RPAS Traffic Management (RTM) System: Concept of Operations

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Record of Revisions

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Foreword

This Concept of Operations document presents a vision for Canada's RPAS Traffic Management framework as it may exist in the 2030 timeframe. It foresees a collaborative eco-system contributing to safe and sustainable growth in the RPAS sector, supported by RPAS Operators and Pilots, RTM Service Suppliers, NAV CANADA, Transport Canada and other industry stakeholders.

The ConOps has been prepared by NAV CANADA's RPAS Traffic Management Team, with close collaboration and key contributions throughout its development by members of the Transport Canada RPAS Task Force. It has also been influenced by stakeholder consultations through various industry forums such as the RTM Advisory Council, the RPAS Supplier Sub-Group and the RTM Trials program.

The ConOps is intended to inform and stimulate discussion and is expected to evolve with the industry.

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1 General

1.1 Introduction

The current mature, safe and secure operating environment for conventional aviation in Canada and internationally is a product of decades of evolution and hard-learned lessons. Supported by a robust regulatory framework, technical organizations and standards and safety-focused operating procedures, it is a system the travelling public has come to trust.

The rapid growth of Remotely Piloted Aircraft System (RPAS) technology and operational use cases is fundamentally changing the composition of the Canadian aviation sector, introducing new opportunities and challenges in the process. The flight dynamics, avionics equipage, operational use cases and potential traffic volume of RPAS are not well suited to integrate into the traditional Air Traffic Management (ATM) system in place in Canada. The support of an appropriate and evolving RPAS Traffic Management (RTM) framework is a key enabler to the realization of the opportunities presented by RPAS while preserving the efficiency of the existing aviation system and ensuring that the safety of Canadians is maintained. (Note: Canada uses the ICAO definition for UTM [RTM in Canada]: "Unmanned Aircraft System Traffic Management (UTM). [RPAS Traffic Management (RTM)] A specific aspect of air traffic management which manages UAS operations safely, economically, and efficiently through the provision of facilities and a seamless set of services in collaboration with all parties and involving airborne and ground-based functions".)

1.2 Purpose and Scope

The purpose of the RTM Concept of Operations (ConOps) document is to present a vision for Canada's evolving RTM framework. The ConOps is intended to inform stakeholders in the RPAS community and to stimulate discussion.

This first edition of the ConOps presents a "snapshot" of the 2030 RTM framework as it may exist at that time. The ConOps is intended to be a living document, incorporating feedback, updates and evolving with the industry. Future editions are expected to present snapshots of the vision for later timeframes.

This ConOps considers RTM in terms of types of RPAS operations to be supported, regulations (current, proposed and potential), airspace design and supporting systems/infrastructure. This edition addresses RPAS operations in Very Low Level (VLL) airspace, both within Visual Line-of-Sight (VLOS) and Beyond Visual Line-of-Sight (BVLOS), including operations over populated areas and operations within controlled airspace but segregated from traditional aircraft. RPAS operating in airspace integrated with traditional aircraft will be served by the traditional Air Traffic Management (ATM) system, and will need to be equipped with communication, navigation and surveillance capabilities consistent with requirements applicable to other aircraft in that airspace. Advanced Air Mobility (AAM) operations are not addressed in this edition of the RTM ConOps.

The document is informed by the activities of other States, Regions and international bodies including Europe's U-Space and Single European Sky ATM Research (SESAR) and the Federal Aviation Administration (FAA). The RTM concepts have been adapted to the Canadian context.

1.3 Considerations

The development of the RTM framework must take into account various considerations particular to the Canadian context, amongst which are the following:

1. Transport Canada and NAV CANADA are committed to extending to RPAS the principle of providing fair and equitable access to airspace.

2. Canada has a very large geographic area, most of which is sparsely populated and subject to extreme climate conditions. The sparse areas are challenging in terms of access to electrical power and communication networks. Ground-based communication networks serving RPAS in VLL airspace will be further challenged by radio line-of-sight limitations to coverage at low altitudes. RPAS operations in these areas will need to consider options such as satellite communication systems, providing wide area coverage, and mission-specific new or portable infrastructure, supporting localized operational needs.

3. Leveraging recognized technical standards to the extent practicable for Canada's RTM framework will give Canadian RPAS operators improved access to technology and reduce costs. It will also improve the opportunities for Canadian suppliers to serve markets outside Canada.

4. Transborder RPAS flights between Canada and USA will have to comply with requirements of both jurisdictions.

5. Distances between locations with infrastructure associated with official points of entry along the Canada/US border may influence regulations and routes for transborder flight operations.

1.4 Implementation

Implementation of the concepts represented in this document are subject to dependencies which include investment and industry growth, demand for complex operations, development of sustainable business models and a supportive regulatory environment.

An implementation plan and associated timeline to progress toward the 2030 RTM framework described in this ConOps will be developed and separately documented.

2 Regulatory Landscape

2.1 Regulatory Foundations

The Constitution Act, 1867, Section 91 grants exclusive legislative authority for aviation to the Parliament of Canada. This authority is further detailed in the Aeronautics Act, which comprehensively regulates all aspects of aeronautical activities. Under this Act, the Governor in Council is empowered to establish regulations encompassing various aspects of aeronautics, such as airspace classification, usage, and the provision of related services and equipment. Moreover, for civilian operations, the Act designates the Minister of Transport as solely responsible for the development, regulation, and oversight of aeronautics, including all aviation activities and the provision of Air Navigation Services (ANS).

The delivery of ANS is governed by the Civil Air Navigation Services Commercialization Act (CANSCA), which assigns to NAV CANADA the role of Canada's Air Navigation Service Provider (ANSP), with exclusive responsibility for providing air navigation services and effectively planning and managing Canadian airspace and any other airspace in respect of which Canada has responsibility for the provision of air traffic control services, other than airspace under the control of a person acting under the authority of the Minister of National Defence. NAV CANADA is held accountable for air traffic and airspace management (certain services can be provided by other entities with the consent of NAV CANADA). ANS accountability has been a significant driver behind the predominantly centralized RTM architecture pursued by NAV CANADA with the support of Transport Canada in its regulatory and oversight roles.

2.2 Implementation of RPAS and RTM Regulations

The initial set of RPAS regulations, which were published in Part IX of the Canadian Aviation Regulations (CARs) and became effective in June 2019, encompasses RPAS up to 25kg operating in all airspace up to 400 feet above ground level (AGL). Flights are permitted within visual line of sight (VLOS) or through Special Flight Operation Certificates (SFOC). RPAS operations in controlled airspace require authorization from the air traffic services unit.

In June 2023, the first set of proposed Beyond Visual Line of Sight (BVLOS) regulations was released for public consultation. These proposed regulations outline specific criteria and requirements to facilitate low risk BVLOS flights and introduce the opportunity for service providers to offer solutions that meet some of the BVLOS flight requirements.

Future rule-making endeavours will prioritize enhancing routine access to higher-risk operations. These efforts are expected to encompass crucial elements such as RPAS identification and tracking, additional technical and operational standards, and heightened safety assurance requirements aligned with the level of risk involved. Furthermore, ongoing studies, in collaboration with industry and international partners, are examining concepts such as airspace structure, flight rules, standards development and other aviation modernization initiatives, particularly in relation to the development of the RTM ecosystem. To facilitate the seamless implementation of RTM-

related regulations and standards, Transport Canada will disseminate relevant guidance material through the Aeronautical Information Manual, Advisory Circulars and other channels.

