PBCS Framework

Global Operational Data Link (GOLD)

Familiarization with Performance Based Communications and Surveillance (PBCS) Workshop

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FAA

Federal Aviation Administration

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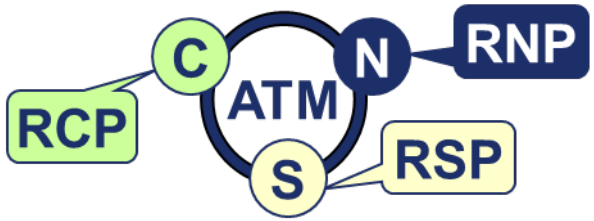
Why do we need PBCS?



- ATM is dependent on communication (C), navigation (N) and surveillance (S) capabilities and performances
- Performance-based navigation (PBN) ensures operator and aircraft **N**avigation systems meet global required navigation performance (RNP) specifications
- **C**ommunications and **S**urveillance capabilities and performances are different — and vary across operators, aircraft C and S systems and infrastructure
- PBCS is needed to ensure operator, aircraft C and S systems and infrastructure meet global required communication performance (RCP) and required surveillance performance (RSP) specifications

Why PBCS?

Operators want / have choices for their “data link”

Technology

- **FANS 1/A**
- **ATN B1**
- **B2**
- **POA (VDL M0/A)**
- **AOA (VDL M2)**
- **HFDL**
- **SATCOM**
  - Classic Aero on I3/I4
  - Data 2/Data 3
  - SwiftBroadBand (SBB)
  - Short Burst Data (SBD)
  - Certus

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Implementation

- **AOC**
- **Cabin Services**
- **Configurable Avionics**
- **Procedures**
- **CSP/SSP**
  - SITA
  - ARINC
  - Inmarsat
  - Iridium
  - MTSAT

Different capability

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System changes and continuous improvement

… and ATM operations, such as applying performance-based separation minima, rely on a specific data link capability TK

PBCS Framework Purpose

PBCS Manual "Scope and Purpose"

- The PBCS concept provides a framework for managing communication and surveillance performance in accordance with **globally** accepted required communication performance (RCP) and required surveillance performance (RSP) specifications
- State safety assurance – The PBCS concept supports safety oversight by providing allocated functional, safety and performance requirements, which are contained in RCP/RSP specifications, and a means of compliance framework for approval of the different communication and surveillance system components, and identify substandard performance for appropriate action. These components include, for example, the aircraft operator, aircraft type/system, ANSP, CSP/SSP, and others, as appropriate

PBCS Framework

PBCS Manual Definitions

- **Performance-based communication (PBC)**. Communication based on performance specifications applied to the provision of air traffic services.

  Note.— An RCP specification includes communication performance requirements that are allocated to system components in terms of the communication to be provided and associated ***transaction time, continuity, availability, integrity, safety and functionality*** *needed for the proposed operation in the context of a particular airspace concept.*

- **Performance-based surveillance (PBS)**. Surveillance based on performance specifications applied to the provision of air traffic services.

  Note.— An RSP specification includes surveillance performance requirements that are allocated to system components in terms of surveillance to be provided and associated data ***delivery time, continuity, availability, integrity, accuracy of the surveillance data, safety and functionality*** *needed for the proposed operation in the context of a particular airspace concept*

PBCS Framework

PBCS Manual Definitions -PBN for Comparison

- **Performance-based navigation (PBN)**. Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

  Note.— Performance requirements are expressed in navigation specifications (RNAV specification, RNP specification) in terms **of accuracy, integrity, continuity, availability and functionality** needed for the proposed operation in the context of a particular airspace concept. (ICAO)

PBCS and PBN

PBCS Manual 1.1.4

- There are some differences between the PBCS concept and PBN concept:
  - The PBCS concept applies RCP and RSP specifications, which allocate criteria to **ATS provision, including communication services, aircraft capability, and the aircraft operator**;
  - the PBN concept applies RNP/RNAV specifications, which allocate criteria only to the **aircraft capability and the aircraft operator**; and

  - The PBCS concept includes **post-implementation monitoring** programmes, on a local and regional basis, with global exchange of information;
  - the PBN concept includes **real time monitoring and alerting** functionality in the aircraft capability.
  - Note.— **PBCS includes real time alerts** (e.g. when a communication transaction expires or a position report is overdue) that25a|PrBeCSconceptually different than the PBN alerts (e.g. RNP UNABLE).

