Privacy No Match For Robots of the Future

BY STEVE THOMAS

German robotics company Festo has created a dragonfly drone called BionicOpter capable of some very complex, acrobatic flying; it can move in any direction and even hover in the air.

FESTO

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A METAL BIRD FELL OUT OF THE SKY recently in Mogadishu—a raptor-shaped drone with propellers in front of its wings and cameras facing down. Pictures swept the internet, along with accusations that the Somalian government was spying on its people.

It's a reminder that governments all over the world want to use technology for spying on constituents and foreigners alike. Even as laws spring up protecting citizens against invasions of each other's privacy, leaks and errors reveal the voracious appetite that governments have for information about what people are doing, both at home and abroad. Governments want to be the fly on the wall, and technology is helping make it happen.

As early as 1998—when phones were still dumb and Google was not yet a word—the Defense Advanced Research Projects Agency (DARPA) of the U.S. Department of Defense launched the Micromechanical Flying Insect project in hopes of using tiny covert robots as "flies on the wall" in military operations. That project continues today, with ongoing research at University of California at Berkeley funded by the U.S. Office of Naval Research and DARPA.

Meanwhile, the U.S. Air Force proposed a bumble-bee-sized Micro-Aerial Vehicle (MAV) in 2008, the same year that TU Delft University in the Netherlands developed the smallest camera-carrying ornithopter (a craft propelled by flapping wings). Then, in 2010, the Tamkang University in Taiwan realized autonomous control of the flight altitude of another ornithopter, this one about 8 inches wide but weighing only about a quarter ounce.

By 2012, the British Army had deployed the Black Hornet Nano UAV, a 4-inch-long, half-ounce helicopter equipped with three cameras that give the operator full-motion video and still images. In 2014, a new BHN version came out with night vision and the capability of transmitting video streams or high-res images up to a mile using a digital data link. Even the U.S. Marine Corps has used them.

Not all efforts are directed at making spybots small. Like the raptor drone in Mogadishu, many are designed to blend in by appearing to be birds or animals.

In 2010, images surfaced of a "pigeon drone" developed by the research division of the U.S. Air Force, with researchers claiming that the drone would be able to flap its wings like a real bird.

Then, in 2013, the Expal division of Maxam, a Spanish defense manufacturer, came out with the Shepherd Mil, a UAV that looked like a gliding bird. The Expal sales director described the drone's purpose as being "the spy in the sky," and the company claimed that the drone could fly as low as 100 meters without being detected.

More recently, a sparrow hawk MAV with perching claws was developed by Vishwa Robotics and MIT in a program sponsored by the U.S. Air Force Research Laboratory.

Whether by size or appearance, these efforts reflect a new chapter in an age-old reliance on nature's remarkably efficient designs, leading to extensive use of animals in every aspect of human endeavor, including the military, such as dogs in K9 units, cavalry horses, even war elephants. Falcons are used to scare other birds away from airports to avoid damage to jet engines. More recently, eagles have been trained to attack and take down quadcopters.

In 1960, the U.S. Navy started a program to use marine animals as part of military operations. Nineteen species were tested, including some sharks and birds. Eventually, the bottlenose

dolphin and the California sea lion were shown to be the best at what the Navy needed them for, and the Navy's Marine Mammal Program, based in San Diego, has developed over the years to the point where it employs five teams of specialists. Marine dolphins helped clear mines from the Persian Gulf during the Iraq War.

But the recent efforts at creating robotic spies tap nature not for its efficiency so much as for its ubiquitous presence, which causes people to take it for granted. A small plane or quadcopter draws attention, but people ignore bugs and birds.

At the same time, robobirds can give a bird's-eye view—and stream video. Bugbots can slip through cracks and crevices and hide in house plants and dark corners, listening and photographing all that goes on "behind closed doors," a phrase historically used as a synonym for private interaction.

As technology more accurately replicates the appearance and dexterity of nature, the more easily it can be used to hide in plain sight while capturing information. And technology has made incredible strides. In the past decade alone, the research and development division of Festo Corp., a German industrial control and automation company, has developed working bionic versions of delicate, flapping butterflies and dragonflies; crawling ants that demonstrate Autonomous Network Technologies; swimming penguins, jellyfish and manta rays; a hopping kangaroo; and even a remarkably realistic seagull ornithopter that flew over the audience at an indoor TED conference in 2011.

More creepy is the Robugtix T8X spider robot, which from a distance looks and moves a lot like a big black spider. It can even be ordered with hairy skin.

These biomimetic robots provide examples of how far science has progressed in copying nature. Adding cameras, microphones and digital data links for streaming are natural next steps.

Privacy is a matter of degree. City life erodes it to an extent. Growing up with siblings, even more. But for so long as there are those who want to peer behind the veil of privacy—sometimes for good reasons, sometimes not—technology holds the promise of secret invasion. The more the world fills with robotic flies on the wall, the more that promise can be fulfilled. ■

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