As not all regulations necessary to support routine higher-risk BVLOS operations within the RTM ecosystem will be in place by 2030, it is anticipated that SFOCs will still be needed for some operations. However, the RTM system should support a streamlined process to facilitate the necessary regulatory approvals from Transport Canada. Efforts are ongoing to adapt the handling of SFOC requests to the dynamic nature of RPAS operations. This approach will also assist regulatory development similar to the way RTM trials have informed the RTM system development.

2.3 Safety Management

Airspace characterisation provides a baseline risk to evaluate the proper safety considerations. To assist in that determination, Transport Canada has adopted the airspace model developed by JARUS in their Specific Operations Risk Assessment (SORA) framework. This approach, adapted for the Canadian context in AC 903-001 *RPAS Operational Risk Assessment* provides a list of required mitigations based on the ground and air risk. It also identifies safety objectives based on the risk, but provides limited guidance for operations within an RTM ecosystem. However, it is expected that JARUS will develop additional guidance, which will provide the basis for an update to AC 903. This update will provide an interim basis for operational approvals through SFOCs and will inform the future development of regulations.

RPAS operations, RTM airspace designations and the provision of RTM services will all be subject to robust Safety Management System (SMS) principles and processes, to uphold the level of safety within Canadian Airspace. Changes will be rigorously assessed prior to implementation, addressing topics such as system reliability and integrity, cybersecurity, ATC interfaces and procedures, user perspectives, etc. A safety oversight framework will be developed for regulatory compliance monitoring of RTM services and organizations delivering these services.

2.4 Performance Considerations for the RTM Framework

The development of the RTM ecosystem and its integration into Canada's Air Navigation System is built upon a comprehensive safety assurance framework. This framework considers not only the RTM system itself, but also aircraft operating within its airspace. The definition of RTM airspace and the required services provide the basis for development of performance requirements and the degree to which equipment function is assured to adequately mitigate risk.

While RTM services play a critical role in providing Specific Operations Risk Assessment (SORA) mitigations, these do not factor into the overall Specific Assurance and Integrity Level (SAIL) for operations, which is based on air and ground risk. RTM Services will rather be considered as means of compliance to achieving operational safety objectives related to air risk management. It is important to note that air risk (specifically distinct from ground risk) significantly influences the performance requirements of the RTM system. The ground risk aspects, not including the impact of RPA collisions, are addressed separately within the recently proposed RPAS Operating Certificate (ROC).

The development of a comprehensive separation model will be supported by specific performance expectations for the communication, navigation, Command and Control (C2) Link, and surveillance systems. High-level metrics such as overall robustness, latency, availability, navigation performance, cyber hygiene, and other pertinent factors, would be carefully evaluated to ensure the effective separation of Remotely Piloted Aircraft (RPAs). Moreover, the performance of the RTM system components becomes a driving force behind the requirements for aircraft capabilities (e.g., available surveillance performance). Industry performance standards are expected to evolve over time in response to technological advancements and operational experience.

One of the central considerations when defining required operational performance is air traffic density, which directly impacts the level of air risk involved for a particular operation in that airspace. Understanding the air traffic density in a specific airspace along with sharing the performance data of the aircraft participating in that airspace will contribute to the development of future performance requirements that support more efficient flight operations without compromising safety.

RTM airspace may be used to segregate RPAS from traditional air traffic which may reduce the performance requirements of a higher SAIL operation to the equivalent of a lower SAIL.

3 RPAS Operation Types

RPAS operations are often considered in terms of the application or mission objectives (e.g. photography, delivery, agriculture, recreation). One limitation of this is that the list can never be complete, because new applications are continually being proposed. In this ConOps document, RPAS operation types are examined from a different perspective, more that of how the operations will be flown, rather than why they will be flown. Although not crucial to the high-level architectural discussion of the ConOps itself, having the types of operations described in this way will provide a useful reference to ensure that the development of detailed specifications for RTM system elements addresses all cases.

Table 1 categorizes RPAS operations into eight types. A single RPAS flight mission may use one or more of these types. For instance, an RPAS may fly *Point to Point* from take-off location to a fixed start point for an *Investigative* operation, then return *Point to Point* to the take-off location after completing the investigation task.

Table 1. RPAS Operation Types

RPAS Operation Type	Operational Volume or Flight Path	Examples
Hand-Flown VLOS	Ad hoc	• Real estate photography • Recreational flight in a field
Point to Point	Point A to Point B, nominal but flexible path	• Package delivery • Organ delivery (hospital to hospital) • Automatic External Defibrillator (AED)
Fixed Path	Pre-defined fixed path	• Inspection of pipeline, railroad, security perimeter
Investigative	BVLOS, defined volume, variable path	• Wildfire perimeter survey
Grid	Defined volume and defined set of paths	• Crop Spraying • Surveying • Search and Rescue
Surveillance	Incrementally defined volume, dynamic path	• Law enforcement targeting
Holding	Defined (small) volume	• Wi-Fi coverage in remote area
Multi-RPAS	Single defined volume for coordinated operations	• Muti-drone display • Air show • Competitive flying • Recreational RPAS gathering

Hand-flown VLOS operations may be conducted for business or recreational purposes. These do not have a pre-defined flight route; they may take any ad hoc flight path.

Point to Point operations fly from a departure location to a destination location. The exact route is not critical to the success of the operation but should be efficient. These departure and arrival locations may be fixed well in advance or only finalized immediately prior to the departure. Operations of this type include delivery of packages or positioning a drone to use its mission payload (e.g. camera).

Fixed Path operations have a predefined flight path, typically linear in nature. Examples of this operation include inspecting assets such as pipelines, railroads or security perimeters.

Investigative operations have a defined BVLOS operational volume but not necessarily a pre-defined path and may be manually controlled. Examples include inspection of a structure or shoreline.

Grid operations are typically highly automated, pre-defined and often repetitive. Examples include crop spraying or surveying.

Surveillance type operations have a dynamic flight route following a moving target. One application for this type of operation would be in law enforcement.

Holding operations maintain a nominal position for a period of time. Examples include providing communication or Wi-Fi coverage in a remote area or during disaster relief.

Multi-RPAS operations have more than one RPA flying within a single defined volume. Examples include an orchestrated light display, an air show, or a recreational gathering by an organization such as the Model Aeronautics Association of Canada (MAAC).

4 2030 RTM Vision

4.1 The RTM Ecosystem

This ConOps foresees the 2030 RTM Framework as a set of tools available to be leveraged as needed to enable various VLOS and BVLOS operations in VLL airspace. The RPAS industry, partners and regulators are working together to make sure that Canada's RTM system supports the immediate needs and has the flexibility to grow with the industry as it expands. RTM is distinct from, and complementary to, ATM; interfaces will exist for the purposes of shared situational awareness, airspace management and exception handling.

For many VLOS and low risk BVLOS operations, the role of RTM will be very similar to today, providing support for planning and authorizing flights. The addition of a departure authorization capability with support for both automated and manual approvals will allow flight plans to be updated to better reflect actual departure times.

The 2030 RTM Framework will also provide new capabilities as enablers to medium and high risk VLL operations. These new capabilities will provide support for flight tracking and conformance monitoring, as well as for pre-flight and in-flight conflict prediction, detection and resolution.

