TERMS OF REFERENCE

VANCOUVER AIRSPACE MODERNIZATION PROJECT

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1 Purpose

The purpose of this Terms of Reference (TOR) document is to outline the review process that will shape a subsequent modernization of the airspace in the Greater Vancouver Region and Southern Vancouver Island. In doing so, the project will develop a concept of operation, in collaboration with all affected stakeholders, that supports sustained safe operations across the region in anticipation of future capacity demand and industry growth.

The TOR is intended to capture the project's scope, goals and strategic objectives, and provides an overview of the current design methodologies being considered and evaluated by the project team. This document provides a common frame of reference for stakeholder discussion and will be used as a basis for garnering input. The TOR will be updated as the project progresses, as appropriate, in order to promote understanding and transparency in the direction of this important project.

This Terms of Reference document:

- details the high-level goals of the Vancouver Airspace Modernization Project,
- describes the methodology that will be used to examine the present operational environment and determine the appropriate airspace structure, classification, procedures and associated services required to sustain a safe operating environment in anticipation of growth,
- summarizes potential resource requirements,
- provides a summary of the project's stakeholders and how they will be engaged, and
- identifies proposed timelines for research, concept design, option assessment, consultation, decision making and implementation.

2 Scope

The aim of the project is to modernize the airspace and sustain safe operations in the long-term in anticipation of continued industry growth. Our approach includes developing concepts and leveraging navigation technologies to propose an airspace structure that increases situational awareness, increases system efficiency, reduces delays and minimizes environmental impacts such as green house gas emissions and community noise exposure. The redesigned airspace will provide an airspace structure capable of adapting to future growth and shifts in demand, that balances stakeholder needs and supports effective air traffic services training.

The scope of the Vancouver Airspace Modernization Project will include both instrument flight rules (IFR) and visual flight rules (VFR) operations in the Greater Vancouver Region and Southern Vancouver Island areas.

Changes to this airspace structure may affect neighbouring enroute specialties, adjacent FIRs and ANSPs, airlines and aircraft operators including general aviation, airport authorities within the Vancouver and Victoria terminal sectors, operational personnel and the communities collectively served by the industry, who may have differing priorities and expectations.

This project will explore opportunities to optimize a range of facets of the airspace infrastructure and operation. As such, scope of the study includes the following components of the airspace structure and management:

- Airspace and Airway infrastructure – both IFR and VFR
- Preferential IFR Routes
- IFR Navigation infrastructure
- Airspace Classification
- Terminal Operations at principal and regional airports
- SID and STAR design
- IFR Approaches
- Delivery of IFR and VFR control service
- Charts and Publications
- Noise and Environmental considerations

