NATA 2015

PBN & the Regs

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Transport Canada
Commercial Flight Standards
PBN Implementation Project

Outline

- Transport Canada
- Performance Based Navigation (PBN)
- Regulations & Guidance
- Next Steps

Transport Canada – PBN Statement

- TC is supportive and accepts:
  - the ICAO PBN initiative, and
  - the need for globally-harmonized operations.
- The Canadian aviation industry is:
  - working together to implement the ICAO PBN plan

Transport Canada Transports Canada
Défense nationale National Defence
NAV CANADA
NORTHERN AIR TRANSPORT ASSOCIATION NATA
ACPA APAC
cbaa
alpa
Helicopter Association of Canada HAC "Bringing the Industry Together"
COPA CANADIAN OWNERS AND PILOTS ASSOCIATION
ATAC
NATIONAL AIRLINES COUNCIL OF CANADA
CONSEIL NATIONAL DES LIGNES AÉRIENNES DU CANADA

Transport Canada's

- Vision
  - Safe,
  - Secure,
  - Efficient, and
  - Environmentally responsible.
- Mission
  - To serve the public interest through the promotion of this vision

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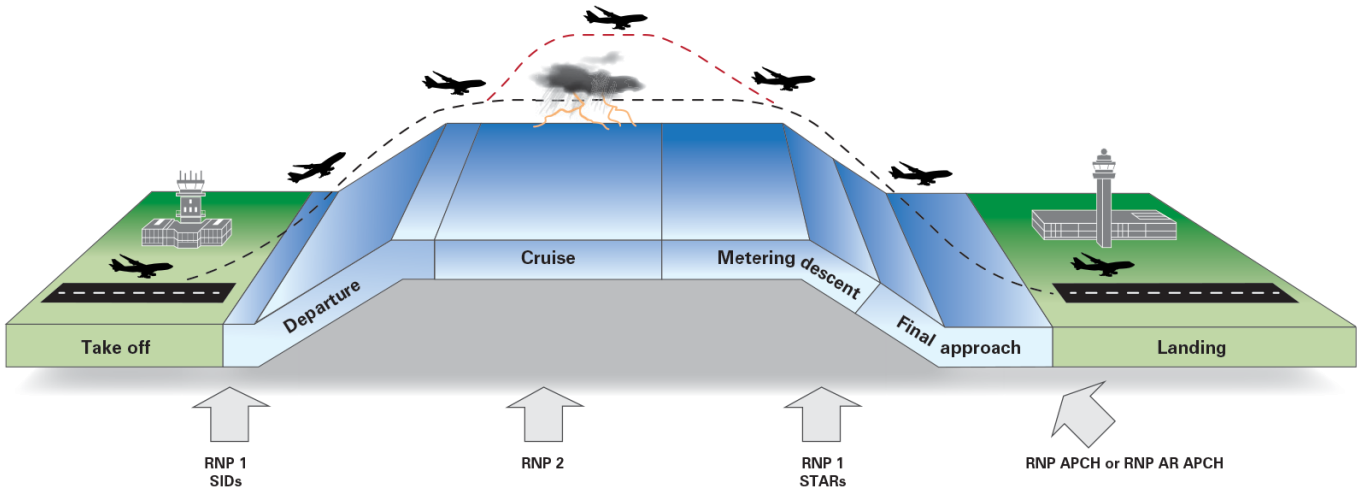
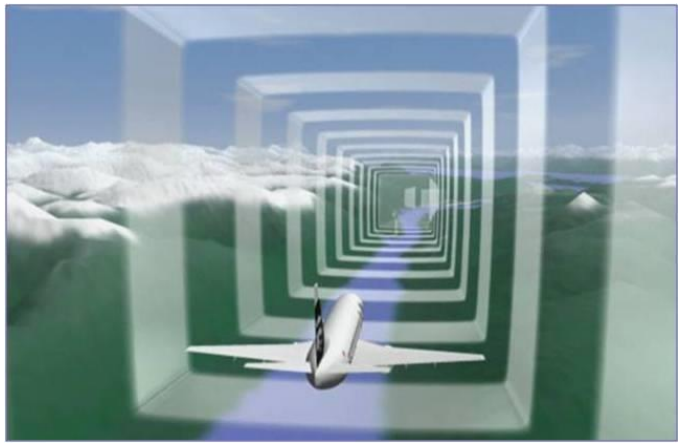
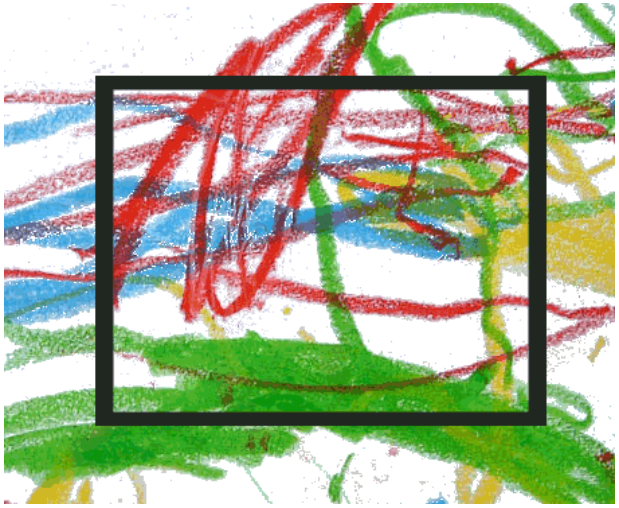


