

**Submission to the Notice of:  
Proposed Amendments to the  
Canadian Aviation Regulations for Unmanned Air Vehicles  
August 2015**



Ministry of  
Transportation  
and Infrastructure

## EXECUTIVE SUMMARY

The BC Ministry of Transportation and Infrastructure, on behalf of the Province of British Columbia, is pleased to provide comments to the Canadian Aviation Regulations Advisory Council (CARAC) on the Notice of Proposed Amendment (NPA #2015-012) regarding the use of Unmanned Air Vehicles (UAVs) and the development of regulations to safely integrate UAVs into Canadian airspace. The Ministry recognizes that the comments included in this submission go beyond the current regulatory proposals, but recent events have emphasized the importance of reviewing the entire regulatory framework for the operation of UAVs in Canada.

Canada has one of the safest and most regulated air space regimes in the world. As such, unmanned aerial vehicles (UAVs) should be incorporated into that regime rather than creating an entirely separated regulatory framework.

UAV's are being adapted and used around the world in a wide variety of applications including tourism, film and real-estate, agriculture, forestry, search and rescue operations, military operations, and personal recreation. The rapid growth and application of UAVs has created a dynamic environment where regulators and governments around the globe are struggling with how to support the benefits of UAV technology while protecting the safety of citizens and organizations from illegal application and abuse.

The high-tech sector plays a vital role in the provincial economy of British Columbia, and the recognition of the importance of this sector to the province is reflected in its role in the B.C. government's *Jobs Plan*. The high-tech sector, including its application to UAVs, is essential in advancing the economic and social interests of the province and in ensuring a high quality of life for its citizens.

However, the advantages and opportunities that UAVs present must be balanced with government's interest in protecting the personal safety and privacy of its citizens. Rapid development, growth and adaption of UAV technology are challenges to both the aviation sector and the public that require the attention of policy makers and regulators. Of particular concern to British Columbia is the unsafe use of UAVs in proximity to other aircraft, violation of personal privacy and the current inability for provincial or municipal enforcement.

British Columbia supports the proposed amendments contained in the Notice of Proposed Amendment (NPA #2015-012) to ensure the safe use of UAVs in Canada's airspace and wishes to promote further action to increase awareness and safety. British Columbia's recommendations are as follows:

- Implement a risk-based regulatory framework for UAVs, based on the size and complexity of UAVs that will allow regulatory requirements to be tailored to UAV use and operators.
- Ensure the regulations create a flexible and responsive framework which recognizes the potential evolution of the sector over the next fifteen to twenty years and does not limit the ability to impose further restrictions, fines or administrative penalties as required, or conversely, does not limit the ability to reduce restrictions as low risk applications emerge.

- Transport Canada should solicit best practices from sectors which legitimately use UAVs (e.g. agriculture, forestry, real estate, film and digital media, emergency response, search and rescue), and post the best practices on Transport Canada's information website.
- Require all UAVs to be registered.
- Incorporate UAVs into the current regulatory and certification/licensing frameworks.
- Require pilot's to be certified for the operation of any UAV.
- Increase the fines to reflect the severity of the violation and to impose substantial deterrents to the illegal use of UAVs and for the use of UAVs for illegal activities.
- Delegate authority to the provinces and municipalities for some aspects of the UAV regulations.
- Formalize a framework, built on partnerships with provincial and municipal governments, to support timely dissemination of information.

## Introduction

UAVs are utilized for many valid and important commercial, industrial and emergency-related applications in British Columbia. In addition, recreational use of UAVs has been increasing as technology and affordability have increased consumer interest. British Columbia hosts a variety of organizations that specialize in UAV research and development, manufacturing, operator training and services, thereby expanding British Columbia's aerospace sector, strengthening the economy, supporting job creation and investment in the province.

As a result of rapid growth and increased utilization of UAVs, British Columbia is also experiencing increased public safety challenges and personal privacy concerns related to their safe operation and enforcement of regulations concerning the safe and legal operation of UAVs. Most recently, the inappropriate use of UAVs in the vicinity of major wildfires in the communities of Oliver and Kelowna led to a grounding of air tankers and helicopters working to extinguish the blazes, putting human lives and property at risk for a number of hours. There have also been recent reports of incidents involving recreational UAVs interfering with aircraft in the Metro Vancouver area as well as reports of UAVs invading the privacy of homeowners in urban areas (see Appendix A).

A key challenge in reviewing the regulatory framework for UAVs in Canadian airspace will be to balance the benefits of improved technology and innovation in the UAV industry against the protection of the public to ensure safety and privacy in an environment of significant growth and availability. Despite this, any review should consider all UAVs, whether they are used for business or recreational purposes. The degree of regulation may be quite different, but the framework should recognize all UAV operators must know the laws affecting their UAV and know how to operate their UAV responsibly and safely.

As UAVs become more accessible, new businesses and new business purposes are emerging in ways that are replacing costly operations involving traditional aircraft. Aerial photography businesses are being established on the basis of inexpensive and easy-to-use equipment. This has led to the use of UAVs in the real estate sector to provide potential home purchasers with more complete views of homes and

properties. Enforcement agencies are using UAVs to provide “birds-eye views” to support their searches for illegal hunting activities. Avalanche and rockslide crews are using UAVs to better identify high risk areas and improve safety while reducing risks to the lives of avalanche and geotechnical technicians.