To support operators seeking SFOCs for trials, experiments and regular operations not fully normalized by regulations, RTM will provide a tool to facilitate preparation of the risk assessment needed to support the SFOC submission.

RPAS and RTM require new traffic management services and capabilities that do not currently exist in NAV CANADA's ATM infrastructure. NAV CANADA is architecting the design for RTM to enable the use of third parties to allow accelerated growth and maximize the benefits of RPAS. To complement and facilitate the third parties, NAV CANADA will provide a set of centralized capabilities, to be delivered by the RPAS Flight Information Management System (rFIMS). rFIMS capabilities will include flight plan authorization, integrated positioning and tracking, conformance monitoring, and strategic and tactical detection of potential conflicts. rFIMS will interface with ATM, authorized agencies such as law enforcement and the Transport Canada Drone Management Portal. More information on rFIMS is provided in section 5 – Architecture.

The primary RTM interface to pilots and operators will be through RTM Service Providers (RSPs). RSPs will provide services to the operators and pilots through a combination of software capabilities and infrastructure to support operations in defined geographic areas. RSP software will interface with rFIMS, and will be the gateway to plan and file flight plans, acquire flight authorization, clearances, and instructions as well as to access other capabilities listed in section 5 – Architecture.

NAV CANADA will also act as an RSP, offering a service to authorities such as Government, Law Enforcement and First Responders who undertake sensitive operations, as well as other users. The NAV CANADA RSP offering will be software-only, at least in its initial deployment.

To mitigate risks for certain medium and high risk RPAS operations, it will be necessary to define RTM airspace design elements with associated RTM services, requirements and operational restrictions. Proposed airspace elements are described in section 6 – Airspace Definitions.

C2 link, Network Identification and DAA functions will be enabled by third party support either with coordination from an RSP or the operator themselves. This relationship will be operation specific, for example, pipeline inspections in class G airspace over remote areas of Alberta may be supported by a consistent C2 link from a partnering company.

As shown in Figure 1 below, the RTM ecosystem includes many elements and participants.

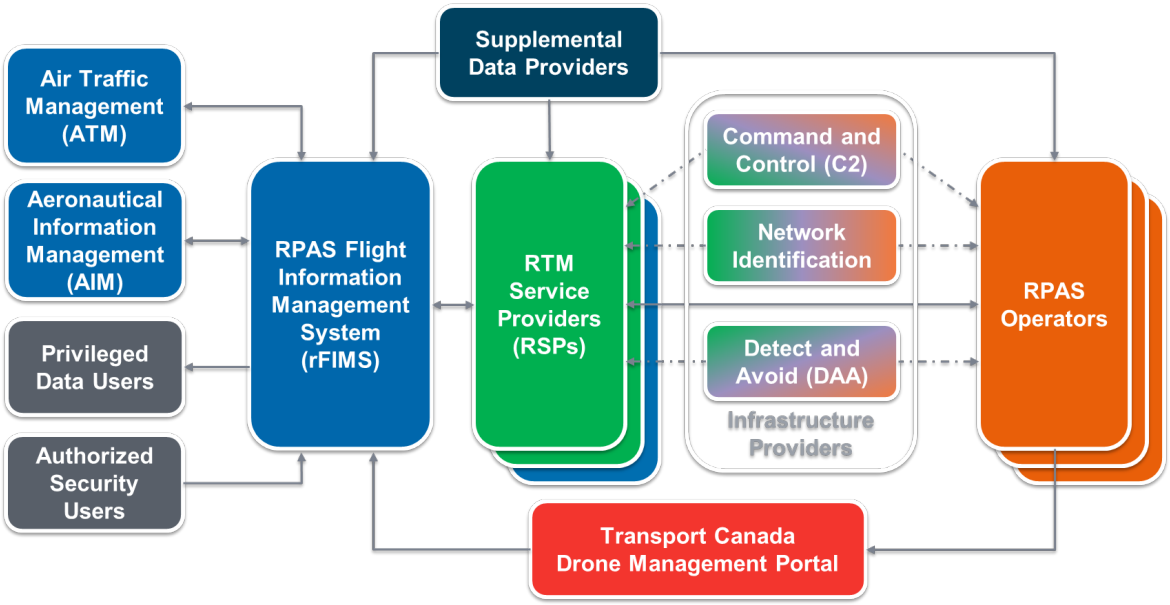

Figure 1. RTM Ecosystem

4.2 Primary RTM Participants

RPAS Operators and their pilots will conduct various RPAS flight operations, using RTM services to enhance the safety and efficiency of those operations.

RTM Service Providers (RSPs) will offer a range of services, technologies, and infrastructure to RPAS operators and pilots to support safe and efficient RPAS operations of varying complexity in defined service areas.

NAV CANADA will provide the central rFIMS service, including its connectivity to ATM and AIM systems. NAV CANADA will also offer RSP services to authorities such as government, law enforcement and first responders, and may be able to offer these services to other users if required.

Transport Canada, in addition to being the Regulator and Civil Aviation Authority, will provide, through use of the Drone Management Portal (DMP), services for registration (and certification where appropriate) of Operators, Pilots and RPAS.

Privileged Data Users will be granted access to rFIMS operational data via an rFIMS user interface in support of public safety, law enforcement or national security.

Authorized Security Users will be able to define and submit for approval, via an rFIMS user interface, temporary RTM airspace restrictions in support of public safety, law enforcement or national security.

Supplemental Data Providers will deliver specialized information to support BVLOS operations. This may include supplemental weather data relevant to RPAS operations, detailed terrain models, etc.

Infrastructure Providers will offer infrastructure-based services, such as communication links for C2 and Network Identification or ground-based DAA, directly to RPAS Operators and/or via RSPs.

5 Architecture

5.1 Architecture principles

The rFIMS architecture will be developed based on the concepts of centralized rFIMS capabilities working together with various RSPs which provide the direct support to RPAS operators.

The architecture principles taken into consideration when defining the RTM architecture are:

Open - Open architecture is a design approach that promotes interoperability, technology agnosticism, extensibility, and accessibility in a software system or hardware platform. The benefits are many but a key benefit for those interacting with the system is that it promotes a consistent, efficient, and transparent method for 3rd party RTM Service Providers to interact with the RTM ecosystem. From the perspective of data accessibility, the Open Architecture incorporates non-proprietary industry data standards to allow data to be easily exported/extracted for other purposes such as data integration and analytics. It also decouples storage from computing to support scalability.

Automated - The architecture will be developed with a high degree of automation in mind. The management of RPAS traffic by Air Services staff to the level of individual flights is not practical, given its accelerating growth.

Modern - A modern architecture is supported by principles of modularity and scalability which promotes, among many technical benefits, minimizing the impact of change to end users of the system such as RPAS operators, RTM service providers and the ANSP.

Cyber Security - The architecture will support the principles of Zero Trust. The core idea behind the zero trust principle is to enforce strict access controls and verification mechanisms at every level of the network, making it much more difficult for attackers to move laterally and gain unauthorized access to sensitive resources. It is based on the philosophy of "never trust, always verify."

Safety - RTM services are considered safety-critical, especially the tactical services. It is imperative that the architecture is highly available and fault tolerant so that all RTM users maintain confidence in the system to the same degree as a user has in the ATM environment.

5.2 RPAS Flight Information Management System (rFIMS)

As the core component of the RTM system, rFIMS will provide centralized digital services and key interfaces to RTM Service Providers, NAV CANADA ATM, Transport Canada's Drone Management Portal and other third-party systems.