Performance Based Navigation

- Area Navigation
- Performance Based Navigation
- Performance Airspace
- Navigation Specifications
- Phases of Flight
- CNS-ATM



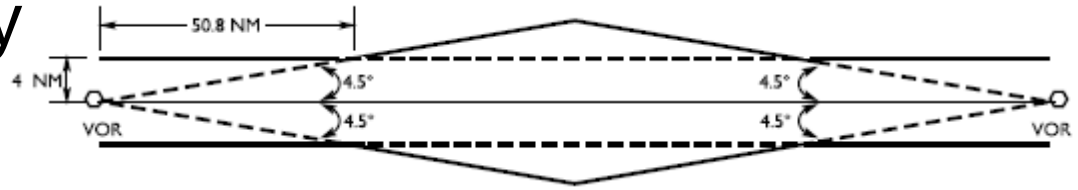
Performance Based Navigation



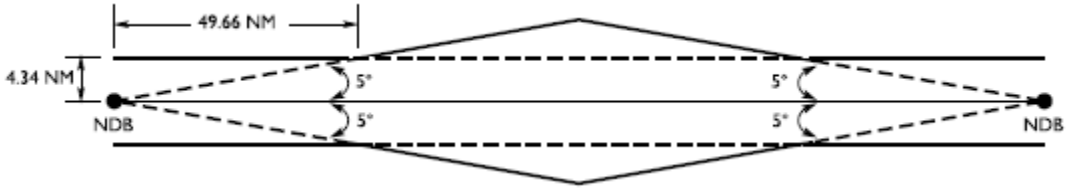
PBN = Area NAV with performance specifications

