Overview of the PBN Airspace Implementation Processes

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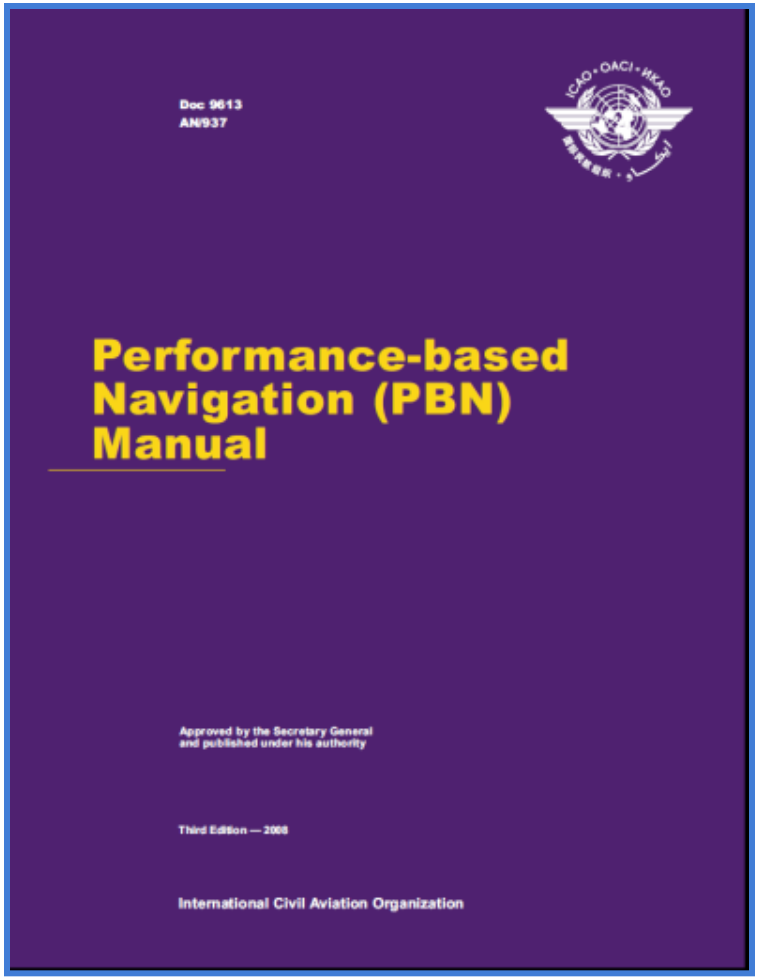
Overview

- Learning Objective:
  - Understand the Processes involved in the planning, design, validation and implementation of a PBN Airspace Concept
- This presentation will discuss
  - The activities that lead up to the implementation of a PBN Airspace Concept.

ICAO PBN Manual
Doc 9613

- **Volume I**
  - *Airspace Concept*
  - *Implementation Processes*
- **Volume II**
  - *Navigation Specifications*



PBN Implementation Processes

- Two main processes are provided to assist States in the implementation of PBN; these cover four project organisation phases of Planning, Design, Validation and Implementation.
- The two ICAO Processes are:
  - Process 1 — Identifying an ICAO Navigation Specification for implementation (Planning and Design)
  - Process 2 — Validation and Implementation
- The ICAO Processes are designed to enhance the application of harmonized global standards, and avoid proliferation of local/regional standards

PBN Implementation Process 1

- Covers project planning and airspace design.
- Outlines steps for a State or region to determine the strategic and operational requirements for the development of an airspace concept in order to implement performance-based navigation.
- Fleet equipage and CNS/ATM infrastructure in the State or region are assessed and navigation functional requirements are identified.
- An appropriate navigation specification is initially selected.

PBN Implementation Process 2

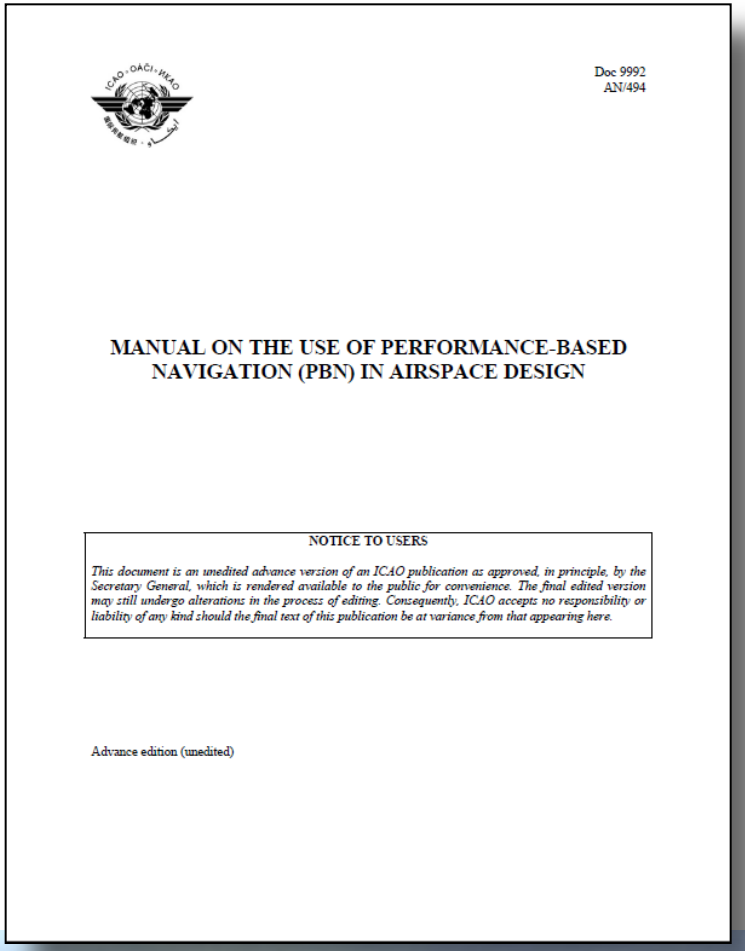
- Covers validation and implementation.

- Provides steps that allow the operational requirement and corresponding navigation specification to be turned into an implementation reality.

