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## BACKGROUND PAPER



# Civilian Drone Use in Canada

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*Civilian Drone Use in Canada*  
(Background Paper)

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# CIVILIAN DRONE USE IN CANADA

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## 1 INTRODUCTION

Originally reserved for military applications, drones are increasingly being used for commercial, research and recreational purposes. The increased use of drones in the public space has not been without challenges, particularly near populated areas and airports.<sup>1</sup> Problems with drones being flown near Canadian airports have been widely reported in the media and represent a growing public safety concern.<sup>2</sup>

This Background Paper provides an overview of drone technology and explains how these vehicles are regulated in Canada. The first section explains what drones are and identifies some of their civilian applications. The second section focuses on how drones are regulated in Canada, and the third section highlights some of the privacy and surveillance concerns related to drones. For comparison purposes, the fourth section looks at how drones are regulated in the United States (U.S.). Finally, the fifth section identifies future considerations policymakers will need to weigh in the balance as they continue to develop the legal framework for drones.

## 2 DRONES: AN OVERVIEW<sup>3</sup>

### 2.1 DEFINITION AND TYPES

In a report published in 2013, the Office of the Privacy Commissioner of Canada (OPC) noted the following:

[T]he term “drone” is a catch-all term that refers to any vehicle that can operate on surfaces or in the air without a person on board to control it; and that can vary in size, shape, form, speed, and a whole host of other attributes. A drone can be a model aircraft someone purchases in a store, a mini-helicopter used by some police forces, or a large plane-sized aircraft sent to a war zone.<sup>4</sup>

Canadian law currently distinguishes between unmanned air vehicles (UAVs) and model aircraft, based on the drone’s size and intended use. In the U.S., regulations refer to drones as “unmanned aircraft systems” (UAS), as do proposed new Canadian regulations, whereas the International Civil Aviation Organization refers to them as “remotely piloted aircraft systems” (RPAS). The three main terms used to identify drones – UAV, UAS and RPAS – are sometimes used interchangeably, despite some minor differences in their definition.<sup>5</sup>

It is difficult to define broad categories of drone, given how much the devices can vary in size, shape, form, speed and other attributes. However, as a general rule, drones can be classified as either fixed wing or rotary wing (see Figure 1 below).

Large fixed-wing drones are typically used for military purposes and can fly at up to 25,000 feet for up to 40 hours. Manufacturers also make small fixed-wing drones that can fly at up to 19,500 feet for over 24 hours and that are becoming popular for law

enforcement purposes in the U.S. Some small fixed-wing drones – designed to look like traditional model aircraft – are also available on the consumer market.

Typically, rotary-wing drones are small, cheap and portable, made to be carried and operated by a single individual. Such drones are more commonly used by hobbyists, although they have also been used for law enforcement operations. For example, the RCMP uses small rotary-wing drones to obtain a bird's-eye view of traffic accidents and crime scenes.<sup>6</sup> However, not all rotary-wing drones are small: Dubai recently conducted its first test of a drone taxi service using an 18-rotor unmanned vehicle.<sup>7</sup>

**Figure 1 – Drone Types**



Some companies have also tested biomimetic drones, which imitate naturally occurring animals or plants (e.g., birds, snakes and insects). For example, in 2011, an American company demonstrated a biomimetic drone that mimics a hummingbird as part of a contract awarded by the U.S. Defense Advanced Research Projects Agency.<sup>8</sup>

Unmanned blimps or balloons are sometimes considered drones, as they can sit up in the sky in a single place to observe an area for an extended period of time; such “drones” have been tested along the U.S. border with Mexico.

## 2.2 DRONE APPLICATIONS

Drones are often considered a desirable alternative to manned flights, due to their flexibility and unique capabilities. These vehicles can be deployed on demand and can sometimes stay in the air longer than a manned aircraft. Drones are flexible in the tasks that they can perform and can be tailored to a specific purpose depending on what equipment, such as cameras and sensors, is mounted on board.

In Canada, there will be an estimated 337,468 drones by the end of 2017. Of these, it is estimated that 74% are used for recreational purposes and 26% are used for non-recreational purposes.<sup>9</sup>

As can be seen in Figure 2, drones can be used for both military and civilian (commercial and recreational) purposes. Worldwide, drones used for military applications account for the majority (almost 90%) of spending on drones.<sup>10</sup> Drones used for recreation are currently the largest civilian market in terms of number of units sold; however, commercial drones are projected to be the fastest-growing segment of the civilian market in terms of revenue. Estimates from Goldman Sachs suggest that military, recreational and commercial drones will represent a US\$100 billion market opportunity between 2016 and 2020.<sup>11</sup> In particular,

government and commercial operators are exploring drone use for jobs that are dull, dirty or dangerous. For example, drones have been used to monitor the progress of the clean-up operation that followed the Fukushima nuclear disaster in Japan.<sup>12</sup>

Other commercial applications for drones include surveillance, construction, agriculture, resource exploration, meteorology, mapping and photography.<sup>13</sup> Drones can also be used, for example, to monitor crops, inspect pipeline infrastructure or fight forest fires.<sup>14</sup>

**Figure 2 – Drone Applications**



In one recent application of the technology, the City of Ottawa hired a company to use its “Goosebuster” drones to control the Canada goose population on Petrie Island. The drones are equipped to play the sounds of predators to scare away the geese, which were deemed a nuisance as their droppings would break down in the rain and leach into the water, raising the levels of E. coli bacteria.<sup>15</sup>

