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REPEAT & SCALE – FINDING THE PATH TO BVLOS

A streamlined route to BVLOS in Canada is here.

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SUMMARY

This brief covers the historical context of safety regulations—focused on collision avoidance—for commercial drones (pp. 1–2), the current framework for achieving BVLOS waivers and special permissions (p. 3), and how The Pathfinder Program is enabling operators to achieve BVLOS capabilities in Canada (p. 4).

Beyond visual line of sight (BVLOS) flight will unlock commercial unmanned aircraft system (UAS) markets globally by enabling repeatable and scalable operations. Significant safety concerns persist, however, around a remote pilot's (RP) ability to avoid collisions. Regulators have created operational constraints on UAS flights to mitigate potential air and ground risks, including the requirement that the UAS remain within the RP's visual line of sight (VLOS). In the United States, BVLOS use case trials are the primary model for influencing regulation to enable the industry. But in Canada, regulation is advancing rapidly and new approaches are opening pathways for commercial operators to access BVLOS today.

BVLOS FLIGHT WILL UNLOCK INDUSTRIAL APPLICATIONS

THE COLLISION AVOIDANCE RULES

Global regulations for manned aircraft codified the "see and avoid" requirement as a lynchpin of flight safety. An on-board pilot's ability to spot other aircraft or objects provides a critical means to prevent collisions.

In the US, a series of catastrophic aircraft fatalities occurred in the 1930s. In the wake of this, The Civil Aeronautics Act created the nation's first Civil Aeronautics Authority (CAA) to investigate and prevent accidents. This organization, which later evolved into the FAA, created the country's first civil aviation regulations (CARs). CARs §§ 60.13(c) and 60.30 required pilots to focus their attention outside the aircraft to ensure a clear path. Around the same timeframe, Canada also finalized and fully instituted its full panoply of civil aviation regulations, also incorporating the see and avoid requirement.

In the early 1940s, the US, Canada, and 50 other states signed The Convention on International Civil Aviation (Chicago Convention). In 1947, upon its final ratification, the International Civil Aviation Organization (ICAO) arose to codify "certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner…" Annex 2 to the Convention on International Civil Aviation, *Rules of the Air*, includes a general collision avoidance rule for the global aviation community in paragraph 3.2.2.1. *Right-of-way*, "An aircraft that is obliged by the following rules to keep out of the way of another shall avoid passing over, under or in front of the other, unless it passes well clear and takes into account the effect of aircraft wake turbulence."

As state-level regulations matured, they retained this critical requirement. In 1989, the US created 14 Code of Federal Regulations (CFR) § 91.113(b), *Right-of-way rules: Except water operations* (amended in 2004), incorporating the ICAO standards:

> **(B)** General. When weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft. When a rule of this section gives another aircraft the right-of-way, the pilot shall give way to that aircraft and may not pass over, under, or ahead of it unless well clear.

Similarly, the Canadian Aviation Regulations (CARs), which came into force in 1996, contains § 602.21 *Avoidance of Collision*, "No person shall operate an aircraft in such proximity to another aircraft as to create a risk of collision."

The underlying assumption of all of these requirements was that there would be an onboard pilot that could see, avoid, and stay well clear of hazards. As a UAS does not have a pilot on board, when regulating them, the global community focused on mitigating collision risk by requiring UAS remain within the remote pilot's visual line of sight.

The ICAO default position is that RPAS operations remain VLOS. In its **Remotely Piloted Aircraft System (RPAS) Concept of Operations (CONOPS) For International IFR Operations** (ICAO RPAS CONOPS), § 1.3.1 *RPAS Operations* describes BVLOS flights as,"generally…being developed in areas not currently served by manned aircraft, e.g. the lower or higher altitude environments and extreme endurance."

In the US, 14 CFR § 107.31 requires that the RP or a visual observer (VO) must know the UAS' location, be able to determine the UAS' attitude, altitude, and direction of flight, observe the airspace for other air traffic and hazards and determine that the UAS does not endanger the life or property of another throughout the duration of the entire flight. Part 107 also incorporates the "well clear" portion of the "see and avoid" requirement in 14 CFR § 107.37, *Operation near aircraft: right-of-way rules,* which states:

> **(A)** Each small unmanned aircraft must yield the right of way to all aircraft, airborne vehicles, and launch and reentry vehicles. Yielding the right of way means that the small unmanned aircraft must give way to the aircraft or vehicle and may not pass over, under, or ahead of it unless well clear.
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> **(B)** No person may operate a small unmanned aircraft so close to another aircraft as to create a collision hazard.

The CARs remotely piloted aircraft system (RPAS) provisions also contain VLOS requirements at § 901.11 for the RP or VO, but also include a built-in exception allowing for a special flight operations certificate (SFOC) for BVLOS. Additional relevant RPAS sections include § 901.17 *Right of Way*, "A pilot of a remotely piloted aircraft shall give way to power-driven heavier-than-air aircraft, airships, gliders, and balloons at all times;" and § 901.18, *Avoidance of Collision*, "No pilot shall operate a remotely piloted aircraft in such proximity to another aircraft as to create a risk of collision."