ICAO Manuals

Airspace Design is documented in ICAO Manual

Doc 9992 –
Manual on The Use of Performance-Based Navigation (PBN) in Airspace Design



Doc 9992
AN/494

MANUAL ON THE USE OF PERFORMANCE-BASED NAVIGATION (PBN) IN AIRSPACE DESIGN

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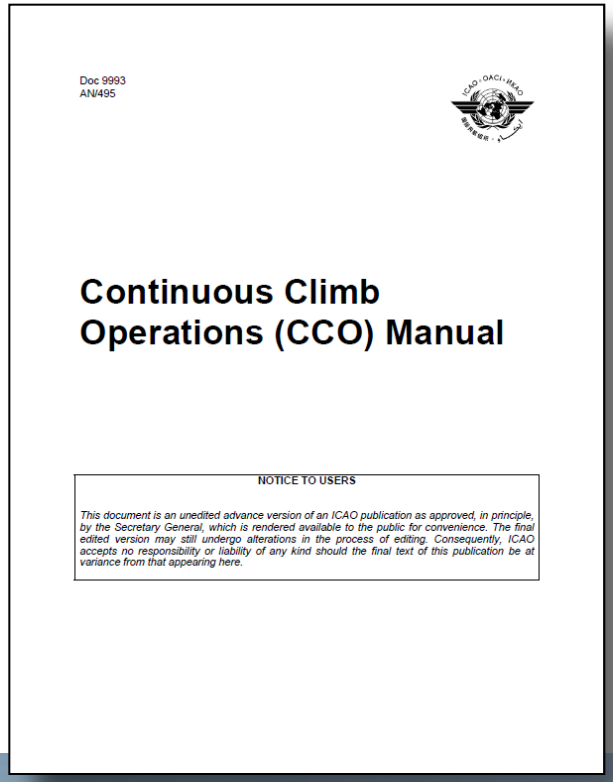
Advance edition (unedited)

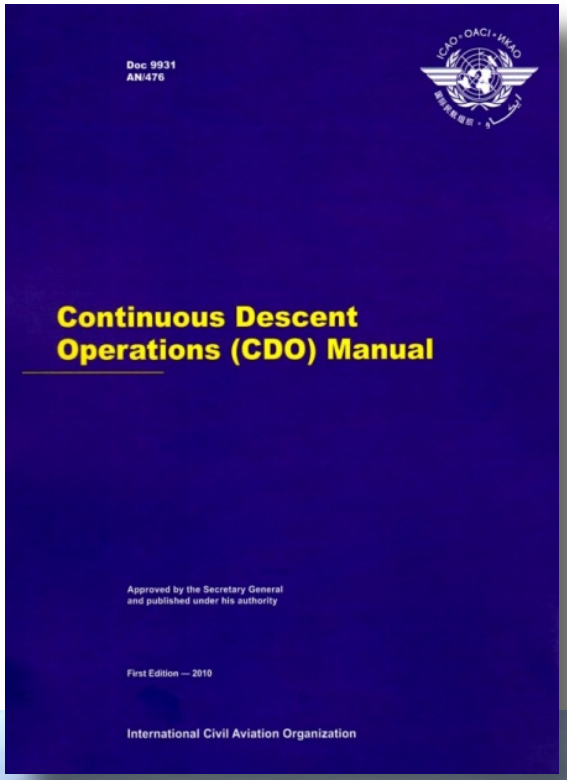
ICAO Manuals

CCO and CDO are documented in ICAO Manuals

Doc 9993 – Continuous Climb Operations Manual



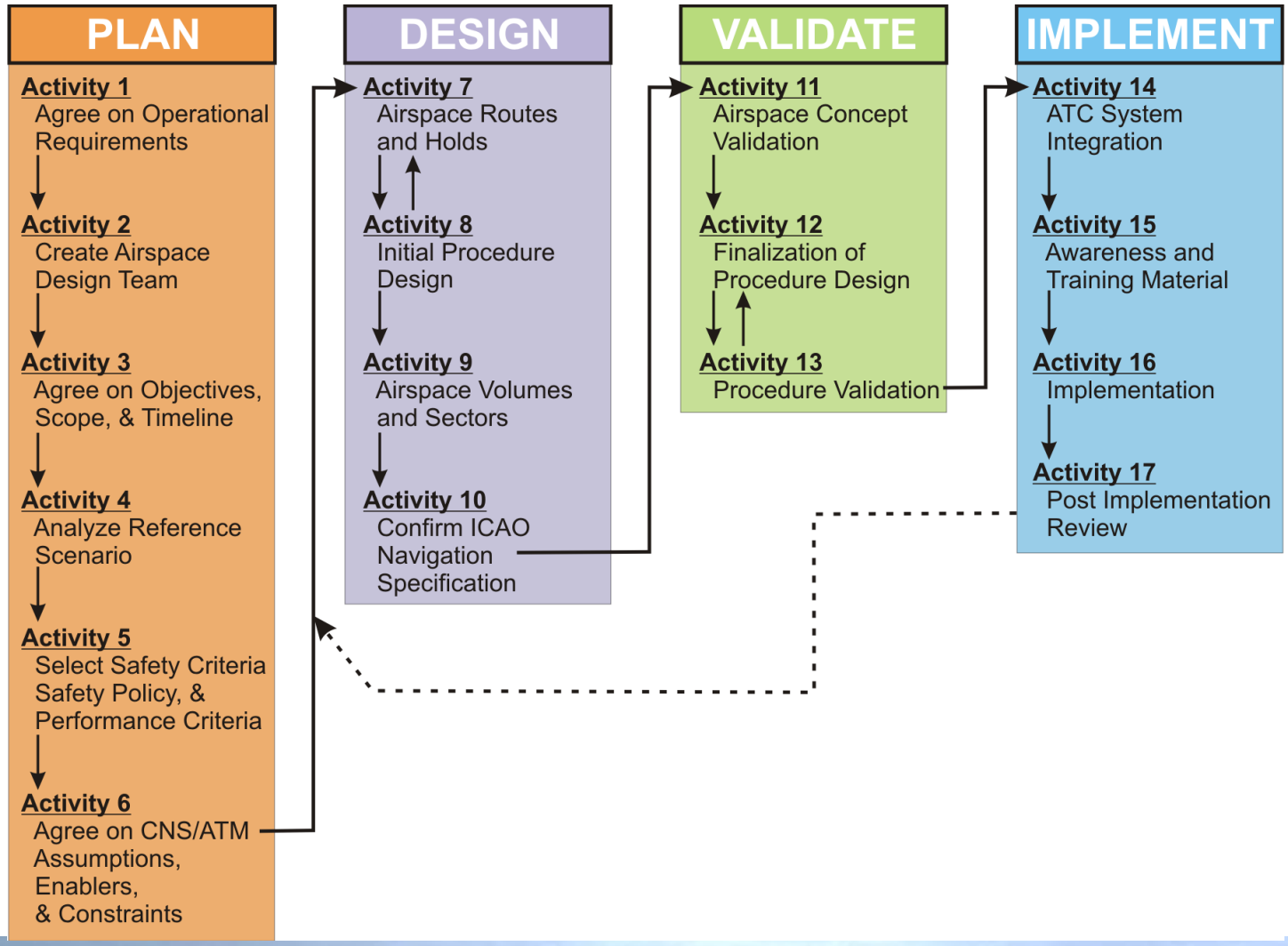
Doc 9931 - Continuous Descent Operations Manual