3 Background

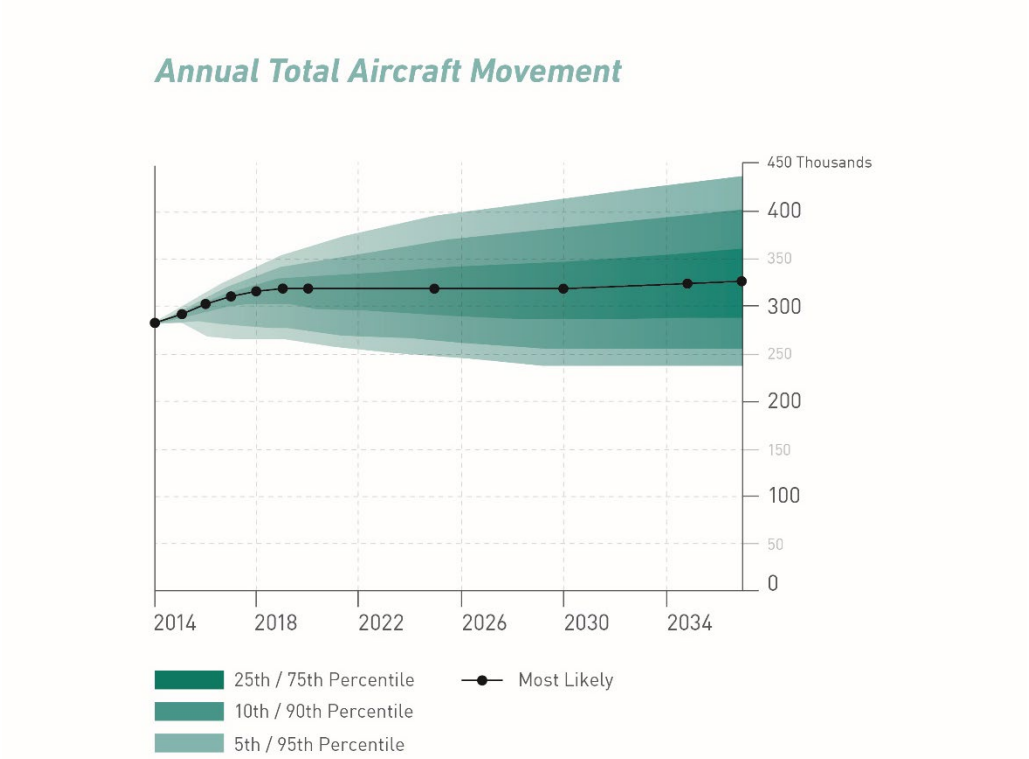
Global air traffic continues to see significant growth, with current projections indicating a doubling in passenger movements by 2031[1].

The Greater Vancouver Region and Southern Vancouver Island have also experienced significant growth in demand for air travel over the past several decades, with aviation being integral to regional and national economic development as well as connectivity to the global economy. In the period between 2013 and 2018, air traffic movements in the region grew by a total of 16 per cent, including an 18 per cent increase in IFR operations and a 10 per cent increase in VFR operations. This represents an increase of more than 100,000 flights across the region per annum compared to just five years ago. The mix of aviation operations is highlighted by the presence of 10 airports within a 50 nautical mile radius, incuding country's second busiest commercial airport, as well as the Vancouver Flight Information Region's top position for VFR traffic movements in Canada.

[1] ACI World Airport Traffic Forecast 2017-2040

3.1 Airports/Aerodromes (CYVR, CYPK, CZBB, CYNJ, CYYJ, CYXX, CYHC, CYWH, CYCD, KBLI)

Vancouver International Airport (YVR) is Canada's second busiest airport in terms of flight movements, with a total of 338,073 movements in 2018. YVR was 24th busiest airport in North America in 2016[2].



Source: YVR 2037 Phase 2 Consultation Summary Report

YVR is poised for significant growth in the future with a multi-billion long-term plan called **YVR 2037**[3]. This is a 20-year Master Plan that focuses on land use and shows how YVR will accommodate expected growth in passenger, aircraft and cargo volumes. YVR 2037 outlines future plans for the construction of a North-South taxiway and the potential for an additional runway, as well as incremental expansion of its terminal buildings.

Given the level of growth at the airport, YVR is currently undertaking work on an Airside Capacity Master Plan to explore options on means to increase the capacity of the airside system. This includes possible infrastructure such as high speed exits and additional taxiways to facilitate the movement of aircraft on the ground, as well as runway usage and operating hours.

In addition to having one of the largest airports in the country, the Greater Vancouver Region and Southern Vancouver Island are well served by several other airports, which have experienced and

[2] http://www.aci-na.org/content/airport-traffic-reports
[3] https://www.yvr2037.ca

anticipate growth, and are part of a complex operational environment benefitting a diverse cross-section of operators and users. As a result, this project will examine opportunities to support the long-term sustainability and safety of aircraft operations through airspace modernization surrounding Vancouver Airport (CYVR), Victoria International (CYYJ), Pitt Meadows (CYPK), Boundary Bay Airport (CZBB), Langley Regional Airport (CYNJ), Abbotsford International Airport (CYXX), Vancouver Harbour Flight Centre (CYHC), Victoria Inner Harbour Airport (CYWH), Nanaimo Airport (CYCD) and Bellingham International Airport (KBLI). The proximity of these airports to Vancouver International Airport as well as the intersecting traffic patterns of both IFR and VFR flights between all airports will require options that will consider this complex traffic mix holistically.

