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The CF MALE/HALE UAV:

Not an Immediate Panacea

By /par

Major S.G. Sarty

Abstract

The Medium Altitude Long Endurance (MALE) and High Altitude Long Endurance (HALE) Uninhabited Aerial Vehicles (UAVs) promise to offer great advantages for Canada as an Intelligence, Surveillance and Reconnaissance (ISR) platform. The vast geography of Canada and long coastlines seem to be ideal for UAV surveillance. The CF recognized the potential for the UAV and launched the Canadian Forces Joint Unmanned Surveillance Target Acquisition System (JUSTAS) in late 1999. The project is scheduled to deliver a fleet of medium-altitude Uninhabited Aerial Vehicles (UAVs) with an initial operational capability in 2011.

This paper argues that this date is too ambitious and the date should be removed or pushed back to until full testing can be completed. Recent tests have proven the MALE UAV to be too limited by weather and speed to meet Canadian requirements. Whereas the HALE UAV is too expensive and unproven at the moment. Additionally, the CF ISR network has to be improved to exploit the capability of a new ISR asset.

The JUSTAS Project is assessing UAV capabilities, however the project will soon run out of time to meet the delivery date and the CF will get what was best at the time instead of waiting for the right ISR UAV. The study must continue but timelines lifted and expectations for the UAV adjusted or there will certainly be disappointment.

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Introduction

Although they are not a new concept, the recent surge in the development and increased military utility in Uninhabited Aerial Vehicles, (UAVs) attracted the interest of the Canadian Forces (CF). The CF purchased several models and the Defence Research and Development Canada Unmanned Aerial Vehicle Research Test Bed continues to explore the integration of the technology.[1] The UAV promises to be a force multiplier with the ability to provide critical information in near real time. There is no doubt that the UAV has the technical capability to contribute vast amounts of information into the commander at the tactical and operational as well as the strategic level. However, the UAV in itself is not a solution. The UAV is simply another Intelligence, Surveillance, Reconnaissance (ISR) platform that provides information into a collective information management and distribution system. The effectiveness and utility of the UAV will not be measured on the information it collects but instead it will be graded on the usefulness of the information it provides to the end user. The management of the information provided by the UAV will determine its success or failure. The information management systems must be critically assessed and improved before the introduction of an operational or strategic UAV will demonstrate its full value.

The CF recognized the potential for the UAV to meet requirement to increase domestic and deployed ISR capability and launched the Canadian Forces Joint Unmanned

[1] Defence Research and Development Canada, "Unmanned Aerial Vehicle Research Test Bed," http://www.ottawa.drdc-rddc.gc.ca/html/ffse_207_uav_e.html ; Internet, accessed 26 February 2008.

Surveillance Target Acquisition System (JUSTAS) in late 1999.[2] Although this is a joint project in name, it primarily involves the Air Force and the Navy as the Army is concentrating on the tactical UAV to support ground operations. The project is scheduled to deliver 'a fleet of medium-altitude Uninhabited Aerial Vehicles (UAVs) capable of overland operations, in Canada and abroad, providing intelligence, reconnaissance, surveillance and target acquisition information." [3] with an initial operational capability in 2011.

This target date for delivery of these systems is too ambitious. The technology is not ready to meet Canada's specific requirements. This paper will outline the reasons Canada would be better to suspend the delivery date until conditions are right.

This paper will focus on the ISR capabilities of the operational/strategic UAV. The UAV acronym has several definitions, used differently by different sources. Although "Ariel Vehicle" appears to be consistent, the "U" can be a variety of words including, Unmanned, Uncrewed, Unpiloted, and Uninhabited. Transport Canada offers a circular differentiation where An "Uninhabited Air Vehicle" is a Department of National Defence term to describe an "Unmanned Arial Vehicle" which is defined as "a power-driven aircraft, other than a model aircraft, that is designed to fly without a human operator on board".[4] However, the FAA takes a holistic approach and defines the vehicles as

[2] Canadian American Strategic Review, "Background-Canadian Forces UAVs-the JUSTAS Project," http://www.sfu.ca/casr/bg-uav-justas-project.htm ; Internet, accessed 22 March 2008.

[3] Department of National Defence, *Report on Plans and Priorities 2008-2009* (Ottawa: Canada Communications Group, 2008), 58.