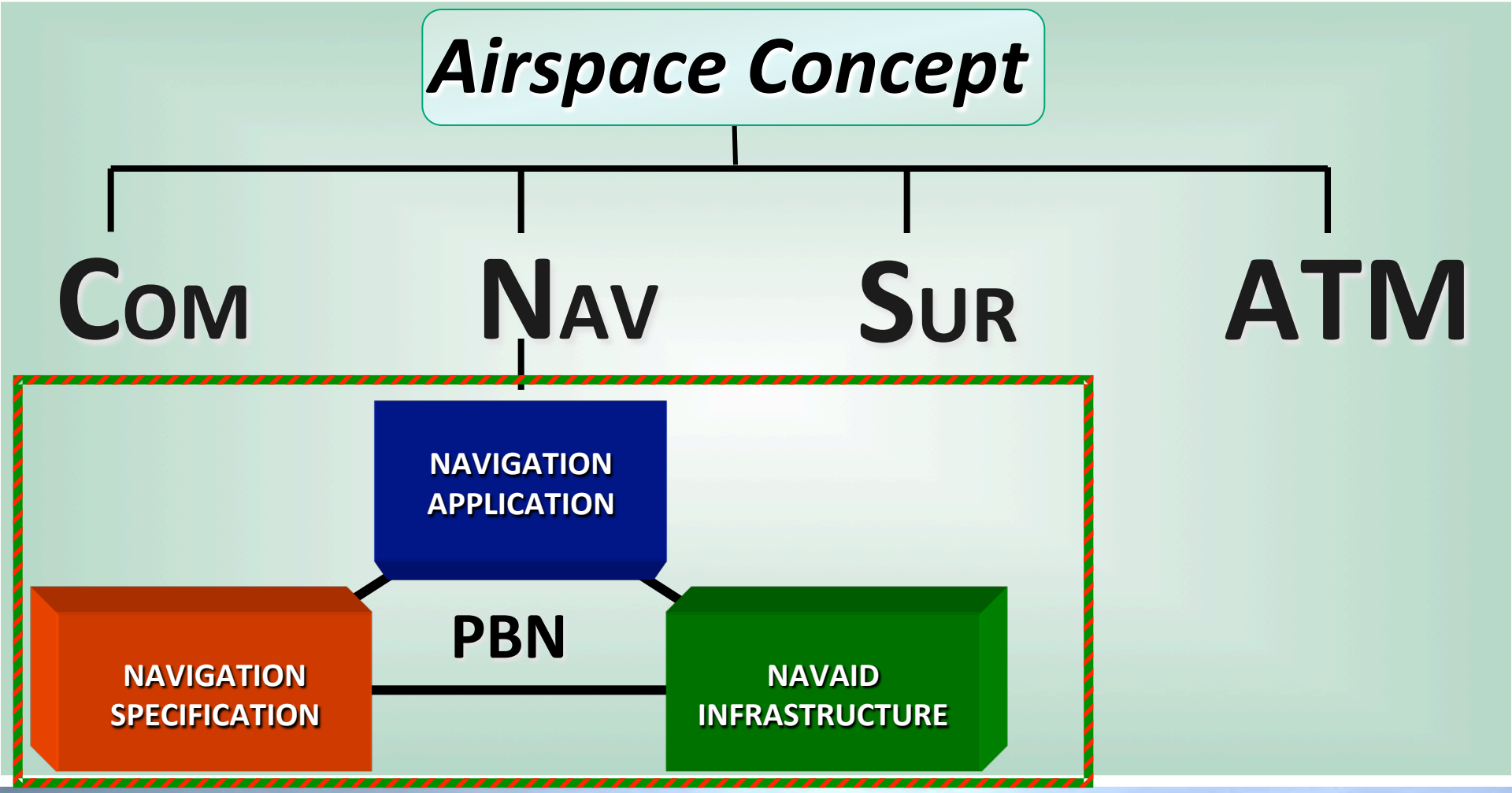
PBN Implementation Processes

High-level sequential outline of processes to use when considering PBN implementation