In the 2030 RTM framework, rFIMS is expected to include the following capabilities:

1. rFIMS Pre-Flight Capabilities
    a. Flight Plan Validation – Accepts or rejects flight plans submitted through RSPs, based on checking for conflicts with other flight plans and active flights and assessing against constraints and restrictions;
    b. Departure Authorization – Provides pre-departure approval after re-checking flight plan for conflicts;
    c. Aviation Weather Distribution – Provides access to NAV CANADA aviation weather;
    d. SFOC Support – Facilitates risk assessment to support operator in preparation of SFOC submission to Transport Canada.
2. rFIMS In-Flight Capabilities
    a. Positioning and Tracking – Assembles an integrated picture of present and forecast positions and tracks of RPAS and other aircraft based on surveillance data, Network Identification and non-cooperative target tracking;
    b. Conformance Monitoring – Alerts NAV CANADA and affected RSP in case of significant flight path deviations or proximity to airspace boundaries;
    c. Dynamic Conflict Detection – Continuously checks RPA flight trajectories for possible conflicts with other aircraft;
    d. Dynamic Re-routing – Proposes tactical modifications to flight routings;
    e. Emergency Response – Assesses RPAS Emergency Declarations received from RSP and issues appropriate alerts to ATM and/or other RSPs;
    f. Message Distribution – Sends messages to one or several RPAS and receives acknowledgments.
3. rFIMS Management Capabilities
    a. Airspace Management – Supports definition and sharing of fixed and temporary airspace classifications and restrictions;
    b. Capacity Management – Dynamically determines maximum numbers of RPAS allowed within defined areas/volumes based on specified criteria, and evaluates active and planned RPAS operations against the maximum numbers;
    c. Reporting – Provides records of RPAS and RTM anomalies.

These rFIMS capabilities are each discussed below.

Flight Plan Validation

The rFIMS Flight Plan Validation capability re-checks each flight plan submitted by an RSP against constraints including terrain, obstacles, airspace classification and restrictions, population density and regulatory requirements (including checks of RPA registration and pilot certificate data using the Transport Canada Drone Management Portal). The capability identifies potential conflicts between the submitted flight plan and known flight plans and active flights of RPAS and other aircraft. The capability gives priority to flight plans designated as supporting public safety

or emergency needs. Based on the results of the validation, the capability accepts or rejects the flight plan and advises the RSP.

Flight Plan Validation, upon rejection of a proposed flight plan, may indicate areas of conflict to the RTM Service Provider to support their deconfliction efforts.

Departure Authorization

The rFIMS Departure Authorization capability provides approval for the RPAS flight shortly before take-off. It re-runs the rFIMS Flight Plan Validation, and checks for conflicts with known in-flight aircraft by using the rFIMS Dynamic Conflict Detection capability.

Aviation Weather Distribution

The rFIMS Aviation Weather Distribution capability gives RSPs access to standard aviation weather data within the context of the rFIMS to RSP interface.

SFOC Support

The rFIMS SFOC Support capability provides a template-based tool to support the RPAS operator in completing the risk assessment, including determination of air and ground risk categories, required as part of an SFOC submission to Transport Canada.

Positioning and Tracking

The rFIMS Positioning and Tracking capability collects surveillance tracking data, Network Identification, non-cooperative target tracking data (e.g. from RSPs) and flight plan data for RPAS and other aircraft to assemble an integrated picture of present and forecast aircraft positions and tracks. The capability provides appropriately filtered data to RSPs to support strategic planning and tactical RPAS operations, and to privileged data users and other authorized stakeholders to support their particular needs.

Conformance Monitoring

The rFIMS Conformance Monitoring capability provides real-time alerts to NAV CANADA and the appropriate RSP in the event of an RPA airspace deviation such as:

- deviations from the approved flight plan into identified contingency volume or beyond limits of the approved operational volume; and
- proximity to or violation of airspace boundaries or constraints.

Dynamic Conflict Detection

The rFIMS Dynamic Conflict Detection capability continuously checks for possible medium or near-term conflicts between RPA flight trajectories and those of other detected aircraft. It alerts the affected RSP and uses the rFIMS Dynamic Re-routing capability to propose tactical modifications as needed. (Note: This capability does not replace direct pilot action or Detect and Avoid functionality for detection of imminent conflicts.)

Dynamic Re-routing

The rFIMS Dynamic Re-routing capability proposes to affected RSPs, for acceptance by RPAS pilots, tactical modifications to speed, level, heading, flight routings or operational volumes of in-flight RPAs in response to:

- detected medium or near-term conflicts between RPA and other observable aircraft; and
- tactical airspace restrictions (e.g. active medevac).

The capability also evaluates and approves RPAS pilot-initiated in-flight rerouting requests submitted through the RSP.

Emergency Response

The rFIMS Emergency Response capability receives and acknowledges RPAS Emergency Declarations forwarded by RSPs. It assesses declared emergencies against pre-defined criteria and initiates appropriate responses, which may include:

- Issuing of alerts and tracking data (if available) to ATM and/or other RSPs; and
- Triggering of Dynamic Conflict Detection capability.

Message Distribution

The rFIMS Message Distribution capability provides a means to send messages defined within rFIMS or composed by an authorized NAV CANADA agent to one or several RPAS pilots, and to receive acknowledgements of message reception.

Airspace Management

The rFIMS Airspace Management capability supports the definition and sharing of fixed and temporary airspace classifications and restrictions (including restricted ground installations, emergency management zones, etc.) as well as ATM/RTM jurisdiction changes. This capability supports activities such as RSP Flight Planning, rFIMS Flight Plan Validation, RSP Geo-Fencing and rFIMS Dynamic Re-routing.

Data for the rFIMS Airspace Management capability come from sources including the Designated Airspace Handbook (TP1820), Transport Canada Aeronautical Information Manual (TP14371), other Government and non-Government reference sources, and NOTAMs.

The rFIMS Airspace Management capability also provides an interface that enables Authorized Security Users to directly define and submit temporary RTM airspace restrictions (security perimeters) in support of public safety, law enforcement or national security. These submissions will be subject to an approval workflow.

Capacity Management

The rFIMS Capacity Management capability allows airspace capacity to be defined based on the maximum numbers of RPAS operating within defined areas/volumes, and dynamically assesses

specified criteria to determine the maximum numbers applicable at a given time. The capability also dynamically evaluates planned and active RPAS operations against the assigned capacities.

Reporting

The rFIMS Reporting capability provides access to a record of anomalies such as:

- warnings and alerts generated by dynamic conflict detection and conformance monitoring;
- RPAS emergency declarations;
- rFIMS/RSP communications performance;
- rFIMS outages or failures; and
- other regulatory requirements.

5.3 RTM Service Providers (RSP)

In the 2030 RTM framework, RTM Service Providers are expected to offer various levels of service to support RPAS operations, based on business decisions. RSPs may provide service to a particular geographic area, or on a national or even international level. RSPs may have overlapping service areas, offering similar or differing levels of service. Some RPAS operators may establish their own RSP.

In terms of the complexity of VLL RPAS operations supported, RSP service offerings may be considered as having three fundamental tiers: supporting VLOS only, supporting VLOS and low-risk BVLOS, or supporting operations including medium and high risk BVLOS.