Drones are also being tested as possible delivery vehicles. In the U.S., for example, the National Aeronautics and Space Administration (NASA) was part of a drone test flight delivering medical supplies over a short distance in Virginia that was the first Federal Aviation Administration (FAA)–approved drone delivery.<sup>16</sup> Some companies, such as Amazon, Alphabet Inc., DHL and UPS, have started testing automated (i.e., computer- rather than human-piloted) drones as delivery vehicles.<sup>17</sup>

In Canada, Drone Delivery Canada has received authorization to test the company’s drone delivery platform in Alberta and southern Ontario. Among other things, the company plans on using drones to serve remote parts of Canada, including Indigenous communities.<sup>18</sup> In addition, Canada Post has started to examine the role of drones in making deliveries, but it has yet to implement any specific projects to test the technology.<sup>19</sup>

Finally, some reports suggest that delivery drones are being used for illegal purposes, for example, to deliver contraband (such as drugs and mobile phones) to prison inmates.<sup>20</sup>

### 3 REGULATION OF DRONES IN CANADA

#### 3.1 CURRENT REGULATIONS AND INTERIM ORDER

Drone users are considered pilots<sup>21</sup> and, as such, their activities are governed by the *Aeronautics Act* and its regulations.<sup>22</sup> Specifically, the regulatory framework for drone operation is contained in the *Canadian Aviation Regulations* (CARs).<sup>23</sup> Transport Canada has jurisdiction to enforce compliance with federal aviation law and can issue fines to both individuals and companies for specific regulatory breaches.<sup>24</sup>

As drone use has expanded and evolved, pressure to adapt the regulatory framework has grown and, in 2010, Transport Canada established a working group to develop recommendations for regulatory change.<sup>25</sup> Some of these changes have already been implemented, while others are expected to come into effect in the near future.

Broadly speaking, the CARs at present regulate drones based on their size and use: drones weighing less than 35 kg that are used for recreational purposes are classified as “model aircraft,” while drones that do not fall into that category are considered UAVs.<sup>26</sup> In other words, drones of any weight used for non-recreational purposes, and recreational drones weighing over 35 kg are categorized as UAVs.

Currently, pilots planning to use drones categorized as UAVs must obtain a Special Flight Operations Certificate (SFOC)<sup>27</sup> from Transport Canada, unless one of two exemptions applies:

- Operators of UAVs weighing 1 kg or less can operate without an SFOC provided they can meet certain exemption conditions.<sup>28</sup>
- Operators of UAVs weighing over 1 kg and up to 25 kg are allowed to operate without an SFOC provided they meet certain exemption conditions and notify Transport Canada of their activities.<sup>29</sup>

The exemptions were introduced in 2014 to allow non-recreational operators to conduct lower risk operations in more remote areas without an SFOC.<sup>30</sup> However, drone operators flying under an exemption must comply with a list of restrictions, including the requirement to operate their drones within visual line-of-sight (VLOS). As a result, many commercial operators have to continue to file for an SFOC, a process that places a considerable burden on both drone users and the department.<sup>31</sup>

In contrast to the regime governing UAVs, model aircraft were minimally regulated until very recently. The main requirement governing the use of recreational drones weighing less than 35 kg was a “catch-all” safety provision that prohibited recreational drone users from flying their drones into a cloud or in a manner that was or was “likely to be hazardous to aviation safety.”<sup>32</sup> However, in March 2017, citing concerns about the growing number of incidents involving recreational drones, the Minister of Transport announced an Interim Order governing recreational drone use.<sup>33</sup> The Interim Order, subsequently revised in June 2017, was designed as a temporary measure, pending the development of permanent regulations.<sup>34</sup>

The Interim Order sets out detailed rules with which recreational drone users must now comply. Notably, recreational drones must not be flown in the following circumstances:

- higher than 90 m above ground level (section 5(1)(a));
- within 5.5 km of an aerodrome (section 5(5)(a));<sup>35</sup> or
- at night (section 5(1)(f)).

In addition, the following conditions apply:

- Recreational drones weighing between 250 g and 1 kg must remain 30 m from vehicles, vessels or the public (section 5(3)).
- Recreational drones weighing between 1 kg and 35 kg must not be operated within 75 m of vehicles, vessels or the public (section 5(4)).
- Operators must not operate more than one drone at a time (section 5(2)).
- Operators must maintain VLOS at all times during the flight (section 7).
- Operators must give way to manned aircraft at all times (section 6).
- Drone owners must ensure that their contact details are clearly visible on the drone (section 8).

Some drones on the market will be exempt from the requirements, as the Interim Order does not apply to drones weighing less than 250 g that are used for recreational purposes.<sup>36</sup> In addition, recreational users who are members of the Model Aeronautics Association of Canada (MAAC) are exempt from the Interim Order, provided they fly at MAAC-sanctioned sites and events (section 3(2)(b)).<sup>37</sup>

### 3.2 PROPOSED REGULATIONS

In July 2017, Transport Canada published its proposed new drone regulations in the *Canada Gazette* for consultation with Canadians.<sup>38</sup> These new regulations will introduce a risk-based approach to managing drone use in Canada. Whereas the purpose of the drone user's activity currently dictates the applicable regulatory regime,<sup>39</sup> the proposed regulations will no longer distinguish between recreational and non-recreational use, and the applicable rules will instead depend on drone size and operating environment.

The proposed rules introduce new categories of drones and operations:

- Very small drones are defined as weighing more than 250 g but no more than 1 kg. Transport Canada contends that most recreational drone users will fit into this category.
- Small drones are defined as weighing more than 1 kg but no more than 25 kg. These are subdivided into two further categories according to intended use:
  - Small drones (limited operations) are intended for users operating in rural areas.