PBN Implementation Processes

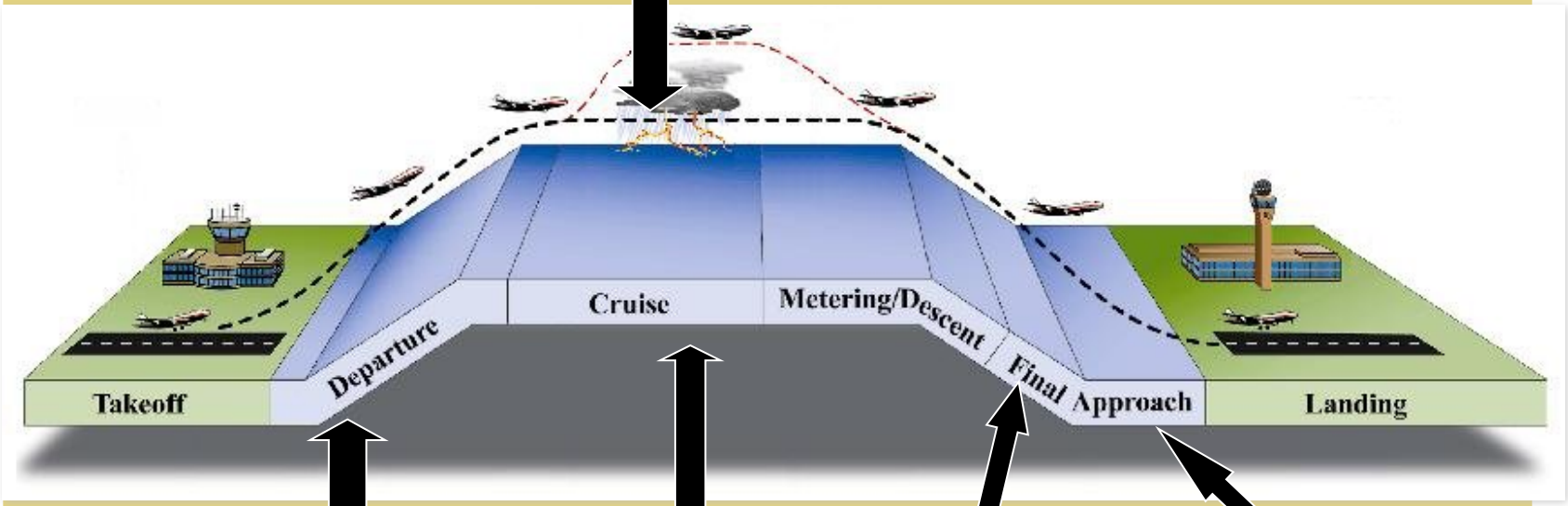


PBN Enables the Airspace Concept



Navigation Specification by Flight Phase

OCEANIC / Enroute Remote (nonSUR)
RNAV 10, RNP 4, RNP 2, Advanced RNP 2



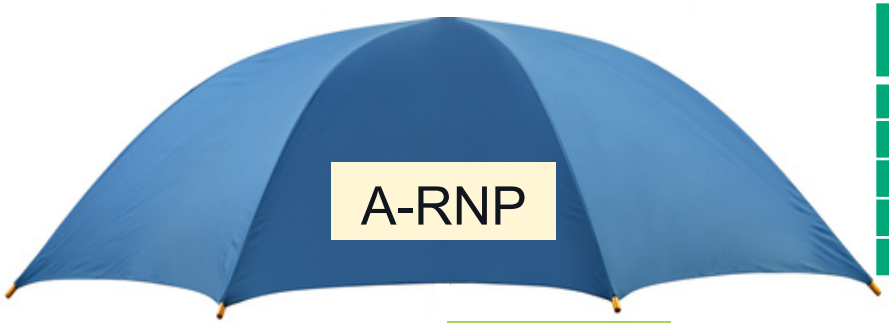
RNAV 1/2 &
RNP 1 SIDs
ARNP 1 SIDs

RNAV 5/2/1
RNP 2
Advanced RNP 2 or 1
Enroute Continental

RNAV 1/2 &
RNP 1 STARs
ARNP 1 STARs

RNP Approach
RNP-AR Approach

Advanced RNP



Optional Performance/ Functionality
RNP Scalability
RNP 2 oceanic/remote
Fixed Radius Transition (FRT)
Time of Arrival Control
Barometric VNAV

RF legs
Parallel offset
RNAV holding

RNAV 5

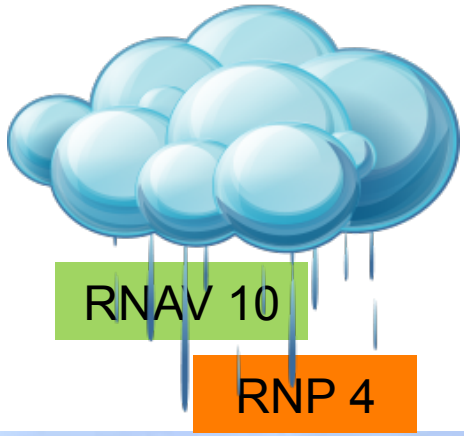
RNAV 2

RNP APCH

RNAV 1

RNP 2
Final approach: RNP 0.3

RNP 1



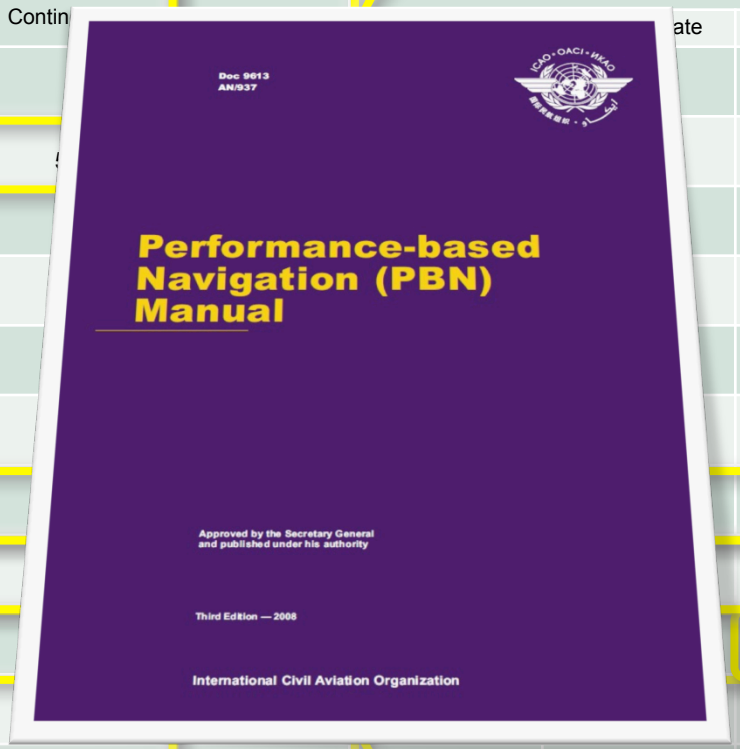
Advanced RNP

- A-RNP is based upon GNSS
  - ANSPs should ensure operators relying on GNSS are required to have the means to predict the availability of GNSS fault detection (e.g. ABAS RAIM)
- Operator procedures, maintenance, dispatch and other operations processes that satisfy the A-RNP criteria will be considered acceptable for RNAV 1, RNAV 2, RNAV 5, RNP 2, RNP 1 and RNP APCH Part A.
- An A-RNP aircraft qualification can be more broadly applicable to multiple navigation specifications without the need for re-examination of aircraft eligibility. This enables an operator's approved procedures, training, etc to be common to multiple navigation applications.
- The RNP system should provide the ability to intercept the final approach at or before the final approach fix. This functional capability must provide the pilot with the ability to rejoin the published final approach track following a period when the aircraft has been flown manually, or in AFCS Heading mode, following ATC vectors to support Final Approach Sequencing.

Navigation Specification by Flight Phase

8. The RNP 0.3 specification is primarily intended for helicopter operations.

Navigation Specification	Flight phase							
	En-route oceanic/remote	En-route Contin	Arrival		ate	Approach Final	Missed [1]	Departure
RNAV 10	10							
RNAV 5 [2]								
RNAV 2								2
RNAV 1							1	1
RNP 4	4							
RNP 2	2							
RNP 1 [3]							1	1
Advanced RNP [4]	2 [5]					0.3	1	1
RNP APCH [6]						0.3 [7]	1	
RNP AR APCH						0.3-0.1	1-0.1	
RNP 0.3 [8]		0.3	0.3	0.3	0.3		0.3	0.3



