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Tracking Bats on the Wing

Studying the behavior and travels of bats is an especially daunting task. These are, after all, animals that fly through complex habitats in the dark of night. A few decades ago, such studies were mostly limited to marking a captured bat and hoping to catch it again later. Today's high-tech tracking techniques include GPS tags, satellites, Doppler radar and radio telemetry. And still bats are tough to track.

Now two Boston University colleagues â€“ biology graduate student Nathan Fuller and visiting scholar Kenn Sebesta, an engineer â€“ are developing a low-cost "unmanned aerial vehicle" â€“ a deftly modified model airplane â€“ for tracking traveling bats. They have support from a BCI Student Research Scholarship.

A test flight for ATLAS, a bat-tracking model airplane. Photo courtesy of Nathan Fuller

Their Automated Tracking and Localization Aerial System (ATLAS) is a collaborative effort by engineers and biologists to automate radio telemetry using off-the-shelf model airplanes and affordable electronics. Although still in its early stages, the goal is a fully autonomous airborne platform that can follow bats more or less on its own and cost less than $500 in parts.

In traditional radio telemetry, you capture a bat and attach a tiny radio transmitter that sends out faint radio pulses, which are, hopefully, collected at multiple ground stations. When the radio beeps are heard, field crews in vehicles follow them madly through the night. It's an exhausting chase, since bats pay no attention to roadways, regularly fly over mountains, rivers and highways and show no interest in property rights.

Life for radiotrackers gets a bit easier if they are lucky enough to have access to an airplane, which sails over roads and usually provides superior signal quality. The drawback, of course, is the extreme cost of aircraft, which dramatically limits their use.

ATLAS, the researchers hope, will provide the best of both worlds: the quality of airborne tracking with a ground-level price tag. With this system, low-cost ground crews will be uplinked to what amounts to a self-guided, flying antenna that's in almost continuous contact with a flying bat, while calculating its own position and that of the bat using an onboard GPS receiver.

ATLAS will fly at an altitude of 350 feet as it listens for the soft radio blips from below. Once a signal is detected, ATLAS will automatically go into an orbit around the source until it triangulates on the radio-tagged bat.

So far, every component of ATLAS works independently. And the complete ensemble works in simulation. "We have a model airplane that flies autonomously and an efficient signal-processing unit," Fuller says. "Now these two components must be connected and tested in a working aircraft. We are working on this connection and plan to be tracking bats autonomously by the summer of 2013."

They hope eventually to transform the way wildlife radio telemetry is conducted. Atlas should be able to track almost any elusive organism from the air at a fraction of the cost of traditional radio telemetry techniques.

BCI Members can read the full story of ATLAS and its possibilities in the Winter 2012 issue of BATS magazine. To help support BCI Student Research Scholarship recipients like these, as well as other critical bat-conservation projects, please visit batcon.org/donate

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