- Small drones (complex operations) are intended for users operating “in urban areas, within controlled airspace or close to anywhere that airplanes, helicopters and floatplanes land and take off.”<sup>40</sup>

The primary objective of the proposed regulations is to mitigate potential safety risks to people and property on the ground.<sup>41</sup> The greater the risk that is posed by the size or operating environment of the drone, the more stringent are the requirements imposed on the drone pilot. For example, the rules propose allowing pilots aged 14 and over to operate very small drones, while pilots would have to be aged 16 or over to operate small drones.

Some rules, including the requirement to hold liability insurance, apply to all of the proposed categories of drone operators. In addition, pilots of very small drones or small drones used for limited operations will have to pass a basic knowledge test, whereas pilots who intend to fly in the complex operations category will need to hold a pilot permit that is specific to small drones.

The proposed regulations do not apply to pilots operating micro drones (drones weighing less than 250 g), although micro-drone operators would still be required to operate in a manner that does not endanger life or property.<sup>42</sup> Drone pilots operating large drones (more than 25 kg) or drones operated beyond the VLOS will have to continue to apply for an SFOC on a case-by-case basis.<sup>43</sup>

### 3.3 CRIMINAL OFFENCES AND COMMON LAW CIVIL LIABILITY

By regulating how drones can be used, the CARs and the Interim Order seek to ensure the safety of airspace users and the public at large, while facilitating drone operations and encouraging innovation.<sup>44</sup> However, despite regulatory efforts, damage to property and persons may still occur. While it is impossible to enumerate every conceivable type of harm that could be caused by drone activity, media and academic commentary has focused primarily on two overarching concerns: safety and privacy.

Even where high levels of regulatory compliance are achieved, users may lose control of their drones or their drones may simply malfunction. In such instances, drone users may incur liability for any damage caused. In addition, some drone users may intentionally use their drones for nefarious purposes or choose simply to disregard the rules. Over and above any penalties they may incur for regulatory non-compliance, drone users may also incur criminal or civil liability if their activities result in harm to people or property.

Recent high-profile incidents – including a drone crashing into a moving vehicle in Belleville, Ontario, and allegations that a drone was used to spy on a woman sunbathing topless in Vancouver – have raised questions as to how the law can sanction irresponsible drone users and provide redress to victims.<sup>45</sup> In some instances, certain provisions of the *Criminal Code* may apply.<sup>46</sup> These include the following:

- endangering the safety of an aircraft or airport (section 77);
- operating an aircraft in a manner that is dangerous to the public (section 249);

- causing death by criminal negligence (section 220);
- causing bodily harm by criminal negligence (section 221);
- committing criminal mischief, relating to the damage, destruction or interference with the enjoyment of property (section 430);
- surreptitiously observing or making a visual recording of a person who is in circumstances that give rise to a reasonable expectation of privacy, where certain conditions are met (section 162); and
- engaging in conduct that causes a person to fear for their safety or the safety of anyone known to them, constituting criminal harassment (section 264).

Equally, the improper use of drones may result in civil liability under certain common law torts<sup>47</sup> (i.e., wrongful acts or omissions), including the following:

- negligence;
- trespass;
- nuisance; or
- breach of privacy.<sup>48</sup>

### 3.4 OTHER STATUTES AND LEGAL PROVISIONS

In addition to complying with the *Aeronautics Act* and its regulations, drone operators must also respect all other applicable federal and provincial legislation and municipal bylaws. While the CARs focus on safety, much of the relevant federal and provincial legislation addresses privacy.<sup>49</sup>

The *Privacy Act*<sup>50</sup> is Canada's federal public-sector privacy law and it applies to all of the personal information that the federal government collects, uses and discloses about individuals.<sup>51</sup> As a general rule, when initiating new programs, federal organizations must undertake a Privacy Impact Assessment and demonstrate that any intrusion on privacy is proportional to the benefit to be derived. The OPC has pointed out that this is "particularly important in the case of covert or intrusive public safety initiatives."<sup>52</sup> Such activities could conceivably include intelligence gathering or drone surveillance.

The *Personal Information Protection and Electronic Documents Act* (PIPEDA) is Canada's federal private-sector privacy law.<sup>53</sup> It applies to the personal information that a private-sector organization "collects, uses or discloses in the course of commercial activities" across Canada.<sup>54</sup> When drones are used for commercial purposes, their use is covered by PIPEDA and subject to the same requirements as any other data collection practice. However, in its 2013 report on drones, the OPC noted that it may be challenging to produce sufficient evidence in support of a complaint that a drone has been used to breach an individual's privacy, especially in the case of covert surveillance.