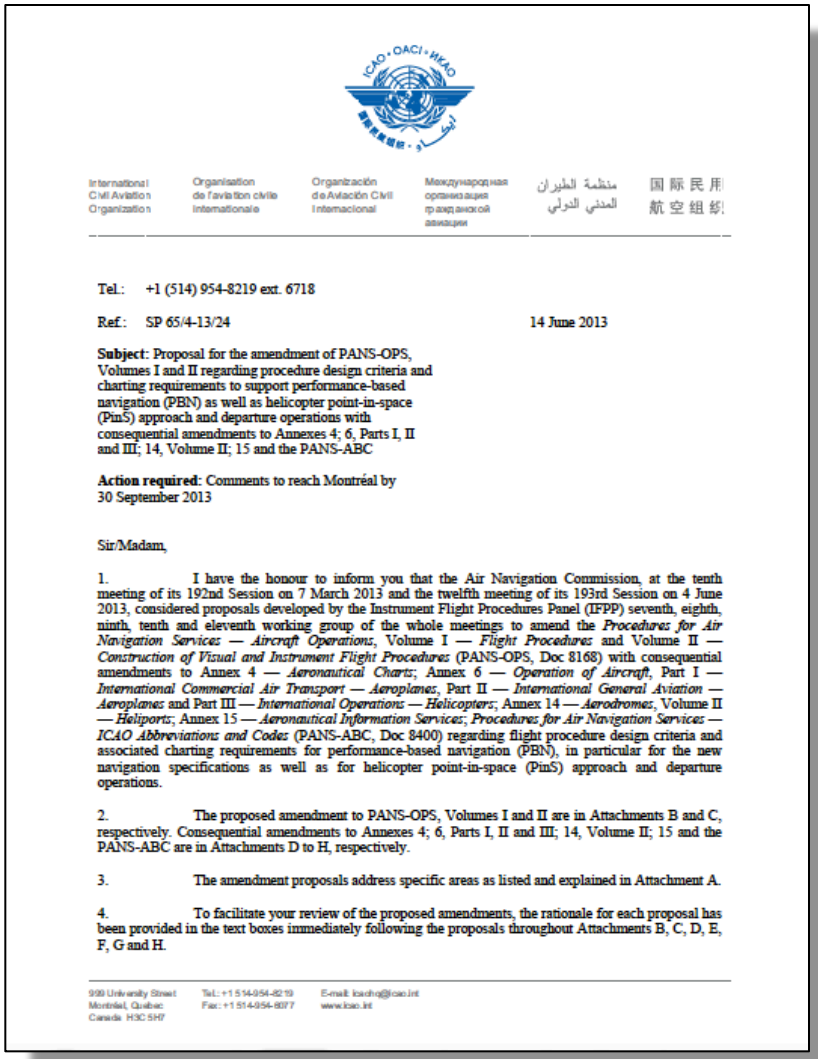
PBN

ICAO State Letter SP 65/4-13/24

Proposes amendments to:

- PANS-OPS, Volume I
- PAN-OPS Volume II
- Annex 4
- Annex 6, Parts I, II and III
- Annex 14, Volume II
- Annex 15
- PANS-ABC

Applicable on 13 November 2014



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Tel.: +1 (514) 954-8219 ext. 6718

Ref.: SP 65/4-13/24 14 June 2013

Subject: Proposal for the amendment of PANS-OPS, Volumes I and II regarding procedure design criteria and charting requirements to support performance-based navigation (PBN) as well as helicopter point-in-space (PinS) approach and departure operations with consequential amendments to Annexes 4; 6, Parts I, II and III; 14, Volume II; 15 and the PANS-ABC

Action required: Comments to reach Montréal by 30 September 2013

Sir/Madam,

1. I have the honour to inform you that the Air Navigation Commission, at the tenth meeting of its 192nd Session on 7 March 2013 and the twelfth meeting of its 193rd Session on 4 June 2013, considered proposals developed by the Instrument Flight Procedures Panel (IFPP) seventh, eighth, ninth, tenth and eleventh working group of the whole meetings to amend the *Procedures for Air Navigation Services — Aircraft Operations*, Volume I — *Flight Procedures* and Volume II — *Construction of Visual and Instrument Flight Procedures* (PANS-OPS, Doc 8168) with consequential amendments to Annex 4 — *Aeronautical Charts*; Annex 6 — *Operation of Aircraft*, Part I — *International Commercial Air Transport — Aeroplanes*, Part II — *International General Aviation — Aeroplanes* and Part III — *International Operations — Helicopters*; Annex 14 — *Aerodromes*, Volume II — *Heliports*; Annex 15 — *Aeronautical Information Services*; *Procedures for Air Navigation Services — ICAO Abbreviations and Codes* (PANS-ABC, Doc 8400) regarding flight procedure design criteria and associated charting requirements for performance-based navigation (PBN), in particular for the new navigation specifications as well as for helicopter point-in-space (PinS) approach and departure operations.

2. The proposed amendment to PANS-OPS, Volumes I and II are in Attachments B and C, respectively. Consequential amendments to Annexes 4; 6, Parts I, II and III; 14, Volume II; 15 and the PANS-ABC are in Attachments D to H, respectively.

3. The amendment proposals address specific areas as listed and explained in Attachment A.

4. To facilitate your review of the proposed amendments, the rationale for each proposal has been provided in the text boxes immediately following the proposals throughout Attachments B, C, D, E, F, G and H.

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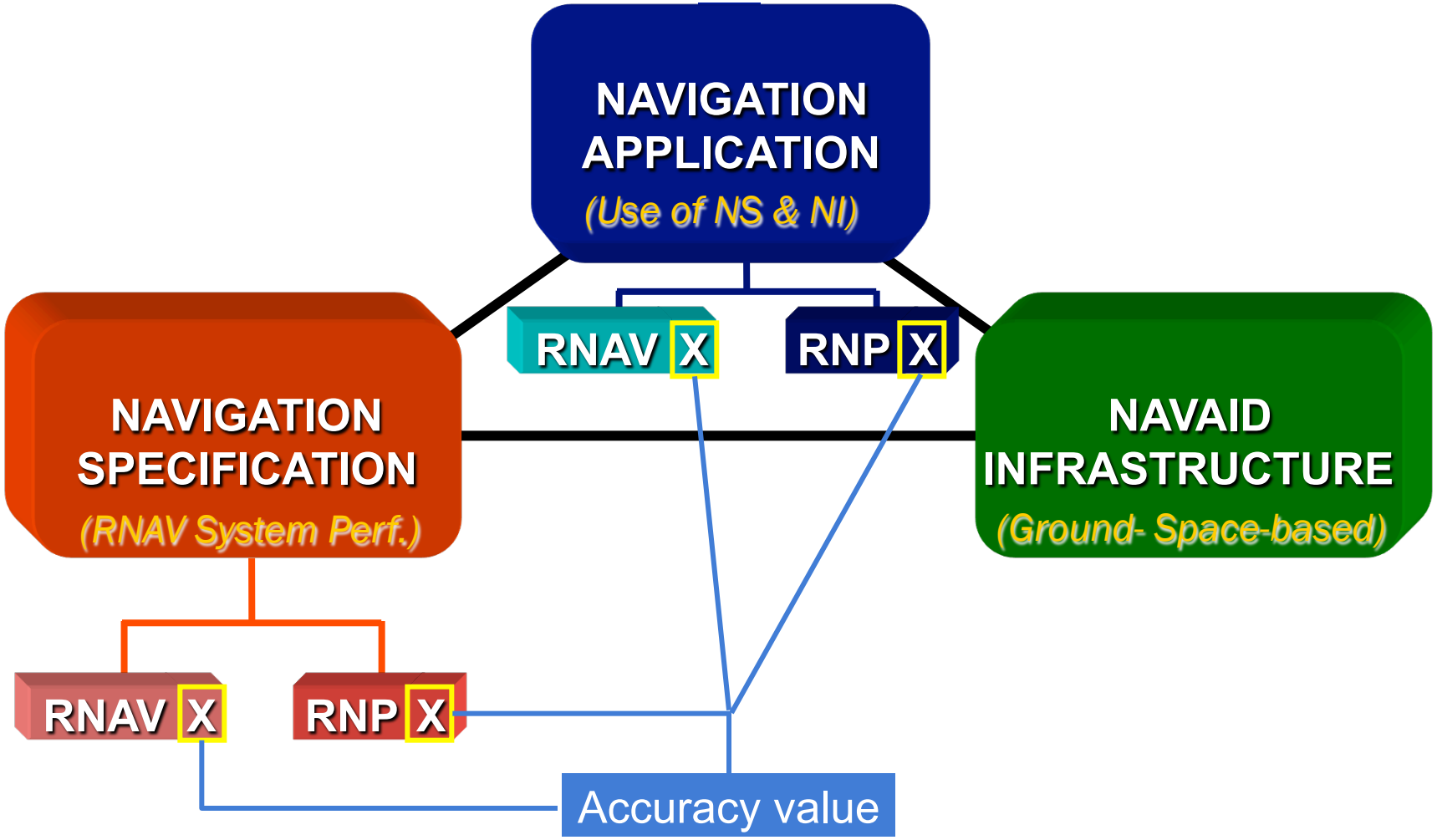
Airspace Concept

