Unmanned Aerial Vehicles Supporting UN Operations: A Commercial Service Model*

David Neil

Situational awareness is fundamental to the success of any military operation. In the twenty-first century, unmanned aerial vehicles (UAVs) have proven to be extremely valuable assets in this regard. The ability of UAVs to provide commanders at all levels with persistent, day/night, high-resolution imagery has made them a staple of modern Western forces engaged in contemporary military operations.

A measure of the growing importance of UAVs to militaries around the world was developed for the European Commission by global growth consultants Frost & Sullivan. The company determined "that between 2004 and 2008, the number of UAVs deployed globally on operations has increased from around 1,000 to 5,000 systems";[1] a fivefold increase in a period of only four years.

US forces have placed greatly increased reliance on UAVs to support operations. UAV hours flown by US armed services increased exponentially between 1996 and 2006. When overlaid against US military campaigns, one sees a direct correlation to increased UAV employment and the rapid rise in the operational tempo engendered by the launch of Operation Enduring Freedom in Afghanistan in 2001 and Operation Iraqi Freedom in Iraq in 2003. In terms of flight hours, the United States broke 50,000 hrs in 2004 for the first time (not including man-portable unmanned aerial systems) and by 2008 had exceeded 350,000 hrs.

The Canadian experience with UAVs exhibits a similar pattern. The first operational use of a UAV by the Canadian Forces (CF) was during Operation Grizzly with a leased I-Gnat flown by General Atomics Aeronautical Systems, Inc., the UAV manufacturer. The I-Gnat provided part of the security umbrella established to protect international heads of state during the two-day G8 summit in Kananaskis, Alberta (a region near the Canadian Rocky Mountains), in June 2002.[2] A fixed wing UAV with a pusher propeller, the I-Gnat can be equipped with electro-optic (EO), infrared (IR) and electronic warfare (EW) sensors and radar. It is designed to take off and land conventionally from a hard surface.[3] The I-Gnat had been leased for a Canadian Forces Experimentation Centre trial during Exercise Robust Ram at Canadian Forces Base Suffield prior to being deployed to Kananaskis during the summit.

* Originally published as David Neil. "Unmanned Aerial Vehicles Supporting UN Operations: A Commercial Service Model" in *Air Power in UN Operations: Wings for Peace* (A. Walter Dorn, Ed.), Ashgate Publishing, Farnham, UK, 2014, pp. 147-164.

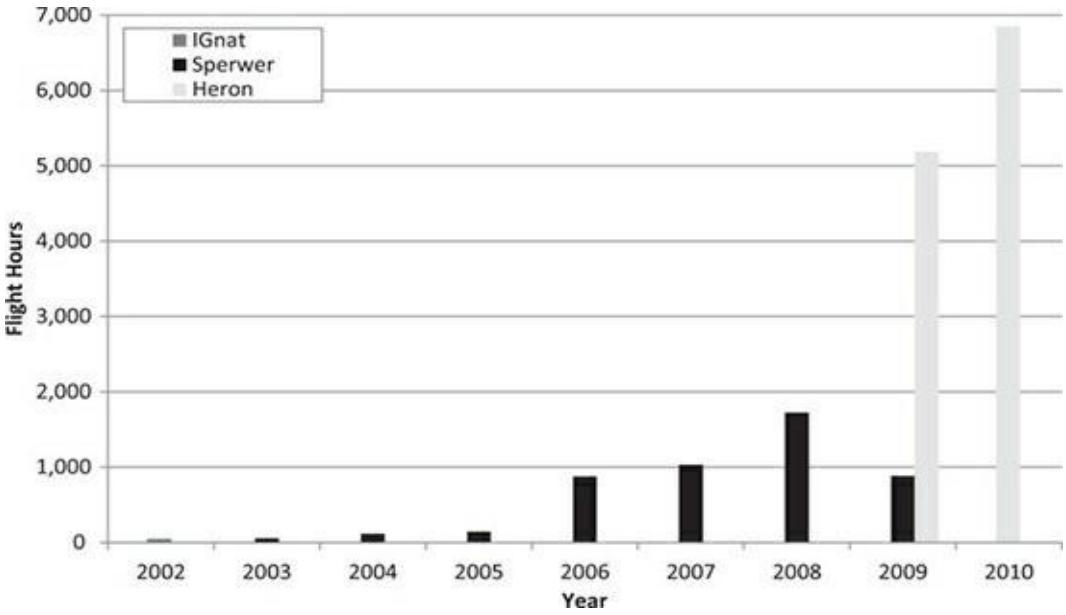

Figure 9.1 Canadian Forces unmanned aerial vehicle yearly operational flight hours
Source: Sperwer data from Canadian Department of National Defence Flying Hours Report generated by the Directorate of Flight Safety; Heron data from MacDonald, Dettwiler and Associates Ltd. flying records. Does not include small UAVs, for example the Scan Eagle that Canada flew. Heron UAV Operations ceased on 7 July 2011.

The remainder of Canadian operational UAV employment has all been in Afghanistan. Operations began with the Sagem Sperwer and then progressed to the Israel Aerospace Industries (IAI) Heron. CF UAV operational flight hours from 2002 to 2011 are depicted in Figure 9.1. In addition to the United States and Canada, all major military powers conducting operations in Afghanistan, including Australia, France, Germany, Italy, and the United Kingdom, employed UAVs.