In addition, some provinces have enacted legislation creating a statutory tort of invasion of privacy.<sup>55</sup> For example, Saskatchewan's privacy legislation provides that

it is a tort to wilfully violate the privacy of another person and lists visual surveillance as an example of a privacy violation.<sup>56</sup>

Finally, while the regulation of airspace is an area of federal jurisdiction,<sup>57</sup> the provinces are responsible for the management of public lands.<sup>58</sup> In an attempt to curb the use of drones in public places, some municipalities have introduced controls through municipal bylaws. The City of Calgary, for example, prohibits the use of remote-control devices both in and over parks, and on and over city streets.<sup>59</sup>

## 4 SURVEILLANCE: PRIVACY IMPLICATIONS

### 4.1 STATE SURVEILLANCE

While recognizing the primacy of safety, some privacy experts have expressed concern that regulators have given insufficient thought to the privacy implications of widespread drone use.<sup>60</sup> The implications of drone use are potentially far-reaching and extend beyond individual cases of voyeurism or criminal harassment to wider societal questions relating to the acceptability of persistent surveillance and changing expectations of privacy.<sup>61</sup>

Although law enforcement officials and other state actors already have access to a wide range of surveillance tools, drones enable surveillance that is “surreptitious, cheap, efficient, persistent and agile.”<sup>62</sup> Thus, drones have the potential to play a transformative role in the way in which societies conduct surveillance and data collection: their mobility allows them to sweep large areas while their “sheer inhuman patience” allows them to observe particular locations for days on end.<sup>63</sup>

Concerns about the use of drones for surveillance purposes have been amplified by rapid advances in payload technology. In particular, cameras and other payload technologies are reducing in size as they increase in both power and capability. For example, some technologies today can use radar to see through walls; facial recognition software to identify personal attributes (such as gender, age or skin colour); or video analytics, among others.<sup>64</sup> It has been argued that the combination of increased imaging capability, remote command capability and the ability to linger for long periods of time could revolutionize surveillance.<sup>65</sup> Moreover, drone technology is not being developed in isolation. Data captured by drones could be correlated with other types of information gathered from, for example, smart phones or connected cars in order to enhance “the growing digital record of everything we do.”<sup>66</sup>

These technological advances have raised concerns about a chilling effect that the broad deployment of drones could have on everyday activities. In other words, it is felt that the broad deployment of drones could “chill associational and expressive freedoms” if people feel unable to act on individual choices without fear of embarrassment or recrimination.<sup>67</sup> Canadian courts take such threats to personal privacy very seriously, arguing that they undermine “the individual’s personal growth and the flourishing of an open and democratic society.”<sup>68</sup>

However, while the temptation may exist to collect data or conduct general surveillance in order to predict crime patterns and prevent criminal activity, the OPC notes that there is no indication that drones are currently being used for these purposes in Canada.<sup>69</sup>

Finally, some commentators have suggested that the increased drone activity could also alter public expectations of privacy. This could happen in one of two ways: on the one hand, drone use may become “normalized” and accepted, as has occurred with the use of closed-circuit television (CCTV) surveillance, which is largely now accepted as a fact of life.<sup>70</sup> Conversely, as the “cold, technological embodiment of observation,” drones might draw public attention to potential privacy issues and prompt calls for more rigorous privacy protections.<sup>71</sup>

## 4.2 COMMERCIAL SURVEILLANCE

As discussed above, commercial drone use is rapidly expanding. In many instances, this is largely uncontroversial from a privacy perspective: for example, the use of drones to measure crop health or conduct topographical surveys does not present obvious privacy challenges. However, drone technology in the commercial sphere could also be harnessed for less desirable purposes. Some commentators have highlighted the potential that drones offer paparazzi photographers and private detectives, while others have focused on corporate espionage and theft.<sup>72</sup> Finally, concern has also been expressed that companies could share data gathered by their drones for targeted marketing purposes.<sup>73</sup>

## 5 REGULATION OF DRONES IN THE UNITED STATES

### 5.1 FEDERAL REGULATION

In the U.S., the FAA oversees both manned and unmanned aircraft operations and is responsible for the safety of U.S. airspace from the ground up.<sup>74</sup> The head of the FAA, the Administrator, is authorized to issue, rescind and revise regulations that are necessary to fulfil his or her role.<sup>75</sup> In 2012, Congress passed the *FAA Modernization and Reform Act*, which mandated the Secretary of Transportation, in consultation with stakeholders, including the FAA, to develop a plan for the “safe integration” of drones into U.S. Airspace.<sup>76</sup> In response, the Department of Transportation developed the Unmanned Aircraft Systems (UAS) Comprehensive Plan, and the FAA proceeded with a number of rule-making projects.<sup>77</sup>

#### 5.1.1 REGULATION OF COMMERCIAL AND RECREATIONAL DRONES

Like Canada, the U.S. distinguishes between commercial and recreational drone use. Historically, commercial drone use was heavily restricted, and drone operators could not pilot their drones in the National Airspace System without specific permission from the FAA.<sup>78</sup> However, in 2016, the introduction of new rules – often referred to as the Part 107 rules – altered this position, laying the groundwork for the commercial operation of small drones to become the norm rather than the

exception.<sup>79</sup> The list of safety rules is extensive and includes, for example, pilot certification requirements and a duty to maintain VLOS.<sup>80</sup> However, the rules also contain a waiver mechanism to allow drone operators to apply for an exemption from the operational restrictions in certain circumstances. The purpose of the waiver mechanism is to allow the rules to accommodate the rapid technological advances that define the sector.<sup>81</sup>

In the U.S., as in Canada, the prospect of drone delivery has attracted considerable interest. The U.S. rules allow for transportation of property for compensation or hire, but only in certain limited circumstances.<sup>82</sup> Specifically, section 107.39 of Part 107 provides that drones cannot fly over “unprotected” people who are not directly participating in the drone operation unless a waiver is obtained, as provided in section 107.205(g). Moreover, section 107.205(c) states that a waiver cannot be granted to authorize delivery for compensation or hire beyond the drone operator’s VLOS. Effectively, this means that commercial drone delivery is not yet feasible.<sup>83</sup> Nevertheless, the FAA Administrator has indicated that rules to allow routine unmanned aircraft operations beyond the pilot’s VLOS will be implemented “further down the road.”<sup>84</sup>

In contrast to its approach to commercial drones, the FAA has traditionally adopted a hands-off approach to recreational drone use, favouring voluntary operating standards and guidelines.<sup>85</sup> Broadly speaking, this remains the case today, although some statutory guidance has been provided. For example, section 336 of the *FAA Modernization and Reform Act* established the Special Rule for Model Aircraft. This rule defines model aircraft and prohibits the FAA from promulgating any rule on model aircraft if five criteria – including the requirement to operate in accordance with safety guidelines – are met.<sup>86</sup> Nevertheless, the FAA maintains authority to protect the safety of the National Airspace System, and the new rules contain a blanket provision prohibiting model aircraft operators from endangering its safety.

