

How I Accidentally Kickstarted the Domestic Drone Boom

· By Chris Anderson

· [Email Author](#)

· June 22, 2012 |

· 6:32 am |

· Categories: [Drones](#)

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Open source drones, like this ArduCopter Quad from 3D Robotics, now outnumber military drones in the US. Photo: Misha Gravenor

At last year's Paris Air Show, some of the hottest aircraft were the autonomous unmanned helicopters—a few of them small enough to carry in one hand—that would allow military buyers to put a camera in the sky anywhere, anytime. Manufactured by major defense contractors, and ranging in design from a single-bladed camcopter to four-bladed multicopters, these drones were being sold as the future of warfare at prices in the tens to hundreds of thousands of dollars.



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In May, at a different trade show, similar aircraft were once again the most buzzed-about items on display. But this wasn't another exhibition of military hardware; instead, it was the Hobby Expo China in Beijing, where Chinese manufacturers demo their newest and coolest toys. Companies like Shenzhen-based DJI Innovations are selling drones with the same capability as the military ones, sometimes for less than \$1,000. These Chinese firms, in turn, are competing with even cheaper drones created by amateurs around the world, who share their designs for free in communities online. It's safe to say that drones are the first technology in history where the toy industry and hobbyists are beating the military-industrial complex at its own game.

Look up into America's skies today and you might just see one of these drones: small, fully autonomous, and dirt-cheap. On any given weekend, someone's probably flying a real-life drone not far from your own personal airspace. (They're the ones looking at their laptops instead of their planes.) These personal drones can do everything that military drones can, aside from blow up stuff. Although they technically aren't supposed to be used commercially in the US (they also must stay below 400 feet, within visual line of sight, and away from populated areas and airports), [the FAA is planning to officially allow commercial use starting in 2015](#).

What are all these amateurs doing with their drones? Like the early personal computers, the main use at this point is experimentation—simple, geeky fun. But as personal drones become more sophisticated and reliable, practical applications are emerging. The film industry is already full of remotely piloted copters serving as camera platforms, with a longer reach than booms as well as cheaper and safer operations than manned helicopters. Some farmers now use drones [for crop management, creating aerial maps to optimize water and fertilizer distribution](#). And there are countless scientific uses for drones, from [watching algal blooms in the ocean](#) to low-altitude measurement of the solar reflectivity of the Amazon rain forest. Others are using the craft for [wildlife management](#), tracking endangered species and quietly mapping out nesting areas that are in need of protection.

To give a sense of the scale of the personal drone movement, [DIY Drones](#)—an online community that I founded in 2007 (more on that later)—has 26,000 members, who fly drones that they either assemble themselves or buy premade from dozens of companies that serve the amateur market. All told, there are probably around 1,000 new personal drones that take to the sky every month (3D Robotics, a company I cofounded, is shipping more than 100 [ArduPilot Megas](#) a week); that figure rivals the drone sales of the world's top aerospace companies (in units, of course, not dollars). And the personal drone industry is growing much faster.

Why? The reason is the same as with every other digital technology: a Moore's-law-style pace where performance regularly doubles while size and price plummet. In fact, the Moore's law of drone technology is currently accelerating, thanks to the smartphone industry, which relies on the same components—sensors, optics, batteries, and embedded processors—all of them growing smaller and faster each year. Just as the 1970s saw the birth and rise of the personal computer, this decade will see the ascendance of the personal drone. We're entering the Drone Age.

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No, You Can't Use a Drone to Spy on Your Sexy Neighbor

· By [Wired Magazine](#)

· [Email Author](#)

· June 22, 2012 |

· 6:30 am |

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Illustration: Señor Salme

What are the laws against drones—and their masters—behaving badly? Turns out, there are few that explicitly address a future where [people](#), [companies](#), and [police](#) all command tiny aircraft. But many of our anxieties about that future should be assuaged by existing regulations. We asked [Ryan Calo](#), a law professor at the University of Washington, to weigh in on some of the issues.

Can I use a drone to spy on my sexy neighbor?

