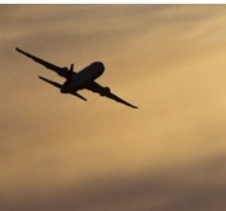


Performance Based Communications and Surveillance (PBCS)

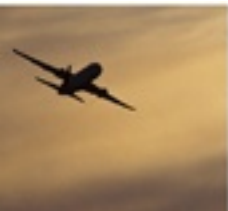
ISPACG FIT/20

Auckland, New Zealand, 26-27 February, 2013

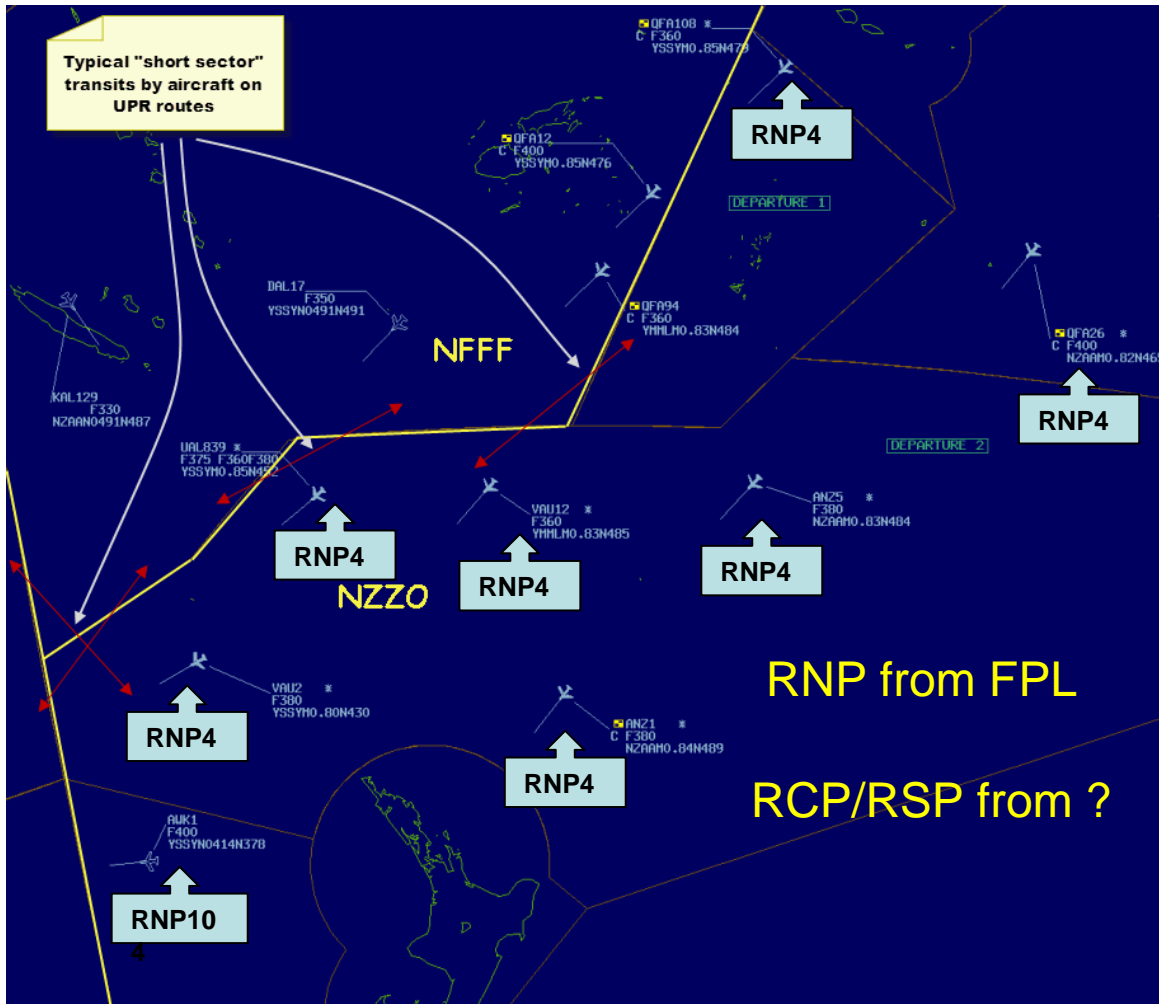


Data link - Enabling Benefits with PBCS

- **Operational improvements using FANS1/A CPDLC and ADS-C data-link are predicated on certain communications, surveillance, and navigation requirements.**
- **We have an obligation to ensure that aircraft and operators are meeting these requirements.**
- **We have performance based navigation (PBN/RNP)**
- **We need performance based communications and surveillance (PBCS/RCP/RSP).**



Why PBCS?

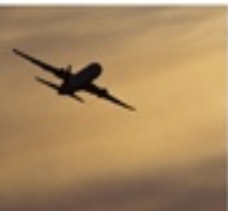


- VHF?
- POA?
- VDL2?
- Inmarsat SBB?
- RCP240?
- Inmarsat I3?
- RCP400?
- Inmarsat I4?
- SATCOM?
- Iridium Next?
- RSP180?
- Iridium?
- RSP400?
- MTSAT?
- HFDL?
- ADMW RBP?
- SATCOM+HFDL?