Regardless of the service tier, RSPs may choose to offer supplemental data services, or infrastructure for C2 and/or Network Identification communication links, or for ground-based DAA. Such services or infrastructure may be provided directly by the RSP or arranged through agreements with third parties (e.g. mobile network operator).

The capabilities expected from RSPs in the 2030 RTM framework are as follows:

1. RSP VLOS Capabilities
   (minimum set of RSP capabilities)
   a. Flight Planning – Assists operators in developing and modifying VLOS flight plans, and submits them to rFIMS for validation;
   b. Departure Request - Allows RPAS pilot to request departure authorization;
   c. Geo-Awareness – Supports RPAS pilots pre-flight and in-flight with situational awareness information such as terrain, obstacles, population, etc.;
   d. Reporting – Provides records of RPAS and RTM anomalies.
2. RSP Low Risk BVLOS Capabilities
   (additional capabilities to support Low Risk BVLOS Operations)
   a. Flight Planning – Assists operators in developing and modifying BVLOS flight plans, and submits them to rFIMS for validation.
3. RSP Advanced Capabilities
   (additional capabilities to support Medium Risk and High Risk Operations)
   a. Network Identification Forwarding – Receives Network Identification data from RPAS operator and forwards to rFIMS;
   b. Emergency Declaration – Allows operator or RPA to report emergency conditions and advises rFIMS;
   c. Traffic Information – Advises RPAS pilot of other traffic near their position or intended flight route;
   d. Conflict Resolution – Alerts RPAS pilot of conflicts and re-routing instructions from rFIMS Conflict Detection, and confirms pilot acknowledgement to rFIMS;
   e. Message Forwarding – Passes messages and acknowledgements between rFIMS and RPAS pilots;
   f. SFOC Capture – Connects RPAS operator to the rFIMS SFOC Support tool.
4. RSP Optional Capabilities
   a. Geo-Fencing – Supports RPAS operator in defining geo-fences for programming into RPA and for use by RPAS pilot;
   b. RPAS Communication Links – Provides C2 and/or Network Identification communication link and link monitoring services to operator;
   c. Detect and Avoid (DAA) – Provides DAA service to RPAS pilot based on ground-based infrastructure;
   d. Supplemental Weather – Provides weather information to RPAS operators and pilots.

These RSP capabilities are each discussed below.

Flight Planning

The RSP Flight Planning capability supports the pilot or operator in the development of proposed flight plans, based on sets of sequenced waypoints and times and/or operational volumes within which an RPA will be active for defined time periods.

The capability takes into account constraints including terrain, obstacles, airspace classification and restrictions, population density, weather and support infrastructure (e.g. communications coverage), as well as the self-declared capabilities of the RPA and the self-declared licence conditions of the pilot, to provide a safe and efficient route and time of flight.

The capability checks for potential traffic conflicts using data provided by rFIMS Positioning and Tracking.

The capability provides a means to submit the operational flight plan to rFIMS for validation, and a means to modify the flight plan in the event that an issue is identified during validation against the above constraints.

Departure Request

The RSP Departure Request capability allows the RPAS operator to request departure authorization for an approved flight plan, forwards the request to rFIMS, and relays the rFIMS response to the operator.

Geo-Awareness

The RSP Geo-Awareness capability supports the RPAS pilot during pre-flight activities and supports in-flight situational awareness by providing airspace information, digital terrain information, obstacle data, population density mapping, and other ground information relevant to RPA operations (e.g. national and provincial parks).

Reporting

The RSP Reporting capability provides access to a record of anomalies such as:

- warnings and alerts generated by dynamic conflict detection and conformance monitoring;
- RPAS emergency declarations;
- rFIMS/RSP communications performance;
- RSP outages or failures;
- Outages or failures of supported third party services; and
- other regulatory requirements.

Network Identification Forwarding

The Network Identification Forwarding capability receives Network Identification data from participating RPAS and forwards the data to rFIMS to support tracking.

Emergency Declaration

The Emergency Declaration capability allows the operator, and possibly the RPA itself, to declare an emergency to the RSP, and notifies rFIMS of the details of the declared emergency condition. Examples of such emergency situations include loss of Command-and-Control (C2) link, loss of navigation performance, or an RPA loss of power.

Traffic Information

The RSP Traffic Information capability provides the RPAS pilot awareness of known or observed RPA and other air traffic which may be in the proximity to their position or intended flight route.

Conflict Resolution

The RSP Conflict Resolution capability alerts the RPAS pilot of conflicts identified by the rFIMS Conflict Detection capability and of associated rFIMS Dynamic Re-routing proposals, and relays pilot acknowledgments back to rFIMS.

Message Forwarding

The RSP Message Forwarding capability passes messages received from rFIMS to the identified RPAS pilots. and passes acknowledgements of message reception from RPAS pilots back to rFIMS.

SFOC Capture

The RSP SFOC Capture capability provides the connection for RPAS operators to access and use the rFIMS SFOC Support tool, which supports completing the risk assessment required as part of an SFOC submission to Transport Canada.

Geo-Fencing

The RSP Geo-Fencing capability supports the RPAS operator in the definition and coding of geo-fences for programming into the RPA and for use by the RPAS pilot. The RSP Geo-Fencing capability uses the flight plan, airspace constraints provided by rFIMS Airspace Management, as well as constraints provided by the RPAS operator.

Communication Links

The RSP Communication Links capability provides to RPAS pilots and operators communication links supporting Command and Control (C2) and/or Network Identification. It also provides coverage information and quality of service monitoring for any RSP-provided communication links.

Detect and Avoid (DAA)

The RSP Detect and Avoid capability provides to RPAS pilots a DAA service based on ground-based infrastructure.

Supplemental Weather

The RSP Supplemental Weather capability provides to operators and pilots weather information relevant to RPAS operations. This may include aviation weather obtained from NAV CANADA and/or additional weather information from other weather data providers.

5.4 Data Considerations

Registration Data

During Flight Plan Validation the User and RPAS data is validated against registration data held by Transport Canada.

Terrain

rFIMS and RSPs will independently access Natural Resource Canada provided topographic data to support flight planning. Third party data providers may supplement this data for RTM Service Providers.

Obstacles

rFIMS will leverage obstacle data from the existing NAV CANADA aviation source of obstacles and provide it to RTM Service Providers. Third party data providers may augment this data for RTM Service Providers.

Airspace classification and constraints

rFIMS will use this information and provide airspace information to Third Party Service Providers. Data sources include NAV CANADA Airspace Information Management (AIM) systems and other sources. This data includes fixed and temporary airspace classifications and restrictions (including restricted ground installations, emergency management zones, etc.) as well as ATM/RTM jurisdiction changes.

Population density

rFIMS and RSPs will independently access Stats Canada provided population density information data to support flight planning and risk analysis. Third party data providers may supplement this data for RTM Service Providers

Weather

rFIMS and RSPs will leverage weather data from the existing NAV CANADA aviation source of weather. Third party data providers may augment this data for RTM Service Providers.

Communication coverage

Communication coverage maps may be held by RTM Service Providers to support flight planning and tactical services.

Position and Tracking Data

Position and Tracking Data includes NAV CANADA sourced surveillance tracking data, Network Identification data obtained through RSPs, and non-cooperative target tracking data sourced from RSPs and other RPAS detection systems where available.

Flight Plans

Flight plans include flight plans for traditional aviation from existing NAV CANADA sources and RPAS flight plans sourced from the RTM Service Providers.