Contribution to Military Operations

UAVs come in all shapes and sizes and have been optimized to perform numerous functions including, but not limited to: environmental monitoring, reconnaissance and surveillance, communications relay, cargo delivery, and weapon delivery. Arguably, however, it is their ability to contribute to the situational awareness of commanders at all levels and national and international leadership that represents their greatest benefit so far.

The importance of situational awareness to any military operation cannot be overstated. According to the Canadian Forces Aerospace Doctrine Manual:

> Decision superiority is the competitive advantage enabled by ongoing situational awareness ... In essence, Sense is about providing a perception of the "state of the world" to a commander in order to enable him to make decisions and to optimize the other functions. Sense ultimately provides commanders the knowledge necessary to direct their forces to achieve the most appropriate effect on the operational environment.[4]

The CF Aerospace Doctrine Manual identifies "Sense" as one of the primary functions of the Royal Canadian Air Force (RCAF). It is clear that a commander's ability to effectively direct forces is highly influenced and instructed by his or her knowledge of the current state, which will seldom be static. Removing uncertainty promotes the ability to make optimal decisions. While UAVs cannot enable perfect awareness or provide enemy intent, they can significantly enhance a commander's understanding of the current state and provide him or her with a sense of how effectively their direction is shaping the battle space or the environment.

Situational awareness is not only applicable to dealing with armed adversaries. It is an essential and fundamental element in the success of all operations undertaken by military forces. Whether the mission is search and rescue, peacekeeping, disaster relief, or humanitarian assistance, success will be highly unlikely without adequate situational awareness. Like most militaries, the majority of missions undertaken by the CF do not involve combat and the adversary over which they need to achieve decision superiority may be any combination of factors, including: the environment; the terrain; a lack of infrastructure or the inability of a state or region to provide the necessary organization or coordination of relief efforts; or even conflict itself.

Advantages for UN Operations

UN military operations do not necessarily involve combat; however, as per the preceding paragraphs, mission success, irrespective of the nature of such operations, relies on having an adequate situational picture. As UAVs can significantly enhance situational awareness, it follows that they would be a very useful capability for supporting a wide range of UN operations. While UAVs should not be regarded as a panacea, they are a true force multiplier. In addition to complementing the traditional tools and techniques employed on UN operations, UAVs can allow commanders to employ their allocated troops more effectively. This assessment is not limited to lower rank forces but also extends to modern, professional, highly technical, well-trained, and well-equipped armies. In some cases, UAVs may even be able to reduce the resources required to conduct a mission.

UAVs can provide persistent high-resolution coverage of areas while employing a range of sensors including day/night full motion video and synthetic-aperture radar (SAR). They can move freely virtually anywhere within a commander's area of responsibility (AOR) and provide real-time information on the situation on the ground. UAVs can be dynamically retasked to loiter over areas of interest or developing hot spots and they can do so without exposing personnel to

weapons fire or other potential risks. In fact, operators could be positioned hundreds or even thousands of kilometres away from the surveillance area. If needed, UAVs can also apply force.

UAVs also offer several advantages over manned surveillance aircraft. They can remain on task much longer than manned aircraft, and the deployment of UAVs can help to minimize the exposure of aircrews to risk. Aircrews and ground support personnel can operate from the relative security of a well-defended operating base far removed from any combat operations or potential armed clashes. Due to limitations in UN search and rescue capabilities, it is understood that night flights of manned aircraft are generally prohibited.[5] UAVs would not require a 24/7 Search and Rescue and air evacuation capability on standby in the event of a crash. Not only would this reduce mission costs and complexity but it would significantly extend the duty cycle into the night for the conduct of aerial surveillance and reconnaissance on UN missions.

The following paragraphs offer an overview of how UAVs could contribute to several broad types of potential UN operations. The categories chosen are meant to reflect the range of UN operations from traditional peacekeeping to more complicated peace support operations, which may include peacekeeping, combat, and humanitarian support elements. Both overland and maritime enforcement scenarios are discussed.

Humanitarian Assistance Operations

UAVs could be very useful for missions involving the delivery of disaster relief or the rendering of humanitarian assistance. They can provide commanders with real-time information on the extent of a disaster, possible access routes and landing zones for relief convoys and humanitarian flights, potential sites for aid distribution points or the establishment of relief services. UAVs can move through the area of operations unimpeded by floods, the destruction of transportation links due to natural disasters, a lack of infrastructure in developing nations, or inhospitable or impassable terrain, though they can be limited by bad weather such as storms, or reduced ceilings or visibility at the take-off and landing point. UAVs can also survey an afflicted area without exposing operators to hazards such as fires, smoke, radiation, or toxic chemicals. They could also be used to establish communications relays to facilitate command and control links where communications infrastructure has been damaged or is non-existent. Certain UAVs such as the MMIST Snow Goose could actually be used to deliver urgently needed supplies directly to the disaster area.[6]

Peacekeeping Operations

On relatively benign peacekeeping operations conducted under Chapter 6 of the UN Charter, forces have relied heavily upon static observation posts and vehicle patrols for situational awareness. These tools impose limits on what a commander can observe within the AOR.

UAVs, on the other hand, are not limited to fixed fields of view as are static observation posts. They can gain access to areas that may be remote or inaccessible by road, or to locations to which access has been denied by belligerents or by the erection or emplacement of obstacles prior to a ceasefire, for example, minefields.