Unfortunately the same equipment can be used inappropriately. As noted, aerial photography has been identified as a means for violation of privacy. In the case of the real estate sector, individuals have expressed concern about the presence of UAVs taking images next to their property when they cannot determine exactly what images are being captured. The same UAVs which are used to identify poachers can also be illegally used by poachers to find animals in the bush.

Responsible businesses have indicated they implement best practices to promote proper use of UAVs. For example, real estate businesses have indicated they “fog out” any portions of images which do not relate directly to the property they are selling. Other organizations, such as flying clubs, have strict codes of conduct which are applied to all members. While these practices or codes are not required or established in regulation, they provide excellent means for promoting awareness of the operators’ responsibilities.

Even within government, the use of UAVs is expanding. For example, British Columbia’s Ministry of Forests, Land & Natural Resource Operations’ Timber Sales Program is currently using UAV’s for operational forest management work. UAVs have been found to be a cost effective field tool for gaining an aerial perspective to optimize ground traversing time, performing visual analyses to the exclusion of field work, and safely conducting field assessments in forest stands that would otherwise be dangerous to traverse due to previous fire, blow down or landslide activity.

UAV’s are considered to be an important current and future tool in the agriculture sector in BC, at both farm unit and regional scales. It is estimated that agriculture applications will total approximately 80% of the known potential commercial markets for UAVs, second only to the military. The main focus will be on data acquisition (imagery), but the automation of crop management activities is emerging as well (e.g. precision spraying, pruning) as field adjustment of insured crops. The same is likely to be observed in most resource management sectors.

An overall consideration in developing the framework for the safe and efficient operation of UAVs should recognize the regulatory regime in the United States. Canada’s regulatory framework should not impose unnecessary delays or encumbrances for legitimate operators of UAVs in key sectors, such as the film industry or search and rescue, who may be able to provide valuable service in Canada. Also, lessons can be learned from the current activities in the U.S. Earlier this year, the FAA released a draft of their proposed rules addressing non-hobby use of UAVs, but has indicated the rules will be only the first step in the process.

Despite all best efforts to implement or enhance regulations intended to protect the public, the greatest risks arise from the use of UAVs by individuals who are not properly trained or aware of their obligations. Mechanisms must be in place to ensure information is disseminated and UAV operators have proven they are aware of their responsibilities.

British Columbia supports the work and consultations being undertaken by CARAC regarding the use of UAVs. We are submitting the following recommendations and look forward to further opportunities to work with Transport Canada in helping to ensure a vibrant and safe UAV environment.

## Key Themes and Recommendations

Developing a regulatory framework for the operation of UAVs in Canadian airspace raises many technical and policy challenges. While the *Notice of Proposed Amendment* contains proposals to address these applicability of regulations and exemptions (model aircraft), harmonization of terminology, and training and operating requirements, more must be done.

Regulations are currently in place that provide for prohibitions and operator certification requirements respecting the use of UAVs. These regulations include the operation of UAVs within visual line-of-sight, no use of UAVs within than nine kilometers of forest fires, airports, or built-up areas, and having to obtain a *Special Flight Operating Certificate* for more complex UAV operations. Despite these regulations, the irresponsible operation of UAVs in British Columbia persists in the vicinity of aerodromes, around private property, and during forest fire aerial suppression services – all of which jeopardize public safety and confidence in the UAV regulatory and enforcement framework.

While there are several themes addressed in this submission, a key theme which flows through all recommendations relates to communication and education. While ignorance of the law is not an excuse, individuals cannot be expected to comply with the laws if the regulations are too complex or are not communicated effectively. At the core of any recommendation will be the need for clear and effective communication targeted at the appropriate user groups.

## Safety

Safety is the primary concern regarding the use and operation of UAVs. While maximizing safety is the most important factor in developing regulations around UAVs, a regulatory framework, as suggested in the *Notice of Amendment*, should adopt a risk-based approach to accurately reflect the level of threat posed by the use of UAVs in different circumstances.

Transport Canada collects and publishes aviation occurrence information through the Civil Aviation Daily Occurrence Reporting System (CADORS). For the year 2014 and 2015 to date, there have been fourteen reported occurrences of UAV's operating in proximity to aircraft in British Columbia, and one occurrence where possible radio interference caused a UAV to crash in an urban environment. These occurrences are referenced in Appendix B.

As the technology evolves, lessons can be learned from the automobile sector where hackers were recently able to control the equipment in an automobile and even shut the car down through remote computer access (see Appendix C). Most UAVs have not reached this level of complexity but as the sector evolves, regulators cannot ignore the possibility that the risks could arise, thus generating

additional safety concerns over the possibility of gaining unauthorized control of a UAV and potentially conducting illegal or dangerous activities that threaten individual and community safety.

***Recommendation: Implement a risk-based regulatory framework for UAVs, based on the size and complexity of UAVs that will allow regulatory requirements to be tailored to UAV use and operators.***

***Recommendation: Ensure the regulations create a flexible and responsive framework which recognizes the potential evolution of the sector over the next fifteen to twenty years and does not limit the ability to impose further restrictions, fines or administrative penalties as required, or conversely, does not limit the ability to reduce restrictions as low risk applications emerge.***

## Personal Privacy

The privacy impacts of UAV technology are outlined in a report<sup>1</sup> prepared by the Office of the Privacy Commissioner of Canada. The magnitude of the impact on privacy, including the extent and type of personal information that may be captured by UAVs, will depend on the purpose of their use, the context, location of their use and technology mounted on the UAV to gather information.