Performance Based Navigation

- VHF/UHF Airway



- LF/MF Airway

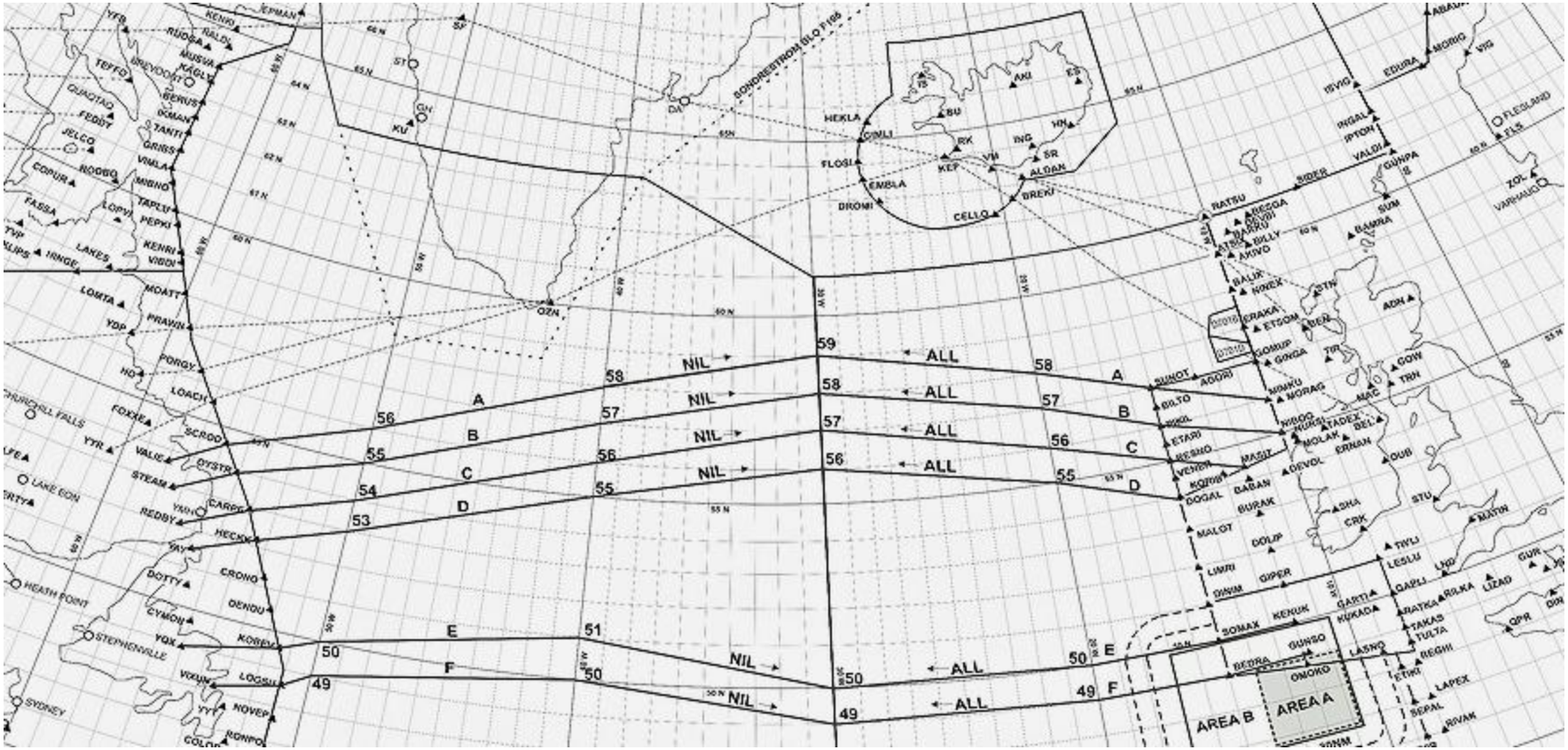


- Q, T, L Route

Canadian Domestic vs. High Level Controlled

Performance Airspace - MNPS

Minimum Navigation Performance Specifications

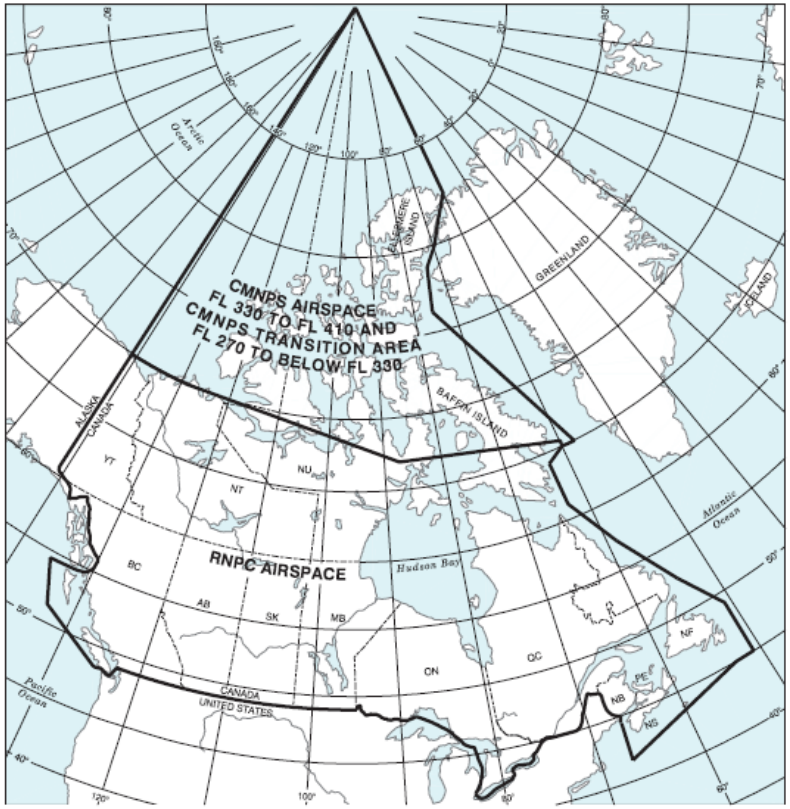


Performance Airspace – CMNPS & RNPC

Canadian Minimum Navigation Performance Specifications
Required Navigation Performance Capability

- **CMNPS** (FL330–410) transition areas (FL270 up to FL350)

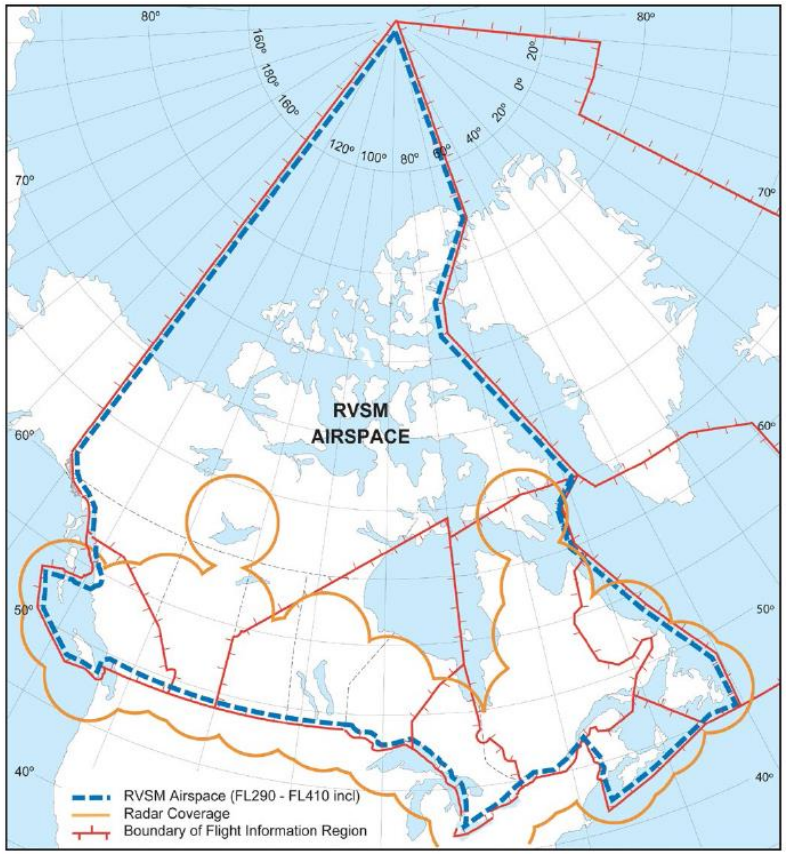
- **RNPC** (see DAH)



