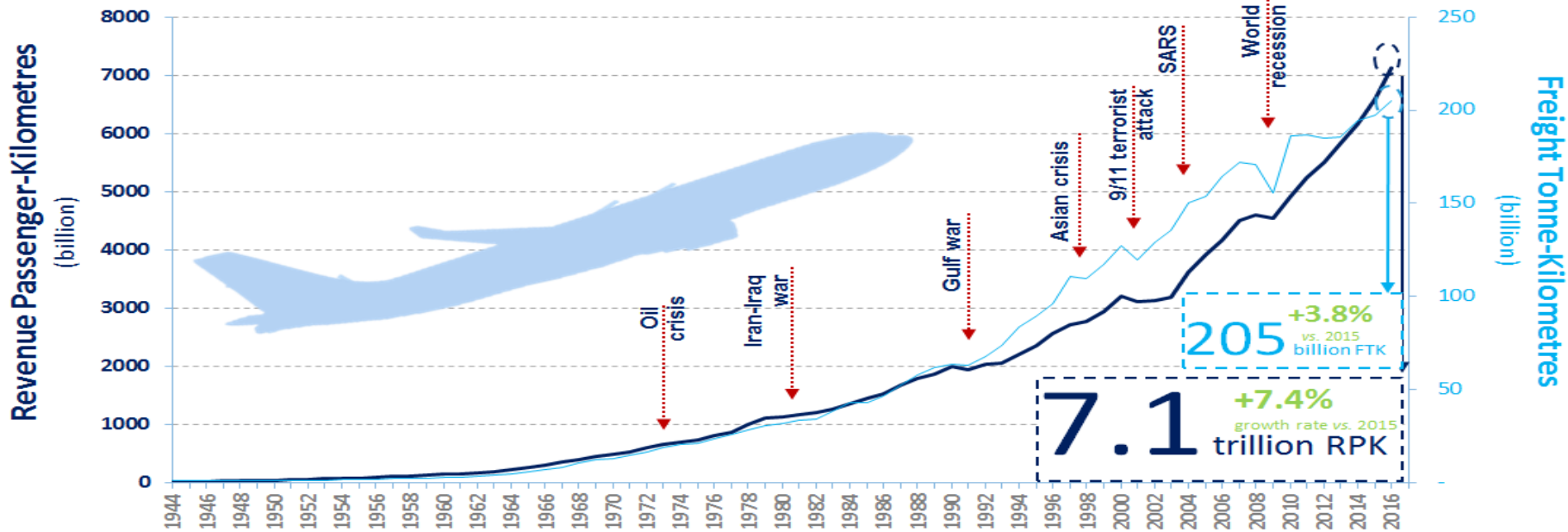# NAT PBCS Workshop

20-21 February 2018

Paris, France

- Need for performance based separation minima
- NAT PBCS implementation
- Why PBCS. PBCS framework
- ICAO provisions and guidance on PBCS
- PBCS authorizations
- Performance monitoring and problem reporting
- Conclusions

Growth of Air Transport

Source: ICAO Annual Report of the Council

➢ Our collective responsibility is to allow the aviation system to safely realize this air transport growth and optimize the use of available airspace

- Reduced Separation

- Optimized trajectories

- Reduced fuel consumption and environmental impact

in accordance with ICAO PANS-ATM (Doc 4444):

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

04/2015 : PANS amendment circulated

17/06/2016
NATSPG Decision for 29/03/2018

10/11/2016
Amendment to PANS Applicable

29/03/2018

Almost 3 years of lead time

16 months of coordinated transition time

LatSM

PANS	COM	NAV	SUR
30NM	-	RNP4	-
50 NM	-	RNP4 or 10	-

NAT SUPPs	COM	NAV	SUR
30NM	CPDLC	RNP4	ADS-C
50 NM		RNP4 or 10	

PANS	COM	NAV	SUR
23NM	RCP240	RNP4	RSP180
			PBCS Capable
50 NM	-	RNP4 or 10	-

LongSM

PANS	COM	NAV	SUR
10 Min	See Note 1	See Note 2	Procedural Position Report
50 NM	DCPC	RNP10	
50/30 NM	CPDLC	RNP10/4	ADS-C