The report notes that UAV use by public and private sector organizations to conduct surveillance or collect personal information are subject to federal and provincial privacy laws. These organizations are legally obligated to ensure that their use of UAVs is carried out in accordance with these laws.

A more challenging aspect of UAV privacy intrusion is the use of UAVs for voyeurism. An example of such occurred recently in Vancouver where a person alleged that a UAV was hovering close to her private balcony with the possible intent of capturing images. As noted in the report, it will be important to ensure the necessary checks and balances are in place.

Other aspects of the personal privacy concerns relate to security of person and property. If UAVs are used by criminals to survey potential targets without the risk of being caught in that process, there will be a growing incentive for individuals to use the technology to support illegal activities. Once again, in these instances, the use of the UAV itself may be legal but the device is being used to support illegal activities with relative impunity. There is a close relationship between the pilot and the safe and legal use of the UAV.

***Recommendation: Transport Canada should solicit best practices from sectors which legitimately use UAVs (e.g. agriculture, forestry, real estate, film and digital media, emergency response, search and rescue), and post the best practices on Transport Canada's information website.***

## Registration

British Columbia supports the proposal that owners of small UAVs (limited operations and complex operations) register their devices with Transport Canada. Registration would allow for an owner of a

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<sup>1</sup> "Will the proliferation of domestic drone use in Canada raise new concerns for privacy?", Research Group, Office of the Privacy Commissioner of Canada, March 2013.

UAV to be identified by law enforcement agencies and regulators, and held responsible whether they or another party using their device was operating a UAV in a prohibited or unsafe manner.

All UAVs should be registered. Larger UAVs can carry identification numbers, and although smaller UAVs may not be able to have legible registration numbers on them, they should still be registered. Even small hobby aircraft can be registered through an online registry. Registration could be built into the sale of the UAV. UAVs could be required to have electronic radio tags or e-tags. The e-tag ID number would be collected as part of the registration which would occur at the point of sale. Alternatively, information collected can be as simple as providing a serial number (similar to registering a product warranty online), but could provide insight into areas where UAVs are located and being used.

Combining UAV registration with appropriate pilot licensing will eliminate the requirement for Special Flight Operating Certificates (SFOC) and could release more staff time for enforcement. Currently, under the *Aeronautics Act*, the Minister delegates the responsibility for approving SFOCs to appropriately delegated inspectors in the regional and national offices. This includes the authority and responsibility to issue SFOCs for the operation of UAV systems and to specify the conditions to be contained in the certificates. Currently, the time required to process an application is in the order of twenty business days, and applications are reviewed on a first come, first served basis. Where the use of a UAV in an emergency or search and rescue situation serves the public interest, an exemption for law enforcement agencies, first response, and search and rescue organizations from the requirement to obtain an SFOC should be available. In this case, regulations would require that these organizations, to be exempt from the SFOC requirement, have certified or licensed UAV operators, and are operating UAVs for public safety purposes. Alternatively, a class of SFOC could be established which is modelled after the current practice of allowing approved individuals to respond to emergencies but report to Transport Canada immediately following the activity. As a formalized approach this would provide long-term approval of UAV use by appropriate organizations subject to meeting operator requirements and other operating criteria.

Incorporating UAVs into the current regulatory framework for aircraft in general, will, over time, eliminate the requirement for SFOCs and replace them with responsibilities associated with different certifications for pilots.

***Recommendation: Require all UAVs to be registered.***

***Recommendation: Incorporate UAVs into the current regulatory and certification/licensing frameworks.***

### **Pilot Certification**

With the growing use of these devices, it is important for the operators to have an understanding of all relevant regulations and guidelines, whether they relate to technical operation of the UAV or privacy laws impacting the use of UAVs. Even now, responsible organizations have implemented programs for UAV operators. For example, BC Hydro currently requires internal UAV operators to satisfy the Transport Canada knowledge requirement (TP 15263E) and be trained by the UAV manufacturer to

acquire practical training. UAV contractors are expected to have the same minimum level of knowledge and practical training. Formalizing requirements for pilot certification would not pose a burden on sectors which already have standards for their UAV operators.

To maximize Canada's positive impact on the sector, British Columbia recommends adopting a streamlined process based on existing models, such as the current online pleasure craft licencing process. In order to operate a motor boat in Canada, the operator must show proof of competency which indicates the boater has a basic level of boating safety knowledge. Prior to requiring a Pleasure Craft Operator Card, anyone could operate a recreational boat without having any minimum boating safety knowledge, experience or training. There were considerable similarities between boaters at that time and the current situation with UAV operators in Canada. Testing and certification programs for Pleasure Craft Operator Cards are administered by private companies authorized by Transport Canada. Implementing a similar program for UAVs, would allow the testing of potential operators on their knowledge regarding the UAVs they intend to operate, their regulatory requirements, and associate laws prior to legally operating a UAV.