Performance Airspace – RVSM

Reduced Vertical Separation Minimum

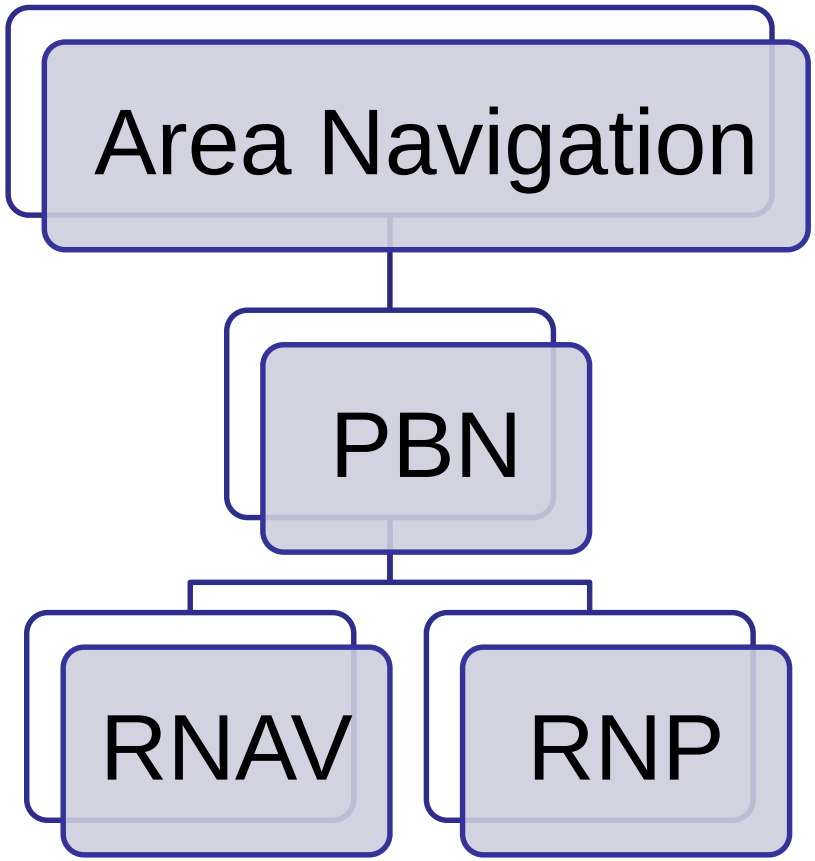
- **RVSM** (FL290–410 inclusive)
  - Non-RADAR – 2,000 ft
  - RADAR – 1,000 ft



Performance Airspace – OPS SPEC

	702 Aerial	703 Air Taxi	704 Commuter	705 Airline
RNPC **CMNPS** **NAT-MNPS** **RVSM** **PAC RNP-10**	**052**	**015**	**037**	**077**
Regulation	702.08 (g) (vii)	703.08 (g) (x)	704.08 (g) (vi)	705.08 (g) (vi)
Standard	722.08 (2)	723.08 (2)	724.08 (2)	725.08 (2)

Terminology



PBN Terminology

Type	Design	Minima	NavSpecs	Naming
APV	LPV	LPV	RNP APCH	RNAV (GNSS) RWY 25
	Baro	LNAV/VNAV		
NPA	LP	LP		
	LNAV	LNAV		

