2019–2023

YVR NOISE MANAGEMENT PLAN

VANCOUVER INTERNATIONAL AIRPORT

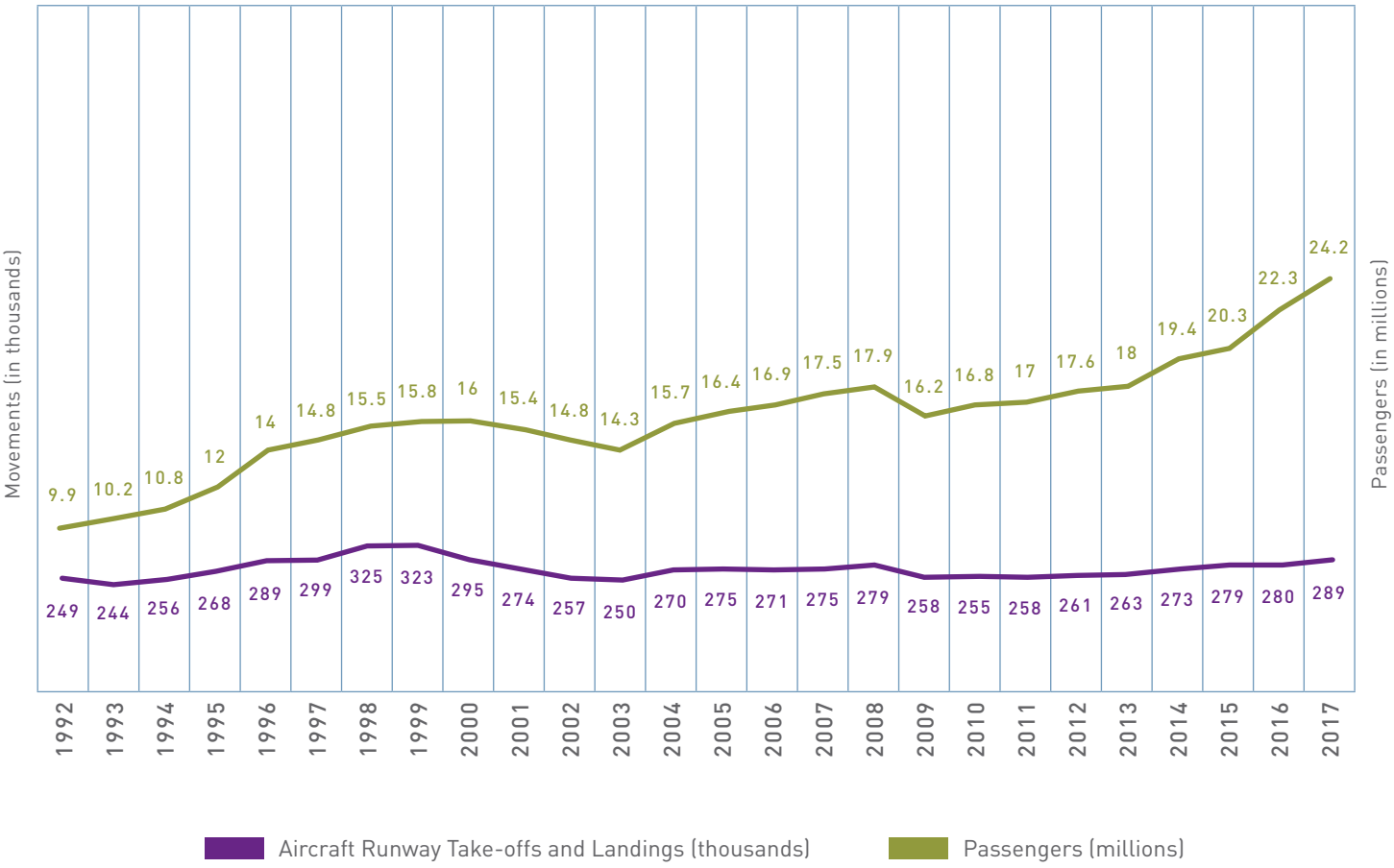
INTRODUCTION

Vancouver International Airport (YVR) is operated by Vancouver Airport Authority, a community-focused and financially independent company. YVR is Canada's second busiest airport, operating 24 hours to support the travel and business demands of the region.