Ogle at your own risk, but the fact that you're spying by plane shouldn't make a difference. Peeping Tom laws say you can't view a fully or partially nude person without their knowledge, so long as they have [a reasonable expectation of privacy](#). Chances are, if you need a drone to see her, your neighbor is justified in thinking she's alone.

If you do spy, she can likely sue for "intrusion upon seclusion." There are limits: The conduct must be highly offensive to a reasonable person, and courts often dismiss cases where the plaintiff can't show any real harm. Still, if you want to see your neighbor naked, the safest technology remains your imagination.

Can I use a drone to deliver a cup of coffee?

No—at least not yet. The Federal Aviation Administration, policeman to the nation's skies, prohibits most commercial use of drones. Hobbyists can fly them outside of populated areas, provided the drones stay within sight and below 400 feet. But delivering a product for compensation is not allowed.

The good news for drone (or latté) enthusiasts is that Congress recently [required the FAA to reexamine its policy](#), under a new law that demands a "comprehensive plan" to allow private-sector drones by fall 2015. Still, technical hurdles cast doubt on whether airborne baristas are the most likely application. The smart money is on robotic paparazzi.

Could a police drone look in my windows for drugs?

Maybe. The law generally doesn't recognize privacy rights regarding anything that cops can spy from a public vantage. Officers in a helicopter can already look into your backyard without a warrant.

That said, the courts often treat the interior of a home as off-limits. For example, [the Supreme Court has rejected the use of thermal-imaging devices to search for indoor grow lights](#) (often used in marijuana cultivation), for fear that the officers might discover “intimate details” such as the time when “the lady of the house takes her daily sauna and bath.”

In that case, the court thought it important that thermal imaging was not in “general public use.” But as drones become common, courts may say we should draw our curtains if we want to maintain an expectation of privacy.

Could the police follow my car with a drone?

Yes, but if it follows you long enough, the police might need a warrant. Generally speaking, officers can follow a vehicle without getting the courts involved—for instance, by driving behind it. But in a recent Supreme Court case, on whether officers need a warrant to affix a GPS device to a car for a month, a majority of justices expressed concern about the length of time. Ultimately, [the Court decided the case on a different ground, holding that a warrant was required to attach any object to a car](#). But [police drones](#) might prompt them to revisit just how much public surveillance is too much.



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Flying-Robot Cops, Farmers, and Oil Riggers Get to Work