6 Airspace Definitions

The existing airspace classification system has defined requirements to enable air traffic management and risk mitigation based on capacity and aircraft performance characteristics. To enable BVLOS RPAS operations in VLL airspace, there is a similar need to differentiate based on the risk mitigations needed and capabilities provided to support such operations. Thus airspace design, with new elements that enable or restrict RPAS operations, becomes an integral part of the RTM system implementation. These elements, designed to safely integrate RPAS into the airspace, will need to be defined through Transport Canada regulations.

There are two types of airspace element in the RTM design. The first set represent generic airspace classifications and how access may be enabled for RPAS operations. The second set are specific volumes which constrain or support RPAS operations. The specific volumes call for an increased level of service provision from both NAV CANADA (rFIMS) and the RTM Service Providers (RSP). The airspace element description and required capabilities are documented in the following pages, together with illustrative use cases and additional information.

Airspace access not requiring specific volumes:

- VLOS / Uncontrolled (RTM-VU) *[Current Regulations]*
- VLOS / Controlled (RTM-VC) *[Current Regulations]*
- BVLOS / Uncontrolled Low Risk (RTM-BL) *[New Regulations, proposed in CG1]*

Future RTM Airspace – Classification Overlays:

- BVLOS / RTM Segregated (RTM-S)
- BVLOS / RTM Cooperative (RTM-C)
- BVLOS / RTM Non-Cooperative Surveillance Volume (RTM-N)
- RTM Restricted (RTM-R)

RTM Airspace Design

	Operation Category	RTM Identifier
RTM Uncontrolled	**VLOS**	**RTM-VU**

1. Description

Small RPAS Flights conducted under Visual Line of Sight in uncontrolled airspace (Class G) at Very Low Level

Conflict management (air traffic avoidance) is the sole responsibility of the RPAS Pilot flying with the RPA in their Visual Line of Sight

2. Airspace Classification Applicability

(TM) Transponder Mandatory Airspace, (TO) Transponder Optional (R) Restricted (A) Advisory

Class	A	B	C	D (TM)	D (TO)	E (TM)	E (TO)	F (R)	F (A)	G
Available	N/A	N/A	No	No	No	No	No	No	No	Yes

3. RTM Service Provision

rFIMS Pre-Flight Capabilities		rFIMS In-Flight Capabilities		rFIMS Management Capabilities	
Opt.	Flight Validation	No	Position and Tracking	Opt.	Airspace Management
Opt.	Departure Authorization	No	Conformance Monitoring	No	Capacity Management
Opt.	Aviation Weather Distribution	No	Dynamic Conflict Detection	Opt.	Reporting
Opt.	SFOC Support	No	Dynamic Rerouting		
		Opt.	Emergency Management		
RSP Capabilities				**Additional Capabilities**	
Opt.	Flight Planning	No	Network ID Forwarding	Opt.	RPAS Communications
No	Departure Request	Opt.	SFOC Capture	Opt.	Geo-Fencing
Opt.	Geo-awareness	Opt.	Traffic Information	Opt.	Supplemental Weather
Opt.	Emergency Declaration	No	Conflict Resolution		

Yes - Mandated, Opt - Optional, No - Not Provided, D - Dependent on surrounding airspace

4. Requirements for operations in this airspace

Aircraft: Registered RPAS
Pilot: Certificate — sRPA (VLOS) — basic operations
Operator: N/A

5. How this airspace volume is established

Regulation

6. Illustrative use cases

Residential Photography (VLOS)
Building Inspections (VLOS)
Recreational (VLOS) – RC Clubs, tourism, photography

7. Alternative UTM Framework References

N/A

8. Impact to Traditional Aviation:

None

RTM Airspace Design

	Operation Category	RTM Identifier
Controlled Airspace	**VLOS**	**RTM-VC**

1. Description

VLOS Flights authorised under CAR Part IX to access controlled airspace with authorization from NAV CANADA (901.71) To automate workflow for VLOS operations in controlled airspace each control zone has an overlay grid which does not change the airspace category. The overlay features a ½ NM grid (or other polygon) and each polygon has a height above ground threshold for automation of Permission Requests.	Conflict management is the sole responsibility of the RPAS Pilot flying with the RPAS in their Visual Line of Sight Requirement to obtain authorization to access controlled airspace is a strategic mitigation to reduce potential conflicts with traditional aviation. Permission is based on a number of factors including established traffic patterns in the control zone.

2. Airspace Classification Applicability (TM) Transponder Mandatory Airspace, (TO) Transponder Optional (R) Restricted (A) Advisory

Class	A	B	C	D (TM)	D (TO)	E (TM)	E (TO)	F (R)	F (A)	G
Available	N/A	N/A	Yes	Yes	Yes	Yes	Yes	No	No	No

3. RTM Service Provision

rFIMS Pre-Flight Capabilities		rFIMS In-Flight Capabilities		rFIMS Management Capabilities	
Yes	Flight Validation	No	Position and Tracking	Yes	Airspace Management
Yes	Departure Authorization	No	Conformance Monitoring	No	Capacity Management
Opt.	Aviation Weather Distribution	No	Dynamic Conflict Detection	Yes	Reporting
Opt.	SFOC Support	No	Dynamic Rerouting		
		Yes	Emergency Management		
RSP Capabilities				**Additional Capabilities**	
Yes	Flight Planning	No	Network ID Forwarding		RPAS Communications
Yes	Departure Request	Opt.	SFOC Capture		Geo-Fencing
Yes	Geo-awareness	Opt.	Traffic Information		Supplemental Weather
Yes	Emergency Declaration	No	Conflict Resolution		

Yes - Mandated, Opt - Optional, No - Not Provided, D - Dependent on surrounding airspace

4. Requirements for operations in this airspace

Aircraft: Registered RPAS
RPAS safety assurance (manufacturer declaration)
Pilot : Certificate – RPA (VLOS) – advanced operations
Operator: N/A

5. How this airspace volume is established

CAR Part IX defines controlled airspace requirements
NAV CANADA Units design grid and thresholds

6. Illustrative use cases

Residential Photography (VLOS,) Inspections (VLOS)
On-airport operations (VLOS), Recreational, Training (VLOS)

7. Alternative UTM Framework References

FAA / Small UAS Rule Part 107 / LAANC

8. Impact to Traditional Aviation:

None

RTM Airspace Design

	Operation Category	RTM Identifier
Uncontrolled, Low Risk	**BVLOS**	**RTM-BL**

1. Description

Airspace that has no specific designation for RTM may be available for low risk Beyond Visual Line of Sight (BVLOS) operations.

If Lower Risk BVLOS (LR-BVLOS) operations can not be conducted per regulations and required standards, no BVLOS flights can be undertaken. A specific RPAS Volume would be required.

