



Pilots and operators of manned aircraft are under a significant threat as inexpensive microdrones proliferate, while the FAA drags its heels in crafting a regulatory framework that will reduce risks, and permit drones and manned aircraft to peacefully and safely coexist.

The core of the problem is that the FAA is thinking about civilian drones as consumer products that can be ordered online, not \$200,000 manned aircraft.

Our article, *Drone Dread*, (R&W June 2014), explored the impact of drone technology on aviation. We used the term “microdrone” to refer to smaller vehicles that weigh less than 20-25 lbs., but carry high-quality video cameras. They are also flown

within the line of sight of the operator. “Macrodrone” are much larger - the size of small airplanes or helicopters - and present more challenging traffic separation and control issues.

We explained that one must think about microdrones differently from macrodrones – that neither category is going to kill off the civilian helicopter industry or dry up pilot jobs.

Microdrones are, however, already quite dangerous because the FAA is not looking for the right way to regulate them, and are instead trying to defend an unworkable ban. Microdrone devices are available now for a few hundred to a few thousand dollars on dozens of websites. The publicity associated with them, and their obvious utility in flying missions

that helicopters and fixed wing aircraft cannot fly safely or economically, is already tempting people to fly them for commercial purposes, notwithstanding the FAA’s ban.

In May 2014, Jim Williams, head of the FAA’s Unmanned Aircraft Systems (UAS) office, told the Small Unmanned Systems Business Expo that general regulations for microdrones would not be promulgated until after 2020. Congress, in the 2012 FAA Modernization and Reform Act, mandated that such regulations be effective no later than 2015. This much of a delay beyond the congressionally mandated deadline invites a lawsuit telling the FAA to move forward quickly.

The reason it will take so long is that the FAA assumes that it will begin with existing regulations for

Unmanned Aerial Vehicles that have law-abiding capability would change the landscape of the UAV community as we know it.

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# G DRONES

This X4 UAV is equipped with position lights for added safety. Photo courtesy of Draganfly Innovations

manned aircraft and adapt them line by line, to the peculiarities of microdrones. Instead, the agency should take advantage of the capabilities of microdrone technology to enforce certain limits on flight profiles autonomously. Such an approach would focus FAA energy on defining what limits should be built into drones commercially marketed, relieving it of detailed regulation of airmen and detailed flight rules to be enforced in the conventional way. A traditional approach will further strain FAA resources far beyond anything seen for much more expensive manned aircraft.

Aviation regulation traditionally has stood on three pillars: certification of aircraft, certification of airmen, and rules for flight operations. The process-

es for aircraft certification are mechanisms for imposing detailed requirements on vehicle design and manufacture. Airmen certification allows for requiring defined skills and knowledge of personnel who operate and maintain aircraft. Flight rules specify how aircraft are to be operated.

Requirements in the three areas are interrelated. For example, more demanding airmen requirements can compensate for more relaxed vehicle requirements; a highly skilled pilot can fly a poorly behaved aircraft safely, while only well-behaved aircraft should be flown by pilots with ordinary skills. And more restrictive flight rules can compensate for simpler airmen or vehicle requirements. For example, FAR section 91.319 imposes flight restrictions such as

VFR-day only on experimental aircraft, unless they meet additional certification requirements.

The capability of microdrones to restrict their flights opens up additional possibilities for this kind of trade-off. Most microdrones already on the market have some capability to hover autonomously. Many can also takeoff, land, orbit a GPS waypoint, and return home autonomously. Many, such as the "Movonator," an octocopter microdrone being built to evaluate mission-specific equipment, can be programmed to stay within an envelope defined by altitude, radius, and speed.

The FAA should embrace this self-enforcement capability, rather than engaging in the seven-year, line-by-line tradition apparently envisioned by Williams. It should

think of microdrones as the consumer products that they are. It should imitate the Federal Communications Commission's (FCC) regulation of Wi-Fi routers and cell phones, or the Consumer Product Safety Commission's regulation of lawnmowers.

Most people would laugh at an approach that would require a license before one could operate a lawnmower. Instead, risks presented by lawnmowers are regulated by prohibiting their manufacture and distribution, unless they meet certain standards.

The FCC uses the same approach to mitigate the risks of Wi-Fi networking by making certain blocks of radio frequency spectrum available on an unlicensed basis for wireless networking of computers. In this regime, users of the technology need not obtain radio operator licenses, as they must for many other wireless services. Operating rules exist, but rather than being enforced directly by FCC inspectors, or through radio operator licensing, the operating rules are internalized into the hardware. The requirements for hardware certification manage the risk of interference from the radio equivalent of a midair collision – though usually with less risk to human life and property – by limiting transmitter power and by requiring software that behaves in a certain way when the device detects a conflicting signal. It's not possible for the hardware to violate the operating rules unless one modifies it.