YVR's mandate is to operate the airport in the best interest of the region and to ensure the airport contributes to the local and provincial economy. As part of YVR's Ground Lease with the Federal Government, YVR is required to manage noise within 10-nautical miles of the airport. As a community-focused operator, we strive to treat our neighbours with respect and consideration.

While YVR is experiencing strong growth, the increase in the number of passengers has been growing at a much faster rate than the number of aircraft landings and take-offs as illustrated below. With the forecasted increase in demands for air travel, we anticipate the growth to continue. As we look to continued growth in the future, we recognize that our operations can have an impact on the communities around us, and we remain committed to minimizing this impact as much as possible.

Annual Runway Movements and Passenger Totals 1992–2017



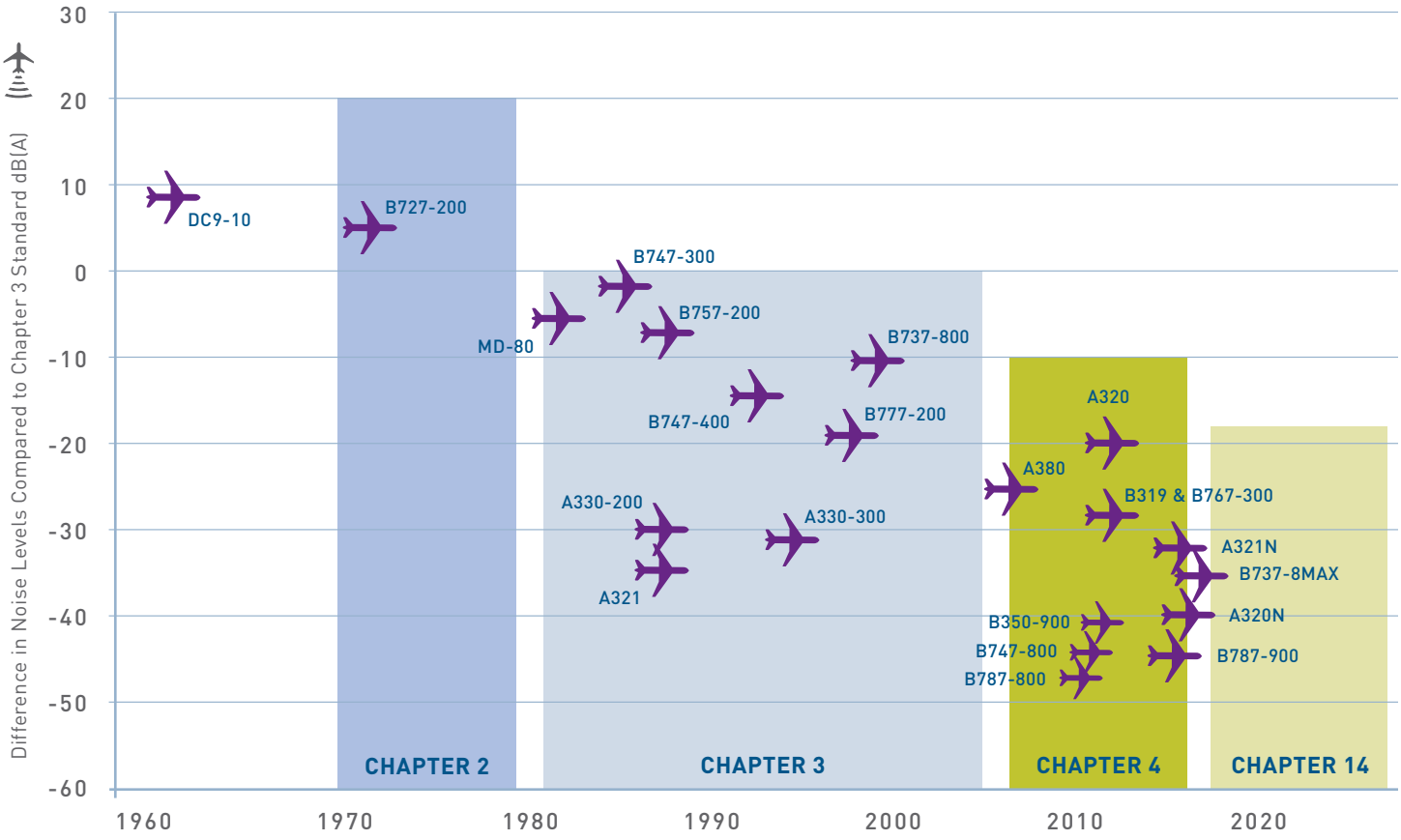
Quieter Aircraft

Aircraft operating in Canada must meet noise and emissions certification standards set by Transport Canada and the International Civil Aviation Organization (ICAO). Aircraft are categorized according to noise levels they generate. These categories are called "Chapters", with the current Chapters being 2, 3, 4, and 14 – the higher the Chapter number, the less noise generated by the aircraft.