2. Airspace Classification Applicability

(TM) Transponder Mandatory Airspace, (TO) Transponder Optional (R) Restricted (A) Advisory

Class	A	B	C	D (TM)	D (TO)	E (TM)	E (TO)	F (R)	F (A)	G
Available	N/A	N/A	No	No	No	No	No	No	No	Yes

3. RTM Service Provision

rFIMS Pre-Flight Capabilities		rFIMS In-Flight Capabilities		rFIMS Management Capabilities	
Opt.	Flight Validation	Opt.	Position and Tracking	Yes	Airspace Management
No	Departure Authorization	No	Conformance Monitoring	No	Capacity Management
Opt.	Aviation Weather Distribution	No	Dynamic Conflict Detection	Yes	Reporting
Opt.	SFOC Support	No	Dynamic Rerouting		
		Opt.	Emergency Management		
RSP Capabilities				**Additional Capabilities**	
Opt.	Flight Planning	Opt.	Network ID Forwarding	Opt.	RPAS Communications
No	Departure Request	Opt.	SFOC Capture	Opt.	Geo-Fencing
Yes	Geo-awareness	Opt.	Traffic Information	Opt.	Supplemental Weather
Opt.	Emergency Declaration	No	Conflict Resolution		

Yes - Mandated, Opt - Optional, No - Not Provided, D - Dependent on surrounding airspace

4. Requirements for operations in this airspace

Aircraft: Registered RPAS
RPAS safety assurance (manufacturer declaration)
Detect, Alert and Avoid Systems
(DAA not required for sheltered operations) (proposed)
Pilot : Certificate – RPA – level 1 complex operations (proposed)
Operator: RPAS Operator Certificate (ROC) (proposed)

5. How this airspace volume is established

Proposed Regulations (not yet established, under CG1)

6. Illustrative use cases

Inspection of linear infrastructure – powerlines, pipelines

7. Alternative UTM Framework References

8. Impact to Traditional Aviation:

None

RTM Airspace Design

	Operation Category	RTM Identifier
RTM Segregated	**BVLOS**	**RTM-S**

1. Description

An RTM volume in Very Low Level (VLL) controlled TM (transponder mandatory) airspace, which is segregated for RPAS use and control is delegated to the RTM system by the ATC. Conflict avoidance is enabled through combined ATM Surveillance and Network ID.	The RTM-S is dynamic and persistent. Dynamic infers it can be activated/deactivated by ATC to manage exception circumstances. Persistent infers that the volume does not change, it can therefore be charted, and will be use to restrict access to traditional crewed aviation under ATC control (potential impact to VFR traffic if flying at very low level).

2. Airspace Classification Applicability (TM) Transponder Mandatory Airspace, (TO) Transponder Optional (R) Restricted (A) Advisory

Class	A	B	C	D (TM)	D (TO)	E (TM)	E (TO)	F (R)	F (A)	G
Available	N/A	N/A	Yes	Yes	No	Yes	No	No	No	No

3. RTM Service Provision

rFIMS Pre-Flight Capabilities		rFIMS In-Flight Capabilities		rFIMS Management Capabilities	
Yes	Flight Validation	Yes	Position and Tracking	Yes	Airspace Management
Yes	Departure Authorization	Yes	Conformance Monitoring	Yes	Capacity Management
Opt.	Aviation Weather Distribution	Yes	Dynamic Conflict Detection	Yes	Reporting
Opt.	SFOC Support	Opt.	Dynamic Rerouting		
		Yes	Emergency Management		
RSP Capabilities				**Additional Capabilities**	
Yes	Flight Planning	Yes	Network ID Forwarding	Opt.	RPAS Communications
Yes	Departure Request	Opt.	SFOC Capture	Yes	Geo-Fencing
Yes	Geo-awareness	Yes	Traffic Information	Opt.	Supplemental Weather
Yes	Emergency Declaration	Yes	Conflict Resolution		

Yes - Mandated, Opt - Optional, No - Not Provided, D - Dependent on surrounding airspace

4. Requirements for operations in this airspace

Aircraft: Registered RPAS
RPAS Safety Assurance (details TBD)
Detect Alert and Avoid Systems (details TBD)
Network Identification (details TBD)
Pilot: Certificate – RPA – details TBD
Operator: RPAS Operator Certificate (ROC) (details TBD)

5. How this airspace volume is established

Request triggers an RTM Airspace Impact Analysis, including validation of ATM/CNS surveillance coverage.

6. Illustrative use cases

Human organ transportation from Airport FOB to Hospital

7. Alternative UTM Framework References

In U-Space the airspace designation "Zu" (Controlled Airspace, under RTM control)

8. Impact to Traditional Aviation:

Segregated area from traditional aviation, charted

RTM Airspace Design

	Operation Category	RTM Identifier
RTM Cooperative	**BVLOS**	**RTM-C**

1. Description

An RTM volume in Very Low Level (VLL) airspace which enables safe integration of RPAS operations. All participants are required to collaborate in the provision of position information. Position information can be shared through the use of conspicuity device or Network Identification capabilities. This position information is integrated centrally and enables situational awareness of all flight objects in the volume.	A third party (RTM Service Provider) would provide required infrastructure within the volume to enable the collection of collaborative position information. RTM-C is Persistent which infers that the volume does not change. It can therefore be charted, and will be use to restrict access to traditional crewed aviation under ATC control (potential impact to VFR traffic if flying at very low level). An RTM-C would require validation by NAV CANADA.

2. Airspace Classification Applicability

(TM) Transponder Mandatory Airspace, (TO) Transponder Optional (R) Restricted (A) Advisory

Class	A	B	C	D (TM)	D (TO)	E (TM)	E (TO)	F (R)	F (A)	G
Available	N/A	N/A	No	No	tbd	No	tbd	Yes	Yes	Yes

3. RTM Service Provision

rFIMS Pre-Flight Capabilities		rFIMS In-Flight Capabilities		rFIMS Management Capabilities	
Yes	Flight Validation	Yes	Position and Tracking	Yes	Airspace Management
Yes	Departure Authorization	Yes	Conformance Monitoring	Yes	Capacity Management
Yes	Aviation Weather Distribution	Yes	Dynamic Conflict Detection	Yes	Reporting
Opt.	SFOC Support	Opt.	Dynamic Rerouting		
		Yes	Emergency Management		
RSP Capabilities				**Additional Capabilities**	
Yes	Flight Planning	Yes	Network ID Forwarding	Yes	RPAS Communications
Yes	Departure Request	Opt.	SFOC Capture	Yes	Geo-Fencing
Yes	Geo-awareness	Yes	Traffic Information	Opt.	Supplemental Weather
Yes	Emergency Declaration	Yes	Conflict Resolution		

Yes - Mandated, Opt - Optional, No - Not Provided, D - Dependent on surrounding airspace

4. Requirements for operations in this airspace

Aircraft:	Registered RPAS
	RPAS Safety Assurance (details TBD)
	Detect Alert and Avoid Systems (details TBD)
	Network Identification (details TBD)
Pilot:	Certificate – RPA – details TBD
Operator:	RPAS Operator Certificate (ROC) (details TBD)

5. How this airspace volume is established

dustry request and provision of infrastructure.
RTM Level Airspace Impact Analysis, including validation of third party infrastructure to ensure performance of the infrastructure.

6. Illustrative use cases

Line inspection passing through medium risk airspace

7. Alternative UTM Framework References

8. Impact to Traditional Aviation:

Yes, conspicuity device required for access

RTM Airspace Design

	Operation Category	RTM Identifier
RTM Non-cooperative	**VLOS and BVLOS**	**RTM-N**

1. Description

An RTM volume in Very Low Level (VLL) airspace which enables safe integration of RPAS operations. Position and tracking for traditional aviation is provided through primary radar or other non-cooperative surveillance capabilities. Remote ID is required for RPAS in this volume. RTM-N is Persistent, which infers that the volume does not change. It can therefore be charted.	A third party (RTM Service Supplier) would provide required infrastructure within the volume to enable the collection of position information. An RTM-N volume would require validation by NAV CANADA.