Overview

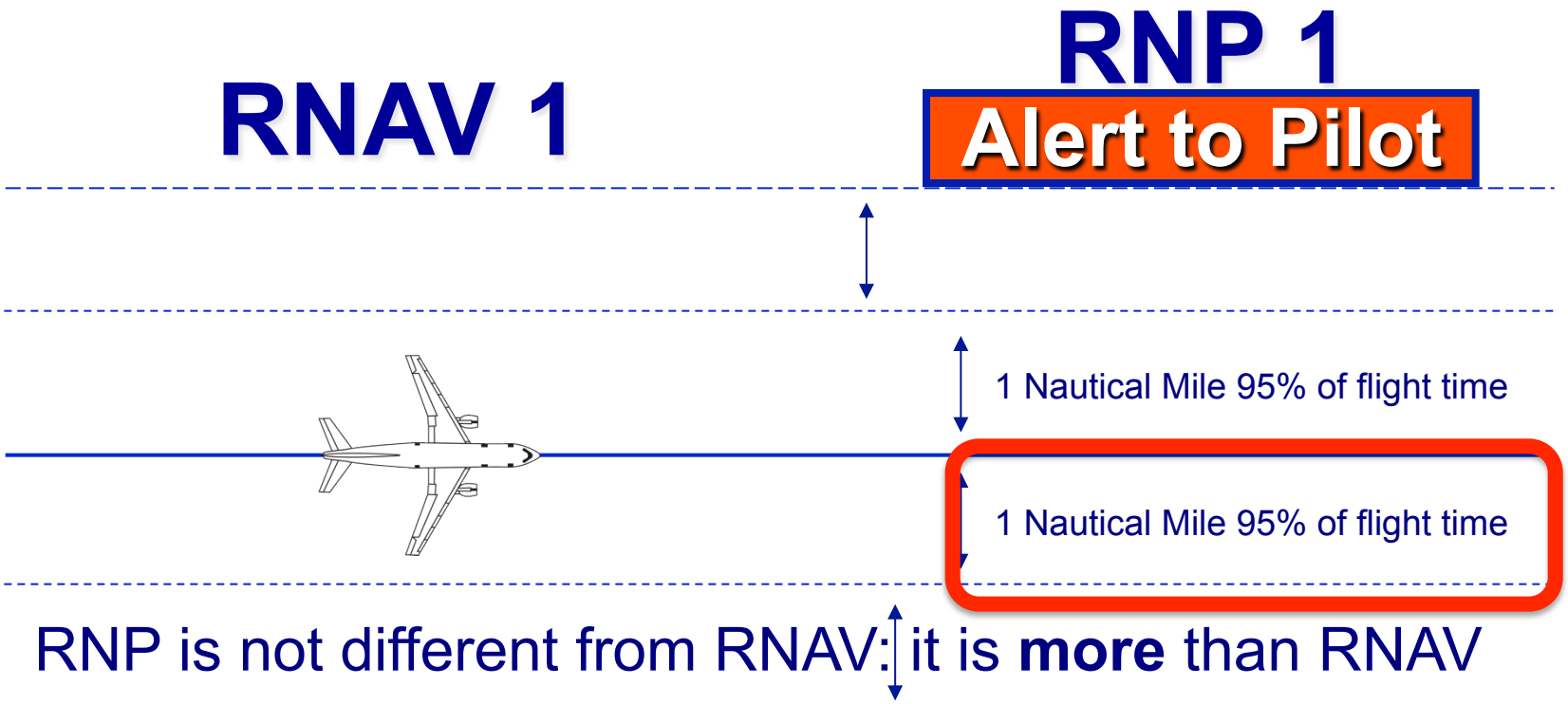
- **Learning Objective:**
  - **Understand the Airspace Concept**

- **This presentation will discuss**
  - **What is an Airspace Concept**
  - **Why develop an Airspace Concept**
  - **Who develops an Airspace Concept**
  - **What is needed to develop an Airspace Concept**
  - **What happens after the Airspace Concept is developed.**