[4]Transport Canada, Civil Aviation, Policy & Regulatory Services, Aviation Terminology Standardization, "Glossary for Pilots and Air Traffic Services Personnel (TP 1158E),"

Unmanned Aircraft Systems (UASs) to encompass the ground station and operator as part of the overall system.[5] For the purposes of this paper, the UAV is an Uninhabited Aerial Vehicle with autonomous capability with a human in control of its actions. This eliminates cruise missiles and other 'fire and forget' vehicles from consideration.

The field is further refined by isolating the primary role of the subject UAV to ISR. Combat Uninhabited Aerial Vehicles (CUAV or UCAV) and target drones are not included in the study group. Tactical UAVs (TUAV) have a distinctive and tailored role to directly support a specific mission. These platforms may contribute to an operational level ISR picture but the primary role is to provide immediate information to the tactical commander on the scene. The TUAV and its emerging role in the battle space is a complex issue worthy of a dedicated study, therefore only their ISR contributions to the operational level will be considered.

The actual airframes that comprise the UAV category vary greatly, from a fixed wing to rotary wing, from jet engine to solar power, and from 100 feet to one foot. each type of UAV has its own pros and cons, every design has a purpose. However, the actual UAV regardless of its size or configuration is simply a platform to provide information to the end user. There is a lot of literature studying the intricate capabilities of these amazing airframes. However, the true value in any UAV to operational and strategic leadership will only be realized through effective employment and streamlined information

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http://www.tc.gc.ca/CivilAviation/RegServ/terminology/glossary/u.htm#unmanned_air_vehicle ; Internet; accessed 23 February 2008.

[5] Federal Aviation Administration, Fact Sheet, "Unmanned Aircraft Systems (UASs)," http://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=6287 ; Internet; accessed 24 March 2008.

management. Therefore, this paper will explore the capabilities of the UAV and the Canadian Forces ability to employee the ISR UAV to effectively manage the information to achieve the desired effects.

ISR UAV Background

Uninhabited Aerial Vehicles were explored as weapons platforms and military intelligence gathering instruments even before the Wright brothers' first manned flight in 1903. In 1863 Charles Pearly used a gas balloon to release explosives over the enemy during the U.S. Civil War.[6] Although it proved quite dangerous with limited success, it opened a new aerial dimension to consider in combat operations. Cpl Eddy recognized the ISR potential in airborne platforms during the Spanish-American War of 1898 where he took a kite fitted with a camera to capture the first wartime aerial surveillance photos.[7] This innovative action launched a new era of intelligence gathering and deception.

The development of manned flight opened the air dimension to a wide variety of ISR platforms. During WWI, airplanes joined balloons and blimps to gather information about the enemy position and actions. Manned flight soon proved reliable and extremely capable platform for gathering information, which lead to the development of more sophisticated manned ISR aircraft such as the SR-71 and the U2. However, it still placed

[6] NOVA Science Programming on Air and Online, Spies that Fly, "Time Line of UAVs," http://www.pbs.org/wgbh/nova/spiesfly/uavs.html ; Internet; accessed 23 February 2008.

[7] *Ibid.*

the pilot at risk, which was infamously demonstrated in 1960 when Gary Powers was shot down over the USSR while piloting a U2 on a CIA intelligence-gathering mission.[8]

It is interesting to note that the same year Gary Powers was shot down over the USSR, the US started the highly successful AQM-34 Ryan Firebee program. The Fire Fly was the Firebee ISR UAV variant that completed over 34,000 missions in Southeast Asia between 1964 and 1975.[9] The Fire Fly also incorporated stealth techniques to reduce radar cross section, which helped it achieve its 83% survivability rate.[10]

The Powers event in 1960 led the United States to look to unmanned sensors in the form of satellites to provide strategic intelligence. The first era of space ISR (190-1975) brought the U.S. to full operational capability in Imagery, SIGINT and missile warning in very short time.[11] The space surveillance tools were very low risk but they did not have much flexibility. The satellite flew by the target when the orbit dictated and there was no chance of changing the sensors after it was launched. With a satellite, you have what you have. This was acceptable during the cold war where the adversary was known extremely well and their potential actions could be scripted. However, as the global nature of conflicts changed from the Cold War to Asymmetric warfare, the need for highly flexible and responsive ISR providers at low risk became immediately apparent. The stage was set and industry responded with modern, purpose built ISR UAVs.

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[8] Central Intelligence Agency, "Francis Gary Powers: U2 Spy Pilot Shot Down by Soviets," http://www.foia.cia.gov/powers.asp ; Internet; accessed 23 Febuary2008.

