



North America's 1st Operational Police UAS

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History/ Development

On August 28th, 2007 the Ontario Provincial Police not only became the first police agency, but the first civilian agency of any type in North America, to begin regular operational use of an unmanned aerial vehicle (UAV) in civilian airspace with federal government approval. On October 3rd with Transport Canada's designation, «FIU-301» prominently displayed, the OPP UAV embarked on the first operational mission at a homicide scene in the Ontario community of Fort Severn. With no fanfare or media attention, eleven investigators assembled along the cool, windy shores of the Severn River, 4 km downstream from the shores of Hudson Bay, to watch the 9lb electric powered aircraft launch skyward to capture a tiny bit of aviation history.

The story began in January of 2004 when I transferred into the Kenora Forensic Unit, which works in conjunction with the Thunder Bay Unit to provide forensic identification services for the 560,000 sq/kms of the OPP's Northwest Region. With our high volume of major case work and the vast geographical challenges we face, obtaining timely and quality aerial photos, suitable for court presentation, was an expensive undertaking. Regional logistics dictated chartering aircraft for these shots, which in some cases, exceeded \$3000.00. Early in 2005, with the confidence of 15 years as an avid modeller of radio controlled model aircraft, I saw an opportunity to mix my hobby with work. I approached our Unit Commander, Sergeant Carmen McCann, with the assertion that I could build a system that could do the job for the cost of 1 or 2 of these charter flights. With his support, we began looking for some seed money for the project and eventually managed to secure it from our regional command staff.

In order to keep costs low, I undertook the design and development of our system into my shop at home. The system had to be electric powered, rugged and modular in design to facilitate ease of transport and operational use. More importantly, Transport Canada needed to be involved in the development process in order to create a system that they would approve for operational use. The cold hard fact is that ANY size of unmanned aircraft that leaves the ground for ANY purpose outside of hobby or pleasure use is the responsibility of Transport Canada and an requires an operation certificate. It wasn't long before my great idea of bringing my hobby to work, became a matter of bringing my work home. Almost 3 years later with over 400 hours invested in the design, construction and testing of 3 separate aircraft configurations, reams of paper entrails plus cultivation and consultations with industry and government contacts, we had a system that was ready for operational deployment.

FIU-301 Unmanned Aerial System (UAS)

This system was developed with a single mission purpose: «To obtain high quality digital aerial images of major case scenes in a timely and efficient manner while operating within a secure police environment.» The aircraft weighs in at just under 9lbs ready to fly, has a 75 inch wingspan and operates



with an electric power system capable of pulling the aircraft straight up under full power.

The airframe is constructed from aluminium, light plywood, balsa wood and Styrofoam.

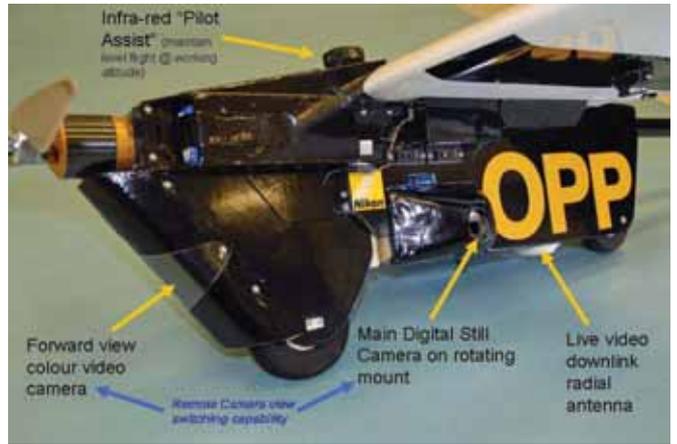
There is an infra-red «pilot assist» on board that helps to maintain a level attitude when at shooting altitude. There is no autopilot system on board as the aircraft must be operated within «line-of-sight» of the pilot. It is modular and quickly breaks down into 7 major components with aircraft and all ground support gear stored in two hard cases for transport. The flying qualities of the design allow it to work within a relatively small area and remain aloft for 20-30 minutes.

The payload consists of 2 on-board cameras; the main being an 8 mega pixel digital still on a rotating mount with a small colour video camera in the nose to assist navigating over the target area. A live wireless down-link provides the camera operator a real time view of what the cameras are looking at in order to facilitate accurate target imaging. There are two separate control systems on board; a 2.4 Ghz system for flight control and a 72 Mhz FM system for camera control. The ground station components consist of the receiver for the live link, antennas with a digital cassette player or laptop used to monitor. Additional batteries, testers, chargers, a two-way approved aviation radio, supporting documentation, flight and maintenance logs are also contained within the transport cases.