These standards continue to increase in stringency to reflect advancements in engine and airframe technology, and newer aircraft designs are considerably quieter than their predecessors. In 2017, over 90% of jet aircraft operating at YVR met Chapter 4 or better noise requirements.

Aircraft and engine manufacturers are committed to developing quieter aircraft. In addition, airlines in Canada continue to invest billions of dollars to upgrade their fleet resulting in direct noise and emission reductions for communities.

Downward Trend in the Noise Certification Standard of Aircraft



ICAO NOISE CERTIFICATION STANDARDS (ANNEX 16, VOLUME I) FOR SUBSONIC & LARGE PROPELLER-DRIVEN AIRCRAFT

- **Chapter 2:** Type certificate required before 6 October 1977 for first generation turbofans & nacelles.
- **Chapter 3:** Type certificate required from 6 October 1977 for second generation turbofans & advanced nacelles.
- **Chapter 4:** Type certificate required from 1 January 2006 for new bypass ratio engines, nacelle technology & airframe design. Introduced a cumulative reduction of 10dB relative to Chapter 3 standard at all three noise measurement points.
- **Chapter 14:** Type certificate required from 31 December 2017 (31 December 2020 for aircraft ←55t) for advanced high bypass ratio engines & nacelles. Introducing a cumulative reduction of 7dB relative to Chapter 4 cumulative levels at all three noise measurement points.