NAT SUPPs	COM	NAV	SUR
50 NM	DCPC	RNP10	Procedural Position Report
50/30 NM	CPDLC **RCP240 monitoring**	RNP10/4	ADS-C **RSP180 monitoring**

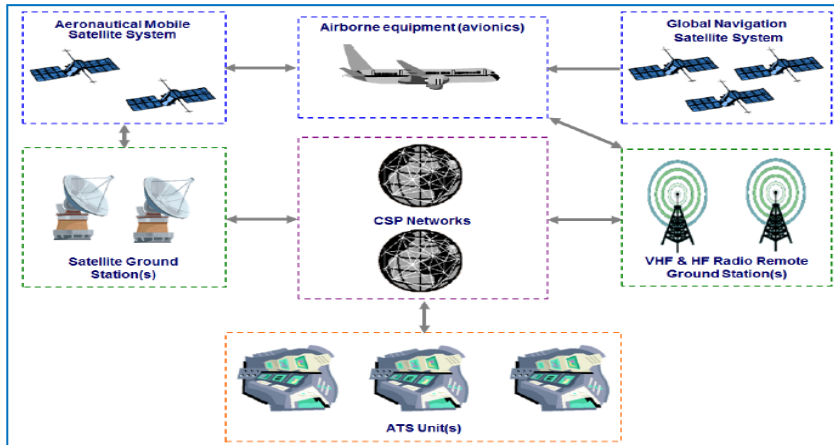| PANS	COM	NAV	SUR
10 Min	-	-	-
50 NM	DCPC	RNP10	Procedural Position Report
5 Min	RCP240	RNP4	RSP180
50/30 NM	RCP240	RNP10/4	RSP180
			PBCS Capable

1. **The NAT PBCS implementation plan** was first discussed in **2008**
2. Endorsed by NAT SPG in **2010** and monitored the progress thereafter, with a target date of implementation in **2015**. It took NAT over 10 years of preparation
3. **For globally harmonized implementation**, the NAT implementation checklist was included in the global guidance (PBCS Manual). The APAC also followed the checklist and closely coordinated with NAT for their implementation plan/decisions (through PIRGs, the Secretariat and OPDLWG members)
4. **NAT SPG Conclusion 52/19 – PBCS Operator Requirements in the NAT Region**
5. **NAT SPG Conclusion 52/20 – RCP/RSP Flight Plan Designators**
6. **NAT SPG/53 – transition strategy, PBCS-I PT, sharing of monitoring information**
7. **NAT Ops Bulletin on PBCS – 6 Feb 2018**
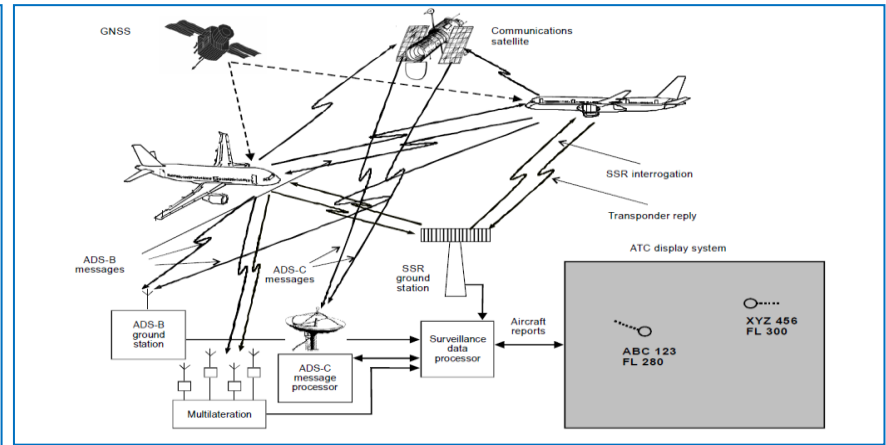8. **Amendment to NAT Doc 7030 – 2 Feb 2018**

Why PBCS ?

