# What's that buzzing?

## *Coming soon: robotic insects that spy, maybe even blow things up*

SUZANNE TAYLOR | November 22, 2007 |

With all the buzz about flying robotic insects these days, you might think you've landed in the middle of a sci-fi thriller. Last year, Israel announced it would develop "bionic hornets" to locate, photograph and, potentially, kill enemy targets. In May, reports surfaced that the Defense Advanced Research Projects Agency(DARPA)— the R&D branch of the U.S. Department of Defense — was working on the development of "cyborg moths" that could carry cameras or explosives and be controlled remotely by humans. Then, last month, the Washington Post ran an article about protesters in Washington and New York who claimed to see flying mechanical insects at political rallies.

Reports like these evoke images of renegade robots beyond our control — Terminators with a mission to destroy mankind. Fortunately for the technologically timid among us, we may be getting ahead of ourselves. There are researchers at the cutting edge of robotics working on state-of-the-art insects, but they aren't ready to unleash a swarm of flying killer cyborgs; in fact, they're still trying to get their robotic flies to, well, fly.

Robert Wood, who founded the Harvard Microrobotics Lab, came closest last summer when he managed to get his fly to produce enough thrust to take off. His tiny robot, which weighs just 60 mg and has a three-centimetre wingspan, can't yet fly without a tether to supply power and keep it stable, but getting it to take off at all was a major breakthrough. It's something Wood had been working on since 1999, when biologists at Berkeley made a seminal discovery in figuring out exactly how flies fly. Eight years later, Wood's carbon-fibre fly has all the requisite parts: an airframe that acts like an exoskeleton, actuators that replace muscles, a transmission system for a thorax, and wings that beat 120 times per second.

The idea is that an army of the miniscule flies, carrying cameras and sensors, could one day be used

for everything from search and rescue missions and locating hazardous materials to environmental mapping and traffic monitoring. And, of course, military reconnaissance(the project is partially funded by DARPA). "By having something very, very small and very, very agile, and potentially even disposable, then you can get places where other robots can't," says Wood.

Before the flies are ready for action, Wood and his team must overcome several obstacles. One is convincing battery manufacturers to create specialty batteries small enough for them — something that's theoretically possible but not very profitable. Another is developing a sophisticated sensory system that will allow the robots to assess their environment and choose a flight path on their own(they're too small to be remote-controlled), and figuring out a way for the flies to communicate their findings. Finally, the insects will have to produce enough thrust to carry their payloads. Wood hopes his robotic critters will be flying around the lab on their own in the next five years; it could be another five years before they would be ready for the real world.

Given the current state of the technology, experts are skeptical about the "mechanical insects" reportedly used to spy on political activists. "If you wanted to monitor people, there are probably a lot easier ways to do it, in terms of just sending a bunch of people with cellphone cameras wandering through the crowd," says Ronald Fearing, a professor at the University of California, Berkeley, who was Wood's supervisor while Wood was a graduate student and who has been working on his own robotic fly since 1998.

Other researchers bypass the difficulties of making complicated robotic parts, miniscule or not, by taking advantage of what nature itself has already created. A few years ago, scientists at Northwestern University connected a lamprey's brain to a robotic device, which the brain then controlled. Earlier this year, scientists in China remotely controlled a flying pigeon after implanting electrodes in its brain. But when it comes to something like fully autonomous cyborg spy moths, "actually using something like that within the military domain is another question," says Kevin Warwick, a cybernetics professor at the University of Reading in the U.K. "I'm a little bit skeptical about it. It's still in the learning stages, still in the research laboratories."

But maybe not for long. Warwick, who made headlines a few years ago when he implanted a microchip in his own arm, is working on connecting chips to neural tissue so that people can control technology with their brain, instead of manually pushing buttons. People can't flick light switches just by thinking about it quite yet, Warwick says, but similar technology is already being used in cochlear implants, which help deaf people hear by translating sound into electrical impulses that stimulate their auditory nerves. Warwick predicts that more advanced technology, including cyborg insects, could be realized in the next decade.

<<< PREVIOUS 1 2 NEXT >>>