3.2 British Columbia South Coast

The South Coast of British Columbia has a unique regional transportation network, with many small communities along its vast coastline and islands relying on air travel as a primary means of transportation. This includes local/regional travel and commuter transportation as well as significant international and transcontinental travel for business, leisure and tourism purposes via YVR. Additionally, the province's two largest cities are separated by the Straight of Georgia, leading to a strong reliance on air travel for business, government activity, recreation and tourism. Aviation stakeholder engagement is high and diverse in this concentrated cross-section of the industry.

A significant amount of this travel is conducted under VFR by seaplane. During peak periods operators offers a large number of flights per day between Vancouver and Victoria.

Extensive flight training is conducted at all surrounding airports as well as sightseeing and by general aviation typically under Visual Flight Rules.

Current IFR airspace requirements, particularly in or near Terminal Control Areas and Control Area Extensions, can result in constraints for VFR operations. To manage growth in international IFR traffic, Control Areas have in recent years been increasing in size and lowering in base altitude. This compresses VFR activity in the airspace below and around Control Areas, increasing congestion and airspace complexity.

3.3 Airspace Assessment

An assessment of the current airspace provides important context for the Vancouver Airspace Modernization Project where the driving force in the airspace redesign is sustained and long-term safety as demand on the existing airspace infrastructure continues to grow. In the period between 2013 and 2018, air traffic movements in the region grew by a total of 16 per cent, including an 18 per cent increase in IFR operations and a 10 per cent increase in VFR operations. This represents an increase of more than 100,000 flights across the region per annum. While operations across the region are safe, system capacity demands can require the application of constraints to operators including traffic management initiatives (flow control), temporary suspension of procedures, altitude restrictions and

limited flexibility to improve local procedures without impacting the broader airspace structure. With anticipated growth, modernization is essential in order to ensure continued safety, to reduce system delays and minimize environmental impacts.

The assessment identifies priority areas based on the relative impact of potential airspace redesign options on sustained and long-term safety and airspace system constraint reduction.

An assessment of the Greater Vancouver Region and Southern Vancouver Island airspace from ground level to 6,000 feet Above Sea Level (ASL) for the 2018 operating environment shows a challenging and complex airspace within the Vancouver and Victoria Terminal Specialties. The region contains an international “hub” airport, multiple regional hubs, waterdromes, heliports, training and recreational airports served by an area control centre as well as several control towers and flight service stations. Within the airspace, a varied fleet mix operates under both IFR and VFR rules. Coastal weather patterns combined with mountainous terrain and intricate airspace designations, including Advisory and Restricted areas, contribute to a complex and demanding environment for both pilots and NAV CANADA controllers and specialists.

The assessment identified three key factors that provide furthere impetus for airspace modernization to ensure sustained operational safety:

1. The proximity of light VFR aircraft operations to heavier IFR aircraft needs to be considered to reduce wake turbulence risks as traffic grows.
2. Boundary-rich airspace increases complexity and the future structure should enhance clarity for operators on ATC jurisdiction and frequencies.
3. Airspace classification poses constraints and a new concept of operation needs to consider that VFR aircraft avoiding or restricted from Class C airspace are operating in increasingly congested areas.

3.4 Performance-based Navigation

There has been a significant shift in aviation technology over recent years with the advent of Global Navigation Satellite Systems (GNSS). The corresponding modernization of aircraft navigation and flight management systems has supported airspace modernization using Performance Based Navigation (PBN). The implementation of PBN is presently a high priority for the global aviation community as identified in ICAO’s Aviation System Block Upgrades (ASBU) and reflected in Transport Canada’s PBN Mandate. PBN is an enabler for quieter continuous descent and continuous climb operations, offers more accurate track keeping, enhances situational awareness and allows for shorter more direct routes, as well as more efficient take-offs and landings. This reduces fuel burn, time in system, frequency congestion and aircraft emissions.