➢ Very complex set of hardware, software, people, procedures, … in a multi-institutional environment

[Overview of a data link system]

[Area control surveillance architecture]

Source: Global Operational Data Link (GOLD) Manual (Doc 10037) and Aeronautical Surveillance Manual (Doc 9924)

Why PBCS ?

- *Address the need for appropriate means* to quantify, measure and improve system performance

- *Provide a framework* that assures that the required level of communication and surveillance performance is managed in accordance with globally accepted specifications (RCP/RSP)

- *Mitigate safety risks* - misapplying current evolving ATM operations to inappropriate aircraft pairs
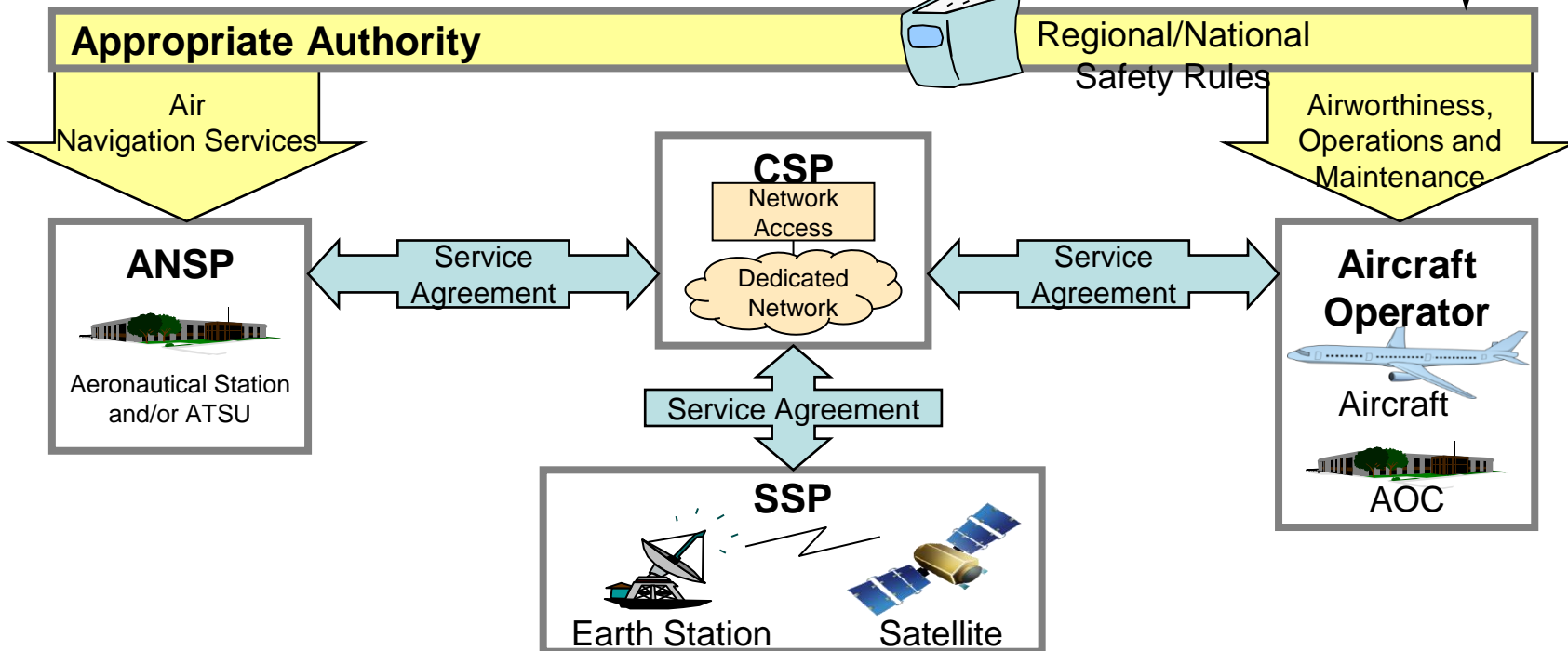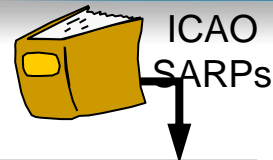
PBCS Framework