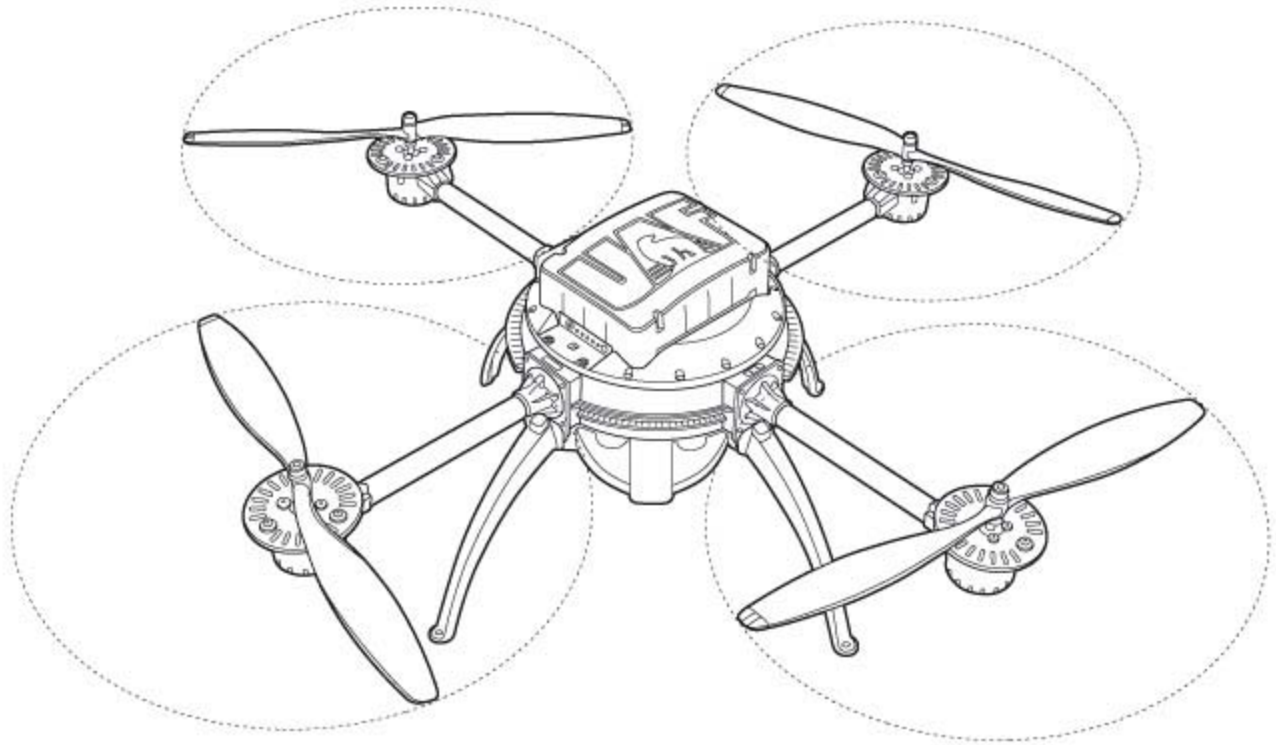
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In the oil-rich fields of Alaska's North Slope, gas flares burn constantly, occasionally bursting into fireballs two stories tall. It's a safety feature of BP's operation: burning off excess gas from drilling. Unless the facility is shut down—which costs BP millions—carrying out a detailed examination of those nozzles is out of the question. Which explains why the operation is inspected only once a year at the most.

At least, that was the schedule until November 2011. As an experiment, BP brought in Greg Walker to fly a 2.5-pound Aeryon Scout quadrotor drone to examine the flares between inspections. With the Scout, Walker—manager of the Poker Flat Research Range for the University of Alaska Fairbanks—was able to spot a crack in one of the nozzles while it was still burning. Doing the repair required a shutdown, but BP was able to speed up the process and save money by ordering the parts ahead of time.

Illustration: +ISM

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Drones' Future: Supersonic Swarms of Robot Bugs

· By Judy Dutton
· June 22, 2012 |
· 6:30 am |
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Courtesy: Center for Micro Air Vehicle Studies

Robotic Flies

What A micro-aviary of drones that look—and fly—like ladybugs, dragonflies, and other insects. Since 2008, George Huang, professor of engineering at Wright State University in Dayton, Ohio, has managed to produce a butterfly model with a 5-inch wingspan. “We haven’t done a final version where we declare victory,” Huang says. “I’ll be happy once it’s fly-sized.”

When [Darpa](#) and the [Air Force](#) have already invested in similarly [tiny craft](#), though with no firm time horizon for deployment. Regardless, micro-drones’ potential goes beyond the military. “Police could use them to fly into a drug trafficker’s house,” Huang says. “Or in a nuclear or mining accident, you can send a fly inside to find victims.”

Swarms

What A swarm of five Frisbee-sized drones equipped with Wi-Fi transmitters that form a kind of aerial Napster. As conceived by Liam Young, cofounder of London-based think tank [Tomorrow's Thoughts Today](#), they can “appear, broadcast their network, then disperse and re-form in another part of the city.”

When After a spotty test flight last November (two of the drones crashed into a river), the file-sharing copters are set to take to the sky this summer at a Dublin science festival called [Hack the City](#). Meanwhile, the [Pirate Bay has announced that it's building its own fleet](#). File-sharing drones, like file-sharing itself, hover in a legal gray zone, but Young's not shaken by the prospect of prosecution. “We see it as our responsibility to get people talking about this,” he says. Done.