ICAO Documentation

Provisions for PBCS – Effective 10 November 2016	
Document ID	**Description**
Annex 6	Operation of Aircraft
Part I	Commercial Air Transport - Aeroplanes
Part II	General Aviation - Aeroplanes
Part III	Operations - Helicopters
Annex 11	Air Traffic Services
Annex 15	Aeronautical Information Services
Doc 4444	PANS – Air Traffic Management
Doc 8400	PANS – Abbreviations and Codes

Supporting Guidance Material	
Document ID	**Description**
Doc 9869	Performance-based Communication and Surveillance (PBCS) Manual, Edition 2
Doc 10037	Global Operational Data Link (GOLD) Manual, Edition 1

One Slide Summary of ICAO PBCS Provision

State, ANSP **and** Operator **each have responsibility**

In accordance with the ICAO PBCS Provision, State	**In accordance with State policies**	
	ANSP	Operator
❑ Establishes PBCS policies for ANSP, operator, airworthiness, etc. ❑ Prescribes RCP/RSP specifications in the applicable airspace for the relevant operations ❑ Publishes PBCS requirements in aeronautical information publication (AIP)	❑ Provides RCP/RSP-compliant air traffic services* ❑ Recognizes RCP/RSP capabilities in air traffic control (ATC) automation ❑ Establishes PBCS monitoring program	❑ Prepares to file RCP/RSP capabilities in flight plan ❑ Participates in ANSP PBCS monitoring programs

* RCP/RSP specifications include allocated criteria to the communication service provider (CSP). These criteria are applied to the CSP through service agreements with theANSP and/or operator.

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PBCS Framework Application

PBCS Manual 1.2.1

- The PBCS concept provides a framework to apply RCP and RSP specifications to ensure the acceptable communication and surveillance capabilities and performance of an operational system. The PBCS concept applies RCP and RSP specifications in any one or more of the following ways:
  - **air traffic services (ATS)** provision and prescription (in accordance with ICAO Annex 11, PANS, Regional Supplementary Procedures (Doc 7030) and/or the AIP (or equivalent publication)) of an RCP specification for a communication capability and/or an RSP specification for a surveillance capability, either of which is required for the ATS in a particular airspace;
  - **operator approval** (under air operator certificate, special authorization or equivalent, in accordance with ICAO Annex 6) of a communication and/or surveillance capability including aircraft equipage where RCP and/or RSP specifications have been prescribed for the communications and/or surveillance capabilities supporting the ATS provision; and
  - **local and regional monitoring** programmes to assess actual communication and surveillance performance against RCP and RSP specifications and to determine corrective action, as applicable, for the appropriate entity.

Impact to ANSPs

* Operators currently eligible for and using **performance-based separation minima** (50 long, 30 long, 30 lat) will require a State issued approval for RCP240 and RSP180 to declare eligibility on and following 29 March 2018

1) CONOPs for use of PBCS for designated ATM operations
2) Modify ATM automation to use applicable “P” codes in Field 10 and “RSP” codes in Field 18 SUR/
    * **ANSPs not using “P” and “RSP180” should ensure flight plans with these codes are not rejected by ATM automation**
3) Modify ATM automation to record and maintain ADS-C, CPDLC, flight plan data and produce monitoring data according to guidance in Appendix D of PBCS Manual
4) Use assembled data to assess actual communication performance (ACP) and actual surveillance performance (ASP) against required communication performance (RCP) 240 and required surveillance performance (RSP) 180

PBCS approval required to be eligible to participate in the following horizontal separation minima in accordance with ICAO PANS-ATM (Doc 4444):

Dimension of separation	Separation Minima	RSP requirement	RCP requirement	Associated navigation requirement
Lateral	**42.6 km (23 NM)***	180	240	RNP4
Performance-based Longitudinal	**5 minutes**	180	240	RNP2 or RNP4 or RNP10
Performance-based Longitudinal	**55.5 km (30 NM)**	180	240	RNP2 or RNP4
Performance-based Longitudinal	**93 km (50 NM)**	180	240	RNP4 or RNP10

* **Also applicable to existing and future applications of 30NM lateral separation minima**

Airspace using or planning to use one or more of the above

- PAC FIRs: Anchorage, Auckland, Brisbane, Fukuoka, Nadi, Oakland, Port Moresby, Tahiti
- NAT FIRs: Gander, Shanwick, Reykjavik, New York, Santa Maria
- Asia: Some routes over Bay of Bengal and South China Sea

Impact to Operators

- **All aircraft with operational authorization to use data link will be able to continue using data link (ADS-C and CPDLC) up to 29 March 2018 and beyond without RCP240/RSP180 approval**
- Operators desiring to use performance-based separation standards from 29 March 2018 and beyond will need to meet the requirements for RCP240 and RSP180 and obtain corresponding approval from State of Operator/State of Registry
  - May then file **P2** in field 10 to specify RCP240 and SUR/**RSP180** in field 18 to specify RSP180
  - Provides indication to data link ground systems that aircraft is eligible to use performance-based separations requiring RCP240 and RSP180
  - No exclusionary airspace planned