PBN

- *Prescription of RCP and RSP* for air traffic services that are predicated on communication and surveillance performance *(Annex11)*

- *Approval of aircraft and operators* for a communication and/or surveillance capability including aircraft equipage for operations where RCP and/or RSP specifications have been prescribed *(Annex 6)*

- *Indication of an aircraft's communication and surveillance capability and performance* in the form of RCP/RSP specifications in the flight plan *(PANS-ATM)*

- *Monitoring programmes to assess actual communication and surveillance performance* against RCP and RSP specifications *(Annexes 6 and 11)*

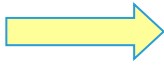- *Corrective actions,* as applicable, for the appropriate entity *(Annexes 6 and 11)*.

Prior to PBCS operation

ICAO SARPs

Appropriate Authority   Regional/National Safety Rules

Air Navigation Services

Airworthiness, Operations and Maintenance

ANSP

Aeronautical Station and/or ATSU

Service Agreement

CSP

Network Access

Dedicated Network

Service Agreement

Aircraft Operator

Aircraft

AOC

Service Agreement

SSP

Earth Station   Satellite

Post PBCS operation

Follow up on non-compliance

NAT CMA

Continuous improvement

Aircraft Manufacturer

Avionics Supplier

Operator

CSP

SSP

ANSP

Regional PBCS monitoring-NAT TIG/NAT DLMA

Local PBCS monitoring, data collection and RCP – RSP analysis

Network

FANS 1/A
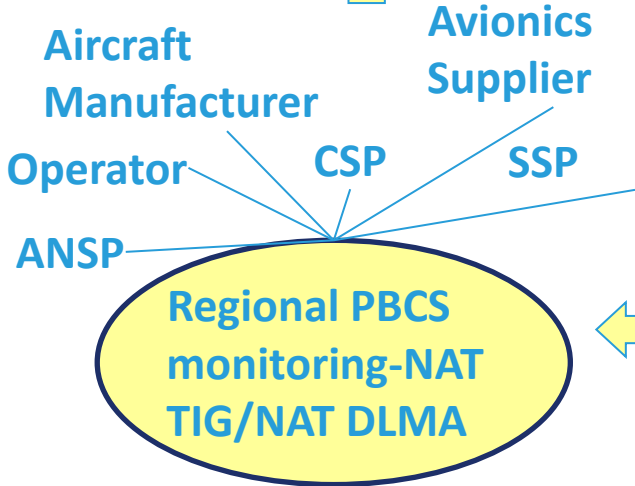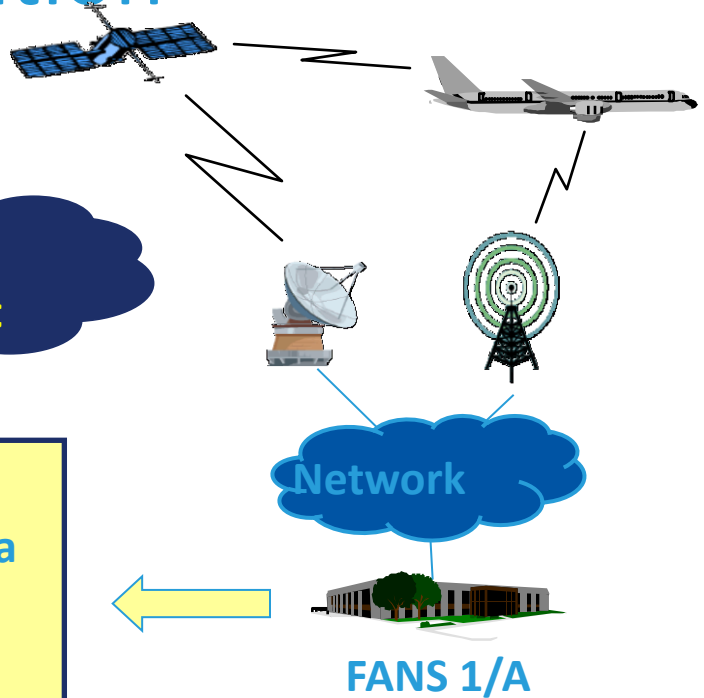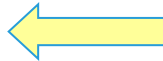
ICAO PBCS Documentation
PBCS Provisions – Effective 10 November 2016