Testing and certification should be built upon the current licensing regime, whereby the education and training requirements are directly related to the type of craft being piloted. Where the operator is piloting light UAVs for recreational purposes, the training and certification process may be a single procedure which remains valid for an appropriate period, such as five years. However, for larger UAVs and for operation in more complex environments, maintaining certification may require more rigorous certification with regular updates to ensure the operators remain current with their training.

***Recommendation: Require pilots to be certified for the operation of any UAV.***

## **Enforcement**

Taking enforcement actions where there is prohibited or unsafe use of UAVs is the most challenging aspect of UAV regulation, as it is currently difficult for law enforcement to identify the operator of the device. In the United States, the Federal Aviation Authority (FAA) admits it has difficulty enforcing its airspace safety regulations for UAV operators.

Identification, markings and registration of UAVs will assist with incident and enforcement investigations. Significant financial penalties, including administrative fines, and loss of permission to operate a UAV should be considered as measures to deter improper use of UAVs.

Consideration may be given to imposing manufacturing standards to ensure all UAVs comply with basic standards. This would allow for UAVs to be electronically tagged for identification by enforcement personnel. Standards would also allow for UAVs to be required to respond to no-fly zones which can be created through geo-fencing (virtual perimeters which can be established using specified coordinates).

As with many sectors, the desired outcome is compliance. If compliance with the regulations is achieved in a broad sense, then enforcement can be targeted at specific aspects of UAV operation. However, compliance will be achieved, and enforcement will become easier, only when information is readily

available to UAV operators and the enforcement agencies have access to related information about registration and pilot certification.

In addition to information, fines and administrative penalties will provide deterrents. The current penalties do not reflect the severity of the violations. Additional considerations include seizure of the equipment (including related tablet computer, controls, and UAV), suspension or cancellation of the person's certification to operate a UAV.

***Recommendation: Increase the fines to reflect the severity of the violation and to impose substantial deterrents to the illegal use of UAVs and for the use of UAVs for illegal activities.***

### **Delegated Authority**

Although aviation is a federal responsibility in Canada, in order to promote enforcement, Transport Canada should delegate some regulatory authority to the provinces and municipalities. Most UAVs, and certainly the UAVs which have generated the most attention in British Columbia, have been small UAVs. They do not travel across borders as part of their business, and were not contemplated when the constitutional responsibility for aviation was established.

Local officials are best informed about the local concerns, needs and opportunities, thus are positioned to be able to specify zones for recreational or research use that do not interfere with other local businesses, private individuals, or even wildlife. This flexibility will allow local businesses to develop within parameters which are considered acceptable to the local residents.

***Recommendation: Delegate authority to the provinces and municipalities for some aspects of the UAV regulations.***

### **Awareness**

Despite best efforts in all of the above areas, success is achievable only if the initiatives are accompanied by solid communications. As with any new technology, the public must be made aware of the responsibilities which accompany its implementation. Government and manufacturers must work together to ensure purchasers are aware of their responsibilities. This can be achieved by building upon the current Transport Canada website to promote direct links to the information for all purchasers.

The federal government establishes requirements for markings on product packaging. Warning statements posted with the recreational UAVs should be mandatory.

In addition to relying solely on federal regulatory realm, the provinces and industry can help with promoting awareness. Provincial and local governments can work with the businesses that sell UAVs to increase distribution of materials through the retail sales outlets. Also, they have access to high traffic areas, such as airports, transit stations, parks and other areas where recreational operators of UAVs may pick up brochures. Industry can promote awareness through its association with trade shows, flying groups, and business users.

In recent years, Canada has initiated new requirements for railways to communicate with municipalities about the movement of dangerous goods. A similar framework could be used through which municipalities can identify primary contacts for safety communications, such as providing quick release of information about no-fly zones near events of local significance, such as new forest fires. The provinces can support dissemination of Civil Aviation Safety Alerts through local networks which extend beyond those who normally access alerts through the Transport Canada website.

***Recommendation: Formalize a framework, built on partnerships with provincial and municipal governments, to support timely dissemination of information.***

## **Conclusion**

British Columbia recognizes the difficult challenges facing Transport Canada is developing appropriate regulations for UAVs. Stakeholders will want regulations in place immediately to address their specific concerns, but the framework will have to balance the individual interests and the overall requirement for safety, both in the air and on the ground.

By integrating UAVs into the current regulatory framework for aviation in Canada, the sector will build upon a strong record of safety. Using this framework to develop and require operator or pilot training, register UAVs, and set conditions for operation will align the UAV operation with the current requirements for pilots and aircraft.

Sound regulations that promote safety, and, at the same time, encourage opportunities for the development and use of UAVs are essential. British Columbia looks forward to continuing to work with its partners in the federal government to implement the broad recommendations included in this submission.

## Appendix A

### Media Reports of UAV Incidents

#### CTV News

Published Wednesday, July 2, 2015

RCMP in Richmond, B.C., are investigating after a drone was spotted flying over a runway at the Vancouver International Airport, creating what they call a “very dangerous” situation.

The Mounties say they received a report from traffic control Monday, about a drone flying over a runway on the airport’s north side.

Police patrolled the area and set up roadblocks, but were unable to find the person flying the drone.



An unmanned aerial vehicle is seen flying close to an airplane above Vancouver International airport in this image taken from a video posted on YouTube, Nov. 4, 2013.