[9] NOVA Science Programming on Air and Online, Spies that Fly, "Time Line of UAVs," http://www.pbs.org/wgbh/nova/spiesfly/uavs.html ; Internet; accessed 23 February 2008.

[10] *Ibid.*

[11] Bill Savage, "Defense—Intelligence Space Integration," available from http://www.fas.org/spp/eprint/article01.html#first ; Internet; accessed 22 March 2008.

Canada and the CF were involved early in UAV development but were never fully committed to funding the capability. In the early 1960's Canadair developed the CL-89 surveillance drone in conjunction with the U.K. and West Germany. The system proved to be highly effective and led to the development of its successor, the CL-289. Canadair built the CL-289 for the French and German militaries yet the Canadian government chose not to invest in them.[12] The CL-289 system entered service in 1990 and established itself as a reliable and effective ISR platform for the Germans and French over Bosnia and Kosovo where they have completed over 1400 sorties with only four losses.[13] The CL-289 procurement for the CF was a victim of partisan politics rather than CF requirements or system capabilities. The decision to pass on the CL-289 essentially handed further development to the French and Germans and placed Canada in the position of shopping for ISR UAVs rather than producing them.

Canadian Requirements

Does Canada need ISR UAVs? To answer the question, we will look at Canadian sovereignty requirements and deployed military ISR requirements then the next section will look at UAVs to determine if they can meet some or all of these needs.

[12] Ron Pickler and Larry Milberry, *Canadair: The First 50 Years* (Toronto: CANAV Books, 1995), 234-236.

[13] Canadian American Strategic Review, "Canadian Unmanned Aerial Vehicles – a Brief Historical Background," http://www.sfu.ca/casr/bg-uav-history.htm ; Internet; accessed 26 February 2008.

Canada has almost 10,000,000 square kilometers of land mass along with 243,000 kilometers of coastline to observe and control.[14] Additionally, most areas are sparsely populated and difficult to travel to by land. Canada has an ongoing requirement to observe and control all sea and air approaches to the country to maintain its sovereignty and assist law enforcement. Furthermore, there is a growing interest in Canada's north due to global warming and the emerging shipping potential of the Northwest Passage. Surveillance in the far north is becoming a priority for the current government of Canada.

In addition to constant surveillance of the country and approaches, Canada has occasional requirements for information gathering for specific geographical areas for specific times. Such as security for government summits, the Olympics and high concentrations of people such as a sporting event that may be a target for terrorism. Additionally, natural disasters and emergency preparations may require specific information or surveillance over part of Canada.

There is a clear requirement for a flexible and responsive domestic surveillance capability. Although some surveillance could be conducted through other means, such as satellite and radar surveillance, the addition of a mobile aerial surveillance platform would enhance Canada's ability to control its borders, provide security and respond to disasters.

[14] Natural Resources Canada, "Coastline and Shoreline," http://atlas.nrcan.gc.ca/site/english/learningresources/facts/coastline.html ; Internet; accessed 26 Febuary 2008.

Deployed CF operations over the last decade are also showing a trend of requiring more ISR resources. Asymmetric warfare requires immediate information to respond to fleeting opportunities. In addition, peace making or peacekeeping missions would benefit greatly from a flexible and reliable ISR platform to monitor combatant's positions and to provide force security.

The CF has a requirement to acquire ISR data from an extremely large but known domestic landmass and coastline. In addition, the CF requires a deployable system to provide ISR in isolated or undeveloped areas of the globe. Although space and radar data can provide some of the required information, the addition of a flexible platform would greatly enhance the CFs capability to quickly assess developing situations and apply the appropriate resources to respond. Overall, this asset would be a force multiplier though its ability to provide more information to allow commanders to have the right resources at the right place at the right time.

UAV ISR Capabilities

Canada has a need for a flexible and accurate ISR platform. Although remote sensing through space-based assets can provide valuable data, it does not offer the flexibility of airborne assets. While manned aircraft have the ability to provide the capability, the UAV offers several advantages. Primarily, safety, endurance, increased maneuverability and (debatably) cost. The safety advantages are realized though the unmanned aspect. A UAV can be flown into dirty and dangerous mission without fear of losing human life on board. Endurance is increased by eliminating the weight needed to sustain and protect

human life on board the aircraft and use the savings to add more fuel. Additionally, pilot fatigue is no longer a limiting factor for endurance since mobile operators can be changed on the ground. Without a human on board, a UAV can maneuver to the limit of its engineered design without fear of pilot blackout or injury. The cost of the UAV systems is significant. Although it is generally agreed that they are cost effective, they do not offer a huge financial incentive to move immediately to the UAV. Cost is a relative term that means many things to many people. An effective cost efficiency measure in western society is to observe the market trends. Current trends indicate UAVs entering the private sector as cost efficient instruments to accomplish critical goals. NASA is currently working on a UAV project to monitor coffee production in Hawaii.[15] At the opposite end of the market, grass roots operations are emerging to offer low cost ISR UAV access to private industry and individuals.[16] These are positive signs that UAV costs are declining.

