

# The Future for Unmanned Vehicle Systems in Canada

The world we face has changed dramatically in recent years. The increasing globalization and technology advances combined with asymmetric threats, has deeply impacted how we view our security. In these changing times, new systems have emerged to face these threats. The proliferation of the Unmanned Vehicle System is evidence of a new path for defence and security. This article will look at the future for these systems and how technology advances may develop for either homeland security or defence missions.

Unmanned Vehicle Systems have been steadily progressing over the past few years. The work conducted by Defence Research and Development Canada and the Canadian Forces Experimentation Centre as well as the deployment of UAVs in Afghanistan has been an overall positive experience. Major General Leslie's comment concerning UAV employment in Afghanistan under scores this experience – "Use of the Sperwer UAV system in Afghanistan kept soldiers out of dangerous situations and saved lives."

This, coupled with our Allies' successes in operations using a variety of Unmanned Vehicle Systems (aerial and land based) has shown how versatile and adaptive these systems can be. The use of Global Hawk for long duration surveillance and real time targeting missions has made this UAV an asset to the US forces. Also, the Commercial-Off-The-Shelf "Packbot" Unmanned Ground Vehicle was quickly and successfully deployed by US forces to meet an urgent operational need in Afghanistan and Iraq to assist in confined area searches. It saved human lives. Within Canada, industry has kept pace with Unmanned Vehicle Systems development with successful work on the

Grasshopper and Snowgoose UAVs as well as the NATO STANAG development and implementation efforts.

The future security environment will of course require Unmanned Vehicle Systems for those dull, dangerous and dirty operations – because they can reduce loss of life. A few examples of these homeland defence or security missions include: long endurance surveillance; communication relay; suppression of enemy air defences (SEAD); and Chemical Biological Radiological and Nuclear (CBRN).

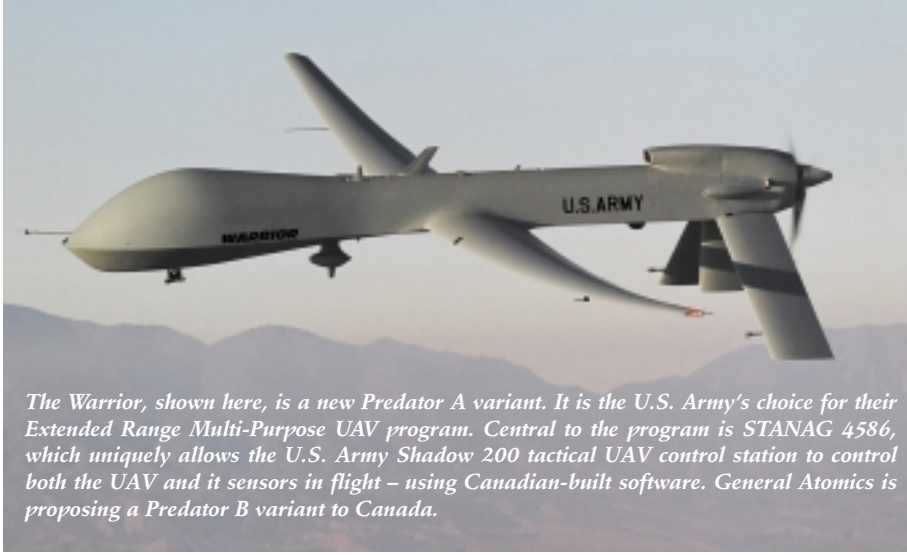
A number of UV Systems are available in the market place today, and improvements continue in the areas of standards, sensors, system reliability and autonomy, to name a few. The following sections outline why these improvements are important for the continued success of Unmanned Vehicle Systems.

**Standards.** The NATO STANAG 4586 "Standard Interface of the Unmanned Control System (UCS) for NATO UAV interoperability," although intended for UAVs, is directly applicable to land and maritime systems. NATO's approach to UAV interoperability has centred on the need to standardize the overall UAV system architecture to the extent that it accommodates the identification of critical interfaces. To achieve interoperability, the communication protocols and message formats across these interfaces are standardized. These interfaces are defined as the Human (Operator), UAV (Vehicle Specific Module), and finally Command and Control.

The use of standards, and their importance to foster innovation, can be seen everyday in our use of PCs. Without these



The real battlefield is unforgiving, and the consequence of error is high. The US Defense Advanced Research Projects Agency Grand Challenge offers a practical approach. The aim of the challenge is "to accelerate research and development in autonomous ground vehicles that will help save American lives on the battlefield." The challenge required Unmanned Ground Vehicles to autonomously complete a gruelling 131.2-mile course in the Mojave Desert less than 10 hours. This past year, the Stanford Racing Team won the Grand Challenge with a time of 6 hours, 53 minutes. The only non-American team to make it to the semi-finals was Ottawa-based, Autonosys Inc.