Last November, a drone video of an airplane landing at the Vancouver airport was posted on YouTube, prompting outrage and safety concerns.

But the person who uploaded that video said it was shot from over a kilometre away, and denied that any aircraft were put in danger.

The RCMP say drones are becoming increasingly popular, creating headaches for police and airports.

“It seems to be a growing trend because of the availability and the power of these devices is getting exponentially more powerful so people can fly them from a farther distance away, they can get them up higher in altitude and it affects the aircraft that are on the glide path,” Richmond RCMP Sgt. Cam Kowalski told CTV Vancouver.

“It puts them in a very dangerous situation.”

Transport Canada regulates so-called unmanned air vehicles, or UAVs, by requiring users to apply for a special flight operation certificate.

However, UAVs or drones that weigh less than 35 kilograms and are used mostly for recreational purposes are considered to be “model aircraft.” The use of model aircraft is not regulated.

Georgia Straight

## Vancouver police and City of Vancouver raise concerns about drones at Honda Celebration of Light

by Charlie Smith on August 2nd, 2015 at 8:45 AM

It's a sign of the times.

Vancouver police and the City of Vancouver have each warned the public about flying drones during fireworks displays.

The city tweeted last night that doing this violates Transport Canada rules.

Whoever oversees the city's twitter feed included a link to the government website where violations can be reported.

<https://twitter.com/CityofVancouver/status/627704422106271745>

Vancouver police Const. Brian Montague told CBC News that he saw about five drones over last night's Honda Celebration of Light.

He expressed concerns about malfunctions, causing them to fall onto the crowd, as well as the possibility of drones interfering with the VPD's helicopter.

Meanwhile, there was none of the hooliganism that's been associated with Vancouver fireworks shows in past years.

Canada won this year's competition with last night's show. Brazil came second and China was third.

*Fire Centre Bulletin 2510*

### **Drones over Westside Road wildfire halt operations**

8/1/2015 12:36 PM

KELOWNA -- Fire suppression personnel have been forced to halt air operations on the Westside Road wildfire due to multiple Unmanned Aerial Vehicles (UAVs) or 'drones' overhead the fire. A helicopter supporting ground crews and involved in water delivery has now been grounded.

All wildfires are considered to be "Flight Restricted" as per the Canadian Air Regulations. The area restricted is within a radius of five nautical miles around the fire and to an altitude of 3,000 ft above ground level. The operation of any aircraft not associated with suppression activities, including UAVs, within this area is illegal. The RCMP is currently working with the BC Wildfire Service in relation to this incident.

This aerial activity is dangerous, and poses a significant safety risk to personnel, especially when low-flying firefighting aircraft are present.

Transport Canada and the BC Wildfire Service explicitly prohibit the use of drones of any size near a wildfire. For more information, check here: <http://www.tc.gc.ca/eng/civilaviation/standards/general-recavi-uav-2265.htm>

WT.mc\_id=1zfhj#safety

In addition, an area restriction put in place for areas around this wildfire to protect the safety of firefighting personnel and the public remains in place. For a map of the restricted area, please click here: <http://bit.ly/1IrFMIt>

The Kamloops Fire Centre is urging extreme caution in the backcountry and asking everyone in the region to refrain from activities that may cause a wildfire. Currently the Fire Danger Rating throughout the Kamloops Fire Centre is "high" to "extreme".

The BC Wildfire Service thanks the public for its ongoing support in reporting wildfires. To report a wildfire or open burning violation, call 1 800 663-5555 toll-free or \*5555 on a cell phone.

For the latest information on current wildfire activity, burning restrictions, road closures and air quality advisories, visit: <http://www.bcwildfire.ca>

You can also follow the latest wildfire news on:

-Twitter at <http://twitter.com/BCGovFireInfo>

-Facebook at <http://facebook.com/BCForestFireInfo>

Media Contact:

Melissa Klassen  
Fire Information Officer  
BC Wildfire Service  
Office: 250 554-5530  
Cell: 250 371-4538

Connect with the Province of B.C. at: [www.gov.bc.ca/connect](http://www.gov.bc.ca/connect)

## **The Globe and Mail**

**Published Sunday, Aug. 09, 2015 9:44PM EDT**

As firefighters worked last weekend to contain a blaze that came dangerously close to properties near West Kelowna, B.C., the helicopter providing air support was grounded because of too many drones in the area.

That same weekend, a drone and a seaplane nearly collided close to Vancouver International Airport, according to an incident report on Transport Canada's website.



An 18-year-old Connecticut man may be in trouble with federal aviation officials after posting a video online that shows shots being fired from a gun-carrying drone. (July 21) AP Video



This undated image provided by Amazon.com shows the so-called Prime Air unmanned aircraft project that Amazon is working on in its research and development labs. The Associated Press

As drones become cheaper and more accessible, they're being used for everything from wildlife surveys to pipeline surveillance. But they also have the potential to dangerously clutter up airspace and experts say Canada's regulatory system hasn't caught up to the technology.

"A collision between a drone and an aircraft, or even if the drone got sucked up into the turbines of an aircraft, could be very dangerous," said Ryan Turcot, a provincial fire information officer for BC Wildfire Service. "It endangers our crews and the personnel operating our aircraft."