In 2015, the FAA promulgated what is known as the Registration Rule with a view to promoting safety by requiring the owners of recreational drones to register with the FAA.<sup>87</sup> This requirement is stricter than the rule in force in Canada, which requires only that recreational drones be labelled with the user’s contact information. However, a model aircraft hobbyist challenged the U.S. rule, and in May 2017, the U.S. Court of Appeals for the District of Columbia agreed that the rule violated section 336 of the *FAA Modernization and Reform Act*, declaring the Registration Rule, to the extent that it applies to model aircraft, unlawful.<sup>88</sup> The FAA has stated that it is working on a final rule to implement the court’s decision. In the meantime, the FAA has offered drone operators who are no longer required to register their drones the opportunity to delete their registration and receive a refund of their registration fee. However, the FAA continues to encourage voluntary registration of all drone owners.<sup>89</sup>

## 5.2 OTHER REGULATORY AND LEGISLATIVE INITIATIVES IN THE U.S.

Although regulating airspace is a federal responsibility, a recent study found that 135 localities across 31 states have enacted drone legislation.<sup>90</sup> It notes that overwhelming majority of these ordinances restrict drone use, seemingly in response to concerns that the FAA’s rules are not strict enough to prevent drones from being

used improperly. However, the authors also observed that concerns have been expressed that local rules may both conflict with federal authority and undermine the integration of drones into the National Airspace System.

Despite these concerns, there appears to be an appetite for regulating drones at a local level. In May 2017, four U.S. Senators introduced the *Drone Federalism Act*, a bill that would encourage cooperation between all levels of government. The senators contend that the legislation would “protect private property rights and allow local communities to tailor drone rules to their specific needs,” while ensuring that U.S. airspace remains the safest in the world.<sup>91</sup> The bill has the support of various organizations, including the United States Conference of Mayors; however, the bill’s detractors argue that it would stifle the emerging commercial drone industry.<sup>92</sup>

U.S. lawmakers have also displayed a keen interest in the privacy implications of widespread drone use. In March 2017, two Senators introduced the *Drone Aircraft Privacy and Transparency Act of 2017* to establish safeguards to protect privacy rights in an era of expanded drone use.<sup>93</sup> Among other measures, and subject to certain exceptions, the legislation would require law enforcement agencies to obtain a warrant prior to using drones to conduct surveillance.

## 6 FUTURE CONSIDERATIONS

Ensuring public safety and security will present challenges to regulators and policy makers as drone use grows. As discussed above, Canada has a regulatory framework in place to allow for the safe operation of drones in the current operational context. However, if commercial drone use becomes routine as expected, the likelihood of unsafe traffic patterns and collisions is expected to increase. Consequently, attempts are underway to develop air traffic control systems for drones.<sup>94</sup>

Traditional air traffic control systems use both human operators and technologies, such as radar and transponders. However, a human operator–based system is ill-equipped to accommodate the “millions of drones expected in years to come” and radar is not always able to detect small drones or operate at low altitudes.<sup>95</sup> For these reasons, other technologies are being explored. In 2015, NASA demonstrated an air traffic management concept that involved cloud-based software tools and geofencing. The tests were the first stage in a four-part project scheduled for completion in 2019.<sup>96</sup>

In addition, commentators have highlighted a number of potential security threats related to drone use, including hacking and terrorist activities. As has been observed, drones are “flying computers” and, as such, can be hacked. Hackers could be motivated by any number of reasons, including intent to steal a drone’s cargo, or intent to cause mischief or carry out a terrorist act.<sup>97</sup>

Of course, a drone does not need to be hacked to be used for terrorist activity. Concern has also been expressed that drones may be used as flying explosive devices or to conduct biological or chemical attacks.<sup>98</sup> While drone terrorism may currently be “a very low probability event,” it is thought that the risk of terrorist activity “will only increase” as drones become more commonplace.<sup>99</sup>

In response to this terrorist threat, various jurisdictions are exploring a range of legal and technological drone countermeasures. Examples of possible legal measures include restricting airspace above high-value targets and creating the necessary legal authority to define who is responsible for countering drone threats, along with the rules of engagement.<sup>100</sup>

Various technological defences are also being developed. Affixing transponders to drones allows for detection and identification, while employing GPS signal-jamming technology renders drones unable to follow the pilot's navigation commands. In addition, laser technology is being tested as a means of destroying drones.<sup>101</sup>

According to media reports, the United Kingdom recently implemented GPS signal-jamming technology to create a drone-proof "shield" around a prison in order to prevent contraband from being introduced via drone.<sup>102</sup> Similarly, France deployed anti-drone technology to protect stadiums during the Euro 2016 soccer championships.<sup>103</sup>

## 7 CONCLUSION

The drone industry is expanding rapidly in both scale and scope, and presents new opportunities to individuals, businesses and governments alike. In the public sector, drones are expected to be deployed in the near term as a simple and cost-effective alternative to airborne law enforcement activities.<sup>104</sup> Using drones to facilitate certain law enforcement activities, such as search-and-rescue operations or crime scene photography, is relatively uncontroversial; however, concerns have been expressed about the impact persistent drone surveillance could have on privacy and civil liberties.