PBN Concept Review

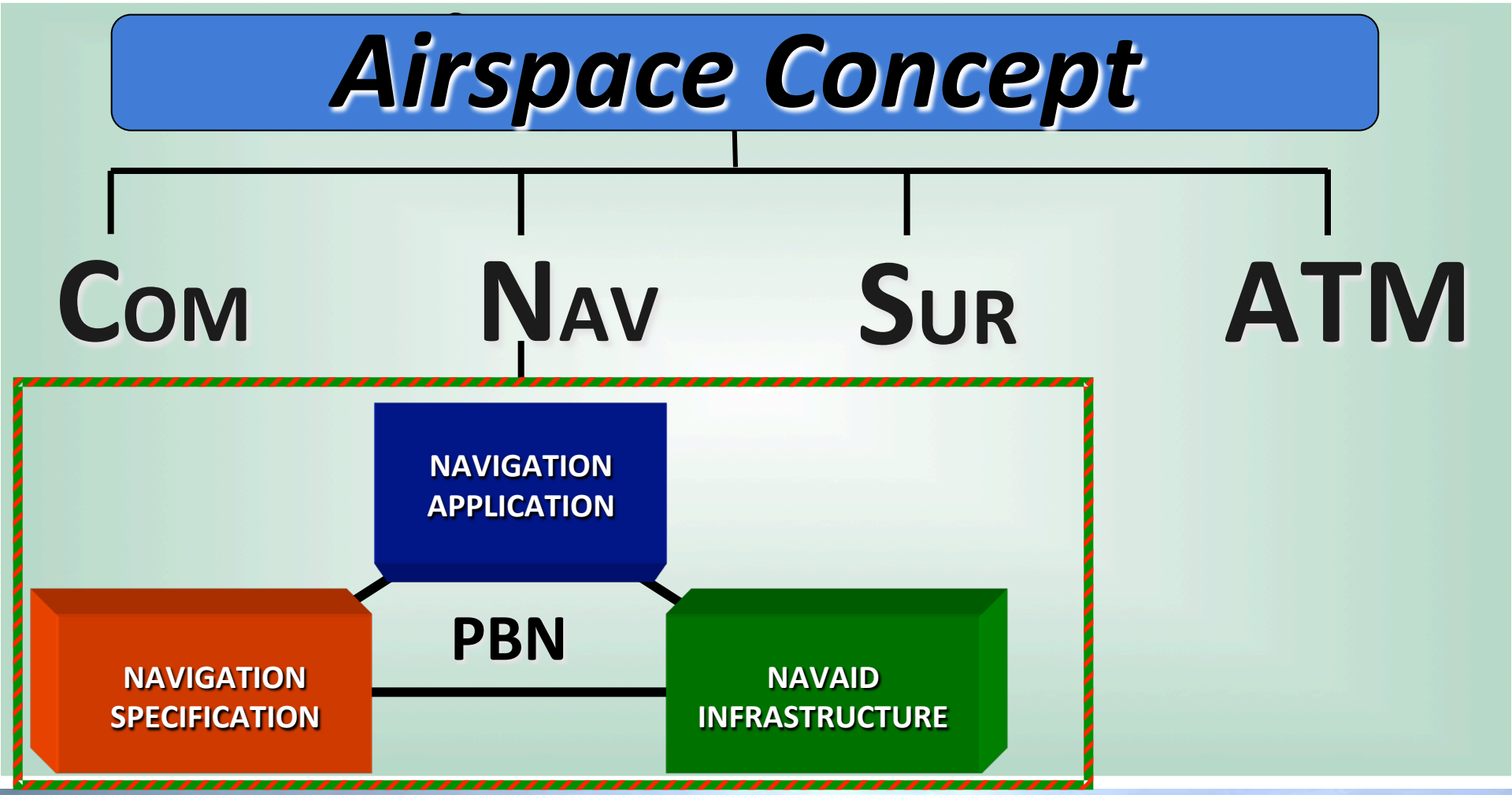


RNAV and RNP



The Key Extra Ingredient:
On-Board Performance Monitoring and Alerting

PBN enables Airspace Concepts

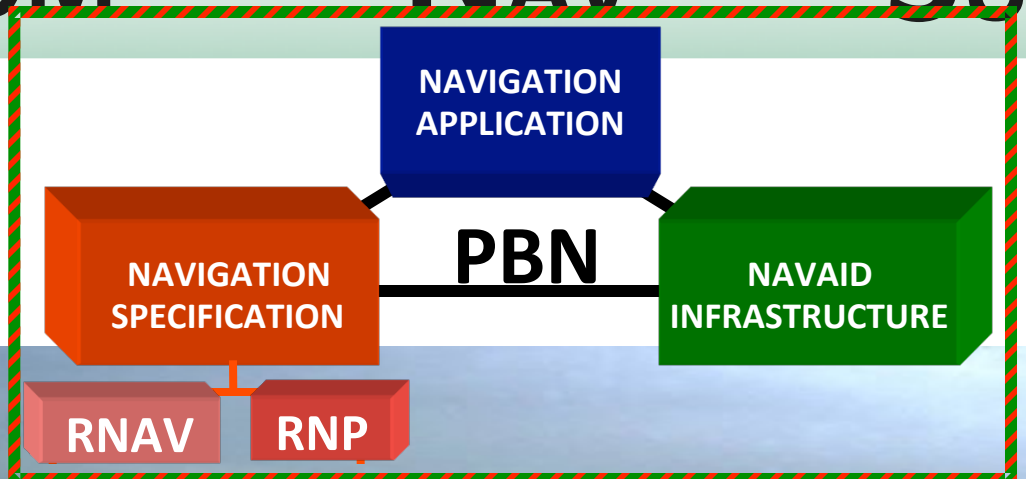


Strategic Goals (Expected Benefits)

Safety? | Capacity? | Efficiency? | Environment? | Access?

Airspace Concept

COM | NAV | SUR | ATM



What is an Airspace Concept?

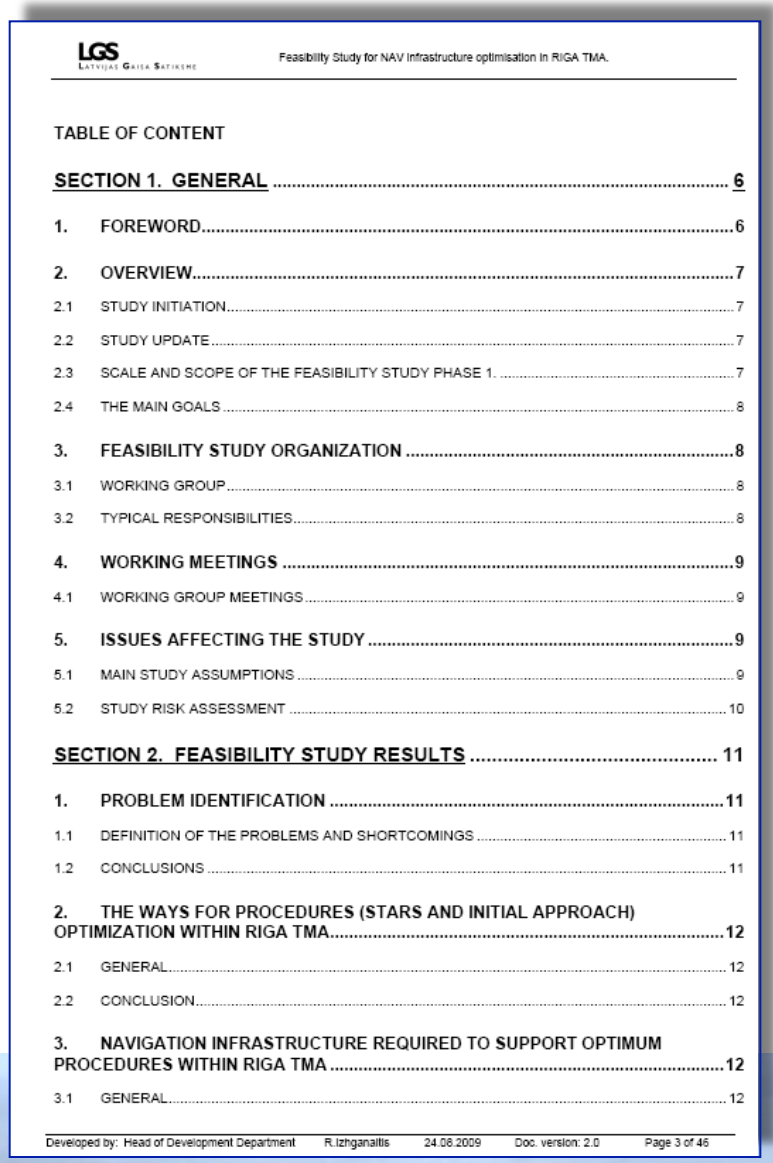
- A master plan of the intended airspace design and its operation
  - Describes the intended operations within an airspace
  - Developed to satisfy explicit and implicit strategic objectives (improved safety, increased air traffic capacity, improved efficiency, mitigation of environmental impact)
- A fully developed Airspace Concept:
  - Describes in detail the airspace organization and its operations
  - Addresses all the strategic objectives identified for the project
  - Addresses all CNS/ATM enablers
  - Identifies all operational and technical assumptions

