



Leashing Drones

DON'T DRONE ME BRO'

Henry H. Perritt, Jr. and Eliot O. Sprague

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THE PROLIFERATION OF CIVILIAN DRONES AND ALL THE TALK ABOUT THEM IS SENDING SHIVERS THROUGH THE HELICOPTER COMMUNITY. IT'S HARD TO TURN ON THE TELEVISION, OPEN A NEWSPAPER, OR BROWSE YOUTUBE WITHOUT A DRONE STORY POPPING UP:

- Someone's been arrested for flying a small drone to take pictures of an automobile accident, claiming he was going to provide it to the local TV station.
- A law-enforcement agency has received a grant to experiment with drones carried in the trunks of patrol cars.
- A pessimistic reporter claims that drones will supplant helicopters in daily news operations.
- E-commerce vendors are hatching plans to deliver packages by drone, even as their competitors buy up drone companies to provide high-altitude Internet points of presence.

It's now not unlikely that one might be driving on the expressway and see a microdrone flying over a construction site conducting a survey. A Chicago resident may look out their apartment window and see one flying down the river. Some people even report them as UFOs.

When asked, FAA representatives sternly reiterate that commercial drone flight is illegal—or express confusion as to what is legal and what is not. In several articles in the trade press, we have argued that the small ones – microdrones – will continue to pop up all over the place, but that they will complement manned helicopter missions, flying in spaces and under circumstances that manned helicopters cannot fly safely or at acceptable costs. The big ones – machodrones—will have to run a gauntlet of regulatory requirements that probably will make them so expensive to buy and operate that no rational decision maker will prefer them over helicopters.

The President of HAI, Matt Zuccaro, argued in a recent column that the helicopter community could benefit from drone technology because drones will round out the aviation support capabilities that it can offer customers. We agree with him. Being both helicopter and airplane pilots, we have undertaken serious research over the last six months into the unmanned aircraft systems (UAS) phenomenon. We have flown several different kinds of drones, from bumblebee size to the much-featured Phantom 2, and are now building a larger microdrone particularly designed to explore capabilities in the arenas of electronic newsgathering, power line and pipeline patrol, law enforcement support, real estate marketing, and farming.

GET IN THE GAME

Helicopter pilots and operators should not sit back in the shadows, counting the days or minutes until drones and DRone OPERators (DROPs) replace them. Instead, we should offer our expertise in rotorcraft operations to shape the future of drones. Microdrones don't threaten our jobs, but they do threaten our safety. Unless we become proactive in channeling the FAA's regulatory response to this new technology, we may spend a significant part of the rest of our careers with adequate job security but regularly dodging drones.

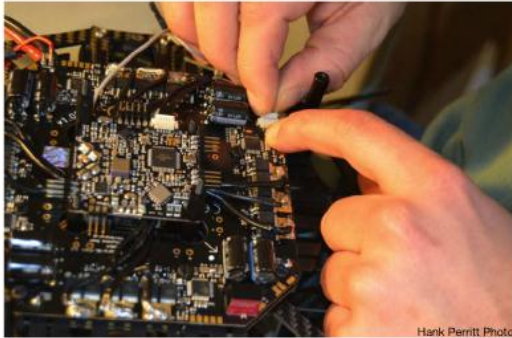
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We can help with two problems that the FAA faces. First, the agency is taking entirely too long to wrap itself around this problem. Jim Williams, the FAA's chief drone policymaker, recently predicted that comprehensive microdrone regulations wouldn't be on the books until after 2020. Subsequently, he acknowledged that some operating certificates might be granted sooner, on a case-by-case basis for specific kinds of operations.

Delays in making drones legal might seem like a good thing for those worried about them, but it is not. The lure of microdrone capabilities, and prices at \$1,000 or less for ones that can take HD video and stream it back to the ground, already are causing freelancers and commercial entities to use them, either ignoring the FAA's ban or rationalizing that commercial drone use is permissible under the recent Pirkler decision by an administrative law judge at the NTSB. This isn't the first time that a legal prohibition out of step with technology and marketplace realities has proven unenforceable.

In the meantime, we need to add our voices to those of the thirty industry groups that recently urged the FAA administrator to speed up his regulatory initiatives and to make some pragmatic accommodations for safe commercial drone use. So far, the loudest voices in the public debate over drones are those of privacy advocates. Of course, privacy is important, but more helicopter voices need to be raised because our concerns are different. The main helicopter associations do a good job of maintaining a continuing dialogue with the FAA over aspects of aviation regulations that affect the rotorcraft community. But they could use a more robust and broader participation by their constituents (us) to sharpen the focus of the discourse over drones. Flying for different industries, and daily experience with diverse mission profiles, give us a deep understanding of the hazards that might be presented by uncontrolled or poorly regulated microdrone

flight. Not only that, we know how to fly all kinds of rotorcraft and therefore have insights into some of the challenges that will confront DROPs. After all, who knows low-altitude airspace better than helicopter pilots?

There's no conference room in Washington big enough to hold all of us. Inevitably, our voices will be heard through our association representatives who regularly participate in the political process. We can shape their input through both casual conversation and more formal communication, in blog contributions, and through comments on the NPRM (Notice of Proposed Rule Making).

Actually the timetable set up by the U.S. Congress in the 2012 FAA Modernization and Reform Act is a pretty good one, if the FAA would only stick to it. It calls for the release of an NPRM now (it's about a year late already) with final rules for commercial microdrones by, say, mid-2015. But merely hurrying is hardly sound policy. What should be the content of microdrone rules? Shaping the content represents the second way that helicopter pilots and operators can help determine their futures.

