Macdonald Reports

Unmanned aerial vehicles: a bird's-eye view

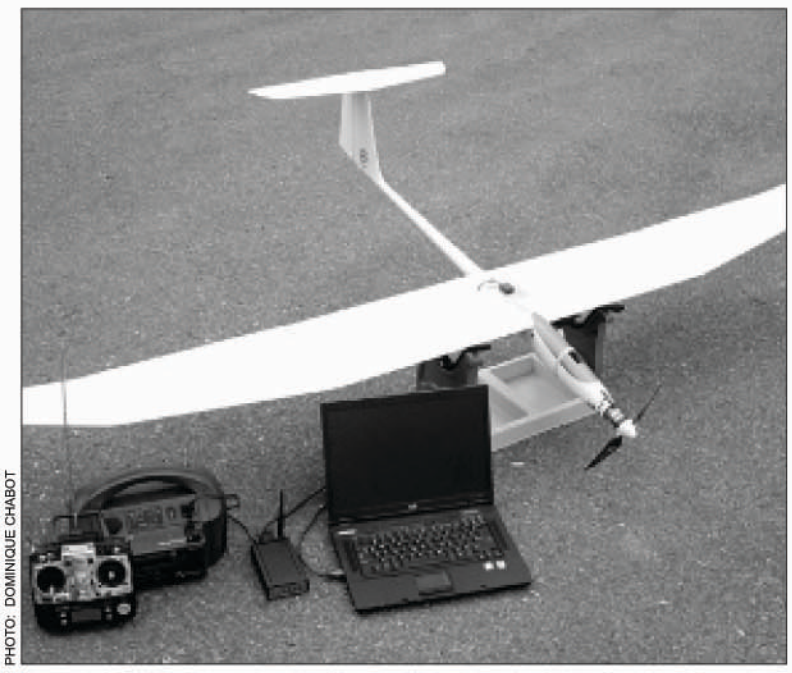

PHOTO: DOMINIQUE CHABOT

PHOTO: GILLES MAILLET

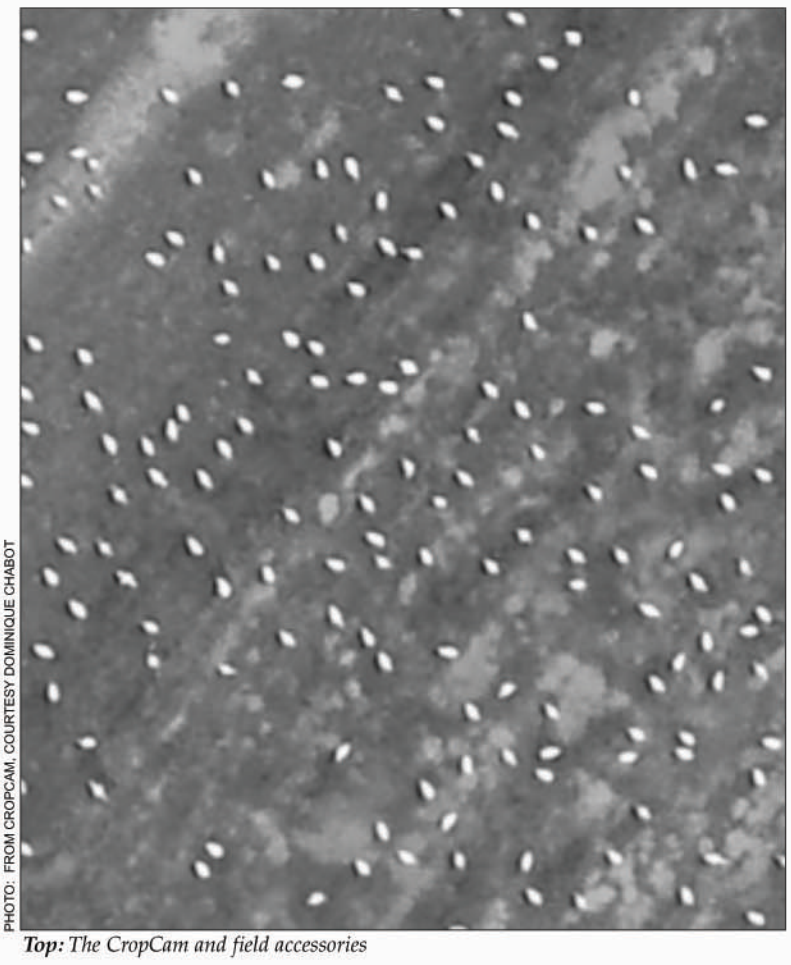

PHOTO: FROM CROPCAM, COURTESY DOMINIQUE CHABOT

Top: *The CropCam and field accessories*

Middle: *Dominique Chabot launching the CropCam*

Bottom: *A bird's-eye view — aerial photo of snow geese taken by the CropCam from an altitude of 600 ft (= 180 m)*

For most people, the word "drone" may conjure up images of stealthy ominous little flying machines engaged in war missions. While it is true that drones, more properly referred to as UAVs (Unmanned Aerial Vehicles), have their origins in the battlefield, recent technological advancements – in computer miniaturization and GPS, for instance – are beginning to open the doors for peaceful civilian applications, and the options seem endless!

