

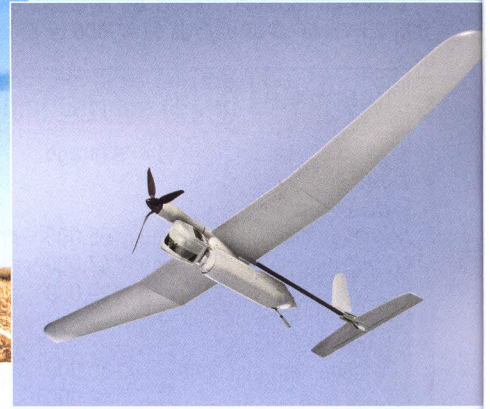
# But who's going to fly them?



Schiebel's Camcopter has 6 hrs of endurance, a maximum takeoff weight of 440 lbs and can fly as fast as 140 mph.



With a flight time of up to 88 minutes, the md4-1000 microdrone was engineered as a geoinformatics tool, to survey and map land areas from the air.



Skylark II from Elbit combines silent electric propulsion with EO/IR/Laser payload and is capable of flying covertly at low altitudes, under cloud cover and at night.

By Henry Perritt, Pvt-SEL/Helo and Eliot Sprague, Comm-Multi-Inst/Helo/CFII

Newspapers, magazines, TV screens, and iPad screens are full of them. UAS, UAV, sUAS, microdrone, machodrone, drones.

Privacy advocates are spinning horror stories of whirling rotors sticking cameras in bedroom windows. Futurists have everyone excited about new ways to receive FedEx deliveries and Amazon orders. We are told that the skies will be full of them, worse than flocks of geese to be avoided by pilots. Pilots think that they hear buzzing noises behind them, precursors to swarms of drones that will ground their helicopters and relegate them to sitting in dark dungeons behind video screens, "flying" from the ground.

This is all nonsense. Commercial drone operation is currently illegal. The FAA allows hobbyists to fly almost anything for recreational purposes—and they are regularly pushing the boundaries of *recreational*—but assesses fines of \$10,000 for flying a small drone sold to hobbyists to take pictures of Thomas Jefferson's iconic University of Virginia campus. Bigger stakes would deter any pipeline patrol operator that values its Part 91 or Part 135 certificate from submitting a bid to replace manned helicopters or airplanes with drones.

## So what is going on?

Some facts underpin a useful starting point. The US Congress has told the FAA that it must come up with a plan for integrating drones into the National Airspace System. It suggested that the FAA distinguish between microdrones and machodrones. Microdrones weigh less than, say, 20 lbs, fly mostly within the line of sight of the operator—a Drone Operator, or "DROP"—and will be relegated to low altitudes, where most manned aircraft

do not fly. Machodrones will be light helicopters or civilian versions of the much publicized military Predator, a fixed-wing drone roughly the size of a Cessna 172.

The FAA has responded with a Comprehensive Plan and Roadmap that accepts the distinction between the 2 size categories and promises to begin the integration process with the release of a Notice of Proposed Rulemaking (NPRM) this year. FAA has already designated 6 test sites to collect data that may be useful in its further regulatory actions and has relaxed restrictions on obtaining Certificates of Waiver and Authority (COAs) for federal, state and local law enforcement experimentation.

Since it is under increasing pressure to get its act together regarding UAV and drone use in the NAS, FAA is studying integration possibilities. Meanwhile an Administrative Law Judge (ALJ) at the National Transportation Safety Board, which hears appeals of civil monetary penalties assessed by FAA, invalidated the University of Virginia penalty. He held that the FAA has never asserted its authority over microdrones flown by hobbyists for recreational purposes. It cannot, therefore, say that they are "aircraft" when they're flown for commercial purposes but not when they are flown for fun. The FAA has appealed the decision to the full NTSB and has a variety of legal powers to circumvent the effect of the decision even if it is upheld.

Responding to the ALJ decision, a couple of dozen trade associations, including all of the major aviation advocacy groups, wrote a letter to the FAA Administrator urging him to expedite release of the NPRM and, in the meantime, to allow more flexibility for commercial experimentation and demonstration of microdrones.

