A camera drone surveys canola crops on a farm in Alberta, Canada. Photo courtesy of Shutterstock.

Canadian Skies Abuzz: Canada's Competitive Edge in the Unmanned Air Vehicles Sector

By Kate Salimi

The use of Unmanned Air Vehicles – or drones as they are more commonly known – represents a tremendous opportunity for Canada's commercial sector to increase efficiency and competitiveness. Canada can strengthen its position as an important player in the anticipated multi-billion-dollar drone industry by considering requests from industry to expand the beyond-the-line-of sight drone testing facility in Foremost, Alberta. And, secondly, Canada should consider moving from a class and weight regulatory framework to a "risk-based" approach. Together, these proposals will allow the industry to remain agile, to innovate and continue to grow while maintaining high civil aviation safety standards.

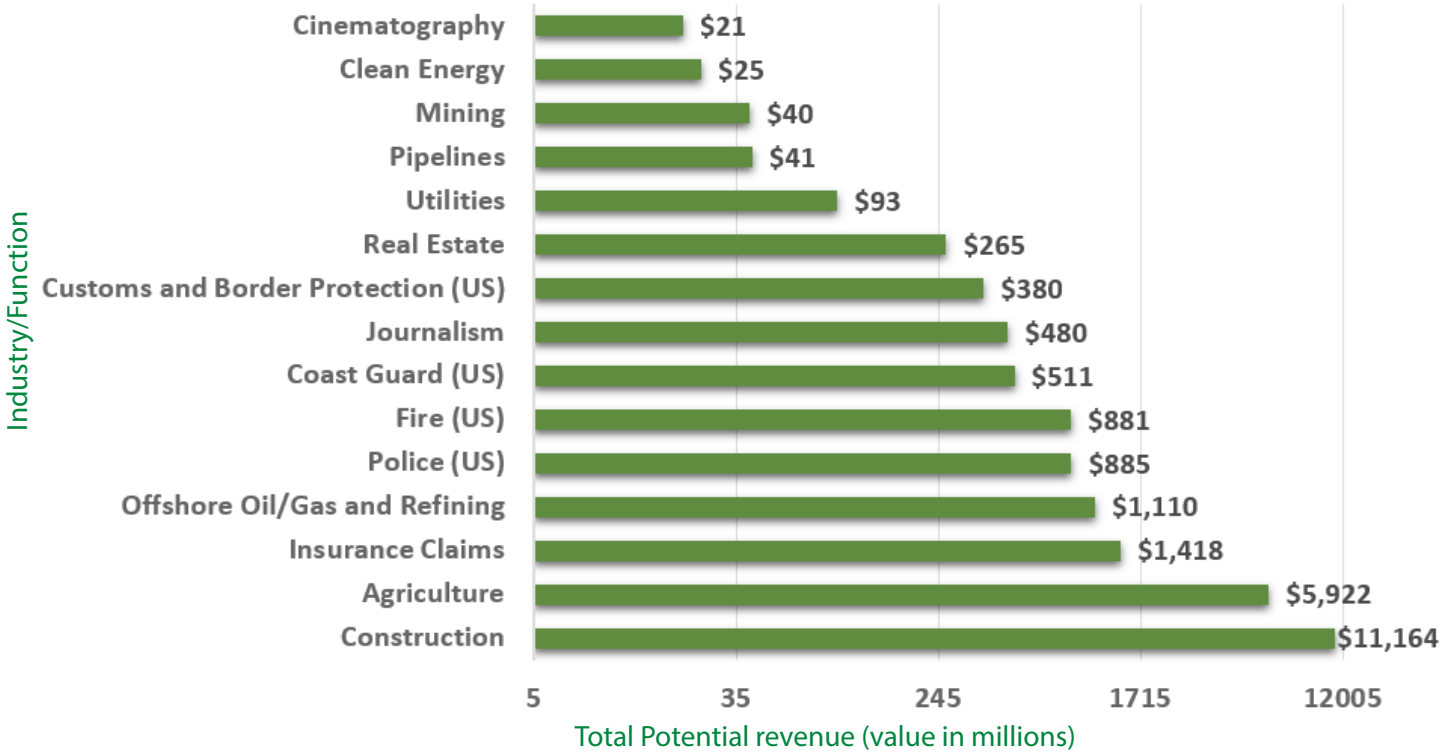
UAVs Take Flight: Popularity is on the Rise in Canada's Commercial Sector