UAVs range in size from micro to full-scale aircraft and include fixed-wing, rotary-wing, lighter-than-air and even flapping-wing designs. These remotely or autonomously piloted devices promise to become the ultimate solution for countless jobs which fall under the categories of dull, dirty or dangerous: forest fire tracking, search and rescue, infrastructure monitoring and agricultural surveillance, just to name a few.

CROPCAM IS A PRODUCT PRIMARILY MARKETED TOWARDS AGRICULTURAL APPLICATIONS AND IS CURRENTLY BEING USED BY NUMEROUS FARMERS IN CANADA AND ABROAD.

Tracking Wildlife

One field in particular that might benefit immensely from the services of UAVs is that of wildlife research and management. For example, they could prove handy for conducting population surveys, such as bird flocks, caribou herds and seal aggregations. They might also offer new possibilities in smaller-scale applications such as bird nest sensing and inspection, behavioural observation and fine telemetry tracking, collect data for habitat studies and ecosystem monitoring, as well as make breakthroughs in nuisance animal management, such as bird control in crops, airports and landfills. With all this potential, it would seem just a matter of time before wildlife biologists begin to adopt this exciting new technology.

That is just what wildlife professor, **Dr. David M. Bird**, and his graduate student, **Dominique Chabot**, set out to do three years ago when, with virtually no prior experience in aviation, they bought a basic "off-the-shelf" UAV with the aim of testing it out for possible wildlife research uses.

The CropCam, made by Manitoba-based MicroPilot, is essentially an electric model sailplane equipped with a miniature autopilot system, a GPS antenna and a downward-pointing digital camera. The small aircraft's missions, which can last upwards of 30 minutes, are programmed ahead of flight on a computer and loaded onto the autopilot, and once the plane has been hand-launched, it carries them out autonomously while being tracked from a portable ground station.

Mastering this state-of-the-art gadget was no easy feat, but once conquered, it went on to explore an assortment of applications, some successful while others less so. These included observing bald eagle nests from above, locating beavers in a wilderness reserve, counting bison herds, surveying flocks of geese, mapping out wetland habitat and detecting bears, caribou, deer and wolves in a nature park.

Though the UAV revealed certain shortcomings in practice, by and large it demonstrated that the massive potential is definitely there. Altogether, the research represents some of the first of its kind in investigating uses of UAVs in the field of wildlife biology, and Bird and Chabot are eager as ever to push forward to new heights with this rapidly advancing technology.

Applications in Agriculture

Incidentally, as the name suggests, the CropCam is a product primarily marketed towards agricultural applications and is currently being used by numerous farmers in Canada and abroad.

It has been designed as an affordable, convenient and easy-to-use solution for anything from assessing crop ripeness, mapping invasive weed outbreaks and revealing irrigation and fertilization anomalies to counting farm animal herds.

In fact, agriculture is one of the fastest growing civilian UAV markets at the moment, and one that is poised to revolutionize the industry and practice. Some other examples of applications being explored include monitoring, sampling and control of crop pests, from insects to birds, and distribution of fertilizers and pesticides.

What this all means in a nutshell is that in the future, you can count on hearing much more about drones and UAVs than just their military achievements.

ABOUT THE AUTHORS:

David Bird is a professor of Wildlife Biology on the Macdonald campus of McGill University. For over 35 years Dr. Bird has worked with various species of birds of prey in field and laboratory, but mainly American kestrels, peregrine falcons and loggerhead shrikes. More recently however, he has discovered the world of Unmanned Aerial Vehicles and the potential they have for wildlife research, management and conservation. He plans to spend the remainder of his research career studying these extraordinary vehicles.

Dr. Bird writes a monthly column on birds in the Montreal Gazette as well as bimonthly columns on bird behaviour in BirdWatcher's Digest magazine and its associated newsletters.

Dominique Chabot is a Ph.D. student in Wildlife Biology at McGill University. Originally hailing from Nova Scotia, his academic background is largely in biological studies, though he also has a life-long passion for technology and gadgets. This combination of interests has made him a prime candidate to undertake the ambitious aim of bringing UAVs into world of wildlife research.

In November 2009, Dominique was one of three student finalists to be invited to speak at the annual meeting of UVS (Unmanned Vehicle Systems) Canada. Presenting his M.Sc. results on the evaluation of a stock unmanned aerial vehicle for small-scale wildlife survey applications, Dominique beat out two very bright engineering students to win the Best Student Paper Award.