UAVs can provide a commander with real-time streaming EO video of unfolding events or situations, thereby enabling more informed and timely decision-making. IR sensors can provide similar information during darkness. Both EO and IR sensors allow commanders to see events unfolding in real time and to rapidly understand what needs to be done, enabling them to act in a timely fashion. This can give commanders the initiative in dealing with escalating situations and allow them to make time-critical decisions when lives may be on the line. Synthetic-aperture radar could also be used to collect imagery in all weather conditions during day or night. Such high-resolution imagery could alert commanders to actions such as the massing of forces, the positioning of heavy weapons, the construction of defensive positions, or the migration or concentration of refugees. Radar equipped with a ground moving target indicator mode could be used to monitor vehicle movements and traffic patterns under the same environmental conditions.

While UAVs cannot replace boots on the ground, they can provide more effective real-time situational awareness over a greater proportion of a commander's AOR. They can loiter over developing situations or trouble spots, allowing commanders to deploy and direct their limited manpower more effectively. UAVs do not expose aircrews to undue risks and they can also provide warnings to ground troops of impending dangers beyond their line of sight, thereby reducing the risk of armed confrontation and enhancing personnel safety.

Complex Overland Operations

Since the end of the Cold War, the conduct of traditional peace support operations has been largely supplanted by more complex operations:

> The transformation of the international environment has given rise to a new generation of "multidimensional" United Nations peacekeeping operations. These operations are typically deployed in the dangerous aftermath of a violent internal conflict and may employ a mix of military, police, and civilian capabilities to support the implementation of a comprehensive peace agreement.[7]

In step with the evolving nature of conflict in a less-stable post-Cold War world, the international community seems to have become more inclined to embrace an interventionist agenda. The recent deployment of North Atlantic Treaty Organization (NATO) air power to Libya under the UN's "Responsibility to Protect" doctrine is a case in point. Consequently, the fundamental principles of the traditional peacekeeping approach – "consent of the parties, impartiality, and non-use of force except in self-defence and defence of the mandate"[8] – have become inadequate for the majority of contemporary UN operations. The need to resolve conflict and establish an

enduring peaceful and stable society in such situations demands a whole-of-government or comprehensive approach, incorporating defence, development, and diplomacy elements working together in a coordinated fashion. Typical complex operations can involve the delivery of humanitarian assistance, the conduct of peacekeeping, and engagement in combat operations. These three distinct missions could all be happening simultaneously within the same AOR.

The International Security Assistance Force (ISAF) formed under UN Security Council Resolution 1386 of 20 December 2001 for stability operations in Afghanistan provides an example of a complex overland peace support operation. Canada's participation in ISAF, dubbed Operation Athena, began in Kabul in July 2003. During this initial phase, ISAF was charged with providing security to the Afghan Interim Authority and the United Nations. Phase II, which began in August 2005, saw Canadian troops redeploy to Kandahar, where they conducted the longest-running CF combat mission, which concluded in July 2011. Coincident with the redeployment to Kandahar, Canada signed the 2006 Afghanistan compact, which outlined "a wide-ranging program of activity based on three "critical and interdependent" areas of activity: a) security; b) governance, rule of law and human rights; and c) economic development".[9]

The applications for UAVs articulated for the previous two types of UN operations would be equally applicable to the conduct of complex operations. The addition of combat operations and the inclusion of civilian aid workers and other experts involved in capacity-building activities would present additional security challenges to which UAVs could be applied.

With their capacity for persistent day/night surveillance, UAVs are ideally suited to provide over-watch, convoy escort, direct support to troops in contact, and battle-damage assessment. Real-time streaming video can be downlinked to the UAV control station and thence to an intelligence centre for analysis, or directly to troops in the field via a remote video terminal such as the Remotely Operated Video Enhanced Receiver (ROVER) system.[10]

Recent conflicts in failed and failing states such as Afghanistan have been more likely to see stabilization forces facing irregulars engaging in asymmetric warfare than conventional forces. In both Afghanistan and Iraq, the improvised explosive device (IED) has been the insurgents' weapon of choice; IEDs have inflicted the greatest number of casualties on Canadian troops in Afghanistan. Of the 158 combat and non-combat-related deaths sustained by the CF in Afghanistan from the start of operations to October 2011, 97 or 62 percent, were the result of IEDs.[11]

UAVs can make the insurgents' task of planting IEDs much more difficult. Without UAVs, casualty rates in Afghanistan both for military personnel and aid workers could have been significantly higher. Colonel Christian Drouin, Commander of the Canadian Air Wing based in Kabul, made the following statement about the CU-170 Heron UAV:

> January 2009, it started flying operationally as our eye in the sky. It sits very high and gives us the ability to see what the enemy is doing so we can manage the battlefield properly. It's a very reliable platform and it's saving a lot of lives.[12]

The evolution of more sophisticated counter-insurgency techniques have seen UAVs employed in more effective campaigns to protect military forces and the civilian population from IEDs. For example, the employment of pattern-of-life analysis has been a key enabler in defeating IED systems, including bomb makers and distribution networks, as opposed to individual devices.