Once almost exclusively used for defense operations, drones or Unmanned Air Vehicles (UAV)[1] are rising in popularity for commercial applications. The various commercial applications of drones include such sectors as agriculture, energy, e-commerce, and mining. Construction and agriculture are the top two industries expected to drive UAV growth (see Figure 1). A 2016 analysis by Goldman Sachs forecasts that the global drone market will reach US$100 billion by 2020, with US$13 billion generated from commercial drones alone.

Drones at Work in Canada: What are the Key Applications for Commercial Drones?

The expansion of commercial applications of drones in the last 10 years has been dramatic.[2] Thanks to Canada's vast geography, small population and resource-focused economy, there are numerous potential drone applications for Canadian businesses. From monitoring the health of blueberry fields in Nova Scotia, to mapping steep, inaccessible inclines of mining sites in the Northwest Territories, to inspecting oil pipelines in remote regions of Northern Alberta – drones are generating important data in less time, while reducing costs for Canadian businesses.

FIGURE 1: UAVs POTENTIAL REVENUE TO INDUSTRY, 2016



Source: Goldman Sachs, Profiles in Innovation: Drones Flying into the Mainstream, Equity Research, 2016.

In the agriculture sector, drones are capable of analyzing crop health, scouting for harmful pests, and measuring parts of the field in need of fertilizer or pesticide (see Text Box 1). Drones are also being used as "flying border collies" to monitor livestock.[3] Within the energy sector, drones glide over rugged and inaccessible terrain to inspect pipelines, electricity power-lines and railways for infrastructure problems. These inspections reduce the likelihood of expensive shutdowns and avoid placing personnel in hazardous conditions. Within the sector of e-commerce, online retailers are benefiting from increased accessibility in both urban and remote areas through the use of drones. In the mining sector, drones monitor and track progress throughout mining projects on site and within site surroundings. Drones with thermal sensors are particularly important to the mining sector as they help geologists identify types of soil and vegetation that may correlate to the presence of underground precious metal deposits.

A drone's-eye view of a blueberry field in Nova Scotia. *Source: The Wild Blueberry Research Program, DalhousieUniversity*

Text Box 1: Drone Application in Mapping Nova Scotian Blueberry fields: Reducing Operation Costs and Farming Time

According to the Wild Blueberry Producers Association of Nova Scotia, drones could save the Nova Scotia blueberry industry millions of dollars in the next few years. Drones can spot troubled areas within a blueberry patch in a fraction of the time it takes a farmer on foot to survey fields of 200 or 300 acres on hilly terrain, saving farmers a vast amount of time and money.[4]

With research support from Dalhousie University, the Wild Blueberry Producers Association expects to expand the application of drones to detect blueberry bushes suffering from blights brought on by a fungal infection. In maps produced by drones, plants with the infection reflect light differently than healthy plants, allowing farmers to detect exactly where sick plants are located. It is expected that drones could reduce the cost of treating sick plants by 30 percent.[5]

The Regulatory Framework for UAVs

Drones that weigh more than 35kg, regardless of their use, or that are used for non-recreational purposes, regardless of their weight, require a Special Flight Operation Certificate (SFOC) that must be obtained from Transport Canada (see Table 1). These drones are classified as "Unmanned Air Vehicles". The objective of an SFOC is to ensure that the proposed use and operation of the UAV is safe. In evaluating SFOC applications, Transport Canada will take into account the nature, complexity and level of risk of the proposed UAV operations as well as the operator's UAV training and/or aviation experience.