EXCEPTIONS TO THE RULE

Obtaining either an SFOC from Transport Canada (TC) or a BVLOS waiver from the FAA requires applicants to provide sufficient technical and operational information to the regulator to allay safety risk concerns. This typically requires utilizing DAA systems that incorporate autonomous features, artificial intelligence, or other advanced technologies. DAA technology allows UAS to timely and dynamically avoid moving objects. Iris Automation's Casia® series of onboard integrated computer vision systems, for example, provides robust situational information and intelligent decision-making in real time to avoid mid-air collisions.

In the US, the FAA has been approving BVLOS waivers to Part 107.31 on a limited basis. According to its website, as of early June 2021, 70 such waivers have been granted. Section 107.200, *Waivers*, requires a complete description of the proposed operation and justification that establishes the operation can safely be conducted, with an emphasis on risk and hazard mitigation.

The FAA provides **Operational Risks and Mitigation questions** for BVLOS waivers that applicants must answer. For DAA, the FAA expects a description as to how the RPIC will avoid other aircraft, flying over/into people on the ground, and ground-based structures and obstacles at all times. For DAA equipment, the key questions include: "What kind of equipment/technology? How does it work? How is it tested to determine system reliability and limitations? (Provide testing data.)" Using a system with defined and accepted test methodologies, such as Casia, expedites this process.

As mentioned, Canada codified a VLOS exception in its RPAS regulations, through the ability to obtain an SFOC. CARs § 903.3, *Issuance of Special Flight Operations Certificate—RPAS*, requires an applicant to demonstrate "the ability to perform the operation without adversely affecting aviation safety or the safety of any person." Canada uses the Joint Authorities for Rulemaking on Unmanned Systems (JARUS) Specific Operations Risk Assessment (SORA) to make these risk assessments. The JARUS SORA outlines Specific Assurance and Integrity Levels (SAIL) for air and ground risk, which dictate required Operational Safety Objectives(OSO). SFOCs for BVLOS operations are rarely granted, with only **two publicly reported as approved.**

The ICAO RPAS CONOPS states that RPAS must meet the DAA capability requirements for the airspace in which it flies and the operations to be performed." (para. 4)

On June 9, 2021, FAA Administrator, Mr. Steve Dickson, announced he had formed an Advisory Rulemaking Committee (ARC) to provide recommendations for a BVLOS regulation within six months. Iris Automation is one of the organizations selected to participate in the ARC. In addition to its **experimental programs**, the FAA's formation of an ARC is another step toward establishing standardized rules for the safe integration of commercial drones into US airspace with fewer direct human dependencies.

THE BVLOS PATH

The work to date in experimental programs like the FAA's Integration Pilot Program and BEYOND has helped establish baselines and groundwork for the eventual regulations. But Canada has moved past the 'trial' format of forming regulations and has begun endorsing more innovative and streamlined processes.

> WE ARE PROUD TO SAY THAT IRIS IS TAKING A LEADING ROLE IN ADVANCING BVLOS IN CANADA THROUGH BOTH OUR DAA TECHNOLOGY AND THE SERVICES WE PROVIDE THROUGH THE PATHFINDER PROGRAM."
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> Jon Damush, Iris Automation CEO

One example of this is a project Iris Automation has developed called **The Pathfinder Program,** to provide a turnkey solution for companies that want to participate in Canada's BVLOS ecosystem. Iris has partnered with TC's two approved test sites and training facilities, **Foremost UAS Range** in Alberta and the **UAS Center of Excellence** (CED) in Alma, Quebec. Davis and his team provide on-site full spectrum assistance to partner with these sites and to obtain SFOCs through a 'templated' approach approved by Transport Canada. Jon Damush, Iris CEO, expounds, "We are proud to say that Iris is taking a leading role in advancing BVLOS in Canada through both our DAA technology and the services we provide through The Pathfinder Program. The value

of Pathfinder is that we do the heavy lifting to enable BVLOS. We provide the front end team of regulatory experts and back end teams to write all the required documentation, including the application and all related documents that TC expects such as training manuals, training programs, maintenance manuals, and detailed standard operating procedures."

Pathfinder has already jumpstarted BVLOS in Canada. Iris successfully marshalled **MVT Geo-solutions** (MVT) through the TC SFOC process, obtaining the country's second such approval in February 2021, to conduct long-line linear power line inspections with the CED in Alma, Quebec, using Casia. William De Keiser, Director of the Cluster of Excellence, CED could not be more excited. "Teaming with Iris Automation to provide this complete program will help many companies to finally embrace the potential of drone operations," he says. This success is repeatable. Let's scale and fly.

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