Document ID	Description
Annex 6	Operation of Aircraft
Part I	Commercial Air Transport
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
Doc 7030	NAT SUPPs (amended on 2 Feb 2018)

ICAO PBCS Documentation

Supporting Guidance Material

Document ID	Description
Doc 9869	Performance-based Communications and Surveillance (PBCS) manual, Edition 2
Doc 10037	Global Operational Data Link (GOLD) Manual, Edition 1
Doc 10063	Manual on Monitoring the Application of Performance-based Horizontal Separation Minima, Edition 1
Draft guidance on PBCS authorisations	Summary of PBCS Manual for States and operators
NAT regional docs	PBCS impl plan, NAT SPG conclusions, NAT PBCS Ops Bulletin

Summary of ICAO PBCS Provision

In accordance with the ICAO PBCS Provision STATE RESPONSIBILTY	In accordance with State policies	
	ANSP RESPONSIBILTY	OPERATOR RESPONSIBILTY
❑ 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 services ❑ Recognizes RCP/RSP capabilities in air traffic control (ATC) automation ❑ Establishes PBCS monitoring program	❑ Files RCP/RSP capabilities in flight plan in accordance with State PBCS policy ❑ Participates in ANSP PBCS monitoring programs

PBCS Authorization

ICAO

Doc 9869

Performance-based Communication and Surveillance (PBCS) Manual

Second Edition, 2017

Approved by and published under the authority of the Secretary General.

INTERNATIONAL CIVIL AVIATION ORGANIZATION

➢ **Chapter 4. Complying with RCP/RSP specifications**

- Guidance for States

- Initial compliance determination and related approvals

- Flight plan requirements

- Continued operational compliance
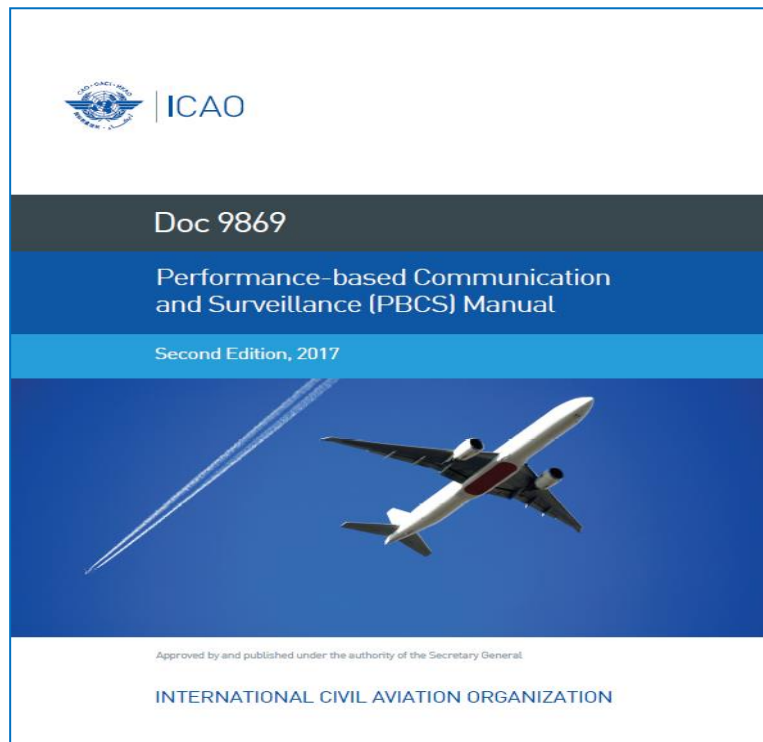
Consistent with the PANS-ATM (Doc 4444), 4.4.1.4 and Appendix 2, Item 10, a communication or surveillance capability comprises the following elements:

a) presence of relevant serviceable equipment on board the aircraft;

b) equipment and capabilities commensurate with flight crew qualifications; and

c) relevant approvals from the appropriate authority.