Similarly, the commercial market has increasingly turned to drones for a variety of applications. In a few short years, drones have proven their worth in certain key sectors, notably construction, agriculture and insurance. Other uses, such as drone taxis and drone delivery, remain largely speculative, but as technology evolves, new opportunities will undoubtedly emerge and mature.

The future of civilian drone use depends not only on technological development, but also on public acceptance and adequate regulation. Future regulatory development and court challenges will determine how the balance will be struck between protecting safety, security and privacy, and fostering economic growth and personal freedom.

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## NOTES

1. Fasken, "[Regulation of Unmanned Aerial Vehicles \("Drones"\) in Canada](#)," *Litigation & Dispute Resolution Bulletin*, 7 April, 2015.

2. For example, see the following: [“Drone seen flying in path of landing planes at Vancouver airport,”](#) *CBC News*, 1 July 2014; [“Calgary man criminally charged for flying drone near airport,”](#) *CBC News*, 21 January 2016; Shanifa Nasser, [“‘Reckless’ flying drone near Toronto’s Billy Bishop prompts police investigation,”](#) *CBC News*, 2 December 2016; and [“Flight crew spots drone flying near Ottawa airport,”](#) *CBC News*, 19 April 2017.
3. Except where indicated, this section of the Background Paper is based on Office of the Privacy Commissioner of Canada [OPC], [Drones in Canada: Will the proliferation of domestic drone use in Canada raise new concerns for privacy?](#), March 2013.
4. OPC (2013), p. 2.
5. This Background Paper will use the terms “drone” and “UAV” interchangeably.
6. Royal Canadian Mounted Police, [“Innovation – Flying the Skies: Unmanned Aerial Vehicles,”](#) *RCMP F Division 2013/2014 – Year in Review*.
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19. The Canadian Press, [“Canada Post looks to drones as possible future of mail delivery,”](#) *CBC News*, 22 June 2016.

20. Misha Gajewski, "[Quebec prison smuggling goes high-tech with drones](#)," *CTV News*, 6 February 2017; and United Kingdom, Ministry of Justice, "[New squad formed to tackle drone threat to prisons](#)," News release, 17 April 2017.
21. Transport Canada, "Notice of Proposed Amendment – Unmanned Air Vehicles" [NPA – UAVs], [CARAC Activity Details](#), 2015, p. 1.
22. [Aeronautics Act](#), R.S.C., 1985, c. A-2. The Act and its regulations apply to civilian drone use; military drone use is regulated by the Department of National Defence. See also OPC (2013), p. 6.
23. [Canadian Aviation Regulations](#) [CARs], SOR/96-433.
24. Fasken (2015).
25. Transport Canada, "Terms of Reference – Unmanned Air Vehicle (UAV) Systems Program Design Working Group – June 29, 2010," [Working Group Details](#).
26. The definitions of "model aircraft" and "unmanned air vehicle" are contained in section 101.01(1) of the CARs.
27. Special Flight Operations Certificates [SFOCs] are short-term authorizations issued on a case-by-case basis; however, longer-term authorizations are issued in certain circumstances. An SFOC may be issued to authorize a UAV to operate for any civil purpose, including for surveillance. See OPC (2013), p. 6; and Transport Canada, [Applying for a Special Flight Operations Certificate \(SFOC\)](#).
28. Transport Canada, "[Appendix A: Exemption from Sections 602.41 and 603.66 of the Canadian Aviation Regulations](#)," *Advisory Circular (AC) No. 600-004: Guidance Material for Operating Unmanned Air Vehicle Systems under an Exemption*.
29. Transport Canada, "[Appendix B: Exemption from Sections 602.41 and 603.66 of the Canadian Aviation Regulations](#)," *Advisory Circular (AC) No. 600-004: Guidance Material for Operating Unmanned Air Vehicle Systems under an Exemption*.
30. Transport Canada, [Getting permission to fly your drone](#).
31. "Regulatory Impact Analysis Statement," *Regulations Amending the CARs (UAS)*, p. 3118; and "[UAV SFOC Exemptions 'For Dummies'](#)," in the *flitelab*.
32. See Fasken (2015); and CARs, s. 602.45.
33. Transport Canada, "[New safety rules for recreational drone use take immediate effect: Transport Canada introduces measures to protect Canadians from reckless drone use](#)," News release, 16 March 2017; and Transport Canada, [Interim Order No. 8 Respecting the Use of Model Aircraft](#). Section 4 of the Interim Order suspends the effect of s. 602.45 in respect of model aircraft weighing between 250 g and 35 kg. It still applies to drones weighing less than 250 g (see also previous note).
34. For the differences between the Interim Order that was published in March 2017 and the revised Interim Order published in June 2017, see Transport Canada, [Recreational and non-recreational drone operations – Frequently Asked Questions](#).
35. An exception to this rule says that drones may not operate within 1.8 km from the centre of a heliport or aerodrome that is used exclusively by helicopters. See *Interim Order No. 8 Respecting the Use of Model Aircraft*, s. 5(5)(b).
36. Best Buy, [Drones under 250g](#).
37. Establishing a regulatory framework that would allow traditional modellers to continue to conduct safe flights was a stated objective of the regulatory reform process. See Transport Canada (2015), NPA – UAVs, p. 11.