*The Warrior, shown here, is a new Predator A variant. It is the U.S. Army's choice for their Extended Range Multi-Purpose UAV program. Central to the program is STANAG 4586, which uniquely allows the U.S. Army Shadow 200 tactical UAV control station to control both the UAV and its sensors in flight – using Canadian-built software. General Atomics is proposing a Predator B variant to Canada.*

standards, interoperability and third party innovation is impossible. Canada's work on the NATO STANAG 4586 has made us a leader in this area. NATO's success in the implementation of these standards will be beneficial to customers by improving interoperability between classes of Unmanned Vehicle Systems and thereby reducing purchase price and overall life cycle costs. This will also benefit industry by giving companies the opportunity to concentrate on core areas of expertise while allowing third party vendors to add value to the product line, similar to the development in the computer industry.

**Sensors.** Improvements in sensor reliability and miniaturization have allowed UV Systems to carry more sophisticated and multiple sensors. These systems are now amazingly versatile and work continues in the areas of data fusion. However, the amount of data being produced by these sensors is becoming unwieldy, and there is a real concern that we will drown in our own data. Techniques for the real time fusion of multiple sensors must continue to be investigated. Along with this, is the increasing need for sensor data bandwidth. Smart sensors are needed to reduce the demand on this finite resource.

**System Reliability.** Unmanned Vehicle Systems were initially viewed by some as being disposable, and system reliability was not necessarily a high priority. As the cost of sensors and the importance of the data they collect both increase, overall system reliability is now seen as critical. This is especially true for UAVs where the additional dynamic of airworthiness certification has driven the importance of system reliability to levels similar to manned systems. A recent

(09 Feb 2006) article in *The Ottawa Citizen*, entitled "Denmark junks unreliable drones: Danes hope to sell trouble-prone craft to Canadian Forces," re-emphasizes the need and importance of system reliability.

**Autonomy.** There has been a lot of study and investigation in this area. Until recently, the employment of Unmanned Vehicle Systems have placed the operator on the ground or in an area remote from the system. The removal of the human operator from the Unmanned Vehicle System *does* result in system cost savings, but the next step, *autonomy*, will allow multiple systems to be operated by a single operator. This is where substantial improvements in mission success can be made – as well as cost savings.



*Most UAV systems have been designed, built, and flown in the desert. Few have been designed for the rigours of Canada's northern climate. This Small UAV, the Aerosonde, has successfully flown 1000+ mission hours in the Arctic – in severe icing conditions and temperatures dropping to -35°C.*

PHOTOS: PETER BAILE, AEROSONDE PTY LTD

The weaponization of autonomous Unmanned Vehicle Systems also needs to be explored further, but not necessarily in the technological domain. The legal aspects of the use of force without human intervention is a complex issue. This is especially true in the homeland security scenario where the Canadian criminal law applies and surveillance of Canadians is not in the military's mandate. Industry can play a part in these discussions, either in assisting governments to understand the technology, or to learn about legal constraints.

New missions for Unmanned Vehicle Systems in Canada continue to be identified by the private sector and government.

The Canadian Arctic is becoming an important area of operations where Unmanned Vehicle Systems can play an important role, particularly regarding sovereignty of the Northwest Passage. The projected opening of the Northwest Passage for maritime traffic has resulted in renewed emphasis on Arctic sovereignty by the Government of Canada. Through communication and cooperation, the UV Systems community can be part of this new security emphasis. The challenge of the lack of high bandwidth satellite communication coverage in the Arctic to accommodate high definition sensors will need to be solved quickly for Unmanned Vehicle Systems to be an integral part of the solution. The recent Canadian Forces Experimentation Centre UAV flights to the edge of the Arctic Circle have resulted in a number of important lessons learned in Arctic satellite coverage.

Holistic solutions incorporating UV Systems need to be developed, such that manned resources are effectively employed when and where needed, leaving Unmanned Vehicle Systems to conduct those dull or dangerous missions.

Those interested in playing an active part in the future of Unmanned Vehicle Systems in Canada should consider becoming involved in UVS Canada, a national non-profit association that is providing a focal point for the Canadian community to advance this sector with both military and civilian applications. The next UVS Canada national conference will be held 6-10 November 2006, at le Chateau Montebello, in Quebec. **FL**

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