*APV	Baro	LNAV/VNAV	RNP AR APCH	RNAV (RNP) RWY 32

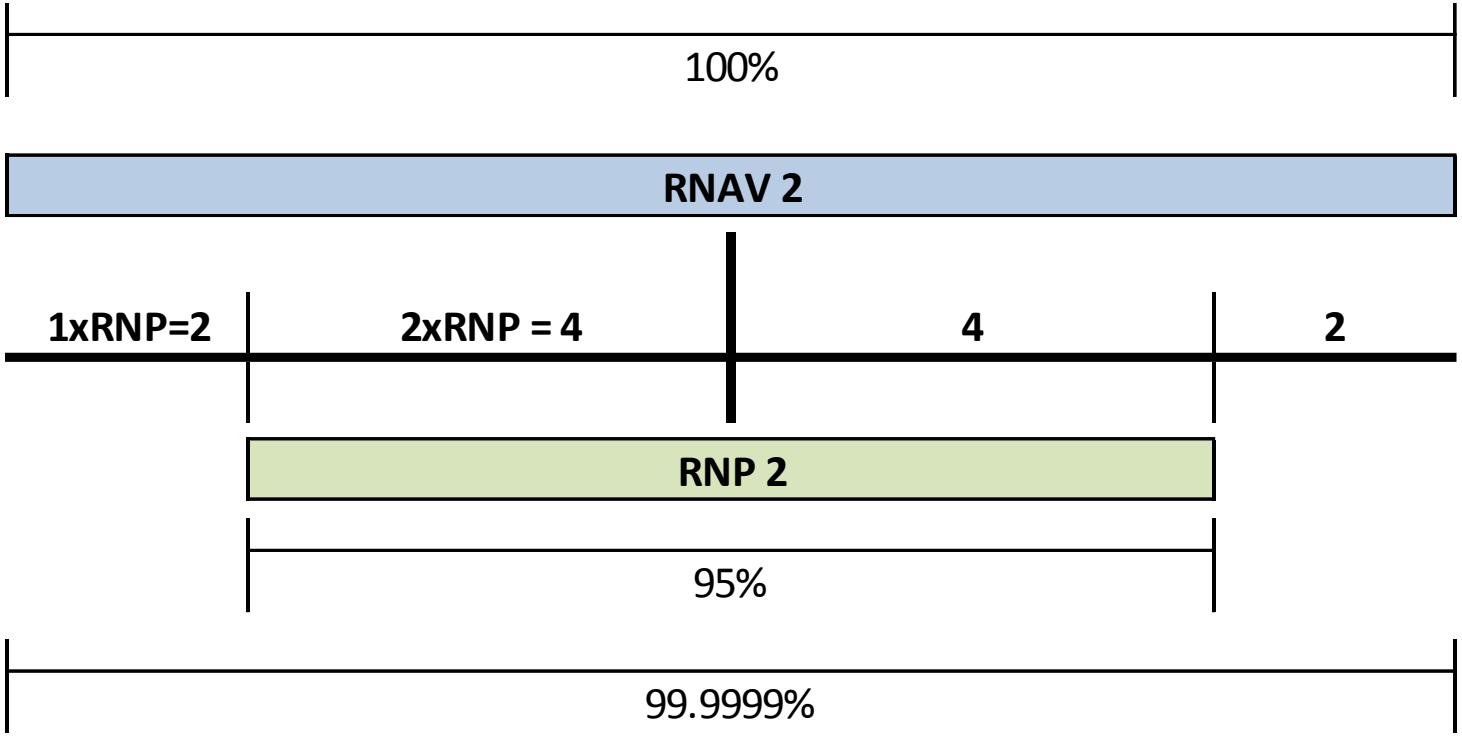
Differences between RNAV & RNP?

	RNAV	RNP
COMM	**UHF, VHF, SATCOM, Datalink**	
NAV	**Satellite, Ground Stand Alone**	**Satellite ONLY**
SURV	**Desired**	**Not Required**
ATM	**Good Separation**	**Reduced Separation**

- ATM
  - Accurate Position – ATC SEP – Better Trajectories

Difference between RNAV & RNP?

Alerting & Monitoring?



NavSpec and Phase of Flight

NAV SPEC	ENR		TMA	APCH	
	Oceanic/ Remote	Continental	STARs/ SIDs	Initial Intermediate Missed	Final
RNAV 10	✈				
RNAV 5		✈	✈		
RNAV 2		✈	✈		
RNAV 1		✈	✈	✈	
RNP 4	✈				
RNP 2	✈	✈			
RNP 1			✈		
ADV RNP	✈	✈	✈	✈	✈
RNP APCH				✈	✈
RNP AR APCH				✈	✈
RNP 0.3 (Heli)		✈	✈	✈	

RNAV-RNP OPS SPEC

PBN NavSpecs	NAV EQUIP		Transport Canada	
	Type	TSO (min)	OPS SPEC	CARS or Advisory Circular
RNAV 10	GNSS, INS/IRU	129	611	AC 700-006
RNAV 5	GNSS, VD, DD, DDI, INS		613	AC 700-015
RNAV 1 and 2	GNSS, DD, DDI		612	AC 700-019
RNAV APCH	GNSS		100	CASS 725.08(3)
RNP 4	GNSS	129a	614	AC 700-006
RNP 2				
RNP 1			618	AC 700-025
A-RNP				
RF Turn			623	AC 700-027
RNP APCH			620	AC 700-023
RNP AR APCH			621	AC 700-024
RNP 0.3 (Heli)		C145/146		

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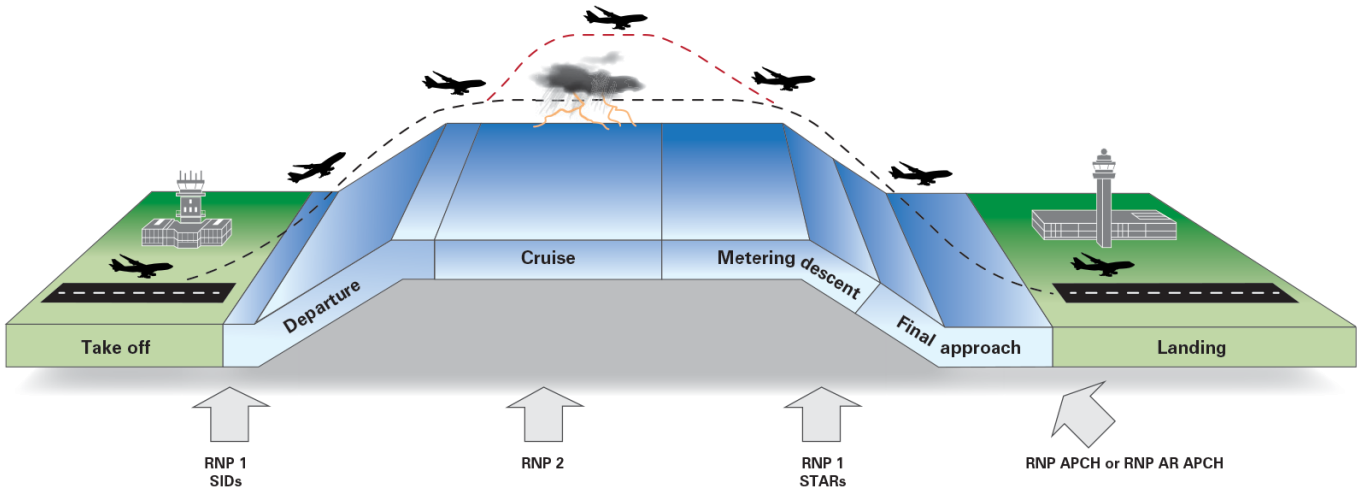