Supersonics

What [The GoJett](#), a supersonic drone designed to hit Mach 1.4—over 1,000 miles per hour—while weighing less than a person and costing as little as \$50,000. Aerospace engineering professor Ryan Starkey and his students at the University of Colorado in Boulder modified their hobby-grade turbojet engine to include military-grade bells and whistles, like nozzles that narrow to accelerate airflow. They're also working with NASA to develop foil bearings that ride on cushions of air, allowing the engine to be oil-free. Laboratory tests have confirmed that it's twice as efficient as any engine its size, and Starkey plans to double the efficiency again before its maiden flight.

When Low-speed flight tests begin this fall, then shift to high-speed tests in 2013. If successful, Starkey imagines, the GoJett could be used for civilian applications, like penetrating hurricanes to gather data. And Mach 1.4 is just a start. “We're working on engine technology that'll go Mach 2 to 3,” Starkey says. “Our first goal, once this is over, will be going faster.”



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Personal Drone's Secret Ingredient: iPhone

- By [Wired Magazine](#)
- [Email Author](#)

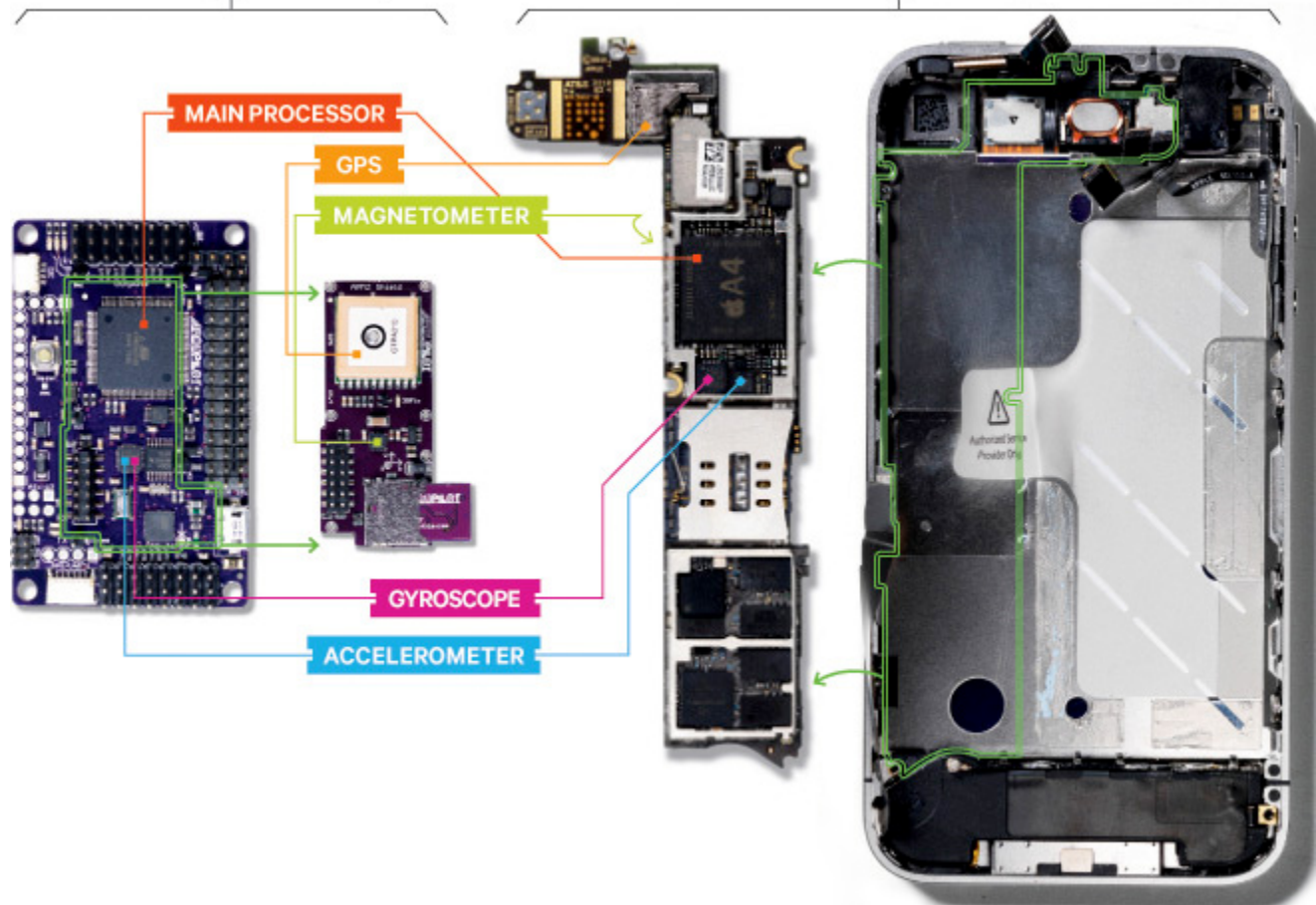
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Today's personal drones have benefited from the same advances in technology that have made the iPhone so powerful.