NOTES

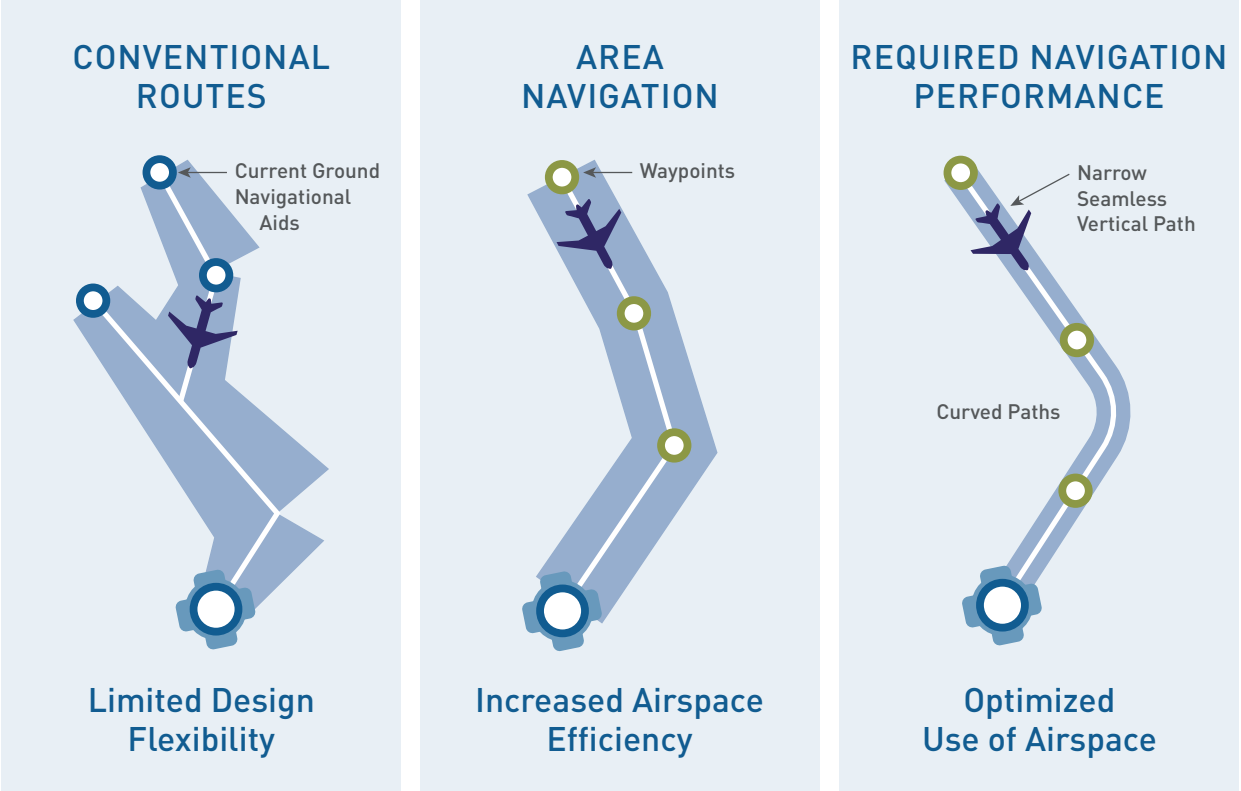
1) Chapter 2 aircraft were banned from operation in major countries around the world, including Canada starting from 1 April 2002.
2) The Effective Perceived Noise level (EPNdB) is calculated from the aggregation of individual measurements from three locations – approach (2km from runway threshold), sideline (450m laterally from runway centreline), flyover (6.5km from the brake release point).

Source: Airbiz

Performance Based Navigation (PBN)

As aviation moves towards navigation systems based on GPS satellite technology, PBN is becoming the new way to navigate. Whereas the conventional navigation infrastructure is based primarily on ground-based systems and equipment, PBN uses GPS and sophisticated avionics to enable aircraft to fly accurate paths, both laterally and vertically.

PBN provides a number of operational and environmental benefits such as more efficient route structure and flight paths to reduce fuel burn and emissions, including noise. There are two types of specifications for PBN: Area Navigation (RNAV); and Required Navigation Performance (RNP). While RNAV and RNP are fundamentally similar, RNP has requirements for onboard performance monitoring and alerting making it more precise.



Source: NAV CANADA

— A ground navigational aid is a physical device on the ground which provides navigational information or position to aircraft in flight.
— A waypoint is a predetermined geographical position defined in terms of latitude and longitude coordinates which is used in flight navigation.

YVR NOISE MANAGEMENT PROGRAM – HOW WE MANAGE NOISE

YVR is committed to minimizing the environmental and noise impacts associated with airport operations. As part of the Noise Management Program, YVR is focused on minimizing noise disturbances while recognizing the need for 24-hour airport operations.

THE CORE ELEMENTS OF YVR'S NOISE MANAGEMENT PROGRAM:

STAKEHOLDER ENGAGEMENT

through the YVR Aeronautical Noise Management Committee (ANMC)

PROCEDURES & DIRECTIVES

to mitigate noise from aircraft and airport operations

FLIGHT TRACKING & NOISE MONITORING

Responding to

QUESTIONS & CONCERNS

from the community

DEVELOPMENT & IMPLEMENTATION

of our five-year Noise Management Plan

EDUCATION & AWARENESS

OTHER STAKEHOLDERS

YVR works collaboratively with a number of stakeholders to manage and minimize noise impacts around the airport.