Canadian Regulations & Guidance

- ICAO
  - Global Air Navigation Plan
  - Aviation System Block Upgrades
  - PBN Manual
- Transport Canada
  - Regulatory Framework
  - Operations Specifications (Ops Spec)
  - Special Authorizations

ICAO

- Global Air Navigation Plan (GANP)
  - Worldwide direction for PBN
  - Performance requirements:
    - Accuracy, integrity, availability, continuity and functionality
  - NavSpec defines:
    - performance requirements (RNAV / RNP),
    - aircraft and aircrew (including training) requirements
  - RNP more stringent (alerting and monitoring), hence recognized as the one to adopt.

ICAO

- Aviation System Block Upgrades (ASBU)
  - Driven by the need for Global Harmonization
  - Blocks:
    - Airport Operations
      - APTA, WAKE, RESQ, SURF, ACDM, RATS
    - Globally Interoperable Systems and Data
      - FICE, D-ATM, D-AIM, SWIM, AMET
    - Optimum Capacity and Flexible Flights
      - FRTO, NOPS, ASUR, ASEP, ATSA, OPFL, ACAS, SNET
    - Efficient Flight Path
      - CDO, CCO, TBO, RPAS

ICAO PBN Manual (DOC 9613)

- Volume 1 – Concept & Implementation
  - A – The PBN Concept
  - B – Implementation Guidance
  - Att.A – RNAV and RNP Systems
  - Att.B – Data processes
  - Att.C – Operational approval
- Volume 2 – Implementing RNAV & RNP
  - A – General
  - B – Implementing RNAV
  - C – Implementing RNP

Transport Canada

- Regulatory Framework
  - Regulations (CARs)
    - Advisory Circulars (AC)
      - Aeronautical Information Circulars (AIC)
- Operations Specification (Ops Spec)
  - Special Authorization

CARs

- I – General Provisions
- II – Aircraft ID/Reg/Operation (Leased)
- III – Aerodromes, Airports and Heliports
- IV – Personnel Licensing and Training
- V – Airworthiness
- VI – General Operating and Flight Rules
- VII – Commercial Air Services
- VIII – Air Navigation Service
- IX – Repeals and Coming into Force

CARs affected by PBN adoption

- I – General Provisions
- II – Aircraft ID/Reg/Operation (Leased)
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- IV – Personnel Licensing and Training
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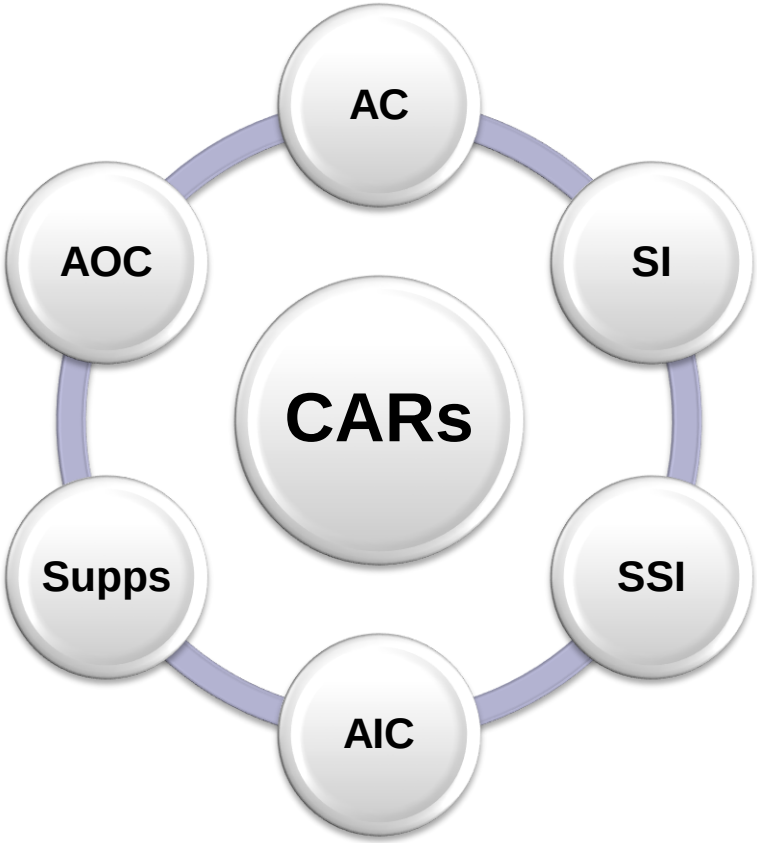
Tentacles with changes to CARs



