

The Unmanned Option



ALTAIR IN FLIGHT

Imagine more than 700 aircraft in a country's airspace in one day. Not generally a big deal. Then imagine them without a single pilot aboard. That's the reality of Iraq these days as the U.S.-led coalition uses an array of unmanned aerial vehicles (UAVs), trying to keep tabs on a theatre of operations that evolves minute-by-minute, 24/7. However, despite their proven effectiveness, UAVs are not problem-free, as evidenced by an occasional mid-air collision.

That's why LCol Gord Smith, a veteran C-130 Hercules pilot with extensive overseas experience, is tasked with sorting out the Canadian Forces' UAV options. Although it wasn't the job he expected when he arrived at National Defence Headquarters in June 2004, and he concedes with a chuckle that it could be considered heresy for a pilot to be doing it, he evidently has taken the job to heart. It's going so well he says that the CF could have a family of UAVs in initial operations by mid-2008, evolving to full operational capability well before the project's official 2012 deadline.

The Department of National Defence, however, is only one of several key players in the federal hierarchy. The potential offered by UAVs also interests the Coast Guard, the Royal Canadian Mounted Police, Fisheries and Oceans, and Public Safety & Emergency Preparedness Canada. They effectively constitute the Canadian counterpart to the U.S. Department of Homeland Security.

"9/11 changed how we're going to handle internal security," LCol Smith says. "I believe that UAVs are going to be a key tool in trying to address the traditional Cold War strategy of defending the coasts and the approaches to Canada, but we also have to focus on what happens within the boundaries of Canada. This includes not only the coastal approaches on all three frontiers, but also the over-land piece."

UAV evaluation, however, is the purview of LCol Smith's office, DND's Directorate of Air Requirements 8 (DAR 8).

One of a series of air force requirements definition sections, DAR 8 has its roots in the Joint Program Office for UAVs, the first NDHQ entity that focused on the technology. It is nested within the office of the Deputy Chief of the Defence Staff, which also includes the Canadian Forces Experimentation Centre (CFEC). The other DAR offices focus on a range of air force issues such as transport airlift, fighters, maritime patrol, communications and command-and-control issues, synthetic environment development, and tactical helicopters.

While the UAV concept had flitted around the Department of National Defence (DND) for some time, it took the 2002 G-8 meeting of world leaders in Kananaskis, Alberta to give it real focus. A surveillance and protection plan was developed through Exercise Robust Ram, which employed the Canadair CL-289 "flying peanut" UAV as well as a pair of aircraft developed in California. One was The Pointer, a hand-launched electric UAV developed by AeroVironment of Monrovia and a valuable tool for U.S. Special Ops teams in Iraq. The other is an I-GNAT "baby Predator" leased from General Atomics Aeronautical Systems of San Diego and capable of 40 hours sustained flight. (AeroVironment also built the solar-power Helios UAV, which reached a record altitude of 29,524m in August 2001, and more recently flight tested its Global Observer UAV, powered by liquid hydrogen and capable of staying aloft for more than a week at up to 19,800m.)

The UAVs were put through their paces in a line-of-sight context at CFB Suffield, Alberta "so we didn't have to worry about bumping into civil aviation assets," LCol Smith says. That set the stage for a G-8 cover mission that "really taught us a lot about what the potential was." Even so, the CF resisted the temptation "to suddenly go out and buy a whole

bunch of things that were out on the market." UAV evolution has been exponential in recent years and hardware considered today could easily be obsolete by the time it is delivered – a clear case for buying off-the-shelf technology when we are finally ready.

So, in 2003, CFEC assembled a UAV team to work on what the CF really needed, a process continuing under LCol Smith, who says that while the army, navy and even the air force are convinced that UAVs will be a useful asset, they're not entirely sure what they'll need them for yet. This is because the mission has not been really defined. "There's more certainty now about what UAVs can deliver, but there's still a certain amount of murkiness."

In addition to Exercise Robust Ram, CFEC conducted trials off the west coast of Vancouver Island with an Israeli Aircraft Industry Eagle 1 equipped with synthetic aperture radar. A simple network transmitted the results to the Pacific Maritime Operations Centre at CFB Esquimalt, where data were integrated into the Recognized Maritime Picture, a continuous surface plot of activity on both coasts of Canada. "That was a big step and, again, it was an experiment, it was not meant to deliver or sell anything to the operations side of the CF," Smith says. "It was CFEC's attempt to put boundaries on expectations, to try to understand what the technology could do for us, another step in the right direction."

What he considers "probably the crown jewel" of the trials involved the use of Telesat Canada facilities in Ottawa to control the General Atomics *Altair*, a marinized *Predator* the CF had leased for two weeks in August 2004. A medium-altitude long-endurance (MALE) UAV (shown above) equipped with electro-optical and infrared-type sensors plus synthetic aperture radar, it uses satellite telemetry to operate beyond line-of-sight for about 40 hours. "That proved a bunch of different things and revealed a few others that we really hadn't come to terms with,"

Smith says. "We had technical problems with the synthetic aperture radar, so we didn't really get a full feel for what it could do," he explains. "It also is a bit of a bandwidth hog, so when you turn the radar on the datastream gets big pretty quickly."