Why develop an Airspace Concept?

- Airspace Concept development provides a structured and systematic way of determining
  - What is to be achieved in an airspace, and
  - How it will be achieved
- The development process helps ensure
  - ✓ Goals (expected benefits) of planned airspace structure are clearly stated;
  - ✓ Objectives of the airspace change are met; and
  - ✓ The means to achieve these goals are appropriate and feasible within the resources available to the airspace system

What does it look like?

- An Airspace Concept can be in any document format
- Maintain configuration control!



LGS Latvijas Gaisa Satiksme — Feasibility Study for NAV Infrastructure optimisation in RIGA TMA.

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What is the most critical point in developing an Airspace Concept?

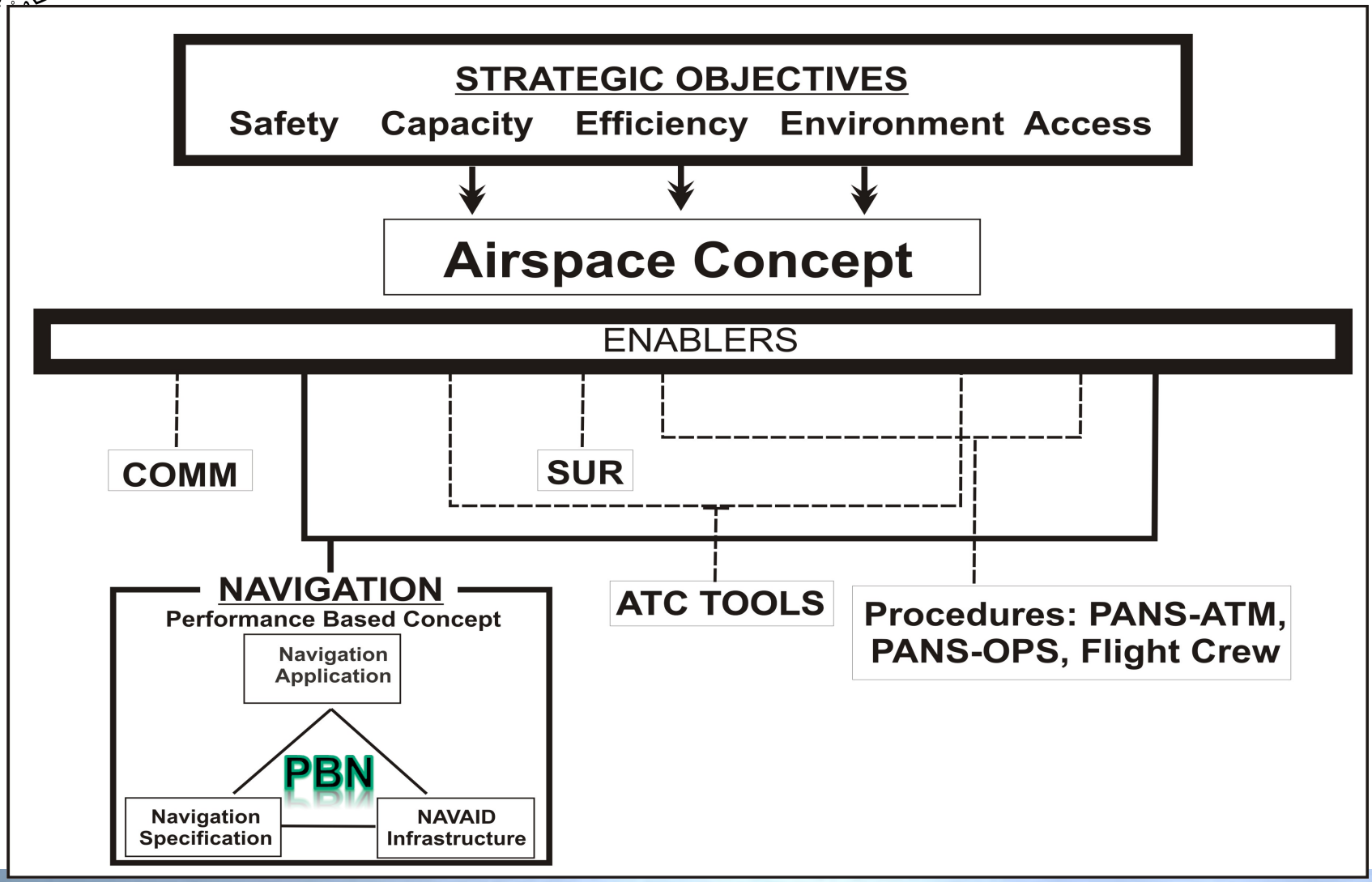
Setting the appropriate objectives and scope

- Enables the project team to remain focused and the budget to be managed within the set time
- Most projects which fail to meet the intended goal do so because of poorly defined scope and objectives.
- Beware of project creep*!*

Once the Airspace Concept is developed, what's next?

- Lay out a detailed program plan for the specific implementation(s) in the Airspace Concept
- ICAO sample action plans (domain-specific and comprehensive)
  - Consider just as a starting point
  - Adapt as needed to the specific circumstances of a project
  - Steps not always conducted in strict sequence
  - Certain steps may be conducted on a recurring basis as the project progresses
  - Steps and the sequence in which they are performed in the project should be evaluated by the implementation team on the basis of experience and judgment

Airspace Concept Summary



Questions??