize existing commercial wireless infrastructure and spectrum to provide command links for the majority of low-altitude BVLOS missions. Commercial wireless networks already cover the vast majority of the population centers, and with appropriate rule changes by the FCC, the existing spectrum allocations should be capable of absorbing a significant amount of UAS command-link traffic.

To this end, several major national cellular carriers and equipment manufacturers are participating in the FAA’s Pathfinder and the NASA UAS Traffic Management projects, and conducting their own research and development, to optimize the wireless networks for such flights. While this commercial spectrum likely cannot accommodate high-altitude flights or flights in very remote areas, leveraging existing networks will substantially reduce the problems associated with infrastructure build-out. Even here, though, regulatory action is needed, as the FCC will have to change its rules in order to allow UAS to use some of the commercial spectrum bands.

2. A Patchwork of State/Local Regulation

State and local restrictions on UAS operations were the specific subject of at least two panels at XPONENTIAL, but they were a recurring theme in many more discussions. The overriding concern, expressed by many at the show, was that state and local governments are increasingly active in this area, and that the inconsistent patchwork that will result presents a serious threat to the growth of the industry.

For decades, there has been little doubt that control of the skies is an exclusively federal affair, and that the authority to regulate aircraft and flight operations rests with the FAA. But as UAS have proliferated, many state

and local governments have begun to enact or consider new restrictions on where these aircraft can fly, who can fly them, and even what technical specifications they must meet.

In December, the FAA issued a fact sheet outlining its understanding of the scope of federal authority in this area. While not itself a legally binding document, the fact sheet is intended to provide practical guidance to state and local officials and legislators so that they do not stray into areas reserved to the federal government.

Despite this effort by the FAA, state and local restrictions have continued to proliferate, sometimes in ways that are directly at odds with the FAA's guidance. While the FAA (and the participants at XPONENTIAL) have recognized that states have legitimate concerns, particularly in the enforcement of existing laws that may apply to UAS use, there is wide agreement in the industry about the need for uniformity in flight rules.

The UAS community must work to educate state and local lawmakers both on the scope of federal authority and on the best policies for states to pursue in those areas where they do have authority. Otherwise, this balkanization may end up destroying innovation. Indeed, state regulation of unmanned aircraft threatens to set a dangerous precedent, calling into question federal primacy over manned aircraft – because if states are permitted to regulate one, there is no reason they cannot regulate the other.

3. Rogue Operators

The FAA is continuing its efforts to safely integrate UAS operations with manned aviation. But as one participant at XPONENTIAL put it, "Rules only matter to those who follow the rules." A large number of the commercial flights currently being conducted are done without FAA authorization, by operators who have not sought exemptions under Section 333. In addition, a number of recreational users are not taking the time to learn where they can (and cannot) fly.

Most of these operators do not intend to jeopardize public safety, and are simply trying to shortcut what they see as an onerous regulatory process. Nevertheless, the risks posed by these rogue operators are significant, falling into two categories.

- First, there is the obvious risk that a rogue flight will cause injury, either to people on the ground or in an air-to-air collision. This is a small risk, but the potential consequences must be taken very seriously.
- Second, there is the less direct, but no less important, risk that comes from potential regulatory reactions to rogue operations. Rogue flights that interfere with public safety or firefighting make headlines – and even if an accident does not occur, state and local regulators may be motivated to take action.

The question of how to deal with rogue operators remains unsettled, but is perhaps one of the most vexing problems facing the industry.

4. Lack of FAA Resources, Inconsistent Procedures, Backlog

The FAA continues to make progress in integrating UAS into the national airspace, and at XPONENTIAL the agency announced the creation of a new Drone Advisory Committee that will assist in solving the problems that this integration poses. But despite the progress, the agency continues to struggle with limited resources and inconsistent procedures. Compounding these difficulties are two broader issues.

First, the existing rules and procedures are for the most part temporary placeholders, which were designed to act as a bridge until the final rules are developed and finalized. The FAA continues to state confidently that the Section 107 small UAS rule will be released in the “late spring.” Once the final rule is released, this should relieve some of the stress on the agency, in part by eliminating the need to process Section 333 exemptions for the vast majority of commercial operators.

Second, and more broadly, there is a fundamental tension between the FAA’s historical paradigm and the new ethos of the UAS industry. Traditionally, the FAA has been charged with certifying aircraft designs whose life spans are measured in decades, and with overseeing the use of the NAS by a relatively limited number of well-educated licensed operators. But the UAS industry brings along a Silicon Valley pace, with design iterations happening on a yearly or monthly timeframe. Moreover, the relatively low cost of entry and operation means that, in terms of sheer numbers, the use of the NAS by UAS will vastly outstrip manned operations.

Ultimately, “integrating UAS” into the airspace is a continuing process, not a goal with a finite end point. The uses of this technology will continue to grow and evolve, and as they do, the FAA will need to keep adjusting its rules and procedures in accommodation. But while the agency has made substantial progress, in order to meet this continuing challenge it will need to reinvent itself and somehow reconcile its historic role in manned aviation with the new reality presented by UAS. The agency is still working out how best to accomplish this reinvention, and many substantial questions remain unanswered. One thing is certain, though – these issues will not get easier or less resource-intensive as the UAS industry rapidly expands over the next few years.

5. UAS Traffic Management

Today, there is no established plan for how to enable and safely manage the operations of UAS in flight in low-altitude airspace (at or below 500 feet). The lack of set “rules of the sky” for low-altitude UAS increases the risk of collisions – among UAS themselves, UAS and manned aircraft, and UAS and property. Engineers at NASA’s AMES Research Center in Moffett Field, California, led by Parimal Kopardekar, are hard at work addressing this problem by developing a UAS traffic management (UTM) solution in low-altitude airspace. UTM will be necessary to set the rules of the airspace for UAS. UTM will also need to balance the need for national and regional security, safe airspace integration, and scalable operations for economic growth. At XPONENTIAL, speakers noted that UTM will assume even greater importance once UAS are routinely permitted to fly BVLOS.

NASA is currently collaborating with other federal agencies as well as industry to develop UTM cloud-based software tools and conduct UAS testing and operations in varying types of airspace. NASA states that its UTM components will include wind and weather integration, congestion management, separation management, and contingency management. The first phase of testing addressed operations for agriculture, firefighting and infrastructure monitoring, with a focus on geofencing, altitude “rules of the road,” and scheduling of vehicle trajectories. The second phase of testing, scheduled for October 2016, will leverage existing research results and focus on BVLOS operations in sparsely populated areas as well as technologies that allow dynamic adjustments to UTM. This important research must continue on schedule in order to keep pace with the rapid development and adoption of UAS.

Conclusion

While these “big problems” present significant challenges to the integration of UAS, FAA leadership has signaled a willingness to engage on the issues and work with industry to reach solutions. Notably, at Xponential the FAA announced the creation of a UAS advisory committee designed to advise the FAA on key UAS integration issues. The FAA intends the committee to represent a wide range of stakeholder views including industry, government, academia, retail and technology. Working together, the FAA, other federal agencies, and stakeholders can try to facilitate resolution of spectrum, preemption, rogue operation, administrative resource scarcity, and UTM – among others – in order to safely and efficiently integrate UAS into the national airspace.