Unmanned Aerial Vehicles for Maritime Operations

Maritime operations executed under a UN Security Council resolution typically comprise interdiction operations by military vessels and aircraft. Two examples of such operations are Operation Sharp Guard[13] and Operation Unified Protector.[14] Operation Sharp Guard was conducted by NATO and Western European Union[15] naval forces between 1993 and 1996 in the waters of the Adriatic Sea off the coast of the former Yugoslavia. Operation Unified Protector, which took place in 2011, was undertaken by NATO forces in the waters of the Mediterranean Sea off the Libyan coast. Both operations involved the monitoring and enforcement of arms embargos. In the case of the former Yugoslavia, the embargo was initially authorized under UN Security Council Resolution 713,[16] and in the case of Libya, operations were conducted under UN Security Council Resolution 1970.[17] Other examples of maritime interdiction operations sanctioned by the United Nations include anti-piracy operations such as those conducted off the coast of Somalia under UN Security Council Resolution 1851.[18]

On typical maritime interdiction operations, ships are assigned geographical boxes in which they challenge all transiting traffic. Organic helicopters[19] are normally used to assist in this task. Any suspicious vessels are boarded and inspected by ships' boarding parties. Once inspected, vessels are either cleared to proceed or seized and escorted to a secure port. Once in port, seized vessels are handed over to national and international authorities co-operating under the UN Security Council resolution in effect.

Maritime interdiction operations normally employ a surveillance aircraft overhead to provide the fleet with situational awareness and coordination, particularly of the air assets within the naval commander's AOR. During Operation Sharp Guard this indispensable support was normally provided by NATO Airborne Warning and Control System (AWACS) aircraft.[20] When AWACS was not available, Long Range Patrol Aircraft such as CF CP-140 Aurora aircraft were employed in this capacity.[21] While information concerning Operation Unified Protector remains operationally sensitive, it is reasonable to assume that a similar approach was employed. Both NATO AWACS and CP-140 aircraft were deployed to the region.[22]

The airborne over-watch and coordination function described above could, in present times, have been performed by a UAV with sufficient endurance and fitted with the right sensor and communications package. A medium-range, long endurance (MALE) UAV such as the IAI Heron has endurance in excess of 24 hours and can carry multiple sensors including EO/IR, SAR and EW systems, as well as a communications relay package. The relay capability would allow UAV operators to communicate directly with ships and aircraft in the operations area. The single-engine, fuel-efficient UAV could be operated by a crew of two to three personnel. On the other hand, NATO AWACS, which is based on the four-engine Boeing 707 airliner, has an endurance of "10+ hours" and carries a crew of 17.[23]

A UAV is much more cost effective to employ than a large multicrew aircraft and can operate without exposing aircrew to enemy fire. In the case of operations Sharp Guard and Unified Protector, UAVs based in Italy could have been used to effectively coordinate maritime interdiction operations. This would have allowed the more sophisticated and costly NATO

AWACS and maritime patrol aircraft to be released for other missions more appropriate to their capabilities. Admittedly, the distances involved in the latter example would have required satellite control links for operations off the Libyan coast. While the nature of their missions remains classified, it is known that such beyond-line-of-sight UAV missions were undertaken during NATO operations in the Libyan AOR. Based in Sigonella, Sicily, the French Air Force launched UAV sorties using the Harfang système intérimaire de drone MALE (SIDM).[24] The Harfang SIDM is a variant of the IAI Heron with the capability for control and data downlink via satellite.[25] The US Air Force has also acknowledged that a Global Hawk UAV, also based in Sigonella, participated in the Libyan campaign.[26]

Smaller UAVs could also have fulfilled or supplemented the role that helicopters routinely play in maritime interdiction operations such as these. The same advantages suggested in the previous paragraph, for example, economy and security, would apply. In addition, UAVs could potentially operate in sea states and weather conditions that would preclude helicopter operations or would place aircrews at unacceptable levels of risk due to environmental conditions. Higher sortie rates could potentially be achieved by supplementing embarked helicopters with small UAVs.

Canadian Forces' International Missions

To date, Canada's international deployment of UAVs has been exclusively in support of operations conducted under UN Security Council Resolutions. Therefore, an examination of the Canadian UAV experience provides some practical insight into the potential employment of UAVs on UN operations, whether under UN command, or within an international coalition acting in the UN's collective interest. The following paragraphs summarize CF overseas experience with the operation of UAVs.

Canada's operation of UAVs abroad began with the deployment of a CF contingent to Afghanistan as part of ISAF. The Sagem Sperwer was acquired in 2003 and designated as the CU-161. It was a tactical (NATO Class II) UAV that was fitted with an EO payload and employed a hydraulic catapult launcher and a parachute and airbag recovery system. Sperwer systems were initially deployed to Kabul in October 2003 but by 2006 all operational CF forces in Afghanistan, including the Sperwer contingent, were redeployed to Kandahar. In Kandahar, the CF became much more reliant on Intelligence, Surveillance and Reconnaissance (ISR) to support combat operations and to minimize casualties due to the growing use of IEDs by the insurgents. After two years of fighting and with the security situation in southern and eastern Afghanistan continuing to deteriorate, Canada's role in Afghanistan was foremost in the minds of Canadians.

To provide advice to parliament and instruct the debate on Canada's future in Afghanistan, an independent review panel was commissioned by the Prime Minister in October 2007. Chaired by former Deputy Prime Minister the Honorable John Manley, the non-partisan panel comprised former government ministers, diplomats, and senior public servants. The committee's report, which was submitted in January 2008, implied that Canada's UAV assets

were inadequate for the mission and recommended that more capable systems be acquired. It stated that:

> to improve the safety and effectiveness of the Canadian Forces in Afghanistan, the Government should secure for them, no later than February 2009, new medium-lift helicopters and high performance unmanned aerial vehicles.[27]

This recommendation was the genesis of Project Noctua. In August 2008, the Government of Canada entered into a multiyear contract with MacDonald, Dettwiler and Associates Ltd (MDA), with headquarters in Richmond, British Columbia, for a turnkey UAV service based on the IAI Heron UAV. The Sperwer System was phased out with the introduction of the Heron and the CF ceased Sperwer operations altogether in August 2009. All remaining Sperwer assets in flyable condition were subsequently sold to the French government.[28]

Figure 9.2 CU-170 Heron unmanned aerial vehicle
Source: Reproduced by permission of MacDonald, Dettwiler and Associates Ltd.