Impact to States

- For All States with aircraft intending to utilize airspace with PBCS requirements:
  1) Develop and promulgate PBCS policies for issuing operator RCP240/RSP180 approvals and filing of respective flight plan codes
- For States with ATM operations requiring RCP240/RSP180 (see slide 5):
  1) Promulgate intended use of RCP240/RSP180 specifications and applicable to ATM operations
     - Aeronautical Information Publication (AIP), Aeronautical Information Circulars (AIC), etc.
  2) Update policies and objectives supporting safety oversight for ANSP to reflect PBCS
     - Aeronautical Information Manual, orders/documentation for flight services, etc.
  3) Contribute to and ensure applicable updates to Doc 7030 regional supplementary procedures to reflect intended applicable of PBCS

Status of State Operator Policy Development

- **Transport Canada**
  - Advisory Circular (AC) 700-041: **effective 1 Jan 2017**
- **United Kingdom**
  - Aeronautical Information Circular Y 062/2017: **effective 8 June 2017**
- **United States**
  - Advisory Circular (AC) 90-117
    - Posted for 30-day public comment (ended 15 May)
    - Anticipated publish date in **September 2017**
  - FAA inspector guidance, authorization templates (A056) and a compliance matrix published anticipated by **Sep 2017**

PBCS Monitoring Requirements

- **Annex 11, 3.3.5.2** Where RCP/RSP specifications are applied, programmes shall be instituted for monitoring the performance of the infrastructure and the participating aircraft against the appropriate RCP and/or RSP specifications, to ensure that operations in the applicable airspace continue to meet safety objectives. The scope of monitoring programmes shall be adequate to evaluate communication and/or surveillance performance, as applicable.
- **Annex 6, Part I, 7.1.5** The State of the Operator shall ensure that, in respect of those aeroplanes mentioned in 7.1.3, adequate provisions exist for:
  a) receiving the reports of observed communication performance issued by monitoring programmes established in accordance with Annex 11, Chapter 3, 3.3.5.2;
  b) taking immediate corrective action for individual aircraft, aircraft types or operators, identified in such reports as not complying with the RCP specification(s).

See also Annex 6, Part I, 7.3.4 (RSP) and Annex 6, Part II, 2.5.1.9 (RCP) and 2.5.3.5 (RSP)

Monitoring and Data Recording

Gold Paragraph 2.1.5.1

- The CNS/ATM environment is an integrated system including physical systems (hardware, software, and communication network), human elements (the flight crew and the controller), and the related procedures.
- The ANSP should establish end-to-end system monitoring in accordance with the guidelines provided in ICAO Doc 9869
  - The guidelines aim to ensure end-to-end system integrity through post-implementation monitoring, identifying, reporting and tracking of problems, and corrective action.
- The ANSP and its CSP(s) should retain records for at least 30 days to allow for accident/incident investigation purposes
  - The ANSP and CSPs should make these records available for air safety investigative purposes on demand
  - These recordings should allow replaying of the situation and identifying the messages that the ATS unit sent or received

PBCS Monitoring Data

- FAA website https://www.faa.gov/air_traffic/separation_standards/PBCS Monitoring
  - Results provided by fleet and by registration number
  - Indicate whether or not a fleet/aircraft has observed performance below requirements
- FANS-CRA/DLMA website http://www.fans-cra.com/
  - Results provided by fleet and by registration numbers for all *participating* FIRs
  - Actual communication performance (ACP) and actual surveillance performance (ASP) shown against 95% and 99.9%
  - Operators can also log problem reports here!
  - NAT FANS Problem Solution Tracker
    - current FANS1/A problems and status
    - workarounds and proposed solutions
    - recommended software versions for different aircraft types for NAT data link operations

Regional Implementation Status

- ICAO Annexes 6 and 11 and the PANS Doc 4444 adopted provisions for PBCS that became applicable in **November 2016**
  - **SAFETY IMPACT** was that the requirements would "enable States to ensure that safe application of air traffic management (ATM) operations predicated on communication and/or surveillance performance to eligible operators and that non-compliance is detected and corrected in a timely manner" (*ICAO State letter AN 11/1.3.29-16/12, 8 April 2016*).
- NAT and APAC regions determined that compliance with the PBCS provisions was not achievable by the November 2016 applicability date
- NAT SPG and APANPIRG reached conclusions that PBCS would be implemented on **29 March 2018**
  - *Summary of Discussions And Conclusions of the 52nd Meeting of the NAT SPG, June 2016*
  - *Final Report of the 27th Meeting of the APANPIRG, September 2016*

Communication and Collaboration

- Continued dialog on PBCS will help promote awareness of requirements and aid in achieving full implementation
- Participation is welcome and necessary
- Formal groups are continuing their work
  - ICAO Communications Panel – Operational Data Link Specific Working Group (CP-OPDLWG)
  - ICAO planning and implementation regional groups Data Link / FANS 1/A Interoperability Team Meetings
  - North Atlantic Technology and Interoperability Working Group

Summary and More to Come

- Discussed the need for PBCS
- Presented an overview of ICAO documents, impact to ANSPs, States, and Operators
- Introduced the need and requirements for monitoring
- Identified current NAT and APAC implementation status
- Now we'll move on to more detailed discussions

Questions Please!

Acknowledgement

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