Sensors for bat-inspired spy plane under development

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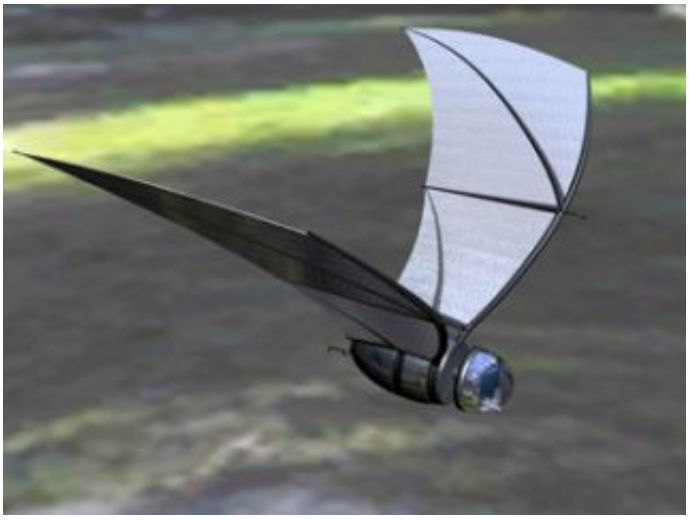

Engineers envision a six-inch, robotic spy plane modeled after a bat that could gather data and send it back to soldiers in real time. Credit: Eric Maslowski, research computer specialist in the University of Michigan 3D Lab

A six-inch robotic spy plane modeled after a bat would gather data from sights, sounds and smells in urban combat zones and transmit information back to a soldier in real time.

That's the Army's concept, and it has awarded the University of Michigan College of Engineering a five-year, $10-million grant to help make it happen. The grant establishes the U-M Center for Objective Microelectronics and Biomimetic Advanced Technology, called COM-

BAT for short. The grant includes an option to renew for an additional five years and $12.5 million.

U-M researchers will focus on the microelectronics. They will develop sensors, communication tools and batteries for this micro-aerial vehicle that's been dubbed "the bat." Engineers envision tiny cameras for stereo vision, an array of mini microphones that could home in on sounds from different directions, and small detectors for nuclear radiation and poisonous gases.

Low-power miniaturized radar and a very sensitive navigation system would help the bat find its way at night. Energy scavenging from solar, wind, vibration and other sources would recharge the bat's lithium battery. The aircraft would use radio to send signals back to troops.

"These are all concepts, and many of them are the next generation of devices we have already developed. We're trying to push the edge of our technologies to achieve functionality that was not possible before," said Kamal Sarabandi, the COM-BAT director and a professor in the U-M Department of Electrical Engineering and Computer Science.

COM-BAT also involves the University of California at Berkeley and the University of New Mexico. It is one of four centers the Army launched as a collaborative effort among industry, academia and the Army Research Laboratory to work toward this vision of a small, robotic aircraft that could sense and communicate. Each of the four centers is charged with developing a different subsystem of the bat, a self-directed sensor inspired by the real thing.

"Bats have a highly-attuned echolocation sense providing high-resolution navigation and sensing ability even in the dark, just as our sensor must be able to do," Sarabandi said.

Echolocation allows real bats to navigate by emitting sounds and detecting the echoes.

The bat robot's body would be about six inches long. It would weigh about a quarter of a pound and use about 1 W of power.

U-M researchers intend to improve on current technologies. They'll work to develop quantum dot solar cells that double the efficiency of current cells. They expect their autonomous navigation system, which would allow the robot to direct its own movements, to be 1,000 times smaller and more energy efficient than systems being used now. They believe they can deliver a communication system that's 10 times smaller, lighter and more energy efficient than today's technologies.

The bat would be designed to perform short-term surveillance in support of advancing soldiers. Or it could perch at a street corner or building for longer assignments and send back reports of activity as it takes place.

"Throughout this research, we expect to make technological breakthroughs and have a much wider range of applications for other types of engineering problems, from medical to industrial," Sarabandi said.

COM-BAT will support 12 faculty members and 18 graduate students at U-M.

Source: University of Michigan

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