Canada’s lead operators and many international operators at CYVR have invested heavily in modern fleets to ensure they realize the benefits of this new technology.

Although the current airspace structure was amended approximately 10 years ago, the underlying system is still based on historic traffic patterns derived from the location of ground based navigation aids and, as a result, increase the need for airspace restrictions and constraints. A full PBN environment will offer the opportunity to mitigate many of these constraints and leverage new technology to improve the overall safety and efficiency of the entire region.

4 Goals

The overarching goal of the Vancouver Airspace Modernization Project is to design and implement airspace and procedural concepts that reduce safety risks in the Vancouver FIR compared to the base case. The Modernization Project will result in a structure that meets current and future demand while seeking to reduce environmental impacts such as noise and GHG emissions.

The specific project goals, which are highly interconnected, are listed below:

4.1 Sustain Safety

NAV CANADA's first priority in all airspace modernization projects is safety. The airspace surrounding CYVR is dense and complex with 10 airports/aerodromes located within a 50 nautical mile radius. The mix of IFR and VFR traffic, flight training, photography flights and paradrop activity makes the surrounding volume of Terminal and Enroute airspace dense and challenging. The co-located seaplane harbour to the south, high terrain to the north, low-level float planes, helicopters, and a varied fleet mix of scheduled commercial traffic –can – at times – require the application of traffic management constraints to maintain safety. The project will look to enhance the structure to ensure sustained safety in anticipation of future demand while reducing constraints and system-related delays.

4.2 Modernize Airspace System

Design and implement a safe, efficient, environmentally responsible, fully integrated, PBN environment. This will include the use of Area Navigation (RNAV) and Required Navigation Performance (RNP) structures in the terminal area as well as deployment of RNP Authorization Required (RNP-AR) approaches to align with existing priorities at CYVR, CYYJ, and CYXX & CZBB. Eliminating the reliance on ground-based navigation aids will support the ANSP's National NAVAID Modernization Plan (NMP).

4.3 Prepare for Growth

Ensure the airspace is designed to handle forecasted growth in traffic as safely and efficiently as possible by creating an airspace design that is adaptable to both short-term and long-term changes in demand, in terms of ATM technology, procedures and resources required.

4.4 Balance the Needs of Stakeholder Groups

In airspace utilized by many different groups, often with very unique needs, the balance of requirements will be an area of primary concern. Consideration will be given to the safe integration of IFR and VFR traffic, with a focus on using modern technology to structurally de-conflict operations to the maximum extent possible. Furthermore, an in-depth review of airspace classification, location of special use airspace, and training areas will be conducted to ensure the relevant airspace functions are aligned with the overall evolution of the airspace and ATM operation. With a primary focus on safety, goals will need to be considered using a systems approach; changes to one aspect of the airspace structure will inevitably impact another.

4.5 Manage the Impact to the Environment

PBN is an enabler for direct and indirect environmental benefits, such as a reduction in fuel burn, associated GHG emissions and community noise exposure. The impact on residential communities will be an important consideration in any potential changes to flight paths and opportunities to reduce exposure will be sought. A robust community engagement plan will be developed in collaboration with

the relevant airport authorities to ensure communities are informed of any proposed changes and have an opportunity to provide input prior to implementation.

4.6 Consideration of the long-term plans of the industry

In the determination of options, future plans of operators and airports shall be taken into consideration to understand planned investment, fleet mix and equipage and anticipated traffic changes, where possible.

5 Methodology

5.1 Project Management Team

The scope of this project is extensive; therefore, the project management team (PMT) will use a phased approach in the development of the concept, and for publication and implementation activities. The specifics of the phasing will be detailed during the concept development phase. The PMT will use the Expert-Panel (EP) format for detailed work breakdown structures of each project phase and during the retrospectives. The PMT will make project status readily available and provide updates and briefings to senior management as required.