International Civil Aviation Organization (ICAO) is a specialized agency of the United Nations which promotes safe and standardized development of international civil aviation. ICAO establishes standards and regulations for aviation safety, security, efficiency and regularity, as well as environmental protection. ICAO is responsible for setting noise and emission standards for aircraft.

Transport Canada is the federal regulator of aviation in Canada responsible for developing transportation policies and legislation to maintain and promote a safe, secure, efficient and environmentally responsible transportation system.

Transport Canada is responsible for ensuring that operating aircraft meet ICAO noise and emission standards and establish the design criteria for air routes and procedures. They enforce Noise Abatement Procedures and Noise Operating Restrictions as well as review and approve proposed changes to procedures and restrictions. To help municipalities with planned development in high noise areas around airports, Transport Canada provides national guidelines on compatible land use planning.

NAV CANADA is the company that provides air navigation services in Canada and responsible for safe and efficient movement of aircraft. As well as providing air traffic control services, NAV CANADA also operates and maintains the navigation and approach aids and equipment. They are also responsible for the design and publishing of air routes and procedures in accordance with criteria set by Transport Canada and ICAO.

Airline partners are responsible for conducting their operations in compliance with applicable Noise Abatement Procedures and other published procedures when operating at an airport.

Local municipalities are responsible for land use planning in British Columbia and are encouraged to follow Transport Canada's land use guidelines when planning developments near airports to protect the public and minimize the number of residents living in areas exposed to high aircraft noise.

YVR works with **community** members to understand issues associated with our operation and incorporate improvements into our planning and engagement with other stakeholders.

The Noise Management Plan is an integral part of advancing the goals and objectives of YVR's Noise Management Program. It is also a requirement under the airport's ground lease. The plan undergoes redevelopment every five years and documents the structure of the program and identifies an action plan with initiatives that serve to support and improve the core elements of YVR's Noise Management Program.

Creating the Plan

To create the new 2019-2023 Noise Management Plan and its five-year action plan, the following process and tasks were undertaken:

Review of Historical Noise Complaints

One of the core elements of YVR's Noise Management Program is responding to questions and concerns from the community. Questions and concerns about specific operations are investigated for compliance with published procedures and logged into a database. To support the creation of the new Noise Management Plan, concerns received between 2014 and 2017 were analyzed to identify trends and key issues. During this four-year time period, a total of 903 individuals registered 6,458 concerns and this formed the dataset for the analysis.

Community Feedback Survey

A web survey was carried out between March 13, 2018 and July 13, 2018 to engage the community in the process of creating the new Noise Management Plan. The survey was designed to collect input on various aspects of YVR's Noise Management Program and identify specific community concerns. The survey also allowed respondents to propose suggested mitigation measures for consideration by YVR. The survey was completed by a total of 721 individuals, which included 218 individuals who completed the survey through the open web link and 503 randomly selected local survey panelists. 68% of the 218 respondents via the open web link cited concerns about aircraft noise whereas 27% of the 503 panelists cited concerns about aircraft noise.

Noise Management Practice Review

YVR retained a consultant to review noise management practices at other international airports. The objective of this review was to better understand industry trends and to help support discussions with YVR's Aeronautical Noise Management Committee (ANMC). The review provided information on possible ways to enhance communication with communities, which helped shape some of the initiatives in the Action Plan.

Consultations with YVR's Aeronautical Noise Management Committee (ANMC)

YVR worked closely with the members of the ANMC to create the new Noise Management Plan. The multi-stakeholder community-based ANMC plays an active role in providing input and informing noise management strategies at the airport. Membership on the ANMC includes: citizen and city staff representatives appointed by the Cities of Richmond, Vancouver, Delta, and Surrey; Musqueam Indian Band; airlines; industry associations; NAV CANADA; Transport Canada; and YVR.