The proliferation of commercial drones in Canada has been dramatic. In 2010, zero SFOCs were issued, compared to 345 licenses issued in 2012 and 2,480 in 2015 – an increase of 719% over three years.[6] The number of SFOCs issued post-2014, however, does not provide an entirely accurate picture of the number of businesses in Canada operating drones for commercial uses.

TABLE 1: CANADA'S REGULATORY FRAMEWORK FOR MODEL AIRCRAFT AND UAVs

	Industry	
	Model Aircraft	UAV
Weight	< 35 kg (77.2 lbs)*	Any weight**
Use	Recreational purposes only	Non-recreational purposes (work or research)
SFOC Application	Not required	Required
	*If a model aircraft weighs more than 35 kg, it is legally considered a UAV and the owner must apply for a SFOC.	** UAVs weighing under 2 kg and operating within visual line-of-sight, are exempt from the SFOC. UAVs weighing more than 2.1kg and less than 25kg and operating within line-of-sight are exempt from the SFOC but a notification to Transport Canada is required.

Source: Transport Canada website (2017)

Transport Canada, in 2014, created exemptions for businesses that would typically require a SFOC certificate (see Table 1). These exemptions, valid until December 2016, helped simplify the SFOC process and reduced wait times. The number of exemptions is not known but can be estimated to be in the thousands.[7] These exemptions were announced as a temporary solution while Transport Canada works on a new set of regulations that is expected to enter into force within the next two years.

As of 2017, Canada joined a handful of countries – and is the only country in North America – to permit Beyond the Visual Line of Sight (BVLOS) for commercial drone use. This ability to fly beyond the pilot's line of sight places Canada's regulation in step with the advancement of drone technology. Canada's first approved BVLOS test range is located in the Canadian village of Foremost, Alberta. The mandate of the Foremost test range is to aid the development of UAV training, research and development for civil and commercial purposes

Foremost, Alberta

Since February 2017, Canada has been home to one of the most unique testing facilities in the world. After a decade of work with various levels of government, Foremost – an Albertan farming community with a population of just over 500 – is the only place in North America where drones can fly beyond what the human eye can see. Established as a village in 1950, after many years of being an agricultural service centre, Foremost has largely depended on agriculture with several generations of families running successful farming operations.

Fuel extraction and chemical plants in the vicinity have also played an important role in the local economy. However, as Ken Kultgen, Mayor of Foremost, indicates, the approval by Transport Canada to manage a permanent area of restricted airspace for flying drones is incredibly important for local job creation and diversifying the local economy.

"Right now the options are get into agriculture or get into oil and gas or chemical business. [The flying range] means the young people of Foremost can go out, get their education in a technical field and come back and be working in the community that they grew up in."[8] The Foremost Mayor believes the community-owned testing facility will not only be a strong economic driver for the community but will play a key role in taking the industry to "the next level." The facility offers drone operators 700 squares nautical miles of restricted airspace, up to 18,000 feet above sea level. As of now there are only a handful of drone facility testing sites in the world that compare in size, scale, and flexibility to the Foremost testing facility. With operations up and running, interest from Canadian and international businesses is expected to grow as manufacturers race to develop cutting-edge technology.

Foremost is an ideal site for drone testing because of its low population density, high number of clear days and prairie-terrain which provide an extensive line-of-sight. But it took a decade of hard work for Foremost to work with governments at many levels to obtain the BVLOS certificate in November 2016. With the test range up and running – thanks to almost half a million dollars in federal and provincial government support – the village of Foremost is setting its sights on expanding test range operations. Foremost would like to see the facility open year-long and offer more space for training and workspaces for companies and universities to test and evaluate complex UAV operations.