2. Airspace Classification Applicability

(TM) Transponder Mandatory Airspace, (TO) Transponder Optional (R) Restricted (A) Advisory

Class	A	B	C	D (TM)	D (TO)	E (TM)	E (TO)	F (R)	F (A)	G
Available	N/A	N/A	No	No	tbd	No	tbc	No	tbd	Yes

3. RTM Service Provision

rFIMS Pre-Flight Capabilities		rFIMS In-Flight Capabilities		rFIMS Management Capabilities	
Yes	Flight Validation	D	Position and Tracking	Yes	Airspace Management
Yes	Departure Authorization	D	Conformance Monitoring	Yes	Capacity Management
Yes	Aviation Weather Distribution	D	Dynamic Conflict Detection	Yes	Reporting
Opt.	SFOC Support	D	Dynamic Rerouting		
		Yes	Emergency Management		
RSP Capabilities				**Additional Capabilities**	
Yes	Flight Planning	Yes	Network ID Forwarding	Yes	RPAS Communications
Yes	Departure Request	Opt.	SFOC Capture	Yes	Geo-Fencing
Yes	Geo-awareness	Yes	Traffic Information	Opt.	Supplemental Weather
Yes	Emergency Declaration	Yes	Conflict Resolution		

Yes - Mandated, Opt - Optional, No - Not Provided, D - Dependent on surrounding airspace

4. Requirements for operations in this airspace

Aircraft: Registered RPAS
RPAS Safety Assurance (details TBD)
Detect Alert and Avoid Systems (details TBD)
Network Identification (details TBD)
Pilot: Certificate – RPA – details TBD
Operator: RPAS Operator Certificate (ROC) (details TBD)

5. How this airspace volume is established

Industry request and provision of infrastructure.
RTM Level Airspace Impact Analysis, including validation of third party primary surveillance radar or other infrastructure.

6. Illustrative use cases

Pipeline inspection passing through medium risk airspace

7. Alternative UTM Framework References

8. Impact to Traditional Aviation:

None

RTM Airspace Design

	Operation Category	RTM Identifier
RTM Restricted	**VLOS and BVLOS**	**RTM-R**

1. Description

An RTM airspace volume in Very Low Level (VLL) airspace which restricts RPAS use, and limits the authorization and access to a controlling authority or agency. Similar in Traditional Aviation to a class F Restricted airspace, with the scope limited to RPAS.	The service requirements for operations authorized by the controlling agency are Dependent (D). The requirements will match those of any RTM airspace volume(s) surrounding the RTM-R volume.

2. Airspace Classification Applicability

(TM) Transponder Mandatory Airspace, (TO) Transponder Optional (R) Restricted (A) Advisory

Class	A	B	C	D (TM)	D (TO)	E (TM)	E (TO)	F (R)	F (A)	G
Available	N/A	N/A	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

3. RTM Service Provision

rFIMS Pre-Flight Capabilities		rFIMS In-Flight Capabilities		rFIMS Management Capabilities	
D	Flight Validation	D	Position and Tracking	Yes	Airspace Management
D	Departure Authorization	D	Conformance Monitoring	D	Capacity Management
D	Aviation Weather Distribution	D	Dynamic Conflict Detection	Yes	Reporting
Opt.	SFOC Support	D	Dynamic Rerouting		
		Yes	Emergency Management		
RSP Capabilities				**Additional Capabilities**	
D	Flight Planning	D	Network ID Forwarding	D	RPAS Communications
D	Departure Request	D	SFOC Capture	D	Geo-Fencing
D	Geo-awareness	D	Traffic Information	Opt.	Supplemental Weather
D	Emergency Declaration	D	Conflict Resolution		

Yes - Mandated, Opt - Optional, No - Not Provided, D - Dependent on surrounding airspace

4. Requirements for operations in this airspace

Requirements dependent on those of any RTM airspace volume(s) surrounding the RTM-R volume

5. How this airspace volume is established

Definition of critical infrastructure and/or on request
Airspace restriction authorized by Transport Canada

6. Illustrative use cases

Critical Infrastructure: Protection of critical infrastructure e.g. Nuclear Power Stations, DND Locations

7. Alternative UTM Framework References

In U-Space the airspace designation "Y" has two use cases, one of these is to restrict/limit RPAS use in a geographic area

8. Impact to Traditional Aviation:

None

Appendix A. Glossary

The following definitions apply in the context of this document.

AIM: Aeronautical Information Management

ATM: Air Traffic Management

Beyond visual line-of-sight (BVLOS) operation: An operation in which the remote pilot or RPA observer does not use visual reference to the remotely piloted aircraft in the conduct of flight.

Canada Gazette Part I (CG1): The Canada Gazette is the official newspaper of the Government of Canada. Part I contains public notices, official appointments and proposed regulations.

Command and Control (C2) Link: The data link between a remotely piloted aircraft and a control station that is used in the management of a flight.

Conspicuity Device: A radio device aboard an aircraft which transmits information adhering to an agreed protocol, to enable other suitably-equipped airspace users in proximity to be aware of the aircraft's location.

Network Identification: Data stream delivered from RPAS to RSP which continually provides identification and current position, velocity and other associated data suitable for use by rFIMS Position and Tracking capability.

Operator: A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Remote Pilot: A person charged by the operator with duties essential to the operation of a remotely piloted aircraft system.

Remote Pilot Station: The component of the remote pilot aircraft system containing the equipment used to pilot the remotely piloted aircraft.

Remotely Piloted Aircraft (RPA): An uncrewed aircraft which is piloted from a remote pilot station.

Remotely Piloted Aircraft System (RPAS): A remotely piloted aircraft, its associated remote pilot station(s), the required command and control links and any other components as specified in the type design.

Remotely Piloted Aircraft Systems Traffic Management (RTM): The organization and oversight over unmanned traffic.

Single European Sky ATM Research (SESAR): Program to modernise European airspace and air traffic management.

Special Flight Operating Certificate (SFOC): An authorization from Transport Canada to operate an RPAS outside the current regulations.

Surveillance system: A generic term meaning variously, ADS-B, radar or any comparable ground-based or space-based system that enables the identification of in-flight aircraft and their present positions.

Visual Line-of-Sight (VLOS): Unaided visual contact at all times with a remotely piloted aircraft, sufficient to be able to maintain control of the aircraft, know its location, and be able to scan the airspace in which it is operating in order to perform the detect and avoid functions in respect of other aircraft or objects.

Very Low Level (VLL) Airspace: Currently, at or below 400 ft Above Ground Level (AGL).

Appendix B. References

1. Federal Aviation Administration: UTM Concept of Operations Version 2.0 (UTM ConOps v2.0)
2. CORUS and SESAR: U-space ConOps (edition 2 and edition 3.10)
3. Switzerland Federal Office of Civil Aviation (FOCA) and the Swiss U-Space Implementation (SUSI) ConOps: U-Space ConOps
4. International Civil Aviation Organization (ICAO): Doc 9859. Safety Management Manual (SMM)
5. Transport Canada: Canadian Aviation Regulations (CARs)
6. Government of Canada: Canada Gazette Part I (CG1)
7. Transport Canada: AC 903-001. Remotely Piloted Aircraft Systems Operational Risk Assessment