- Annex 6:

- *7.1.3 For operations where communication equipment is required to meet an RCP specification for performance-based communication (PBC), an aeroplane shall, in addition to the requirements specified in 7.1.1:*

- *a) be provided with communication equipment which will enable it to operate in accordance with the prescribed RCP specification(s);*

- *b) have information relevant to the aeroplane RCP specification capabilities listed in the flight manual or other aeroplane documentation approved by the State of Design or State of Registry; and*

- *c) have information relevant to the aeroplane RCP specification capabilities included in the MEL.*

- *7.1.4 The State of the Operator shall, for operations where an RCP specification for PBC has been prescribed, ensure that the operator has established and documented:*

- *a) normal and abnormal procedures, including contingency procedures;*

- *b) flight crew qualification and proficiency requirements, in accordance with appropriate RCP specifications;*

- *c) a training programme for relevant personnel consistent with the intended operations; and*

- *d) appropriate maintenance procedures to ensure continued airworthiness, in accordance with appropriate RCP specifications.*

- *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; and*

- *b) taking immediate corrective action for individual aircraft, aircraft types or operators, identified in such reports as not complying with the RCP specification(s)."*

- ICAO Operational Authorization Guide

Operational Authorization Guide

Performance-based Communication
and Surveillance (PBCS)

By the Operational Data Link Specific Working Group of the Communications Panel
January 2016 (Version 1.0)

Future amendment to Annex 6

➢ Authorizations

- Specific Approval

- Approval

- Acceptance

➢ Review of Annex 6 to align text of provisions with authorization

➢ "shall ensure" is equated to an approval

NAT CMA and monitoring information sharing

- **NAT SPG Conclusion 53/8 – NAT PBCS monitoring information sharing mechanisms**

❑ That NAT ANSPs in coordination with their State authorities, implement the following mechanisms for communicating the Performance Based Communication and Surveillance (PBCS) monitoring information to the NAT airspace users and States concerned:

- For communicating the routine PBCS monitoring results the aggregated data would be provided through the joint NAT Data Link Monitoring Agency (DLMA)/Asia Pacific Central Reporting Agency (CRA) portal; and

- PBCS information on underperforming aircraft be communicated directly by NAT ANSPs and NAT provider States to the NAT airspace users and States of Registry/Operator until other centralized solutions are agreed and implemented.

http://www.fans-cra.com

NAT SPG Conclusion 53/9 –   Terms of Reference of NAT CMA and RMAs

- That the ICAO Regional Director, Europe and North Atlantic, take appropriate actions to:
  - amend the *NAT SPG Handbook* (NAT Doc 001) section 4: Terms of Reference for the NAT SPG Services, 4:A "NAT Central Monitoring Agency (NAT CMA)", as presented in **Appendix G** to this Report; and
  - coordinate amendment to the ToRs of other Regional Monitoring Agencies (RMAs) to include the same elements as in a) above, through appropriate Planning and Implementation Regional Groups (PIRGs) and ICAO Regional Offices.

NAT CMA ToR (EUR RMA and EURASIA RMA)

- receive reports of non-compliance (Doc 9869 refers) with RSP 180 and RCP 240 from NAT ANSPs and transmitting reports to the respective RMA associated with the State of the respective operator/aircraft;

- receive and maintain records of RCP and RSP approvals issued by States of Operator/Registry associated with current State responsibility and incorporating into expanded RVSM/PBCS approvals database and follow-up as appropriate instances of non-approved aircraft being identified in PBCS airspace. This would be determined by augmenting the existing monthly RVSM approvals check to incorporate a similar check against PBCS Approvals where these have been included in the flight plan but no approvals record is held by RMAs;

- sharing records of RCP and RSP approvals between RMAs in line with current sharing practices of RVSM approvals for the ability of States/ANSPs to verify that aircraft operators filing PBCS capabilities in the flight plan are authorized to do so.