38. *Regulations Amending the CARs (UAS)*, pp. 3163–3207. Public consultation on the proposed changes closed on 13 October 2017. See Transport Canada, [Proposed rules for drones in Canada](#). The final package of regulations will come into force six months after the day on which they are published in the *Canada Gazette*, Part II.
39. Unless the drone weighs over 35 kg.
40. Transport Canada, *Proposed rules for drones in Canada*.
41. Transport Canada, “Regulatory Impact Analysis Statement,” *Regulations Amending the CARs (UAS)*, p. 3116.
42. *Ibid.*, p. 3119.
43. *Ibid.*, p. 3125.
44. Transport Canada (2015), NPA – UAVs, p. 1.
45. “Transport Canada following up on drone vs. vehicle crash in Belleville, Ont.,” *CBC News*, 4 January 2016; David Contant, Nelligan O’Brien Payne, [Explicit Videos and Peeping Tom Drones – Emerging Torts in the Twenty First-Century](#), 1 July 2016; and Greg Meckbach, “Drone operators risk lawsuits, criminal charges for privacy breaches: OIAA speaker,” *Canadian Underwriter*, 1 February 2017.
46. [Criminal Code](#), R.S.C. 1985, c. C-46.
47. See, for example, the discussion in Contant (2016).
48. Note that the common law “has not developed a discrete and well-defined tort of invasion of privacy.” Nevertheless, in 2012, the Court of Appeal for Ontario recognized the common law tort of intrusion upon seclusion and there are indications that the courts are generally moving towards recognizing invasion of privacy as a discrete tort. See [Jones v. Tsige](#), 2012 ONCA 32, paras. 65 and 66.
49. A more detailed list of other applicable federal legislation can be found at Transport Canada, [“3.7 Other Legislation,” Staff Instruction \(SI\) No. 623-001: Review and Processing of an Application for a Special Flight Operations Certificate for the Operation of an Unmanned Air Vehicle \(UAV\) System](#).
50. [Privacy Act](#), R.S.C. 1985, c. P-21.
51. OPC, [Overview of privacy legislation in Canada](#), Fact sheet, May 2014. Note that each province and territory has its own public-sector privacy legislation that applies to provincial and territorial government ministries, agencies and their data collection, usage and disclosure activities.
52. OPC (2013), p. 13.
53. [Personal Information Protection and Electronic Documents Act](#) [PIPEDA], S.C. 2000, c. 5.
54. PIPEDA, s. 4(1)(a). Nevertheless, organizations operating wholly within a province that has legislation that is “substantially similar” to PIPEDA are exempt from the federal legislation. Currently, Quebec, Alberta and British Columbia have general private-sector legislation that has been deemed “substantially similar” to PIPEDA. See OPC (2014).
55. Philip H. Osborne, *The Law of Torts*, 5<sup>th</sup> ed., Irwin Law, 2015, p. 285.
56. [The Privacy Act](#), R.S.S. 1978, c. P-24, ss. 2 and 3.
57. For a discussion of the origins of Parliament’s jurisdiction over aeronautics, see Peter W. Hogg, *Constitutional Law of Canada*, 5<sup>th</sup> ed., Thomson Carswell, para. 22.11.
58. [Constitution Act, 1867](#), 30 & 31 Victoria, c. 3 (U.K.), s. 92(5).

59. City of Calgary, [Bylaw Number 20M88](#), s. 12; and City of Calgary, [Bylaw Number 20M2003](#), s. 24(c).
60. OPC (2013), p. 9.
61. The Surveillance Studies Centre at Queen's University notes the potential for persistent UAV surveillance to capture a large body of environmental data:
 

Mass data collection afforded through the persistent capture capabilities of UAVs can both target and track specific individuals and groups, but also collect a wealth of 'ambient' information across a wide variety of terrestrial environments, including the people, objects and behaviours that are occurring within them.

See Ciara Bracken-Roche et al., [Surveillance Drones: Privacy Implications of the Spread of Unmanned Aerial Vehicles \(UAVs\) in Canada: A Report to the Office of the Privacy Commissioner of Canada, under the 2013–2014 Contributions Program](#), Surveillance Studies Centre, Queen's University, 2014, p. 46.
62. OPC (2013), p. 10.
63. Ibid.
64. Ibid., p. 4.
65. OPC, "[Submission of the Office of the Privacy Commissioner of Canada to the Canadian Aviation Regulation Advisory Council \(CARAC\)](#)," *OPC comment to Transport Canada on Unmanned Aerial Vehicles*, 27 August 2015.
66. OPC (2013), p. 11.
67. Supreme Court Justice Sotomayor in *United States v. Jones*, as quoted in David Gray and Danielle Citron, "[The Right to Quantitative Privacy](#)," *Minnesota Law Review*, Vol. 98, No. 1, 2013, p. 91.
68. [R. v. Ward](#), 2012 ONCA 660, para. 71.
69. OPC (2013), p. 13.
70. Benjamin J. Goold, "Privacy rights and public spaces: CCTV and the problem of the 'unobservable observer,'" *Criminal Justice Ethics*, Vol. 21, No. 1, 2002, p. 21.
71. M. Ryan Calo, "[The Drone as Privacy Catalyst](#)," *Stanford Law Review Online*, December 2011.
72. With respect to paparazzi, see Calo (2011). For the use of drones by private investigators, see Rose Eveleth, "[The private investigator who spies using drones](#)," *BBC Future*, 18 March 2015. As regards the use of drones in corporate espionage, see OPC (2013), p. 5. On the issue of theft, see Candace Cooper, "Preparing for biometrics and drones in the 'post-privacy' era," *Inside Counsel*, 24 November 2014.
73. See Calo (2011); Tony Romm, "[Drone privacy push could stall out](#)," *Politico*, 1 March 2016; and Kelsey D. Atherton, "[Marketing Drones Scanned Los Angeles For Cellphone Location Data](#)," *Popular Science*, 26 February 2015.
74. United States, Federal Aviation Administration [FAA], [Busting Myths about the FAA and Unmanned Aircraft](#).
75. United States, [49 U.S.C. §106 – Federal Aviation Administration](#), subsection (f)(3)(A).
76. United States, [FAA Modernization and Reform Act of 2012](#), Public Law 112-95, 112<sup>th</sup> Congress, 126 Stat. 11 (2012), s. 332(a).
77. United States, Department of Transportation, Joint Planning and Development Office, [Unmanned Aircraft Systems \(UAS\) Comprehensive Plan: A Report on the Nation's UAS Path Forward](#), September 2013.