Some aspects of a gradually forming consensus are sound. Most fundamentally, microdrones should be confined to certain spaces where they are less likely to encounter manned aircraft. How should these spaces be defined, and how can we make certain that microdrone DROPs will be able to control their microdrones and keep them there? That depends on the content of specific rules in the three traditional categories of aviation regulation: flight rules, airman certification, and aircraft certification.

FLIGHT RULES

Let's start with flight rules, and then consider how airman and aircraft requirements can reinforce them. First, routine microdrone flight should be allowed only below 400 feet AGL, and only outside class B, C, or D airspace. Most of the time, most airplanes and helicopters do not fly below 500 feet AGL unless they are landing or taking off.



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So, relegating microdrones to this airspace achieves a good deal of traffic separation all by itself.

Since microdrones are unlikely to have the useful load capability to carry the full panoply of VHF and UHF transceivers, mode S transponders and other ADS-B apparatus, application of the see-and-avoid rule requires that microdrone flight be confined to areas within the line of sight of the DROP. Flight rules for microdrones should reinforce a line of sight requirement. One way to do this is to limit the radius at which a microdrone can be flown, measured from the DROP's console, say a horizontal limit of 1,500 feet.

Of course, imposing rules on DROPs for microdrone flight will do no good unless the DROP retains control of the vehicle. That implicates rules for aircraft behavior when control is lost. Much of that involves aircraft design and should be part of the aircraft type certification process. However, flight rules should require that the control link be maintained and that the drone be landed or returned to its launching point immediately when the control link is lost.

DROP CERTIFICATION

The more that rule compliance is hard-wired into the microdrone, the less necessary is airman certification. Any kind of airman certification requirements should reflect an understanding of the risks that can be mitigated by qualified airmen and the knowledge and skills they need to play such a risk mitigation role. No one can obey rules that he or she does not know and understand. So, like pilots of manned aircraft, DROPs should be required to have a basic understanding of microdrone regulations.

DROPs also need knowledge and skills different from those of pilots. For example, they need to understand how wireless control links work, what can cause a link to be lost, and what responses by the DROP are appropriate when the link is lost. They also need to acquire and demonstrate proficiency in certain maneuvers and perceptual activities unique to microdrone flight where the operator is outside the aircraft. Flying from outside the cockpit is quite different from flying from inside. For example, they must be proficient in detecting a microdrone's orientation as it flies further away and becomes less visible. They need to be able to use two-dimensional screen images of flight profiles or a video captured by the drone, often called first person view (FPV) by model aircraft hobbyists. They need to be good judges of height and distance, with or without the aid of telemetry from the microdrone. Simply requiring that DROPs be licensed pilots is not the solution. What it takes to be a good airplane or helicopter pilot is quite different from what it takes to be a safe microdrone DROP.



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AIRCRAFT CERTIFICATION

Aircraft certification requirements can begin by codifying certain features already available in most of the microdrone products offered for sale. The most fundamental of these are requirements that the control link between microdrone and DROP be robust, that the microdrone respond quickly to DROP control inputs, and that they have various autonomous capabilities that can be brought into play by the DROP, or automatically when the control link is lost or a mishap is about to occur. Autonomous hover and autonomous return to home are available now in most of the commercial products, even at the very low end of the price range. These should be required before microdrone types are certified. How responsibility should be allocated between the DROP and the machine for deciding when to trigger these automatic control algorithms is another matter. We plan to explore, in a subsequent article, the possibility that requiring most of the flight rules to be built into the drone could greatly reduce the burden on the FAA of writing detailed flight rules and airman certification rules.

Now, with a reasonable outline of what the microdrone rules should be, we can take our time with the rules for larger machodrone aircraft, because they will be much more detailed, reflecting a much different risk profile. But we can't take our time with the microdrone rules. Otherwise, we're going to be flying in skies occupied not only by us, but also by millions of small outlaws.

GET TO WORK

There's no reason that translating the outline of microdrone rules presented in this article into regulatory language should take ten years – or even five – depending on how you interpret Mr. Williams' prediction. Indeed, a group of motivated helicopter pilots and operators, aviation lawyers, and FAA personnel probably could come up with a NPRM reflecting this approach by sitting around a table together for a week.

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This is what should happen. We need an NPRM, even if there are details to be filled in later. We need to get to work. The FAA, and those of us who help it craft the rules, must recognize that we're regulating something that is available off-the-shelf at very low prices. In other words, the economic barriers to entry are quite low. People purchasing microdrones are likely to be individuals and small businesses not now in the aviation industry. If they are confronted with a regulatory process designed for type certification of the 787, the Diamond Twin Star, or licensing requirements for instrument-rated medevac helicopter pilots, they are more likely to take the outlaw route. The regulatory process needs to be much simpler.

Helicopter pilots and operators must be at the table, not sitting in the ready room wringing their hands about how "they" are going to introduce drones into their skies. It will not turn out well if helicopter pilots and operators simply avoid the subject—so don't.

About the authors: **Hank Peritt** is a professor of law and former dean at Chicago-Kent College of Law and a private helicopter and airplane pilot. **Eliot Sprague** is a professional news helicopter pilot and a helicopter instrument flight instructor. Mr. Sprague taught Mr. Peritt how to fly helicopters. Together they manage **Modovolate Aviation, LLC**, which conducts drone research, evaluation, demonstration, and education programs.

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