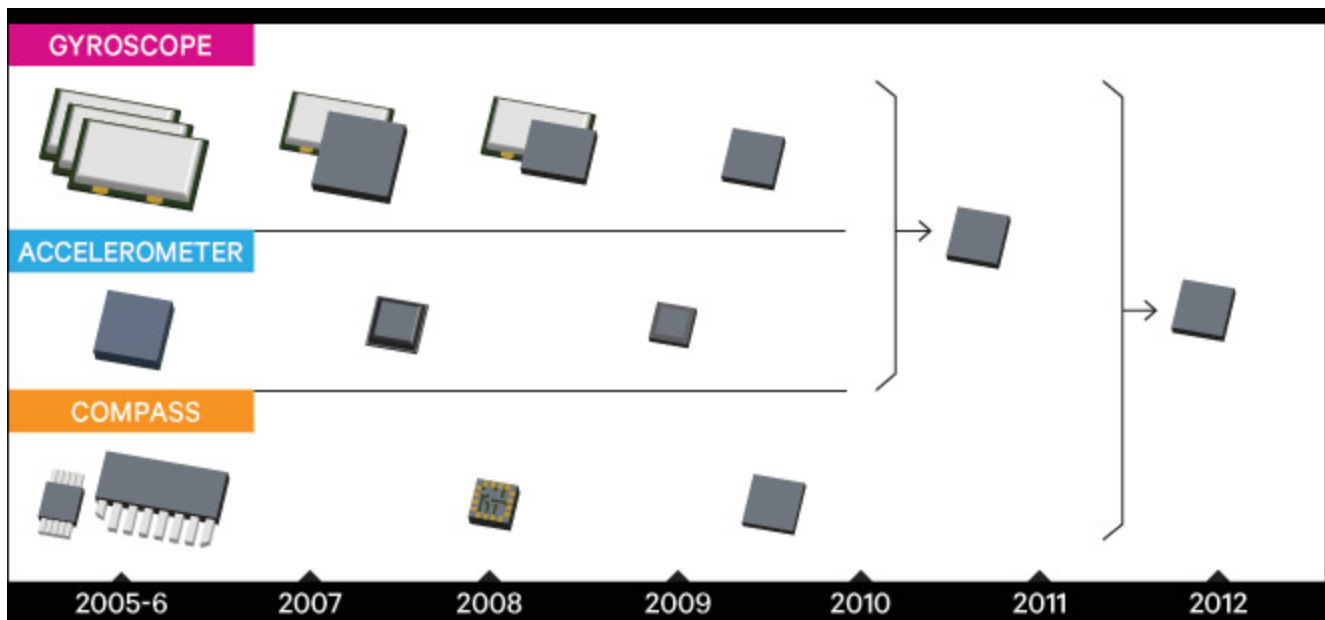
ArduPilot Mega 2.0 Autopilot

iPhone 4



Less is More

It takes three kinds of sensors—each recording data in three dimensions—to gauge an aircraft's orientation. In the past seven years, the number of components needed to do this has shrunk from six chips costing around \$60 to a single \$17 chip.



Sensor Chart Source: Invensense; Illustrations by Gus Wezerek



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