Canada's Project Noctua

In order to satisfy the recommendation of the Independent Panel on Canada's Future Role in Afghanistan regarding the introduction of high-performance UAVs, the Canadian Department of National Defence (DND) had to adopt an innovative strategy and a very aggressive implementation schedule. DND turned to industry to provide a turnkey solution that could be

deployed within months, as opposed to the years normally associated with fielding a new capability of such complexity. The desired solution was to be delivered via a service arrangement whereby the selected contractor would provide the systems, maintenance, supply chain, and training, while DND would provide the operators.

A competitive tender was issued in February 2008 and on 1 August 2008 a contract was awarded to MDA and its partner, IAI, for a service based on the Heron UAV. In January 2009, only five months later, the CF were conducting operational ISR missions in Afghanistan with the Heron (Figure 9.2).

The Heron is a MALE platform (NATO Class III) with an all-up weight of 1,150 kg, a wingspan of 16.6 m and a payload capacity of 250 kg. It has a service ceiling of 30,000 ft and endurance in excess of 40 hrs. Payloads include an EO/IR turret, various EW systems and overland or maritime SAR. While both satellite relay and line of sight control systems are available, the CF variant utilized a line of sight system that supported operations out to 200 km. Extended ranges can be achieved by using another air vehicle as an airborne datalink relay station. The system is highly reliable, with redundancy built into virtually every sub-system.[29]

Meeting the extremely tight timelines imposed by the CF to introduce this sophisticated capability into a very dynamic operational theatre at the end of a very long supply chain was nothing short of remarkable. It was also a testament to what can be achieved by an integrated government/industry team with shared goals and a high level of motivation. In addition to the establishment of all infrastructure at the Main Operating Base in Afghanistan, individual and collective training had to be conducted in Canada and a training pipeline created to sustain the capability. Airworthiness clearances, flight permits, and frequency allocations had to be obtained, and the MDA maintenance organization had to be accredited by DND's Technical Airworthiness Authority.

A key element in minimizing fielding time was to establish requirements based on existing technologies available in the marketplace. Modifications to the Heron system were essentially limited to conversion of sensor data to standard NATO formats and the addition of a second shelter (a transportable, containerized unit, externally similar to the UAV Ground Control Station) into which sensor data was relayed to EW experts and intelligence analysts for interpretation and exploitation.

The use of experienced aircrew and former military technicians enabled individual training times to be greatly reduced. Another critical factor in minimizing the training schedule was the Heron's highly reliable Automatic Take-off and Landing (ATOL) system. The skills required to manually land a UAV take a substantial period of time to acquire and are perishable. The Heron's ATOL system obviated the need for CF aircrews to develop or maintain those skills, thereby significantly reducing training time and proficiency requirements in theatre.

Great importance was attached to collective training in Canada for the entire deploying battlegroup. It allowed the joint force to gain familiarity with the UAV capability and an appreciation for how to employ it prior to arriving in theatre. This applied to commanders from Brigade down to Section level as live streaming video from the UAV could be directly received by troops on the ground using the man-portable ROVER remote video terminal system.

Once in theatre, Heron was quickly recognized as a significant advancement from the earlier Sperwer tactical UAV. To safeguard operational security, precise details of how the Heron was used are not available in unclassified sources. However, the RCAF's unclassified

website provides some insight into capabilities, general missions, and expectations for the system. It states:

> The Heron's primary functions are to gather imagery and data for use in surveillance, reconnaissance, intelligence analysis and target acquisition. It can scout out convoy routes and other ground operations areas, scan for insurgents, or observe suspicious activity, such as planting improvised explosive devices. Its capabilities will help reduce insurgent attacks, and save lives – Canadian and Afghan alike.[30]

Whereas previously, UAVs were routinely almost an afterthought in mission planning and an adjunct to the conduct of operations, the Heron became one of the cornerstone capabilities around which CF operations in Afghanistan were planned and executed. Commanders at all levels praised the system for its capability and its availability. Many indicated they never want to conduct operations again without this type of asset.

On a daily basis, Herons performed and contributed to a wide variety of critical tasks essential to conducting successful operations and protecting allied troops and civilian aid workers. Persistent, relatively stealthy and able to operate over the Afghanistan battle space with relative impunity, Herons were major contributors to traditional surveillance and reconnaissance missions and helped to shape new techniques such as pattern-of-life and collateral damage analysis. "The longest flight the Canadians flew in Afghanistan was 30.2 hours and the aircraft still had 4.5 hours of fuel left in the tank".[31] Herons were not armed, so strike missions were not conducted.

The Heron UAV service operated in support of the CF from January 2009 until combat operations ceased in July 2011. Flying operations were conducted every day unless prevented by weather or aircraft unserviceability. No-fly days during Canada's two-and-one-half-year Heron deployment were extremely rare: "Through 30 months of operations, the Herons logged more than 15,000 hours of flight time".[32] A procedure was also developed to operate more than one UAV simultaneously if the situation warranted this level of effort.