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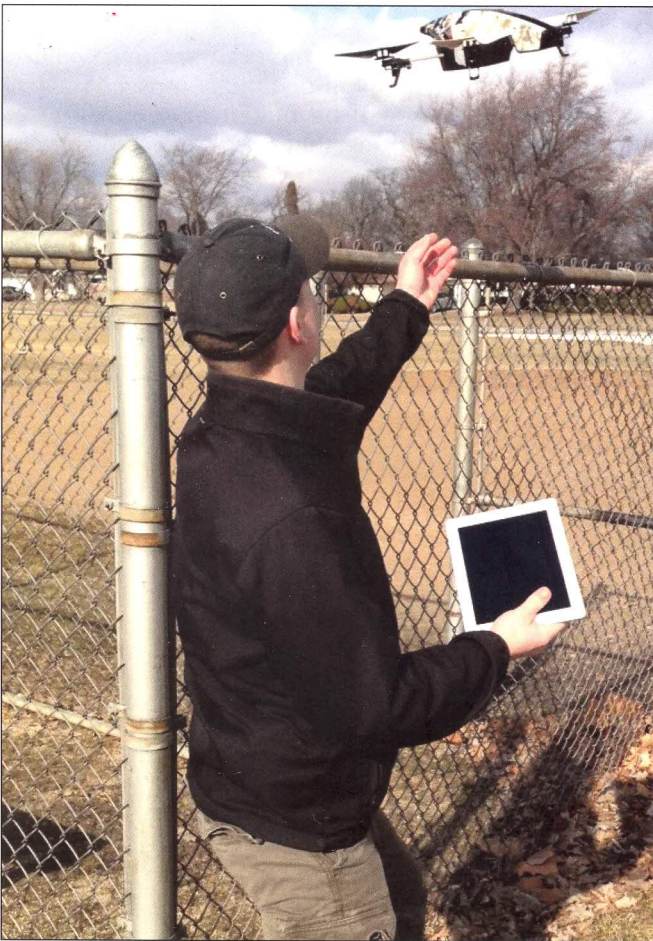
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## Market for microdrones has unlimited possibilities

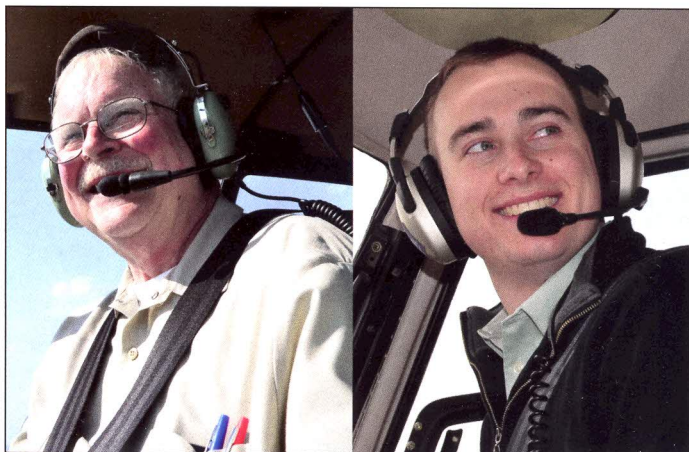
The market for microdrones—legal or not—is flush with offerings. You can buy a Parrot AR Drone 2.0 quadcopter for \$299.95, or a Phantom 2 Vision for \$978.95 on Amazon. Both use high-definition cameras that can stream or store video, have autonomous hover and return-to-home features, and can fly at 35 kts or so at altitudes up to 500 ft AGL. Beefier microdrones are available from European vendors and US vendors such as Quadcopter.com for \$5,000-\$20,000. As one law-enforcement wag said, “This is a lot less than the cost of a patrol car.” They have big useful loads and very long endurance. Police commanders, TV station and network executives, utility managers, and realtors are salivating at the possibilities—and many are not waiting for the FAA.

## Machodrone markets still to be determined

As for machodrones, it's anyone's guess. If one of the bold inventors who has designed one, taking advantage of electric propulsion systems that control thrust by varying rpm—a specialty of electric motors—instead of controlling blade pitch, and thus dispensing with fuel tanks, gearboxes, long drive trains, control rods, and pitch links, he's got to get an airworthiness and type certificate. Every new feature and subsystem will be subjected to flight testing and FAA second-guessing. The cost will be enormous. And then what about operating



Sprague retrieving a microdrone after a test flight.



Hank Perritt, who has his private helicopter and airplane pilot licences, learned to fly helicopters from Eliot Sprague, a graduate of Hillsboro Aviation Flight School and helicopter flight instructor for Midwestern Helicopters.

costs and performance? ADS-B equipment, which will be required of all aircraft by 2020, will allow other aircraft to see the machodrone. Multiple cameras will feed multiple video displays so the DROP can pretend that he's in the cockpit. Special autopilot subsystems will enable return-to-home flight if the control link is lost. Before long, a design engineer will say, “Screw it. Let's just put someone in the cockpit.”

## View of the authors

Our view—and we are both helicopter and airplane pilots and have tested microdrones from the sparrow size to the Phantom, and are building one of our own at the high end—is that the sky will soon be full of microdrones, but that machodrones will remain mainly a fantasy for the foreseeable future. Pilot jobs and manned-aircraft contracts are safe.

Microdrones will do close-in, ad-hoc law-enforcement support, news gathering, pipeline and power line inspection, and real estate marketing functions that manned aircraft cannot do safely or economically today. This is likely to be the case regardless of what the FAA says; the lure is just too strong. Hopefully the FAA will be nimble enough to stay a step ahead of the technology and the market, although the many delays in formulating components of NextGen, of which drone integration is to be a part, are not encouraging.

A timely release of the NPRM is essential so the aviation community can begin to engage specifics about how to realize the advantages of microdrones while protecting airspace from near-miss chaos – hopefully no worse than near-miss.