This approach also addresses the reality that microdrone technology is exploding. Already these vehicles have the capability to fly far beyond any reasonable limits. The problem will only get worse unless the FAA acts a lot quicker than Williams forecasts. The FAA can act more quickly if it puts detailed regulation of the drone operator



This "microdrone's" location can be tracked on a monitor that could let the remote pilot know when it is about to encroach controlled airspace. Photo by Ernie Stephens

(DROP) and intricate flight rules on the back burner, and instead focuses its resources on limits that must be built into microdrones.

No one likes further government intrusion into the open skies. But government has been a partner in aviation safety for ninety years, and only the government has the power to direct technology in directions that protect life and limb. Under this approach, only well-behaved microdrones would be legal. If someone buys one and operates it, he wouldn't need to know the content of flight rules for microdrones, because the microdrone would know them. The FAA would not need to roam the country looking for people flying microdrones too high or too far. The microdrones themselves would enforce the rules.

The most basic rules to be encoded into microdrones are already agreed on. First, a height limit is necessary to keep microdrones away from the airspace in which manned craft fly most of the time. Under the proposed approach, legal microdrones must have a navigational mechanism – a combination of barometric pressure sensors and GPS navigational systems – that would not permit them to fly above 400 ft. AGL.

Second, microdrones can be

flown only within line of sight. In order to keep them there, microdrones must have a built-in radius limit of, say, 1,500 ft. horizontally from the DROP.

As a further prerequisite for certification, microdrones must have a return-to-home feature that could be triggered by the DROP, and which would be automatically triggered by loss of signal. This also might be triggered by an indication that the DROP has become inattentive, kind of like the "dead man control" on railroad locomotives.

Specific airspace restrictions also could be enforced. Relatively inexpensive moving map systems for manned aircraft could automatically alert pilots that they are about to enter controlled airspace. The same technology could be used to prevent microdrones from flying into that space.

Once a microdrone meets these requirements and is type certificated by the FAA, it could be offered for sale through any channel. A potential operator could buy one anywhere and fly it for whatever purpose without having to worry about compliance with FAA rules. Compliance would be built-in.

To be sure, no regulatory system encounters 100 percent compliance, but the incidence of noncompliance is a function

of the incentives for and ease of noncompliance. If the microdrone type certification requirements are a reasonable balance between legitimate safety concerns and productive utility, few purchasers of these systems would have a significant incentive to corrupt them so they would become outlaws.

Furthermore, the UAVs themselves can be made extremely difficult to corrupt. After all, if a smartphone is designed to resist user modifications, so can a small aircraft. While it might be overkill, microdrones could be programmed to detect tampering and create a log that could be used as evidence against those who tampered with them, the same as with smartphones.

This approach is far better suited to regulation of consumer products – which microdrones already are – than what Williams is used to. He thinks about a regulatory strategy designed around expensive airplanes and helicopters, which are not bought online, used, and discarded casually.

The subsequent announcement by Williams that the FAA is willing to consider, on a case-by-case basis, applications by individ-

This Draganfly Innovations X6 is operated by the Grand Forks (S.D.) Sheriff's Dept. The agency works closely with various experts and the FAA to ensure its safe operation. Photo courtesy of GFSD



ual operators to use microdrones for specific purposes is welcome. Presumably, any such applications would resemble the current Special Airworthiness Certificate-Experimental process. Applicants must provide the details of the microdrones and their characteristics, the purposes of the program, and a defined geographic area within which operations would be conducted. This is better than continuing a fruitless effort to ban all commercial drone flight, but it is not a sustainable approach. Only larger operators have the resour-

es to participate effectively in such a detail-intensive process, while individuals and smaller operators will continue to plow ahead, willing to take the risk of FAA detection and enforcement.

The main regulatory challenge –and derivatively the threat to our safety – is that the FAA has no experience in regulating consumer products. It needs to acquire that expertise. And it needs to get moving, before the attractiveness of microdrones makes the FAA's position irrelevant and puts us all in peril. 🚫

## Is it a Drone?

Over the past few years we have all read a lot about remote controlled aircraft, though different terms have been used to make reference to them. With the term "drone" originally being used to describe an unmanned aircraft used for target practice, but the general public adopting the word to describe any unmanned aircraft used for any purpose, the question within the professional aviation community is: Should the word "drone" keep its original meaning, or should it and variations thereof (i.e., microdrone, macrodrone, etc.) be used to replace the terminology?

**Optionally Piloted Vehicle (OPV)** - Any vehicle that can quickly and easily be converted from remote control to being flown by an onboard pilot.

**Remote Piloted Vehicle (RPV)** - Same as a UAV, but perhaps the most accurate term in the sense that these aircraft are neither stupid, as implied by the word "drone," nor unpiloted, as implied by the term "unmanned?"

**Unmanned Aerial System (UAS)** - The term used to collectively describe an unmanned aircraft and its controls, telemetry, mission equipment and sometimes the remote pilot.

**Unmanned Aerial Vehicle (UAV)** - Arguably the second most popular term (just behind "drone") to describe any remotely controlled aircraft not marketed as a toy. 🚫