Dave Kroetsch, the president of drone manufacturer Aeryon Labs in Waterloo, Ont., said the technology exists to give drones automated systems that can sense and avoid collisions with first responders, or stop unwanted entries into restricted airspace. But regulations are at least five years away from mandating manufacturers to implement such systems into their code.

The regulatory environment that's fostered growth in Canada's small-scale commercial drone use has yet to introduce guidelines for a large-scale traffic management system that Mr. Kroetsch and other experts say could be used now to avoid accidents.

"The building blocks are there," Mr. Kroetsch said. "No one can take those building blocks to a full solution because the regulations aren't there."

Drones are considered aircraft in Canada and are subject to the same airspace restrictions as other planes and helicopters, including near or over military bases, prisons or forest fires and anywhere that may interfere with first responders. Flying unmanned aerial vehicles (UAVs) into restricted airspace is punishable under the Criminal Code and penalties include fines or even jail time.

Under the current regulatory framework, those flying drones for commercial use or using devices weighing more than 35 kilograms must apply for a special permit – called a Special Flight Operations Certificate (SFOC) – from Transport Canada.

The transport regulator issued 296 of those permits in 2014 in British Columbia, a steep rise from just four in 2010.

In October, Federal Transport Minister Lisa Raitt launched a public campaign to help make sure Canadians are flying drones safely. She referred to Transport Canada's safety guidelines, which state that the small aircraft can't be flown higher than 90 metres and must stay within the line of sight of the pilot or someone who is in contact with a pilot.

Diana Cooper, head of drones and robotics at the law firm LaBarge Weinstein LLP, reiterated that the technology is already there to play an important role in safety.

DJI, the manufacturer of the drone that crashed onto the lawn of the White House in January, for example, has since implemented geo-sensing technology in its drones that stops its products from flying into restricted space, including that around the White House, Ms. Cooper said.

"It's actually hard-coded into the technology that you can't enter certain spaces," she said.

NASA is working on a traffic management program for sky highways that would manage drone traffic using geo-sensing to prevent drones from steering outside their lanes, Ms. Cooper said.

She added that Amazon – which is doing its drone testing in B.C. – is also looking at introducing similar traffic management technology for its drone delivery system.

While such systems are not available in Canada, Mr. Kroetsch noted that manufacturers could build drones to detect other aircraft or use GPS systems to sense no-fly zones if Transport Canada made it a hardfast rule.

"You can build that technology quite easily, but it takes a regulator to draft those requirements, and then industry will build to those requirements," he said. "But the regulator has to spearhead the requirements."

Liability is another hurdle, Mr. Kroetch said, to expanding Canada's regulatory framework. Under the current rules, the drone operator is liable for any accidents or incidents caused when breaking fly rules. That all changes, he said, when the drone highways expand.

"How do you deal with the liability challenge of some centralized computer scheduling deliveries all over the place, flying a bunch of drones, and somebody wrote a bad line of code and there's now an accident?" he said. "There's a big legal challenge to solve there."

But in Ms. Cooper's view, drones unfairly get a bad rap when it comes to safety and accidents.

"If we look at other technology, we accept a certain level of accidents and we still allow the technology to move forward, like automobiles [and] airplanes," she said. "Nobody's suggesting that we get rid of any of these technologies."

“People want to hold drones up to an impossible safety standard that we are not holding other technologies to,” she said.

**Times Colonist (Victoria)**

**Wednesday, August 19, 2015**

Page A08

By Editorial

## **Rogue drones create problems**

Crews who battle wildfires already have a difficult job - they don't need rogue drones adding to the risks.

As unmanned aerial vehicles - popularly known as drones - increase in numbers, regulations will have to keep pace, but more important is the need for personal responsibility.

The small, remote-control aircraft, usually equipped with video or still cameras, offer countless possibilities, but they also pose potential problems.

One of those problems was evident Sunday when a drone flew near a wildfire in the Oliver area, resulting in the grounding of eight helicopters and an air-tanker team for several hours until it was safe to fly again.

"UAVs are here to stay," says Prof. Afzal Suleman, director of the University of Victoria's three-year-old Centre for Aerospace Research, which focuses on UAV research and development. "The technology is very useful, very cost-effective."

Once largely the domain of the military, remotely operated aircraft are becoming increasingly used for a wide array of purposes as technology improves and costs come down. They can be used to assess wildlife habitat, catch poachers before they kill, ensure port security, patrol pipelines, inspect power lines and assist in **search** and **rescue**.

The value of drones in **search** and **rescue** was proven a couple of weeks ago when a hiker was injured on Mount Finlayson. David Carlos, owner of Victoria Aerial Photos and Survey, who operates a stable of aerial vehicles, was called in to assist. It took only minutes for his drone to locate the hiker, just as rescuers were arriving at the scene.

As the use of drones increases, so does the need for regulations commensurate with technological advances.

"The regulations need to catch up with the technology," says Suleman.

That doesn't mean the skies are wide open, he says. Regulations are already in place; problems arise when amateurs don't obey the rules.

"It comes down to taking responsibility," Suleman says. Commercial operators of drones require a special flight-operations certificate that comes with restrictions on how high and where the craft can be flown. A person operating a drone that weighs less than 35 kilograms - it's considered a model aircraft - doesn't need a licence or a special permit, but still must follow Transport Canada safety guidelines. Those guidelines include not flying UAVs:

Closer than nine kilometres to any airport, heliport or aerodrome.