Ops Spec to Special Authorizations

ICAO PBN NavSpecs	Transport Canada	
	OpsSpec	Special Authorization
RNAV APCH	100	To be revoked
RNP APCH	620	RNP - LPV RNP - LNAV/VNAV RNP - LP RNP - LNAV
RNP AR APCH	621	RNP AR APCH

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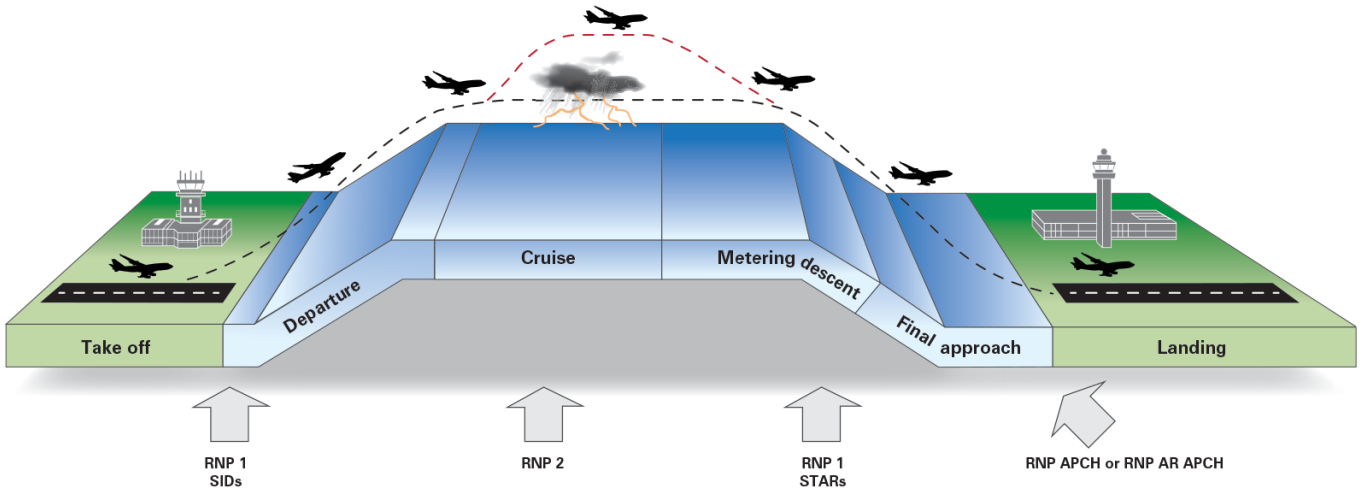
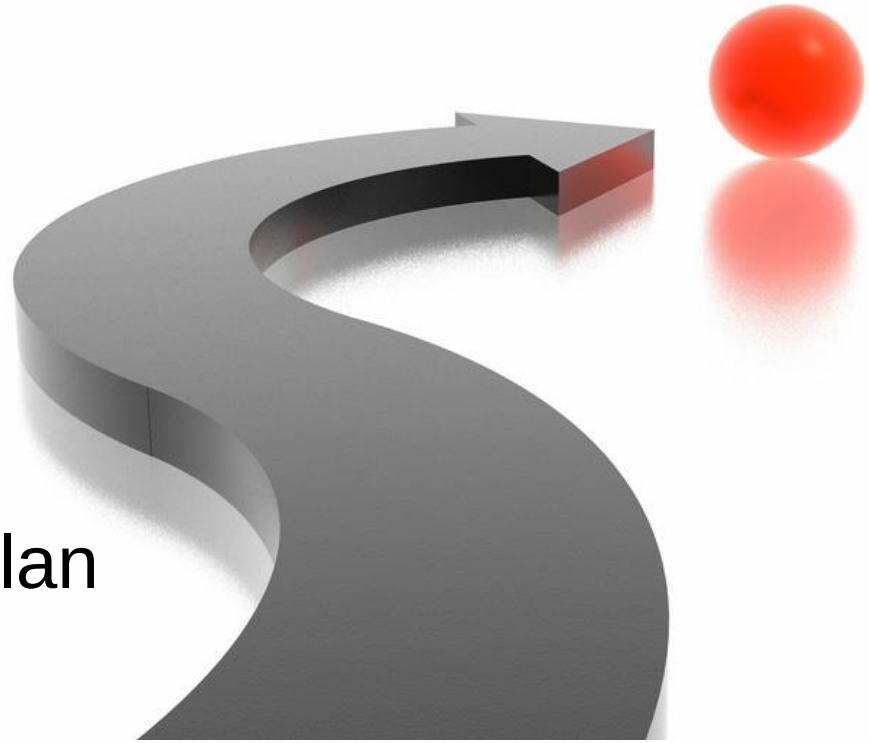


