

# Drones at Home

*Tiny, unmanned aircraft are ready to warn you about traffic or spy on you in your backyard*

Airborne eyes that peer down from the sky are already changing how science gets done and how wars are fought, and a commercial fleet of them is destined to radically change how we live our lives.

Scientists such as Lian Pin Koh of the Swiss Federal Institute of Technology and Serge Wich of Liverpool John Moores University in England are helping to create that intriguing and possibly unnerving future. After spending two and a half years and \$250,000 tracking orangutans in Sumatra on foot, Koh and Wich devised a quicker, cheaper method. They bought a battery-powered model airplane and added an inexpensive open-source autopilot and high-resolution camera. For less than \$2,000, they created a Conservation Drone—an autonomous plane with a 4.5-foot wingspan that uses GPS signals to fly preprogrammed routes and bring back remarkably detailed pictures and data about orangutan nests and new areas of

deforestation. “We’re still surprised how easy it was to assemble from off-the-shelf components,” Koh says.

The first tests in early 2012 were so successful that other conservationists have been clamoring for their own planes. Working with a Swiss startup company, Koh and Wich have now built more than 20 drones.

The military already depends on big drones such as the Predator to fight enemies and on small autonomous planes and helicopters to scout paths for convoys or ferret out ambushes. Officers use them to find illegal activity along the U.S.-Mexico border. But civilian enthusiasts are getting into the act, too; they have customized drones to nab polluters, inspect drilling rigs, and take stunning pictures for movies and real

estate listings. “Drones are going to change the world in profound ways,” says Matthew Waite, a journalist-turned-professor at the University of Nebraska-Lincoln who is exploring the use of drones for journalism.

This revolution is being propelled by rapid advances in technology. With powerful smartphone chips and open-source hardware platforms such as Arduino, do-it-yourselfers and communities such as DIY Drones have begun to build inexpensive but sophisticated autopilots that transform radio-controlled aircraft into autonomous ones. Companies that build drones for the military are pitching their wares to police departments and government agencies. The U.S. Department of the Interior has already obtained 60 Raven planes, weighing 4.8 pounds apiece, from aviation

pioneer AeroVironment, to observe roosting sandhill cranes and measure stream temperatures and sediment flows, among other tasks. Future possibilities seem endless: with sophisticated cameras and sensors, small drones could tell when crops need water, chart oil spills and report on traffic jams. “We’re just at the tip of the iceberg of what’s possible,” says Mike Hutt, manager of the U.S. Geological Survey’s National Unmanned Aircraft Systems Project Office.

The full iceberg will not come into view for several years, however, because the Federal Aviation Administration has banned commercial uses of drones, fearing the confusion and accidents that could occur if thousands of unmanned craft take to already crowded skies. The FAA basically allows flying by hobbyists, government agencies

and researchers and usually limits the altitude to a few hundred feet. But the FAA Modernization and Reform Act of 2012, signed by President Barack Obama in February, requires the agency to develop rules permitting more civilian uses. The FAA is working with companies on the key technology: systems that allow drones to sense and avoid other flying objects. Final rules are expected by 2015, opening the door to an explosion of commercial applications.

The current pause before that explosion is a boon, Waite suggests. “Drones raise humongous questions about safety and ethics and law and privacy,” he says. “But now we have a rare opportunity to think about how we are going to use a technology before we actually use it.”

—John Carey