Operational Protocols

Safe operation is our number one priority when deciding to deploy. We must strictly adhere to safety procedure and operating restrictions contained within our standing «Special

Major UAS Components



Flight Operations Certificate» (SFOC). The SFOC is renewable on a yearly basis, but can be suspended by Transport Canada at any time due to safety concerns, accident or other related issues. Being the leader in the police UAV community, we certainly have an eye on future development for all police services and want to demonstrate safe and responsible operations.

Operational deployment must be within a secure police area with a minimum of 3 officers dedicated to the UAV Operation; pilot, camera operator and safety officer. Some of the key restrictions include; operations within our northwest region only, a maximum operating altitude of 400 feet, daylight hours only and remaining within the pilot's «line-of-sight». We cannot operate in winds above 30 km/h and there can be no precipitation.

We cannot operate over non-police personnel and need permission to over-fly private property. Flight control services within any operating area have the authority to prohibit or terminate operations at any time with additional restrictions if operating within 5 nautical miles of an airport.

Costs

The total cost of the current system tallied at just over \$5000.00. At the time of this article, we had used the system successfully at 3 separate homicide scenes and considering the cost of charter services, the system has already paid for itself twice-over. Future Development:

It must be stressed that this system's sole purpose is to obtain overall aerial images at major case scenes within our

region of operation. It has met or exceeded expectations to date, but requires too much piloting skill to be practical for wide-spread use.

Regulating agencies in Canada, the US and Europe are proceeding very cautiously in allowing any type of UAV to work in «civil airspace». To this end, Transport Canada has begun the long process of drafting comprehensive legislation to regulate all aspects of UAV systems. Our unit was positioned uniquely for success due to the population density of our region, my personal aviation related experience and the ability to immediately put the system to work in a secure police operational environment. Any police service considering ANY type of UAV system needs to clearly understand the need to receive operational approval from Transport Canada before expending significant resources.

That said, we have learned much and I believe there is room for wider police use of UAVs within the current rules if we proceed carefully and methodically. If properly approached, while working in partnership with Transport Canada, the entire police community as well as federal regulators can benefit with the emergence of this new tool by setting standards to base future legislation on. The two immediate police functions that make the most sense to pursue for broader service are continued forensic support with the addition of tactical support emphasising officer and public safety. Operations «beyond line of site» by civilian UAVs is very unlikely to be approved for a number of years.

Surveillance systems should not be pursued due to added legal complications and justified concern of the public and media relating to issues of privacy. Surveillance issues and the resulting negative PR impact have demonstrated the ability to quickly overwhelm the potential public benefits these systems can offer. If beyond line of sight operations are to be pursued, it would be my suggestion that search and rescue missions in unpopulated areas should be the catalyst.

Our system is an initial step in demonstrating to Transport Canada, and other international federal regulators, that police



services can safely operate unmanned aerial systems, on a limited basis, within civil airspace. I believe the next step to broader police use is to focus on the forensic and tactical safety applications with systems that can launch and recover within a standard sized residential lot, are very reliable and easy to operate. We must continue to maintain line-of-sight operation, use them for individual incident deployment, and keep them as light as possible while operating below 300 feet.

To be successful, we will need to work with commercial manufacturers to develop such systems while in consultation with Transport Canada to establish training protocols and standard operating procedures for deployment and maintenance for each individual system. I envision individually approved systems for police use that would meet risk assessment standards set by Transport Canada. In this way, a police service would then be able to choose from approved systems and receive certified training from the manufacturer as part of the purchase agreement. The final phase would be registering their system with Transport Canada and follow a standard set of operational rules and regulations.

Setting the dull regulatory stuff aside, my personal thoughts on the ideal aerial platform to progress to the next stage are:

- As small and light as operationally practical;
- Minimal assembly;
- VTOL (Vertical Take Off & Landing) capabilities;
- Not a traditional Helicopter configuration. (too many moving parts/difficult to operate and transport);
- No external launch system;
- Hands-off altitude & position hold system while hovering;
- Minimum 15 minute hover capability;
- Interchangeable payload option of high-resolution digital



still camera (8 mp min.), high quality colour video or low light/IR video option;

- Complete system transportable in no more than 2 portable hard cases.

As a result of our success, it has opened the door to the possibility of testing/operating commercial systems within our unit that can meet these preferred criteria. We intend use the opportunity to work towards the stated goals of developing systems, training and operational procedures that can be applied across the country and perhaps beyond. Stay tuned.