78. United States, "[Federal Aviation Administration: Unmanned Aircraft Operations in the National Airspace System](#)," in *Federal Register: Rules and Regulations*, Vol. 72, No. 29, 13 February 2007, pp. 6689–6690.
79. Small drones (referred to as small UAS) are defined as an unmanned aircraft weighing less than 55 lbs. See *FAA Modernization and Reform Act of 2012*, s. 331(6).
80. United States, "[Title 14: Aeronautics and Space, Part 107 – Small Unmanned Aircraft Systems, Subpart B – Operating Rules](#)," *Electronic Code of Federal Regulations*. See ss. 107.12 (remote pilot certification) and 107.31 (visual line of sight). For a summary of the major provisions of Part 107, see also FAA, "[Summary of small unmanned aircraft rule \(Part 107\)](#)," *FAA News*, News release, 21 June 2016.
81. United States, FAA, [Operation and Certification of Small Unmanned Aircraft Systems](#), p. 10.
82. The conditions that must be met are as follows:
  - The aircraft, including its attached systems, payload and cargo weigh less than 55 pounds total;
  - The flight is conducted within visual line of sight and not from a moving vehicle or aircraft; and
  - The flight occurs wholly within the bounds of a State and does not involve transport between (1) Hawaii and another place in Hawaii through airspace outside Hawaii; (2) the District of Columbia and another place in the District of Columbia; or (3) a territory or possession of the United States and another place in the same territory or possession.

See *ibid.*, p. 11.
83. See Lance Ulanoff, "[The FAA's new rules for drones are bad news for Amazon](#)," *Mashable*, 21 June 2016.
84. United States, FAA, [Speech – "Drones: A Story of Revolution and Evolution"](#), Speech by Michael Huerta, FAA Administrator, 6 January 2017.
85. United States Court of Appeals for the District of Columbia, [John A. Taylor v. Michael P. Huerta](#), Case no. 15-1495, 19 May 2017, p. 4.
86. United States, *FAA Modernization and Reform Act of 2012*, s. 336.
87. United States, [Registration and Marking Requirements for Small Unmanned Aircraft](#), in *Federal Register: Rules and Regulations*, Part VI, Vol. 80, No. 241, 16 December 2015, p. 78594.
88. *Taylor v. Huerta*, p. 8.
89. UAS Vision, [FAA Offers Registration Deletion and Refund for Hobbyists](#).
90. Center for the Study of the Drone at Bard College, [Drones at Home: Local and State Drone Laws](#), March 2017.
91. See United States Congress, [S.1272 – Drone Federalism Act of 2017](#), 115<sup>th</sup> Congress (2017–2018); and "[Feinstein, Lee, Blumenthal, Cotton Introduce Bill to Protect State, Local Authority on Drones](#)," *United States Senator for California Dianne Feinstein*, News release, 25 May 2017.
92. Zacc Dukowitz, "[Feinstein Drone Act Could Ruin Everything We've Worked So Hard to Build](#)," *UAV Coach*, 1 June 2017.
93. United States Congress, [S.631 – Drone Aircraft Privacy and Transparency Act of 2017](#), 115<sup>th</sup> Congress (2017–2018).

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95. Mark Harris, "[US testing an 'air traffic control system' for drones](#)," *Guardian*, 26 November 2015.
96. NASA, "[First Steps Toward Drone Traffic Management](#)," *NASA Ames*, News release, 19 November 2015.
97. Peter Singer cited in Katia Moskvitch, "[Are drones the next target for hackers?](#)," *BBC Future*, 6 February 2014.
98. See Kevin McCaney, "[An emerging threat: Small drones as flying IEDs](#)," *Defense Systems*, 9 October 2015; and Tung Yin, "[Game of Drones: Defending Against Drone Terrorism](#)," *Texas A&M Law Review*, Vol. 2, Issue 4, 2015, pp. 667–668.
99. Tung (2015), p. 673.
100. *Ibid.*, pp. 669–671.
101. *Ibid.*, p. 656.
102. "[British prison is first to use 'disruptor' to create drone-proof 'shield' around jail](#)," *Telegraph*, 16 May 2017.
103. Eugénie Bastié, "[Euro 2016 : les stades seront équipés de technologies anti-drones](#)," *Le Figaro*, 18 May 2016.
104. OPC (2013), p. 5.