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# Canada's New Arctic Drone in Context

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On December 21, 2020, the Government of Canada awarded the Israel-based defence firm Elbit Systems a $36.16 million CAD contract for a remotely piloted aircraft system (RPAS), more colloquially known as a drone. Required to fly at least 1400 nautical miles (roughly 2600 kilometres), the system is Canada's first civilian-operated drone in the medium-altitude long-endurance category.[1] Amidst several other ongoing drone programs in Canada, this particular contract stands out for its relatively low cost, which is due to a number of factors: procuring only a single airframe, the contract length being only five years, and several elements (such as the L-3 Wescam MX-15HDi electro-optical infrared camera system) being government-furnished.[2] Nonetheless, it should provide a substantial increase in Canada's Arctic aerial surveillance presence while serving as a "proof of concept" for how future large RPA systems can contribute to Canadian maritime domain awareness.

## The National Aerial Surveillance Program's Current Fleet

Under the new contract, Elbit Systems will be providing the Hermes 900 StarLiner drone to augment Transport Canada's National Aerial Surveillance Program (NASP), which currently consists of three permanent aircraft: two Bombardier/De Havilland Canada Dash 8s and one Dash 7.[3] Painted bright red, the Dash 8s are based in Vancouver and Moncton, while the Dash 7 is forward-deployed from Ottawa to Iqaluit in order to provide coverage for the Arctic summer shipping season. Equipped with surface-search radars, ultraviolet infrared scanners, and high-resolution electro-optical infrared (EO/IR) cameras, their primary role is to detect, identify, and locate the source of any on-water pollution, especially ship-source oil.[4] On board the aircraft operating these advanced sensors are both Transport Canada and Environment Canada personnel, who together make up Marine Aerial Reconnaissance Teams (MARTs). Should any pollution be identified, the data collected by the MARTs can be used as evidence for issuing fines or other judicial actions. Due to their advanced sensors and aerial perspective, NASP aircraft are also employed for other duties such as ice reconnaissance, marine mammal observation, search and rescue, and fisheries enforcement.[5] On a more *ad hoc* basis, the NASP aircraft can also be used for national and domestic security operations – with a Royal Canadian Mounted Police (RCMP) officer on board, the Moncton-based Dash 8 used its MX-15 infrared camera on the night of June 5/6, 2014 to help locate and capture Justin Bourque, who had just killed three RCMP officers and wounded two others.[6] The NASP aircraft are also unique in North American government service: when the

Deepwater Horizon catastrophe occurred in the Gulf of Mexico in 2010, a NASP aircraft was the only dedicated aerial asset that could identify the extent and concentration of the oil spill.[7]

Despite all these powerful capabilities and the current fleet's admirable performance throughout its history for Transport Canada, there remains room for improvement. The benefits of employing a remotely piloted system versus purchasing and operating an additional Dash 7 aircraft (or its equivalent, given the dormancy of that production line) lie predominantly in endurance.[8] While the Dash 7 typically flies six to seven hours on ice reconnaissance missions and has an endurance of around ten hours, the drone's uninhabited nature has allowed its manufacturer to advertise up to thirty-six hours of endurance – much longer than an aircrew on the Dash 7 can sustain itself in the absence of crew changes.[9] This allows for a much more consistent presence to observe a greater swath of surface area or to loiter over specific areas of interest for longer periods of time. This is especially important with the limited number of NASP airframes available, which restricts their departure point to whichever airport in the Canadian Arctic the aircraft is based out of – primarily Iqaluit for the Dash 7 and the new Hermes 900. This results in long transit times that will reduce the endurance on station. Other than the drone's fuel capacity, the only limit on such "airtime" would be the availability of the remote pilots and operators in Ottawa, who can change off with their replacements for consecutive shifts while the drone remains in flight. As part of the contract awarded to Elbit Systems, training is to be provided for six pilots and six payload operators, which should provide sufficient numbers to take full advantage of the drone's endurance.[10] With the Dash 7 airframe entering its fortieth year of service, the five-year contract for the Hermes 900 drone may serve not just as a "proof of concept" for complementing the existing fleet, but may also be carefully studied in the context of potential replacement options for the Dash 7.[11]

## The Hermes 900 and its Role

Awarding the contract to Elbit for the Hermes 900 was perhaps not entirely surprising despite the popular association of large aerial drones with American companies. Large maritime surveillance drones – particularly ones equipped with the "payload" of maritime search radars and Automatic Identification System (AIS) receivers to detect shipping – have not been as prevalent in the global drone market as their land-centric counterparts. Of these, there are even fewer that have been tested in Arctic conditions. In some sense, then, Canada was quite limited in its options, especially considering the fairly low $36 million price tag (contrasted with the larger, used Euro Hawk that Canada considered buying from Germany in 2018-2019, which cost the Germans some $800 million in total).[12] The Hermes 900 has, however, been undergoing operational trials in Iceland via the European Maritime Safety Agency ever since summer 2019. In September 2020, the same model also underwent demonstrations for the United Kingdom's coast guard. The Hermes' performance during both these stints is likely still being analyzed, so Transport Canada and Public Works may have been limited in its access to third party operational data – though one hopes there were some discussions and consultations between the different agencies during those trials to have at least some preliminary information.