Rotary-wing machodrones, if they ever are offered for acquisition at all, will be crippled in performance and cost by conservative regulation and political hysteria.

Fixed-wing machodrones, on the other hand, already are operational in remote civilian environments. Introducing them elsewhere, where runways must be made available, will be a bigger challenge. The FAA has issued its first restricted-category type certificates for ConocoPhillips to fly a ScanEagle off the Alaska coast and for AeroVironment to fly a Puma AE for oil spill



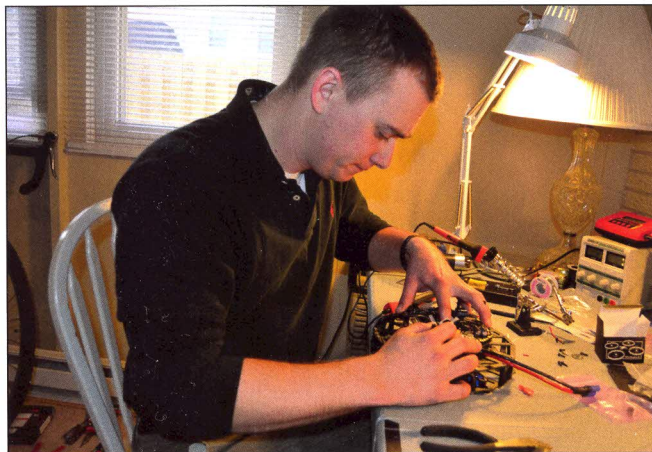
Perritt working on the structure of the Movonator, a 15 lb octocopter that he's building with Sprague as a test platform for specialized mission equipment.

monitoring and wildlife observation off the coast of the Beaufort Sea in the Arctic Circle.

### Eventually technology will overcome political defense of the status quo and offer attractive economics

There will be drones in our futures. But who will fly them? Who will be the DROPS? Your kid? How will that conversation go? The kid sits you down, taking a break from drinking beer with his friends, rebelling against everything you have built your life around, and says, "Dad, tell me what it's like to be a pilot. I've been thinking about it." Will you say, after overcoming your astonishment at the rejection turning into imitation, "Well, son. I love flying, but I have to advise you to go to the University of North Western Michigan, or North Dakota University or Embry-Riddle and learn to become a drone pilot—what some people call a DROP. Better career opportunities there.?"

No, you won't. You may lament that the glory days of aviation are past. That the romance and excitement is gone. That he should seek another field altogether—fantasy sports software development, perhaps. But if you do that, he will know that the romance of aviation has left your heart. If the quest for perfection, the search for confidence, the feeling of flying an aircraft like it were a glove, has not abandoned you, you will tell him something different. Here's what we suggest you tell that kid of yours: "Son, you've gotta be brave. Once upon a time—before my time—you had to be brave in the physical sense. In my time, you had to be brave in the sense that you had to press on against prejudice—I heard stuff like 'You're too young; you don't have enough turbine time. In your time, you'll have to know who you are—what you want—and be strong enough to ignore those who say 'bah! Helicopters. They're a thing of the past; they're going to be replaced by drones.' Flying helicopters is not like working on an assembly line, where purely repetitive tasks requiring little judgment or adaptation to unpredictable environmental variations can be performed more accurately and tirelessly



Sprague refining the navigation system for the Movonator. Sprague and Perritt aim to evaluate suitability for these vehicles to support law enforcement, newsgathering, power line and pipeline patrol, aerial surveying, real estate marketing and agriculture support.

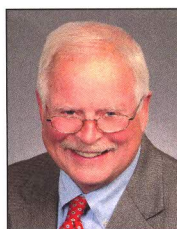
by a robot than by a human being. There will always be jobs for helicopter pilots—good helicopter pilots."

"Now, son, you and I are different. That's a mandate of life—God's prescription. You've got your mother's DNA as well as mine. You may be somewhat clumsier in learning to hover than I was. You may be longer in overcoming your fear of autorotations than I was. In that case, flying essentially the same machine from the safety of the ground may be a way to have the best of both worlds."

"Thanks, Dad," the kid says.

And that won't be bad advice. There will be about as many helicopter jobs as there are now, growing with the economy. Machodrones will be mainly a psychological threat. Microdrones will be buzzing around, but in areas and under circumstances where manned helicopters don't fly.

And, yes, becoming a DROP will be a new career option. "But, son, even though types of machines available to you in the future will probably change, you can still have a proud, well-paying and satisfying career as a pilot."



Hank Perritt is a professor of law and former dean at Chicago-Kent College of Law. Perritt is a private helicopter and airplane pilot and received his BS degree in aeronautics and astronautics from MIT. He worked as an application engineer and senior sales planner for Lockheed from 1968 to 1971.

He writes on law and technology.

Eliot Sprague is a professional ENG helicopter pilot, dir of market development and commercial pilot, AM Air Service and helicopter flight instructor for Midwestern Helicopters. He is a member of the board of directors of the Midwest Helicopter Association.

Together, Perritt and Sprague manage Modovolate Aviation, which conducts drone research, evaluation, demonstration and education programs.