The first role of the PMT will be to draft a detailed project plan, estimate total resources required and submit for budget approval. This will be a multi-year project with cost estimates identified in each fiscal year.

Function	Responsibility	Accountability
Project Sponsors	○ Project approvals	AVP Service Delivery *and* General Manager FIR, Vancouver
Program Director	○ Provide briefings to Steering Committee ○ Monitor project progress and outputs ○ Project risk management ○ Coordinates: ○ Communication plan ○ Project work plan ○ Project budget ○ SMS ○ Coordinate sub-working group activities	Program Director
Project Steering Committee (PSC)	○ Define acceptable risk profiles and thresholds ○ Set priorities ○ Allocate resources ○ Release budget ○ Support Program Manager	EVP Service Delivery VP Operational Support VP ATS Service Delivery AVP Service Delivery AVP Operational Support AVP Stakeholder and Commercial Relations
Project sub-working groups	○ SWG work plan ○ Workgroup activities ○ Documentation	SMEs TBD ○ Depending on activity and specialty requirements

(FIR, AIM, LOS, PBO, Change management, Safety Management, Engineering, Stakeholder Relations)	○ Reports ○ Public and Elected Official Engagement	○ To be named by responsibility managers ○ In charge of workgroup activities

5.2 PBN Operational Deployment Team

Navigation and Airspace's Performance Based Operations (PBO) department identifies and implements changes that support Operations in moving towards a Performance Based Navigation environment. PBO also provides both research and development of new ATM concepts and implementation of airspace change to provide a vision and evolution path towards a future ATM strategy. This future ATM strategy also supports the company initiative of increasing efficiency and throughput at the four major airports.

The Operational Deployment Team (ODT) is a multi-disciplinary team assembled from a number of functional groups resources and managed by PBO. The ODT has delivered the benefits of PBN through essential collaboration and transparency with customers and stakeholders. Internal and external priorities are harmonized and the ODT provides a focal point to foster a common vision and understanding of the various milestones in pursuit of full PBN implementation. These milestones help contributing agencies focus on deliverables in alignment with both national and project priorities.

5.3 Level of Service

Level of Service (LOS) will conduct Aeronautical Studies in support of the project where there is a requirement triggered by CAR 802, a potential material change in the level of service to our customers, or a potential change in the level of safety in the system.

Examples of the potential changes in air traffic services that would require an aeronautical study are:

- Increase/decrease in operating hours of airport control service or airport advisory service
- Adjustment in operating hours (no change in number of hours) of airport control service or airport advisory service
- Establishment of new service
- Increase/decrease in size of Mandatory Frequency area

If any of the following airspace changes are proposed they will require an aeronautical study:

- New Special Use Airspace or change in location, altitude, or activation time to existing
- Change of classification of existing airspace
- Change in transponder requirement (including potential Mode S or ADS-B mandate)
- Full or partial revocation of airways, air routes, approaches, SIDs or STARs
- Creation of new airways, air routes
- Change of dimensions of exiting airspace, including:
    - Control zone (CZ)
    - Control area extension (CAE)
    - Terminal control area (TCA)
    - Transition area (TA)

5.4 AIM Capacity Management

The AIM project lead will coordinate with the Program Manager and ODT and manage the capacity of the planned publication cycles as well as the integration with other AIM commitments.

Multiple publication cycles will be required to publish the volume of changes and therefore a phased deployment will be required. Project delays must be communicated to AIM as soon as they are perceived as they may put AIM at risk with the FIR implementation phase given competing priorities

Follow-up publication capacity, approximately 6-12 months post-implementation, will be reserved for project 'wrap-up' tasks and minor alterations. Early identification of this timeline is essential to ensure all AIM objectives are met.

5.5 Federal Aviation Administration Coordination

A coordination working group will be established to collaborate with the following FAA groups:

Agency	Purpose
FAA ATC	FAA ATC and NAV CANADA ATC coordination through YVR OPS
FAA Aeronautical Information System (AIS)	FAA AIS and NAV CANADA AIM coordination through Client Relations Unit (CRU)
FAA Minimum Operational Network (MON)	FAA MON and NAV CANADA NMP coordination through CRU
DND/DOD	Special Use Airspace

This working group will consist of the YVR ATC SME, Manager Client Relations and ODT liaison and will report back to the Program Manager as required.