MDA's UAV service consistently received high praise from the Canadian military establishment for the contribution it made to operations in Afghanistan. Air Force Colonel Al Meinzinger, the last commander of the Canadian Air Wing in Afghanistan, lauded the performance of MDA's UAV service, referring to it as "an incredible capability. They really kept the commander on the high ground, operating the UAV almost 20 to 22 hours a day, providing critical information and situational awareness".[33] Meinzinger put the importance of that situational awareness into perspective when he said: "They were saving lives up to the last minute".[34]

Commercial Service Model for UN Operations

While Canada's mission in Afghanistan was clearly conducted in the context of complex overland operations, this same commercial service model is equally applicable to traditional peacekeeping, humanitarian assistance, or maritime operations. As has been emphasized in this chapter, the ability of the Heron to provide decision makers with enhanced situational awareness will have been as important to the effective delivery of humanitarian assistance and disaster relief as it was to the conduct of peace support and combat operations.

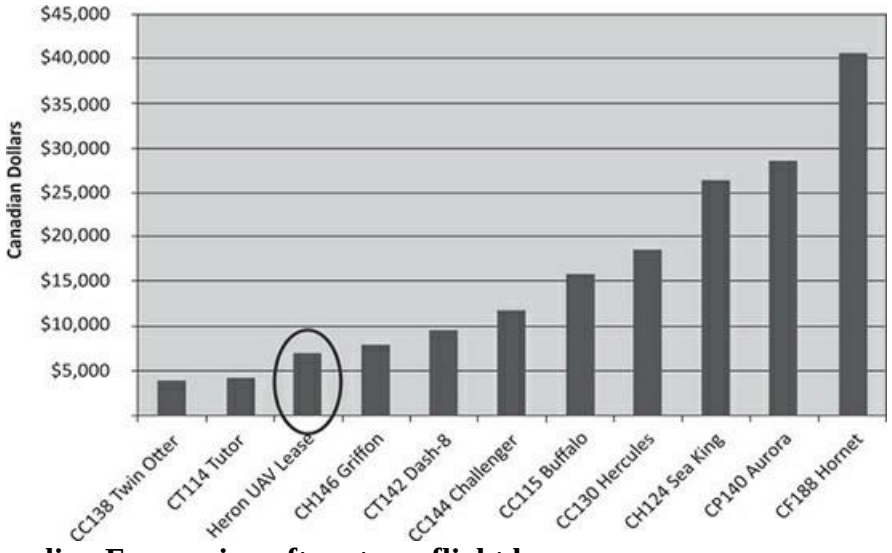

Figure 9.3 Canadian Forces aircraft cost per flight hour
Source: MDA.

As reflected in Project Noctua, a commercial service can provide the UAV systems, maintenance, training, and supply chain. The customer can provide the operators or can opt for a complete turnkey service in which the contractor would also fly the UAVs, operate the sensors and provide the data to the end user. As a commercial enterprise, such services are unarmed and exist to conduct long-endurance ISR missions to enhance situational awareness.

Project Noctua demonstrated that operating Heron under a commercial leasing arrangement was a very cost effective means of obtaining persistent ISR as compared to using manned military platforms. Figure 9.3, developed by MDA, illustrates the costs per flying hour for major CF aircraft fleets and equivalent costs for the Heron UAV lease. Costs for manned aircraft operation were obtained from the DND *Cost Factors Manual*,[35] while Heron costs were derived from actual Noctua contract costs for hours flown.

While the service concept was initiated for Canada, the model is adaptable to meet the needs of other client nations. Within one year of commencing the service for Canada, MDA was under contract to the Commonwealth of Australia to begin training Australian military aircrews for a parallel service in Afghanistan. The service, which commenced operations in January 2010, continues to operate at full capacity and is expected to continue until Australian forces are withdrawn from Afghanistan. The capability delivered through the MDA UAV service has also

garnered praise from the highest levels within the Australian military. On a visit to Afghanistan in November 2010, Air Marshall Mark Binskin, then Chief of the Royal Australian Air Force, remarked: "The Heron is an important component to the modern battlefield, providing vital situational awareness for troops on the ground. It has assisted in saving lives by identifying threats".[36]

Relying on troop-contributing nations to provide UAVs can be problematic, however. While virtually all nations can offer boots on the ground, relatively few can offer UAVs. Not even first-rank military powers such as Canada and Australia own advanced UAVs. Those that do have such assets may not be keen to offer them, as they may be committed to higher-priority missions in support of national interests elsewhere. In cases where UAVs cannot be secured from troop-contributing nations, the United Nations itself should strongly consider contracting for them using a centrally funded approach, as they do now with fixed wing and rotary wing air transport resources. This capability can be obtained today from industry and could be rapidly deployed anywhere on the globe.

The MDA service offering for Canada and Australia was based on Heron because that was the platform that best met the customers' requirements. However, virtually any system could be offered, depending on the UN mission-specific requirement. MDA has recently launched Persist-INT™, an on-demand, UAV-based ISR service for ISAF nations in Afghanistan. This complete turnkey offering was conceived to provide UAV services to nations with limited means or which do not desire or require long-term UAV support. The Persist-INT™ concept allows users to immediately access UAV services without incurring substantial capital investment or infrastructure costs. It also obviates the requirement to recruit and train specialist operators, engineers, technicians, logisticians and other services.

The Persist-INT™ approach offers a rapid and uncomplicated means of obtaining UAV services for UN missions, or in support of multinational coalitions engaged in the enforcement of UN Security Council resolutions. If a centrally funded approach were not possible, the UN or coalition leadership could appeal to nations to contribute contracted UAVs as an alternative to making a troop commitment. Depending on national or international circumstances, this could provide a more appropriate means of making a significant and highly valued contribution to a mission.