The village of Foremost is located in southeastern Alberta, 53 km north of the U.S. border. *Source: Canadian Centre for Unmanned Vehicle Systems website (2017)*

The Mayor of Foremost sees the testing range as an "essential economic driver" for attracting Canadian and international customers.[9] The village has already heard from Canadian and international companies interested in setting up permanent workspaces to assemble and test drones before being shipped worldwide.

Mayor Kultgen sees these companies as important job creators, "[The arrival of] thirty people makes quite a bit of difference, if they have families, to keeping the school open, and the grocery store open, all the service businesses that we have in town."[10]

Canadian companies such as Toronto-based Drone Delivery Canada, an e-commerce delivery company, and Calgary-based Ventus Geospatial, a geomatics mapping and inspection firm, are using the Foremost UAV Range to test new technology and further expand their commercial operations.

As the CEO of Drone Delivery Canada, Tony Di Benedetto, highlights, "the success of these flights now allows us to expand our testing with both new and existing clients that include large corporations and government organizations in Canada and abroad."[11] Recently Drone Delivery Canada secured deals with office supply giant Staples and automotive supplier NAPA Auto Parts, both of which are interested in using drone technology to expand their logistics capabilities.

Government Actions to Support UAV Commercialization

Canada's openness to work with drone companies on early testing is at the forefront of the boom. Drone companies, especially those focused on solving technologically challenging problems surrounding machine learning and autonomy, are multiplying rapidly in Canadian innovation hubs like Waterloo and Toronto. The relatively relaxed regulatory regime in Canada, coupled with the opportunity for companies to fly beyond visual line of sight will help to ensure Canada's emerging drone industry remains competitive.

Traditionally, the United States has been at the vanguard of aviation innovation, but the approach of the U.S. Federal Aviation Authority (FAA), in comparison to the can-do attitude of their Canadian counterparts, has been markedly uncertain. For example, in 2015, Amazon, frustrated with attempts to persuade U.S. regulators to launch a drone delivery-testing site in Washington state, decided to move its operations to Canada where Transport Canada approved the retail giant's application in just three weeks. By comparison, the approval by FAA for Amazon's application requested an initial 23-page application, followed by a review of 75 pages of further documentation, a four-hour presentation at FAA headquarters, a three-hour site visit, together with ongoing reporting and record-keeping obligations.[12]

> Transport Canada is proud of the progress we are making to support innovation and research in Canada's drone sector. By partnering with the industry and our communities, we are making great strides as we continue to facilitate research and development and leverage technology to fulfil our mandate.
>
> - The Honourable Marc Garneau, Minister of Transport

Drone technology is seen by many tech companies and aeronautics experts as the next frontier for innovation, with billions of dollars in the balance. For Canadian companies to remain competitive in drone innovation, Canada will need to keep pace with the rapidly developing UAV global industry. Currently, the United States does not have a UAV BVLOS testing range, however that may change within the next couple of years.

Creating Canadian aviation history: An Aaeryon SkyRanger about to make Canada's first ever sanctioned BVLOS flight in Foremost, Alberta. *http://chatnewstoday.ca/article/502113/foremost-marks-canadian-first-drones*

In partnership with the Iqaluit-based company Arctic UAV Inc. and the University of Alaska Fairbanks, Transport Canada will operate drones to survey ice and oil spills in the Canadian Arctic.
Source: *http://www.uasvision.com/2017/06/30/transport-canada-approves-drone-test-range-in-alma/*

In January 2017, the FAA approved the Northern Plains UAS Test Site in Grand Forks, North Dakota to phase in the operation of BVLOS drone testing. As Canada's southern neighbour begins to loosen the regulatory burden for commercial drones, Transport Canada's "Forward Regulatory Plan" [13], expected to be released within the next two years, will need to ensure future amendments to UAV regulation continue to allow greater accessibility, flexibility and opportunity for UAV businesses.