Way Ahead

- State Plan
- NC Operational Plan
- CPAAT
- TC Implementation Plan



PBN State Plan - Canada

- ICAO Recommendation
- Includes:
  - What's PBN, the ICAO Plan, the Canadian Plan
  - Benefits of PBN and Global Harmonization
  - PBN RNAV versus PBN RNP
  - Challenges and our Strategic Direction

PBN State Plan - Advantages

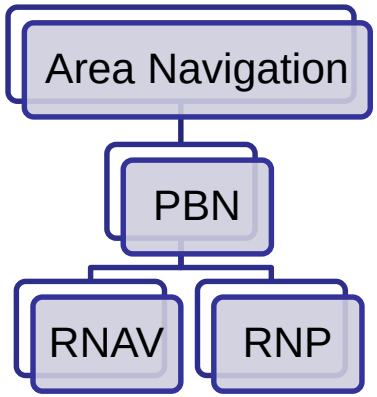
- Some PBN advantages:
  - increased airspace safety;
  - reduced environmental impact;
  - reduced need to maintain NAVAIDs and avionics;
  - eliminates sensor-specific operations; and,
  - simplification of the operational approval.

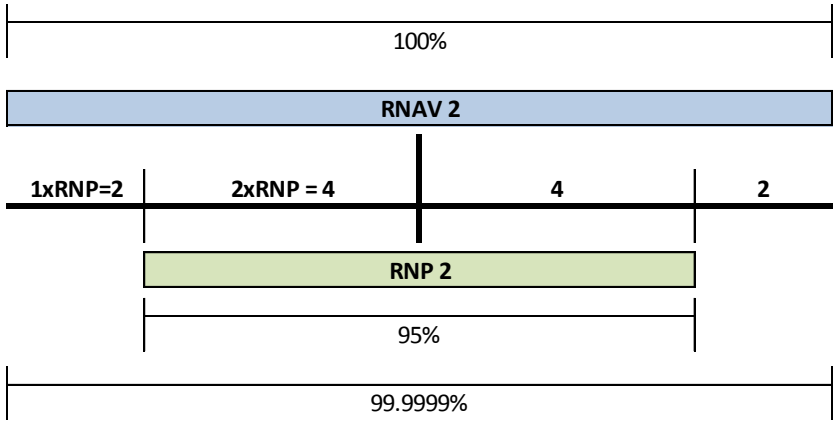
Global Harmonization

PBN State Plan - Canada

- The Canadian PBN State Plan aims to:
  - enhance the overall safety of Canadian ANS;
  - provide a strategy to transition to Satellite-based ANS;
  - apply ICAO concepts for SIDs, STARs
  - allow fixed and dynamic routes;
  - implement the CNS/ATM system for operational req's;
  - avoid need for multiple types of equipment;
  - avoid multiple airworthiness/operational approvals; and
  - establish a time-line for implementing PBN in Canada.

Plan – RNAV vs RNP





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RNP APCH				✈	✈
RNP AR APCH				✈	✈
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PBN State Plan – Challenges (Safety)

- Safety challenges include:
  - integration of PBN into ATM;
  - safety monitoring of ATM system;
  - mixed fleet/system operations;
  - education and training of stakeholders;
  - approach naming and charting conventions;
  - data base integrity and control; and,
  - GNSS interference (intentional or unintentional).

PBN State Plan – Challenges (Regs)

- Regulatory challenges include:
  - accommodation of DME/DME navigation;
  - certification of equipment and aircraft;
  - development of crew training and licensing req's;
  - development of PBN Regulatory Framework;
  - Remain in harmony with NAV CANADA's PBN plan.

Direction

- COMM
  - Datalink, SATCOMM
- NAV
  - Full PBN environ
- SURV
  - ADS-B (Satellite)
- ATM
  - Trajectory-based management

Transport Canada Transports Canada

PBN State Plan – Canada

February 2015

Blocks

CNS/ ATM	Block 0 2013 – 2017	Block 1 2018 – 2022	Block 2 2023 – 2027
COMM	Increase use of Data-Link and satellite communciations	Use of Data-Link and SATCOM-Voice in lieu of VHF-Voice in some scenarios. Introduction of 8.33 KHz VHF spacing	To be determined
NAV	Mixed mode: moving to PBN. Review existing airspace designation; develop methodology and triggers for future reviews. Navigation systems will be reviewed and progressively adapted.	Some exclusive PBN environments. Full review of Canada's airspace.	Full PBN environment, with some system redundencies. Ongoing review of airspace impacts from new technologies.
SURV	Planning for progressive use of 1090 MHz ADS-B Out.	Plan for the mandatory use of ADS-B in designated airspace	Continued plan for mandatory use of ADS-B in designated airspace. Contingency capability.
ATM	Infrastructure, procedure and tool development towards: trajectory-based management, and education programs.	Implementation of trajectory-based management tools with training and education.	Trajectory-based management in place supported by integrated information and collaborative processes.

CPAAT

Canadian Performance-based Aviation Action Team

- Serves as a focus group for PBN Regs and Stds
- Will facilitate:
  - the implementation of Performance-based Ops (CNS/ATM);
  - the meeting of short, medium and long term goals;
- Provides a multi-disciplinary forum for the:
  - regulator, service provider, users & manufacturers.

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