As UAVs evolve, the categorization of the different models and capabilities is also evolving. The U.S. military alone, the Army, Air Force and Marines each have their own tier system to categorize and identify the role of the UAV within the organization. Regardless of the specific categorization, three main types of ISR UAV are generally recognized within the community and are of interest to us. The tactical UAV with a range of 160 km and altitudes up to 18,000 ft, the Medium Altitude Long Endurance

[15] NASA, Ames Research Center, Fact Sheets, "The Uninhabited Aerial Vehicle (UAV) Coffee Project," http://www.nasa.gov/centers/ames/research/factsheets/FS-020901ARC.html ; Internet, accessed 12 April 2008.

[16] UAV Systems-Unmanned Aerial Photography & Survey, "About UAV Systems," http://www.hotfrog.com.au/Companies/UAV-Systems-Unmanned-Aerial-Photography-Survey ; Internet, accessed 12 April 2008.

(MALE) with ranges over 200 km and up to 60,000 ft, and the High Altitude Long Endurance (HALE) with indefinite range and operating altitudes over 60,000 ft.[17] These are broad definitions subject to interpretation but serve to categorize vary basic types of UAV. As was mentioned earlier, the tactical UAV has a primary role within the CF to support the tactical commander. Therefore, it is the MALE and HALE platforms that are of primary interest as operational and strategic ISR providers. It is these vehicles that may meet Canada's requirement to improve the capability to conduct surveillance over the vast landmass and coastline as well as provide operational level ISR in deployed operations.

Current CF Position

As mentioned in the Introduction, the JUSTAS project is mandated to deliver a fleet of medium-altitude UAVs with an initial operational capability in 2011. The project is further mandated to procure integrated and joint interoperable system to include the UAV, sensor suites, communications and infrastructure.[18]

The JUSTAS project conducted several in-depth tests of available platforms. A test was conducted on the west coast with the navy in 2003 (Pacific Littoral ISR Experiment) followed by the Atlantic Littoral ISR Experiment (ALIX) in 2004.[19] The ALIX event employed a MALE UAV (General Atomics 'Altair') to conduct a recce in Nunavut, a

[17] Roland Weibel, "Safety Considerations for Operation of Different Classes of Unmanned Areil Vehicles in the National Airspace System" (master's thesis, Massachusetts Institute of Technology, 2005), 43.

[18] *Ibid.*

[19] National Defence and the Canadian Forces, "Atlantic Littoral ISR Experiment (ALIX)," http://www.forces.gc.ca/site/Newsroom/view_news_e.asp?id=1432 ; Internet, accessed 26 February 2008.

maritime surveillance exercise over the Grand Banks followed by a mission with the Army in Gagetown. The ALIX event marked the first time a UAV flew under a flight plan in Canadian airspace. The experiment revealed the capability of the Altair as a viable ISR platform; however, it also exposed some significant limitations.

The platform experienced serious limitations in austere weather, a common environment in Canada's north and littoral regions. The UAV was not able to fly through icing conditions, which severely limited the ISR value and data collection while it was in Nunavut.[20] Additionally, the Altair cruises at 120 knots which presents a challenge for a country with the geography of Canada. The aircraft experienced 110 knot crosswinds in the north and 80-85 knot tailwinds (which presumable turned to headwinds on the return leg) over the Atlantic.[21] Goose Bay, Labrador was used as the staging base for the experiment, which is approximately 675 nautical miles from Iqaluit. Therefore, on a calm day, it will take over 5.5 hours for the UAV to transit. A modest northern wind could double that time. Furthermore, overcast or icing conditions could render the platform useless once it gets there. The picture does not get much better over the Atlantic, where weather conditions are unpredictable and often austere. Additionally, as chance would have it, the CF often needs to acquire ISR information during poor weather. Often, the information is needed when the weather is dangerous for manned flight and would suite a UAV type mission. However, this option is eliminated if the vehicle cannot operate in the adverse environment. This alone is a significant limitation for this ISR platform in domestic operations.