Operationally, the new drone will greatly help "connect the dots" when it comes to surveilling Arctic waters and enforcing Canadian regulations. While Canada's RadarSat satellites can and do detect anomalies on the sea surface that can correlate with oil spills, their brief visits and distance over the Arctic make it difficult to identify the exact nature of the anomaly or its origins; the ability of a drone to loiter for long periods of time with mobile high-resolution sensors will help fill this gap. For example, while the latest RadarSat Constellation

Mission's synthetic aperture radars (SAR) have a maximum resolution of 1 metre in spotlight mode, the Hermes' own SAR is to be capable of 0.6 metres resolution from a distance of 20 kilometres.[13] Whereas RadarSat's distance from a given spot on the Earth is fixed, a drone can always fly closer to the desired location in order to collect more detailed and higher resolution data. Once a target of interest has been identified on the longer-ranged radar, the drone can use its multispectral sensors operating on the infrared, ultraviolet, and visible spectrums to positively identify, for example, an oil spill and trace it to its source. As on the current NASP fleet, the rainbow-like hue of oil slicks is easily identified with the naked eye through the high-zoom optical systems, while the infrared and ultraviolet scanners detect the thickness and total extent of the spread, respectively.[14]

Those same sensors and their ground controllers in the Ottawa mission control centre will collect valuable evidence to document any activities such as illegal dumping and fishing. Indeed, one of the scenarios for the drone that was included in the Request for Proposals involved the drone being flown on a ten-hour patrol (in addition to flying time to and from Iqaluit) on behalf of Fisheries and Oceans Canada to surveil the Davis Strait for illegal fishing, with a Fisheries officer advising and directing the sensor operator. To do this, the drone's detection of a vessel at sea will be correlated with any AIS data being broadcast from it.[15] "Dark" vessels are those that have their AIS and Vessel Monitoring System (VMS) turned off, which can be a sign that they do not want to be detected while conducting illegal activities; alternatively, fake information may be sent by the ship's AIS and VMS as to its identity and activity.[16] Such vessels, if detected by the drone's long-range radar as being within the Canadian Exclusive Economic Zone, would then be prime suspects for closer observation using the drone's visual sensors to identify the vessel and its activities. Such observation includes using "high-resolution streaming video" to "see minute detail such as fishing gear" on the ship's deck or in the water.[17] Other times, it may be as simple as pointing the MX-15's optical camera at the ship's stern to confirm that its name and port of registration match its AIS information.[18]

## Concluding Remarks

Ultimately, a $36 million investment into a single airframe is a mere drop in the Government's budget bucket. However, not only does it double the number of aircraft available for the NASP program in the Canadian Arctic in summer and along the Great Lakes in winter, but its remotely-piloted nature acts as a "force multiplier" to enable that one airframe to do many of the missions assigned to its traditional counterparts, for much longer. Even more importantly, it is not so much what this one particular contract will add to Canada's overall maritime surveillance and enforcement capabilities, but the lessons it will provide for the inevitable future renewal of the NASP fleet, both in the Arctic and along the Pacific and Atlantic coasts.

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[1] Public Works and Government Services Canada [PWGSC], "Annex A – Statement of Work," in *Request for Proposal: Remotely Piloted Aircraft System: Solicitation No. T8493-150035/D*, January 30, 2020, 37.

[2] PWGSC, "Annex A – Statement of Work," 6-7; PWGSC, "Remotely Piloted Aircraft System for the National Aerial Surveillance Program (T8493-150035/D)," *Government of Canada*, July 2, 2020, https://buyandsell.gc.ca/procurement-data/tender-notice/PW-CAG-004-27603.
[3] PWGSC, "Annex A – Statement of Work," 5, 45.
[4] PWGSC, "Annex A – Statement of Work," 5.
[5] PWGSC, "Annex A – Statement of Work," 6.
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[11] PWGSC, "Annex A – Statement of Work," 6.
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[15] PWGSC, "Annex A – Statement of Work," 98.
[16] Chris Elvidge, "Identification of 'dark vessels'," *Global Fishing Watch*, June 8, 2018, https://globalfishingwatch.org/research/viirs/.
[17] PWGSC, "Annex A – Statement of Work," 98.
[18] Dixon, "Ensuring the coast."