Challenges

There are challenges to employing UAVs; however, in MDA's experience, few if any of these are technical. While the hot, high, and dusty operating environment in Afghanistan was demanding, both equipment and contractor personnel proved fully capable of coping with all circumstances encountered. MDA was contractually incentivized to deliver system availability and reliability in excess of 90 percent. During Project Noctua, the company consistently exceeded those targets and averaged 94 percent mission availability and 94 percent mission reliability.[37] In addition, no aircraft were lost in Afghanistan. That more than 15,000 flying hours were achieved in a 30-month period is a clear testament to the technical success achieved.

Of greater concern are the regulatory challenges to employing this new technology. All aircraft, including UAVs, must be operated under some sort of an authorization for flight. Such

an authorization could either be issued by the regulatory organization within the military force that operates the UAVs, or by the civil regulatory agency of the nation in which they are being operated. For example, delegated officers within the Canadian Forces Directorate of Technical Airworthiness and Engineering Support issued flight permits to MDA for UAV operations in Afghanistan and within Canadian Military Airspace. Transport Canada issued Special Flight Operations Certificates to MDA to operate in Canadian airspace when their UAVs were not on the military register.

Access to appropriate portions of the radio frequency spectrum would also need to be allocated to control the UAV and to enable the transmission of the surveillance data it collects to the ground control station. Frequency allocation is also regulated. On a military operation it would have to be built into the communications plan and allocated by the responsible military agency within the coalition. Authority may have to be sought from civil regulators within the nation in whose airspace the UAV is to be operated. Industry Canada allocated frequency spectrum to MDA for operations within Canadian airspace. In Afghanistan frequency spectrum was allocated by ISAF. The fact that UAVs are operating in support of UN resolutions today indicates that any regulatory challenges are not insurmountable. However, they must be considered early in the planning process and addressed before flight operations commence. It is assumed that the United Nations has dealt with the issue of spectrum management for previous intervention operations and is no stranger to dealing with international air regulation issues. After all, the International Civil Aviation Organization is a UN agency. Where required, the United Nations should be able to use its good offices to obtain the necessary flight authorities from appropriate civil regulators.

Conclusion

Situational awareness underpins the success of all military operations regardless of whether they involve combat or not. The evolution of remote sensing technology and unmanned aerial vehicles in particular has offered military users reliable, persistent situational awareness while significantly reducing risk to deployed troops. These developments have made UAVs an essential component of military forces in the developed world. Consequently, we have seen exponential growth in their use on contemporary military operations conducted during the past decade.

In addition to its obvious advantages over traditional UN surveillance tools and manned aerial surveillance platforms, the MALE UAV is a true force multiplier that can allow commanders to employ their assigned resources much more effectively. MALE UAVs would clearly constitute an extremely valuable addition to any UN mission regardless of its nature. Today, only a handful of the world's elite military forces have MALE UAVs in their inventories. In some of those nations, UAVs may be considered too scarce or too valuable to be offered in support of non-national missions. Employment of a commercial service model could provide an effective alternative to reliance on troop-contributing nations for this critical capability. It offers a convenient, cost-effective and expeditious means of acquiring top-tier UAV mission support

via a commercial arrangement and has become the template for rapidly delivering a highly technical and complex capability to meet an urgent need. A commercial service model offers the means to provide a short-term or interim capability, a long-term solution, or an approach to augment existing high demand/low density assets.

Assured access to MALE UAVs may require the United Nations to explore innovative and non-traditional solutions, just as Canada did with Project Noctua. By adopting the same centrally funded approach that has been successfully used to furnish commercial airlift services, UN operational commanders can be provided with sophisticated UAVs and the indispensable benefits they offer.

Endnotes

[1] Frost & Sullivan and European Commission Enterprise and Industry Directorate General. *Study Analysing the Current Activities in the Field of UAV*, ENTR/2007/065 (2008), 5.

[2] Van Bavel, G. *A Survey of Experimental UAV Squadrons in Exercise Robust Ram and Operation Grizzly*, Operational Research Division–Directorate of Operational Research (Joint), 2003/05, Defence Research and Development Canada, 3. Available at: http://cradpdf.drdcrddc.gc.ca/PDFS/unc10/p520035.pdf [accessed 9 September 2012].

[3] Unmanned.co.uk. *I-GNAT – Unmanned Vehicles (UAV) Specifications & Data Sheet*. Available at: http://www.unmanned.co.uk/autonomous-unmannedvehicles/uav-data-specifications-fact-sheets/I-Gnatspecifications/ [accessed 9 September 2012].

[4] Chief of the Air Staff. *Canadian Forces Aerospace Doctrine*. 2nd edition (B-GA-400-000, Winnipeg/Trenton: Air Force Doctrine and Training Division / Canadian Forces Aerospace Warfare Centre, 2010), 37.

[5] Dorn, A.W. *Keeping Watch: Monitoring, Technology and Innovation in UN Peace Operations* (Tokyo: United Nations University Press, 2011), 65.

[6] MMIST. *Snow Goose UAV*. Available at: http://www.mmist.ca/pg_ProductsSnowGooseOverview.php [accessed 9 September 2012].

[7] United Nations Department of Peacekeeping Operations. *United Nations Peacekeeping Operations Principles and Guidelines* (New York: United Nations, 2008), 21.

[8] Ibid., 31–4.

[9] Canadian Expeditionary Forces Command. *Operation Athena*. Available at: http://www.forces.gc.ca/en/operationsabroad-past/op-athena.page [accessed 7 May 2014].