[20] Peter La Franchi, "Smart Alix," Flight International, (September 21-27, 2004), 48.
[21] *Ibid.*

Another limitation was expected and proven when the Altair traveled above 66 degrees north (where the Northwest Passage is located). Line of sight, and therefore communication, with geostationary communication satellites is lost in the far north. This was mitigated by leasing bandwidth from the Iridium constellation of low earth orbit communication satellites. Although the communication arrangement was adequate to control the UAV, it was not sufficient to transmit imagery.[22] This limitation is not unique to the UAV, it is a challenge that will have to be dealt with regardless of the atmospheric ISR platform (manned or unmanned) used in the North. The MALE UAV does not offer a solution to this Canadian geographic challenge.

The ALIX tests also revealed the delicate balance between the endurance and capability of the MALE UAV ISR platform. An externally mounted maritime patrol radar was attached to the UAV to improve ISR capability, however it experienced problems and demanded a heavy price in endurance.[23] The capability of a domestic Canadian UAV would have to be carefully calculated to ensure the range and endurance of the UAV are not crippled. A MALE UAV with high quality imagery equipment may not have the weight budget to accommodate Canadian requirements for range.

The HALE UAV platforms offer a considerable improvement over the MALE limitations. For instance, Northrop Grumman reports the Global Hawk (the only real contender at the moment) has speeds of up to 340 knots at up to 65,000 feet with 35 hrs

[22] Peter La Franchi, "Smart Alix," Flight International, (September 21-27, 2004), 49.
[23] *Ibid.*

endurance.[24] Grumman advertises an on station loiter time of 24 hours after transiting 1,200 nm. In addition, the ISR package on board is state of the art with room to add additional capability without immediate impact to performance. Northrop Grumman is continuing testing on the system in austere weather and de-icing,[25] which would greatly increase the flexibility for use in Canadian domestic operations. The HALE UAV will not solve the communication problem above the 66th parallel but with the extensive loiter time and altitude, it could contribute by acting as a communication relay. Overall, the Hale UAV appears to be the logical solution for Canadian Domestic ISR UAV requirements and should be tested in that role.

Although the HALE UAV appears to fit Canadian domestic requirements, it is overkill for current deployment requirements. The system could conceivably deploy from Canada or a friendly nation outside the theatre to conduct missions within theatre. However, it would still require the flexibility of a tactical UAV to augment its capability.

The drawback of the HALE UAV is the tremendous price. Cost overruns have plagued the development of the Global Hawk, which are forwarded on to the consumer. The costs were reported at $35M per unit in 2005[26] without the required support and logistical

[24] Northrop Grumman, "RQ-4 Block 10 Global Hawk," http://www.is.northropgrumman.com/systems/ghrq4a.html ; Internet, accessed 12 March 2008.

[25] Northrop Grumman, "Northrop Grumman Details BAMS Airframe Risk Reduction Element," http://www.irconnect.com/noc/pages/news_printer.html?d=121070&print=1 ; Internet, accessed 12 March 2008.

[26] Defense Industry Daily, "$143M for Global Hawk Cost Overruns," http://www.defenseindustrydaily.com/143m-for-global-hawk-cost-overruns-0408/ ; Internet, accessed 12 March 2008.

systems. As a basic comparison, the P-3 Orion is reported to cost $36M per unit.[27] A comprehensive cost comparison would have to be conducted before any useful conclusions could be derived regarding cost efficiency of the Global Hawk. However, it is reasonable to expect costs to draw down as research and development costs are spread over more units and competitors enter the market in the future. The HALE UAV is a new technology with significant capability and a price tag to match.

The JUSTAS project has taken a cautious approach to evaluating the capabilities of the various ISR UAV platforms over the last nine years, however, the market is changing and the HALE UAV has to be seriously considered and tested before rendering a decision. The project should not be tied to the 2011 delivery timeline.

The ISR Network

It is largely recognized that the ISR UAV will not replace manned platforms in the near future but they will add to the network of ISR assets available to the commander. Part of this network will be the upgraded CP-140. The Aurora Incremental Modernization Project will keep the platform available for long-range ISR missions until 2020.[28] Additionally, the Air Force and Navy are defining requirements for the successor to the Aurora, which indicates the UAV will be part of a network of airborne ISR assets.

[27] Air Test and Evaluation Squadron Two Zero, "P-3 Orion," http://force.navair.navy.mil/p3.htm ; Internet, accessed 12 March 2008.