Evaluating Proposed Initiatives for the Action Plan

To create the action plan for the new 2019-2023 YVR Noise Management Plan, all proposed initiatives received from the community, the ANMC, and other stakeholders were evaluated based on the following criteria:

- Noise mitigation
- Impact on safety
- Impact on airport or aircraft operations
- Effects on air quality and greenhouse gas (GHG) emissions
- Economic cost to the industry
- Noise impact on neighbouring communities or areas
- Impact on current and future airport capacity
- Alignment with YVR's mandate to provide 24-hour air service for the region

Action Plan

1

EDUCATION
& AWARENESS

WORK FOCUS

AWARENESS—COMMUNITY

OBJECTIVE

Inform the community about aircraft/ airport operations and noise management efforts.

INITIATIVE / ACTION

1.1 Identify and implement new online web tools to enhance information sharing and analytical capabilities to better inform the community about aeronautical noise and aircraft operations.

1.2 Report the results of noise monitoring, aircraft operations, complaints statistics, and progress on noise management initiatives in the annual noise report.

1.3 Track the trend of the use of quieter aircraft designs at YVR and provide updates in the annual noise report.

1.4 Review noise management information on YVR's website to ensure information is up-to-date and relevant. Where possible, look to convert materials to other forms of media to increase accessibility of information.

1.5 Engage Musqueam Indian Band to provide information and enhance knowledge of airport and aircraft operations.

1.6 Track and provide educational information on emerging trends in aircraft and navigation technologies.

1.7 Include information on annual traffic forecasts and growth in the annual noise report to provide clear expectations to the community.

2

EDUCATION
& AWARENESS

WORK FOCUS

AWARENESS—INDUSTRY

OBJECTIVE

Engage with aviation stakeholders on noise management activities at YVR.

INITIATIVE / ACTION

2.1 Participate in discussions with other major airports in Canada to share and exchange information on emerging trends and noise management strategies, and to coordinate responses and positions on national issues.

2.2 Host regular meetings with NAV CANADA to discuss and exchange information on noise management strategies.

2.3 Acknowledge airline partners that demonstrate good noise management practices by presenting YVR's Fly Quiet Awards annually and explore opportunities for further recognition and engagement.

2.4 Participate in discussions with Transport Canada and other government agencies on national and international issues.

Action Plan

3

PROCEDURES & DIRECTIVES

WORK FOCUS

NIGHT-TIME OPERATIONS

OBJECTIVE

Monitor and report on the number of night operations.

INITIATIVE / ACTION

3.1 Perform an annual review of YVR's guidelines for approving operations at night to ensure the guidelines remain relevant.

3.2 Report on the number of night operations by aircraft noise certification in annual noise reports.

3.3 Monitor compliance with the night-time approval requirement and report suspected violations to Transport Canada.

3.4 Assess and communicate the benefits and economic contribution of 24-hour operations.

4

SHAREHOLDER ENGAGEMENT

WORK FOCUS

YVR AERONAUTICAL NOISE MANAGEMENT COMMITTEE (ANMC)

OBJECTIVE

Ensure that the YVR ANMC remains relevant and functional.

INITIATIVE / ACTION

4.1 Review YVR's ANMC Terms of Reference for membership, expectations, scope, objectives, etc. Host at least three meetings a year and consult members on emerging issues.

4.2 Develop customized reports for ANMC city staff and citizen representatives to support their role on the Committee.

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FLIGHT TRACKING & NOISE MONITORING

WORK FOCUS

AIRCRAFT NOISE AND OPERATIONS MONITORING SYSTEM (ANOMS)

OBJECTIVE

Ensure functional and reliable collection of noise and operations data.

INITIATIVE / ACTION

5.1 Assess the current network for Noise Monitoring Terminals (NMTs) and determine locations in the City of Delta, Musqueam, and other areas in Metro Vancouver where new NMTs could be located to capture noise data related to current and future operations.