To remain competitive, regulators could consider moving away from a weight and use classification regulatory framework to a risk-based one. A risk-based approach, similar to the UAV regulatory framework proposed by European regulators in May 2017, would introduce a set of rules that are proportionate and risk-based. Drone operations vary a great deal within the commercial sector encompassing a large number of missions (inspection, exploration, delivery, etc.), displaying different levels of risks for other airspace users. A regulatory risk-based approach, similar to the framework proposed by European regulators, could help to reduce red tape to low risk commercial applications of drones, permitting companies to get a 'jump-start' in the industry.

Across the globe, companies are finding endless ways to use UAVs for various applications - from inspecting pipelines in the oil and gas industry to crop monitoring in the agricultural sector. Within Canada, the commercial and civil sector have taken advantage of the country's relative regulatory clarity, producing a robust and growing ecosystem of companies, universities, and business in the UAV space. While American regulators have struggled to come up with a rulebook for the fast-moving industry, the rules governing flight and certification of UAVs in Canada has been industry-friendly.

Global drone technology is still in its early to mid-phases of commercial development, but is advancing at a rapid pace. Canada has the ideal geography and the human capital to establish a sizable global market share. Government investment and action will be necessary to ensure Canada maintains its competitive edge over global rivals in this emerging industry.

ENDNOTES

1. UAV is simply an unmanned aircraft that is piloted remotely. There are numerous types of UAVs, with system technology ranging from small and simple remote controlled models (e.g., quadcopters) to large and complex unmanned aerial systems that operate at high altitudes and for long distances without direct human control (military UAVs).

2. Library of Congress, "Regulation of Drones: Canada," July 22, 2016, https://www.loc.gov/law/help/regulation-of-drones/canada.php.

3. Nikki Wiart, "Birds, bees, and drones: The new face of Canadian agriculture," Maclean's, November 3, 2016, http://www.macleans.ca/education/birds-bees-and-drones-the-new-face-of-canadian-agriculture/.

4. David Burke, "Drones watch over blueberry fields, saving farmers time and money," CBC News, April 5, 2017, http://www.cbc.ca/news/canada/nova-scotia/drones-blueberries-farming-costs-money-technology-1.4054715.

5. David Burke, "Blueberry blues: bumper crops hurt Nova Scotia industry," CBC News, March 29, 2017, http://www.cbc.ca/news/canada/nova-scotia/blueberries-farming-weather-price-export-1.4045845.

6. Library of Congress, "Regulation of Drones: Canada," July 22, 2016, https://www.loc.gov/law/help/regulation-of-drones/canada.php.

7. Ibid.

8. Kyle Bakx, "'It's the future': Small prairie village pins economic fortunes on drones," CBC News, June 6, 2017, http://www.cbc.ca/news/business/foremost-uav-drones-1.4146655.

9. UAS News, "Drone Delivery Canada Advances Toward Compliant Operator Certificate at Transport Canada Approved Drone Test Range," January 11, 2017, https://www.suasnews.com/2017/01/drone-delivery-canada-advances-toward-compliant-operator-certificate-transport-canada-approved-drone-test-range/.

10. Kyle Bakx, "'It's the future': Small prairie village pins economic fortunes on drones," CBC News, June 6, 2017, http://www.cbc.ca/news/business/foremost-uav-drones-1.4146655.

11. Vision Systems, "NASA's UAS traffic management system, beyond visual line of sight drone testing," June 14, 2017, http://www.vision-systems.com/articles/2017/06/nasa-s-uas-traffic-management-system-beyond-visual-line-of-sight-drone-testing.html.

12. Ed Pilkington, "Amazon tests delivery drones at secret Canada site after US frustration," The Guardian, March 30, 2015, https://www.theguardian.com/technology/2015/mar/30/amazon-tests-drones-secret-site-canada-us-faa.

13. Transport Canada, "Regulations Amending the Canadian Aviation Regulations (Unmanned Air Vehicles (UAV))," April 3, 2017, https://www.tc.gc.ca/eng/acts-regulations/forward-regulatory-plan.htm#item5.

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