[10] Kenyon, H. "Video Streams to the Tip of the Spear", *Signal Magazine*, April 2009.

[11] CBC News. *In the Line of Duty: Canada's Casualties [in Afghanistan]*. Available at: http://www.cbc.ca/news2/interactives/canada-afghanistancasualties/ [accessed 7 May 2014].

[12] MacLeod, C. "Flying Above Afghanistan", *The Maple Leaf*, 3 February 2010.

[13] NATO. *NATO/WEU Operation Sharp Guard*. Available at: http://www.nato.int/ifor/general/shrp-grd.htm [accessed 9 September 2012].

[14] NATO. *NATO Arms Embargo against Libya Operation UNIFIED PROTECTOR*. Available at: http://www.nato.int/nato_static/assets/pdf/pdf_2011_03/20110 unified-protector-factsheet.pdf [accessed 9 September 2012].

[15] The Western European Union is a now defunct military grouping whose functions transferred to the European Union's Common Security and Defence Policy.

[16] United Nations Security Council (1991), *Security Council Resolution 713 (1991)* ["Continued hostilities in Socialist Federal Republic of Yugoslavia"], S/RES/713 (1991), 25 September.

[17] United Nations Security Council, *Security Council Resolution 1970 (2011)* ["Situation in Libya/Peace and security in Africa"], S/RES/1970 (2011), 26 February 2011.

[18] United Nations Security Council "Security Council Authorizes States to Use Land-based Operations in Somalia, as Part of Fight Against Piracy Off Coast, Unanimously Adopting 1851 (2008)", UN Doc. SC/9541, 16 December 2008. Available at: http://www.un.org/News/Press/docs/2008/sc9541.doc.htm [accessed 9 September 2012].

[19] "Organic" is a term defined as "assigned to and forming an essential part of a military organization" (US Department of Defense Military Dictionary) such as all helicopters assigned to a Task Force. The author's military experience includes participation in Operation Sharp Guard, where a Naval Task Force deployed to the Adriatic Sea to enforce UN Security Council Resolutions. In this context, "organic helicopters" were those assigned to the Task Force; they were military helicopters from contributing nations that were embarked in the ships of the Task Force, and under the operational control of the Task Force Commander.

[20] NATO. *NATO Airborne Early Warning and Control Force E-3A Component.* Available at: http://www.e3a.nato.int/eng/html/organizations/wing_ow.htm [accessed 9 September 2012].

[21] Maloney, S. "Force Structure or Forced Structure", *Choices*, May 2004, 11.

[22] Canadian Expeditionary Forces Command, *Operation Mobile*. Available at: http://www.forces.gc.ca/en/operationsabroad-past/op-mobile.page [accessed 7 May 2014]. Military Daily News, *NATO AWACS Eye Libyan Skies*. Available at: http://www.military.com/news/article/nato-awacs-eye-libyanskies-.html [accessed 9 September 2012].

[23] NATO. *AWACS: NATO's Eyes in the Sky.* Available at: http://www.nato.int/cps/en/natolive/topics_48904.htm [accessed 7 May 2014].

[24] Air Recognition. *French Air Force deploys Harfang SIDM UVA over Libya.* Available at: http://www.airrecognition.com/index.php/archive-worldworldwide-news-air-force-aviation-aerospace-air-militarydefence-industry/news-year-2011-aviation-aerospace-airforce-defence-military-industry/august-2011-2/108-french-airforce-deploys-harfang-sidm-uva-over-libya.html [accessed 9 September 2012].

[25] Air Force Technology, *Harfang MALE Unmanned Aerial Vehicle (UAV), France.* Available at: http://www.airforce-technology.com/projects/harfang-drone/ [accessed 9 September 2012].

[26] Flightglobal News. *US arms UAVs for Libya missions*. Available at: http://www.flightglobal.com/news/articles/usarms-uavs-for-libya-missions-355895/ [accessed 9 September 2012].

[27] Her Majesty the Queen in Right of Canada, represented by the Minister of Public Works and Government Services, *Independent Panel on Canada's Future Role in Afghanistan*, FR5-20/1-2008. Available at: http://publications.gc.ca/collections/collection_2008/dfaitmaeci/FR5-20-1-2008E.pdf [accessed 9 September 2012], 35.

[28] Royal Canadian Air Force. *CU-161 Sperwer*. Available at: http://www.airforce.forces.gc.ca/v2/equip/hst/cu161/indexeng.asp [accessed 9 September 2012].

[29] Israel Aerospace Industries. *Heron Family*. Available at: http://www.iai.co.il/18900-en/BusinessAreas_UnmannedAirSystems_HeronFamily.aspx [accessed 9 September 2012].

[30] Royal Canadian Air Force. *CU-170 Heron*. Available at: http://www.airforce.forces.gc.ca/v2/equip/cu170/indexeng.asp [accessed 9 September 2012].

[31] Ibid.

[32] Marsden, W. "The Allies' Eyes in the Skies", *The Vancouver Sun*, 23 July 2011.

[33] Pugliese, D. "Canada: Not Enough People to Fly New UAVs", *Defense News*, 31 October 2011.

[34] Marsden, "The Allies' Eyes in the Skies".

[35] Director Strategic Finance and Costing. *Cost Factors Manual 2009–2010*, Department of National Defence, 22 June 2009.

[36] Australian Defence Force. "Chief of Air Force visits Middle East", 17 November 2010. Figures provided by MDA UAV Services Project Manager.