That set the stage for the Atlantic Littoral ISR Experiment (ALIX), a intelligence surveillance reconnaissance trial. Launched from Goose Bay, Labrador, the aircraft went as far as the southern tip of Baffin Island, at which point the controlled confirmed that the curvature of the earth can be a limiting factor because geostationary satellites "look angle" from closer to the equator is significantly diminished. "Because of the latitude and the shape of the earth, things get a little flaky at about 66° North," LCol Smith says, "but that's a simple geometry problem." The missions lasted upward of 22 hours in an area fraught with often difficult meteorology and a preferred route for commercial aviation.

The ALIX team had to be careful on two fronts. They didn't want the UAV to become trapped in a no-return situation by headwinds equal to its 200-knot capability, reducing its speed over ground to zero. They also had Transport Canada and Nav Canada monitoring the flights. "It was the first glimmer of the CF trying to interact with what has been a normal and traditional airspace management situation for Nav Canada," Smith says, "there was a great deal of liaison done in advance."

And the Arctic is a sensitive sovereignty issue, which traditionally has been bolstered by long-range patrol aircraft, the Canadair CP-107 Argus and its successors, the Lockheed CP-140/140A Aurora/Arcturus. Geostrategically, the Northwest Passage is likely to become as much of an economic as sovereignty issue over the next couple of years and there is some hope that UAVs could be extremely effective in that role. However, Smith says the results of ALIX indicate that "we haven't quite got the ideal solution right now for UAVs to deal with the northern patrol." There also is the fact that satellites in geostationary polar orbit would be hugely expensive for a budget-constrained DND and there is still the challenge of curbing their bandwidth appetite.

CFEC and DAR 8 recently began trials of a mini-UAV system, *Silver Fox*, designed by Advanced Ceramics Research of Tucson, Arizona. Thales Canada is doing the support work on the ACR plat-

form, which is essentially being loaned out to the army, navy and air force so that they can better understand how UAVs will affect how they fulfill their missions from command-and-control and surveillance perspectives. "UAVs are going to be more than just another aerospace platform," Smith says. "I believe they are going to change the wholesale way in which we do the business of information management for... supporting commanders at various levels, both on deployed operations as well as globally."

Again, managing the staggering datastream presents an enormous challenge. Smith is concerned that it could rupture the traditional data pipelines the CF has in place. That begs the question: at what point does it become uneconomical or impracticable, forcing the use of human pilots who would digest the information and process it before transmitting it to commanders? "There's absolutely no way technology can compete with the human mind right now," Smith agrees, adding that he doesn't think the CF has a good grip on that level of cost-benefit analysis. "In other words, how much UAV is enough? The intent of the CF is not to fully replace anything with UAVs, we are complementing our existing fleets."

However, those fleets – fighters, transports and rotary – are aging, and while some are being replaced, others are having to make do with upgrades. Is the UAV seen as a replacement strategy for those 'rustied out' fleets? "I've never been given that indication," he contends. That said, he has a philosophical concern that UAVs may be seen by some as a panacea for the human resources challenge faced not only by DND but also other govern-

ment departments and agencies, and the private sector.

"UAVs will save some lives," he says. "Certainly, from the army's experience in Afghanistan – but it's difficult to quantify – that ability to look around the next corner actually did save soldiers' lives." There's no escaping the tactical reality, however, that a properly deployed UAV could obviate the need to risk a tactical helicopter and its crew by using them for sneak-and-peek missions. It's the over-the-next-hill proposition that makes it very attractive.

Most UAVs, including all of the ones being examined and/or tested by the CF are fixed-wing. Some manufactures have shown mini rotary platforms, but they are mostly configured like conventional helicopters with main and tail rotors, as in the Fire Scout from Schweizer Aircraft, a Sikorsky subsidiary. A notable exception is the Eagle Eye from Bell Helicopter Textron, functionally a miniature version of the V-22 Osprey tilt-rotor that's now part of the U.S. Marine Corps fleet. Still a prototype, it's not expected to roll out for its first flight test until early 2006.

UAV autonomy remains a "growth piece" that DAR 8 has yet to come to terms with. "Autonomous? Not really a great word," Smith replied, preferring "limited" due to the data management issue as well as the meteorology challenges, including visibility and icing, neither of which is UAV-friendly. "We have a long way to go in terms of autonomy." And what about armaments. The Predator has 500-pound hardpoints from which operators have launched Hellfire missiles. "Combat UAVs may be something the Canadian Forces gets to in time," Smith said, "but we have to crawl a

little bit before we can actually start running with this technology." **F**

Freelance writer, Ken Pole, is the National Correspondent for WINGS magazine.

DND PHOTOS



SERPWER AT CFB SUFFIELD