NAT PBCS Monitoring Report by Operator/Aircraft Type Pair
Period: January to June 2017

Color key:
- Meets criteria
- 99.0%-99.9%
- Under criteria

Data Source (FIR)	Operator/ Aircraft Type	State of Registry	ADS-C downlink Message Counts	95% RSP 180 benchmark ASP <=90 sec	99.9% RSP 180 benchmark ASP <= 180 sec	CPDLC Transaction Counts (WILCO Received)	95% RCP 240 benchmark ACP <= 180 sec	99.9% RCP 240 benchmark ACP <=210 sec
New York	ACA/B763							
New York	ACA/B77W							
Reykjavík	WJA/B763							
Gander	WJA/B763							
Santa Maria	VKG/A332							
Shanwick	VKG/A333							
Santa Maria	VKG/A333							
Reykjavík	ETH/B788							
Santa Maria	ETH/B788							
Santa Maria	AFR/B77L							
Gander	DJT/B752							
Shanwick	DJT/B752							
New York	DJT/B752							
Shanwick	BOX/MD11							

NAT PBCS Monitoring Report by Airframe
Period: January to June 2017

Color key:
- Meets criteria
- 99.0%-99.9%
- Under criteria

Data Source (FIR)	State of Registry	3-letter ICAO Operator code (where	4-letter ICAO Aircraft Type	Registration Number	ADS-C downlink Message Counts	95% RSP 180 Benchmark	99.9% RSP 180 Benchmark	CPDLC Transaction Counts (WILCO Received)	95% RCP 240 benchmark	99.9% RCP 240 benchmark
New York	ARGENTINA	ARG	A332	LVGKP	1,287	86.0%	91.5%	NONE or COUNT<100	-	-
New York	AUSTRIA	AOJ	GLF4	OEIMZ	181	91.2%	95.6%	NONE or COUNT<100	-	-
Reykjavík	AUSTRIA	AUA	B772	OELPE	329	93.0%	98.0%	NONE or COUNT<100	-	-
Shanwick	BARBADOS	GA	GLF5	8PMSD	101	91.1%	96.0%	NONE or COUNT<100	-	-
Reykjavík	BERMUDA	ABW	B748	VQBLQ	250	93.3%	95.9%	NONE or COUNT<100	-	-
Gander	BERMUDA	AFL	A332	VQBBE	1,194	94.3%	95.4%	NONE or COUNT<100	-	-
Shanwick	BERMUDA	AFL	A332	VQBBE	400	90.3%	93.3%	NONE or COUNT<100	-	-
Shanwick	BERMUDA	AFL	A333	VQBMV	116	88.8%	96.6%	NONE or COUNT<100	-	-
Gander	BERMUDA	AFL	A333	VQBPI	229	93.9%	95.6%	NONE or COUNT<100	-	-
Gander	BERMUDA	AFL	B77W	VPBGB	216	91.2%	98.2%	NONE or COUNT<100	-	-
Reykjavík	BERMUDA	AFL	B77W	VQBQB	637	94.1%	96.5%	NONE or COUNT<100	-	-
Gander	BERMUDA	AFL	B77W	VQBQE	385	94.0%	96.1%	NONE or COUNT<100	-	-
Gander	BERMUDA	AFL	B77W	VQBQF	367	94.0%	97.0%	NONE or COUNT<100	-	-
Shanwick	BERMUDA	AFL	B77W	VQBQF	133	89.5%	96.2%	NONE or COUNT<100	-	-
Shanwick	BERMUDA	AFL	B77W	VQBQM	135	94.1%	97.0%	NONE or COUNT<100	-	-
Gander	BERMUDA	AFL	B77W	VQBUB	306	94.4%	97.7%	NONE or COUNT<100	-	-
Shanwick	BERMUDA	AFL	B77W	VQBUB	128	93.8%	96.9%	NONE or COUNT<100	-	-
Gander	BERMUDA	AHY	B788	VPBBR	855	94.0%	97.8%	NONE or COUNT<100	-	-
Reykjavík	BERMUDA	AZG	B748	VQBBH	466	94.4%	96.5%	NONE or COUNT<100	-	-
Shanwick	BERMUDA	AZG	B748	VQBBH	191	94.2%	98.4%	NONE or COUNT<100	-	-

THANK YOU