Higher than 90 metres above the ground.

Closer than 150 metres to people, animals or buildings.

Near moving vehicles, highways, bridges, busy streets or anywhere you could endanger or distract drivers.

Within restricted airspace, including near or over military bases, prisons and forest fires.

Anywhere that might interfere with first responders.

The person who flew the drone near the Oliver fire, if caught and convicted, could face a fine of up to \$1,000, but that's small potatoes compared to the expenses added to fighting that fire, not to mention the extra danger firefighters encountered. Similar incidents have occurred near California wildfires.

Should hobbyists be licensed before they can operate drones? Do the devices need to be registered? Those measures could be necessary if violations of laws and ethics continue.

The future is bright for these fascinating machines, but it is being dimmed by dimwittedness on the part of the thoughtless few who will make more laws necessary.

### **Drones causing black bears stress**

CBC Online

Thursday, August 13, 2015

Drones operated by researchers may have unintended consequences for wildlife, warns the lead author of a new study showing the buzzing of unmanned aerial vehicles overhead can leave black bears stressed, with racing hearts.

Researchers flew drones about 20 metres above black bears that were wearing GPS collars and cardiac monitors to measure what effects the unfamiliar noise had on the bears.

Lead author Mark Ditmer said they thought the bears might flee, but they hardly moved at all.

Instead, their heart rates spiked, showing a major stress response.

"For them to mostly stay in one spot, and have this racing heart rate, was a little bit of a surprise for us," said Ditmer, a postdoctoral researcher in conservation biology at the University of Minnesota who led the study published in Current Biology.

Stress response 'pretty severe'

The team gathered data on the bears' movement while the drones flew, with the collars sending a new location every two minutes as the bears ambled through corn fields and aspen **forests** in northwestern Minnesota.

But they had to wait until the bears were in hibernation before downloading the heart rate data.

The researchers had expected some physiological reaction to the unfamiliar buzzing overhead, but not such a strong response, said Ditmer.

"I couldn't believe it," said Ditmer.

"It became strikingly obvious that we were seeing a pretty acute stress response that was pretty severe, at least in some cases."

In the most extreme case - a mother bear with two cubs - the bear's heart rate spiked to 400 per cent of her resting rate, jumping from 41 beats per minute before the drone flight to 162 beats per minute when the drone circled overhead.

That kind of stress response, which likely also included a surge of adrenalin and other changes, helps a wild animal in a real emergency, but chronically stressed individuals are more susceptible to disease and other problems, said Ditmer. 'Cautionary tale'

Ditmer and colleagues wanted to look at the bears' reaction, because drones are increasingly used in research and conservation - not to mention by hobbyists - with little known about their effects on wildlife.

This study was limited to 18 flights over the four adult bears in a zone where federal rules allowed drone flights. Other types of wildlife would respond differently to the unfamiliar sound of a drone, said Ditmer.

Still, he hopes it's a "cautionary tale" as drone use increases.

"Just because we're not noticing an animal changing behaviour, that doesn't mean there's not some sort of negative response happening." [forr, env, tran]

**Appendix B**  
**Reported Civil Aviation - UAV Occurrences**  
**British Columbia**  
**(2014 – 2015 to date)**

| <b>CADORS Reference</b> | <b>Date</b> | <b>Incident</b>  |
|-------------------------|-------------|--|
| 2015P1498               | 2015-08-04  | A privately registered Cessna 172M from Powell River, BC (CYPW) to Boundary Bay, BC (CZBB) reported sighting a drone over Stanley Park in the vicinity of Beaver Lake. The Cessna 172 was at 2000 ft and was following a flight path of Third Beach, eastbound on the south shoreline. The pilot said the drone was approximately 300 - 400 ft below the aircraft and was red/silver in colour and round. ECOMM was also called and given the details. |
| 2015P1470               | 2015-08-03  | The pilot of a Seair Seaplanes Cessna 208 (C-FJOE) to Vancouver Water, BC (CAM9) reported a black drone with 4 propellers missed the aircraft windshield by about 10 feet when the aircraft was about 40 feet from touching down on the river. The drone was observed turning northbound toward the airport before the pilot lost sight of it. The incident was reported to the Richmond detachment of the Royal Canadian Mounted Police (RCMP).       |
| 2015P1461               | 2015-08-02  | A Helijet International Sikorsky S-76C (C-GHHJ) departed from Vancouver General Hospital, BC (CBK4) reported a drone at 300'-400' near the Planetarium, dark in colour and circular in shape. Police informed.   |
| 2015P1135               | 2015-07-01  | Drone (unmanned aerial vehicle (UAV)) reported operating 1nm east of Runway 27 threshold at approximately 200' ASL at Victoria, BC (CYYJ). Local Royal Canadian Mounted Police (RCMP) notified. No impact to aircraft operations.  |
| 2015P1043               | 2015-06-21  | A Neil Rob Holding Ltd Cessna 172M (C-GWXG) from Delta, BC (CAK3) to Boundary Bay, BC (CZBB) reported a Drone at 1500' near the Crescent Beach area 5 NM east of CZBB airport.   |
| 2015P0884               | 2015-06-04  | An Orca Airways Piper PA-31-350 (C-GPAK/ ORK146) from Qualicum Beach, BC (CAT4) to Vancouver, BC (CYVR) reported a close encounter with a drone at approximately 491715N 1240736W, in the vicinity of Nanoose, BC. The drone was about 1 metre in width, 4 blade configuration, brown and black with camera. The drone was reported at approximately 800ft altitude.   |
| 2015P0846               | 2015-05-23  | During the SwiftSure Sailboat Race, an Unmanned Aerial Vehicle (UAV) was observed operating at Clover Point within the Victoria Harbour, BC (CYWH) control zone. Altitude was unknown and the time of the occurrence is approximate. The operator of the drone was not known to have a Special Flight Operating Certificate (SFOC) and did not get approval from CYWH Flight Service Station (FSS).  |