5.2 Prepare a multi-year system plan for ANOMS to schedule hardware replacement and software enhancements.

Action Plan

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FLIGHT TRACKING & NOISE MONITORING

WORK FOCUS

TEMPORARY NOISE MONITORING

OBJECTIVE

Deploy the portable NMT to capture objective data on noise exposure.

INITIATIVE / ACTION

6.1 Identify potential locations for temporary noise monitoring, deploy the portable Noise Monitoring Terminal, and ensure a summary of results is made available.

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PROCEDURES & DIRECTIVES

WORK FOCUS

RUN-UPS

OBJECTIVE

Further manage noise from engine run-ups.

INITIATIVE / ACTION

7.1 Undertake an annual review of the Engine Run-up Directives and Procedures with a focus on optimizing noise reduction opportunities at all run-up locations.

7.2 Report the number of run-ups by hour, location, and power setting in the annual noise report.

7.3 Provide new operators at YVR with information on engine run-up procedures and directives.

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EDUCATION & AWARENESS

WORK FOCUS

PERFORMANCE-BASED NAVIGATION (PBN) PROCEDURES / FLIGHT PATH CHANGES

OBJECTIVE

Identify opportunities for noise mitigation during the development of new flight paths or procedures where feasible.

INITIATIVE / ACTION

8.1 Assist with evaluating community and noise impacts associated with the introduction of new flight paths and procedures and ensure that noise and emissions reductions and capacity impacts are considered during design.

8.2 During the design phase of creating new procedures, provide baseline information on current aircraft activity levels over the community to assist with identifying mitigation options to lessen current impacts where feasible.

8.3 Support the development and introduction of PBN procedures at YVR by providing resources, information, and data to assist in the design process.

8.4 Collaborate with aviation partners to ensure communities are engaged and advised before any changes to flight paths are implemented as outlined in the *Airspace Change Communication & Consultation Protocol*.

Action Plan

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PROCEDURES & DIRECTIVES

WORK FOCUS

NOISE ABATEMENT PROCEDURES

OBJECTIVE

Ensure procedures to manage noise remain relevant and current.

INITIATIVE / ACTION

9.1 Perform an annual review of the published Noise Abatement Procedures for YVR with the aim of ensuring clarity and continual improvement.

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PROCEDURES & DIRECTIVES

WORK FOCUS

MANAGING CAPACITY

OBJECTIVE

1. Ensure runway system at YVR is used effectively to reduce delays while managing noise impacts on the community.
2. Develop analytics and identify data requirements to evaluate impacts of future runways.

INITIATIVE / ACTION

10.1 Work to quantify the environmental and economic costs of delays at YVR associated with various aspects of operations, including runway operating restrictions.

10.2 Collaborate with aviation partners to assess airside capacity, including emerging constraints, coordinate planning for optimal use of the runway system at YVR and assist with the assessment of short, medium, and long-term capacity enhancement strategies.

10.3 Identify evaluation criteria, metrics, and analysis requirements to assess future noise impacts associated with potential new runways and airfield infrastructure and work collaboratively with municipalities and stakeholders to ensure required data is collected.

Action Plan

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EDUCATION & AWARENESS

WORK FOCUS

YVR FLOAT PLANE OPERATIONS

OBJECTIVE

Further manage noise associated with YVR float plane operations.

INITIATIVE / ACTION

11.1 Continue ongoing dialogue and work with YVR float plane operators to assess ways to further manage noise.

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SHAREHOLDER ENGAGEMENT

WORK FOCUS

LAND USE PLANNING

OBJECTIVE

1. Promote compatible land use planning in the vicinity of the airport.
2. Minimize noise from future airport developments on Sea Island.

INITIATIVE / ACTION

12.1 Work with adjacent communities to promote the adoption of compatible land use and design standards that reflect airport operations and plans.

12.2 Provide input on applicable municipal community plans, rezoning, and development applications.

12.3 As part of the process for development on airport property, assess the use of berms, barriers, and landscaping as ways to minimize noise from airport ground-based activities.