[28] National Defence, "The Future of the CP-140 Aurora," http://www.forces.gc.ca/site/newsroom/view_news_e.asp?id=2532 ; Internet, accessed 12 March 208.

In addition to the Airborne ISR platforms, Canada has ground, sea and space based ISR assets. The NORAD warning radar network is a significant source of surveillance information. In addition, the many civilian radar systems through the country are beginning to feed information for national surveillance purposes. Naval ships have radar systems and submarines monitor the sea. Above all of this activity are Canadian and ally satellites with significant ISR capabilities, such as the recently deployed RADARSAT-2.[29] The ISR UAV will be joining a diverse team of information gathering instruments. The question is, is the CF ready to manage all the information?

The role of ISR is to provide the commander or decision maker with immediate comprehensive and relevant information to allow them to decide on a course of action. Information has a lifespan and it can quickly become useless if it does not get to the right person quickly. The concept of net-centric operations is used throughout the Aerospace capability Framework to describe this sharing and management of information.[30] The current information management for ISR data is not efficient within Canada, let alone interoperable within a coalition in deployments. Populating the various "Common Operating Pictures" within the Command and Control (C2) system in the CF is a challenging endeavor. There are difficulties with the link technology to allow the various current assets to talk to each other and/or to the C2 networks. Simply feeding the radar from a Canadian Navy Frigate to the NORAD radar system is not a simple or routine task. The collective effect of all the available ISR assets is greatly diminished by the

[29] Canadian Space Agency, "RADARSAT-2," http://www.space.gc.ca/asc/eng/satellites/radarsat2/; Internet, accessed 22 March 2008.

[30] National Defence, "The Aerospace Capability Framework," http://www.airforce.forces.gc.ca/site/vision/acf_e.asp ; Internet, accessed 22 February 2008.

difficulty in managing the data and the information. A newly acquired ISR UAV would be subjected to the same impediment.

Canada has significant ISR instruments and resources that are not able to contribute to the ISR picture to their full capacity. Although there are efforts to correct this situation, it remains a significant hurdle to overcome. The potential of the ISR UAV will not be realized until the information management architecture is established to get the right information to the right people at the right time. This Architecture should take priority over the acquisition of all but critical ISR contributing instruments, including a new UAV.

UAV Integration in the CF

The UAV is simply a tool to gather data to be interpreted and sent to the right people to help them make decisions. The platform itself does not have this effect it is the information architecture the management of the tool and above all the management of the information that has the effect. This aspect of the UAV procurement can not be forgotten and must be addressed before the UAV for any other ISR asset will provide the expected returns.

While tactical UAV procurement should continue, the JUSTAS project should have the UAV Initial Operating Capability timeline extended indefinitely for the following two reasons.

First, the MALE UAV does not offer a significant advantage over current ISR capability. It is limited too much by weather and it will have difficulty reaching the area of interest in a timely manner if there are any winds. Although the HALE UAV is promising, it is an emerging technology, which comes with the associated costs and risks. Research and testing should continue to determine a suitable UAV platform to meet Canada's requirements but the procurement should not be cemented in time.

Second, The ISR information management architecture is not robust enough to handle current ISR assets. This information gathering and dissemination system must be made more efficient to fully realize the current ISR capability and to exploit newly procured platforms.

Conclusion

Canada has an extremely large and sparsely populated landmass along with the world's largest coastline. Providing surveillance of the approaches and the country to provide safety, security and sovereignty is the responsibility of the CF. There will never be enough resources to accomplish this enormous task; however, every opportunity to acquire a new resource to tackle the task is welcomed. The ISR UAV is a very capable platform that offers some advantages over manned aircraft, primarily endurance. However, the limitations of the MALE UAV outweigh the advantages it provides. The HALE UAV is extremely capable but too early in its development to be affordable or proven. The HALE holds a lot of promise but the CF must be given time to properly evaluate it.

The time spent studying the UAVs further could also be used to develop an integrated information management system to collate current CF ISR assets and provide a framework for new acquisitions. The capability of the new UAV will never be realized if the information does not get to the proper user.

The JUSTAS Project is assessing the capabilities of the UAV in a systematic method to ensure the CF procures a desired capability. However, the project will soon run out of time to meet the delivery date and the CF will get what was best at the time instead of waiting until there are clear advantages to the ISR UAV. The study must continue but timelines lifted and expectations for the UAV adjusted or there will certainly be disappointment.

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