5.6 Stakeholder Consultation

Industry stakeholders will participate fully in the identification of issues and in the development of solutions. In order to effectively communicate with stakeholders, four consultative committees will be formed as follows:

- The General Aviation and Flight Training, Float plane and Helicopter operator consultation panel, comprised of a number of major flight training establishments operating in the region, as well as float plane and helicopter operators and representatives from recognized aviation advocacy organizations.

- The Commercial and Air Carrier consultation panel, comprised of commercial operators, air carriers and industry representatives who have indicated an interest in participating in the development of the IFR traffic management plan.

- The Airports consultation panel comprised of all airports as described in sections 3.1 and 3.2 above.

- The community panel, for which participants will be identified through the public engagement plan developed by the NAV CANADA Stakeholder Relations team.

In addition to these consultation panels, the success of this project will require collaboration and consultation with a number of other stakeholders. For example, these include Transport Canada, the Canadian and US Military, as well as NAV CANADA operational staff.

NAV CANADA is committed to effective communication and stakeholder participation to inform project decisions.

5.7 Community Consultation and Elected Official Engagement

NAV CANADA understands that airspace and airport operations, and updates or changes to these operations, can impact communities in material ways. We recognize their role as important stakeholders and are committed to considering community impact in the airspace design process and to open and transparent engagement with communities on proposed changes.

The ANSP adheres to the Airspace Change Communications and Consultation Protocol in all airspace change matters. A robust community outreach effort will be developed collaboratively with Airport Authorities Should the project propose changes to the airspace that would result in material impacts to communities, public engagement activities will be undertaken to inform communities of the proposals, provide accurate information about potential impacts and seek input prior to implementation. A local Public Participation Plan will be developed with airport authorities that will set the scope for the consultation and plan outreach to communities and elected officials. Promotion and engagement methodologies can include newspaper notices, social media promotion, detailed web content, elected official outreach, survey/feedback mechanisms, public open house-style consultation events, proactive outreach to community groups. Subsequent to any public consultation process, a public engagement report will be published detailing and responding to the feedback received, including potential further enhancements to the design concepts. Noise modelling of proposals will aid in ensuring that residents can assess the anticipated change in community impact.

The time required to conduct to communicate and consult with residents, municipalities and elected representatives, and for the input provided to be assessed, is part of the project's critical path.

5.8 Training Planning

A detailed training plan will be developed and documented for implementation of the project as the concept options mature.

6 Safety Management Activities

A Safety Management Plan (SMP) will be developed and adhered to for this project. The SMP will describe the program of work and demonstrate that the appropriate safety management activities will be undertaken, and due diligence employed.

7 Project Timeline

Due to the large scope of the project, a phased approach will be used, for design and development, publication and implementation.

Phase 1 will focus on research and concept development with stakeholders.

The concept development phase will result in an option set which will then be analysed for viability.

On the assumption of viable options, **Phase 2** will include the planning and execution of the community consultation plan and associated reporting, followed closely by the initiation of related multi-department implementation plans.

Phase 3 will concentrate on implementation. This phasing will support AIM production, controller training, operator adoption and overall resource management.

Phase 1 – April 2019 to March 2020

Create TORs – March 2019
Initial communication and stakeholder consultation - June 2019
Concepts for options – Fall 2019
Analysis of potential options – Spring 2020

Phase 2 – April 2020 to August 2020

Community consultation plan developed and executed – spring/summer 2020
(Any concept amendments resulting from consultation will be made at this phase)
Implementation Planning – late summer 2020

Implementation – TBD

AIM publication dates – TBD
Controller training delivered – TBD
Full implementation - TBD

Questions or comments related to this TOR may be directed to service@navcanada.ca.