| CADORS Reference | Date       | Incident   |
|------------------|------------|--|
| 2015P0585        | 2015-04-22 | A K.D. Air Piper PA-31 (C-GPCA / KDC203) from Tofino, BC (CYAZ) to Vancouver, BC (CYVR) reported a drone flying approximately 1 mile south of Richmond Square (2 miles south of Runway 26L localizer at 2 mile final) at 1500 feet ASL. Royal Canadian Mounted Police (RCMP) advised.  |
| 2015P0438        | 2015-03-27 | Two drones were seen operating just north of Ford Road up to 200 feet. Royal Canadian Mounted Police (RCMP) was advised. Departing aircraft from Pitt Meadows, BC (CYPK) were advised of the traffic.  |
| 2015P0338        | 2015-03-07 | The pilot of a HSE Holdings Ltd Cessna 177 (C-FHSE), on a local flight from Boundary Bay, BC (CZBB), reported taking evasive action to avoid a drone (RC aircraft) one mile south of the Alex Fraser Bridge at 1100 ft. Nothing observed on radar. This was reported to police.  |
| 2014P2095        | 2014-12-10 | Tower controller received a report from Vancouver Port Operations that a drone (unmanned aerial vehicle (UAV)) was operating on the waterfront east of the Vancouver Harbour Heliport, BC (CBC7). Tower acquired the UAV visually at 0014Z and observed both the operator and the UAV. The UAV was being operated up to an estimated altitude of 100 to 150 feet AGL. A landing Helijet International (JBA722) was cautioned about the UAV but the UAV remained east of the heliport and did not impact heliport operations. The Vancouver Police Department was contacted but by the time they responded the UAV operator had departed the area.  |
| 2014P1483        | 2014-08-29 | An Orca Airways Piper PA-31-300 (ORK148) from Qualicum Beach, BC (CAT4) to Vancouver, BC (CYVR) reported a drone approximately 100 feet below them while at 1400 feet ASL. Aircraft was at 491345N 12357W. Royal Canadian Mounted Police (RCMP) and Shift manager were advised.  |
| 2014P1478        | 2014-08-28 | After landing Runway 08R, a Carson Air Beech B300 (C-GRUU/ CA911) from Dawson Creek, BC (CYDQ) to Vancouver, BC (CYVR) reported having seen a drone on final between 300-500 ft. Airport Operations advised. Runway 08R approach not used for 25 minutes while drone sighting investigated. Royal Canadian Mounted Police (RCMP) advised. Drone not located and no further sighting.   |
| 2014P0646        | 2014-05-12 | Aviation Incident Report#13454: A drone/UAV was being operated in a secure location at 1000 West Hastings and Hornby in downtown Vancouver during filming for a commercial. The UAV was being operated within all guidelines specified in the Special Flight Operating Certificate (SFOC) and the Open Permit application. At some point during the flight of the UAV, control was lost and it hit a building and fell to the street. The UAV landed between the sidewalk and a car (production vehicle). There were no injuries, no visible damage to the building and only slight damage to the vehicle. The cause of the loss of control is under assessment, however, there is speculation that radio interference may have played a role. |

## Appendix C

### Media Report of Car Hacking

**CBC News**

Aug 06, 2015 1:48 PM ET

#### **Tesla Model S car hacked, shut off while driving**

A Tesla Model S 70D is seen during a test drive. Researchers from the cybersecurity firm Lookout said they shut down a Tesla Model S and activated the hand brake while it was driving

Tesla Motors Inc said on Thursday it has sent a software patch to address security flaws in the Tesla Model S sedan that could allow hackers to take control of the vehicle.

The Financial Times reported on Thursday that cybersecurity researchers said they had taken control of a Model S and turned it off at low speed, one of six significant flaws they found that could allow hackers to take control of the vehicle,

Tesla said it had developed and deployed an over-the-air update to Model S owners to address the "vulnerabilities".

The dashboard of a Tesla Model S is shown at a Tesla Motors dealership at Corte Madera Village in California in 2014. Hackers said they found six significant security flaws in the software in Tesla cars. (Robert Galbraith/Reuters)

In a statement, Tesla said the hackers did not turn off the car remotely, but from inside the vehicle.

"Our security team works closely with the security research community to ensure that we continue to protect our systems against vulnerabilities by constantly stress-testing, validating, and updating our safeguards," the automaker said.

The hack will be detailed at cybersecurity conference Def Con in Las Vegas on Friday, the FT said.

The hack on Tesla follows a similar attack on Fiat Chrysler's Jeep Cherokee last month that prompted the company to recall 1.4 million vehicles in the United States.