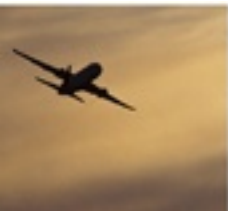
PBCS – an introductory history (1)

- In 1991, the 10th ANC endorse the Future Air Navigation System concept.
 - This becomes known as the communications, navigation, surveillance/air traffic management (CNS/ATM) systems concept.
- In 1996, at the 4th meeting of the Aeronautical Mobile Communications Panel (AMCP/4) recognises the absence of objective criteria to evaluate communications performance.
- In 2000 AMCP is renamed the Operational Data Link Panel (OPLINKP)
- In 1997, the Air Navigation Commission tasks OPLINKP to develop the concept of Required Communications Performance (RCP).
- In 2001, OPLINKP completed a concept of RCP and the Air Navigation Commission solicit State comment.
- In 2002, OPLINKP were tasked to develop a manual on RCP and as necessary develop SARP's and procedures relating to the use of RCP in ATS.



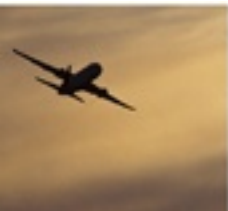
PBCS – an introductory history (2)

- In **2003**, the 11th ANC endorse recommendations to :
 - Confirm development of RCP
 - Investigate further areas including:
 - Relationship of RCP to separation studies and interoperability
 - RCP Types and Allocations
 - Safety performance monitoring
- In **2007**, Annex 6 - Operation of Aircraft,
 - Amended to introduce concept of RCP in the provision of ATS.
- In **2007**, Annex 11 – Air Traffic Services and Doc 4444 PANS - ATM,
 - Amended to introduce definitions and associated procedures for RCP.



PBCS – an introductory history (3)

- In 2007, RTCA DO-306/EUROCAE ED-122 Safety and Performance Standard for Air Traffic Data Link Services in Oceanic and Remote Airspace (Oceanic SPR Standard) is published.
 - Provides operational, safety, and performance requirements for data link services that support specific ATS functions in oceanic and remote airspace.
 - Specifically provides RCP/RSP allocations for reduced separation standards
- In 2008, ICAO Doc 9869 Manual on Required Communications Performance is published.
- In 2010, ICAO Global Operational Data Link Document (GOLD) is published.
 - Appendix B – RCP Specifications
 - Appendix C - RSP Specifications
 - Appendix D – Post Implementation Monitoring and Corrective Actions



PBCS status following APANPIRG 2012

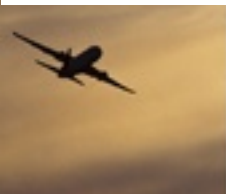
3.4.30 The Second Satellite Operational Continuity Meeting (SOCM/2) proposal of planning and implementation of a performance based framework for communication and surveillance included in the Global Operational Data Link Document (GOLD) was discussed in the meeting. The meeting also reviewed performance-based framework for communication and surveillance developed by ISPACG and noted changes required to be implemented to Master Minimum Equipment List (MMEL), Regional SUPPs etc.

3.4.31 The USA recalled that the SOCM/2 recommended the APANPIRG Sub-Groups to include in their work program, the development and execution of a plan to implement a performance based framework for Required Communication Performance (RCP) and Required Surveillance Performance (RSP) and give due priority to such task. The RCP and RSP framework will initially apply performance specifications and monitoring per the GOLD to FANS 1/A based CPDLC and ADS-C. The meeting was informed that in June 2011, the North Atlantic Region System Planning Group endorsed its RCP and ADS-C Surveillance Performance based operations implementation plan with an effective implementation date of February 2015. The performance-based framework should eventually apply to satellite voice (SATVOICE) communication for air traffic control per the SVGM.

3.4.32 After lengthy discussion on the subject, the meeting identified need to further understand the proposed framework for RCP and RSP. Accordingly, the meeting agreed on the requirement of organizing a regional workshop on RCP and RSP and adopted following Conclusion.

Conclusion 23/XX – Workshop on RCP and RSP

That, ICAO be invited to organize a workshop on RCP and RSP in the Asia/Pacific Region



RCP – Required Communications Performance

- **RCP concept seeks to manage the performance of communications supporting evolving ATM concepts and emerging technologies. This is achieved by:**
 - **Determining an RCP type for the communications capabilities supporting an ATM function; then**
 - **Prescribing the RCP type(s) related to the communications system(s) supporting the ATM functions within that airspace; and**
 - **Complying with the prescribed RCP type(s) through analysis, operational assessments, and performance monitoring of the communications systems**



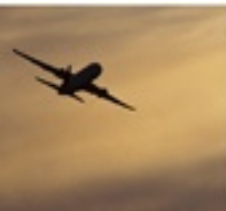
PBCS - RSP/RCP – ICAO 2012 FPL

- **Currently, there is potential for an ATSP to misapply Air Traffic Services to an operator or aircraft type.**
- **Flight Plan 2012 makes provision for RCP allocation in Item 10 but does not assign values to the designators.**
- **Asia/Pac guidance stated that ATSP should process reserved RCP designators without error**
- **No similar provision was made for RSP allocation in Item 10 but does make mention use of SUR/ in Item 18.**
- **ICAO OPLINKP have agreed that:**
 - **For RCP Field 10a - P1 = RCP400 and P2 = RCP240**
 - **For RSP Field 18 use SUR/RSP180 or SUR/RSP400**

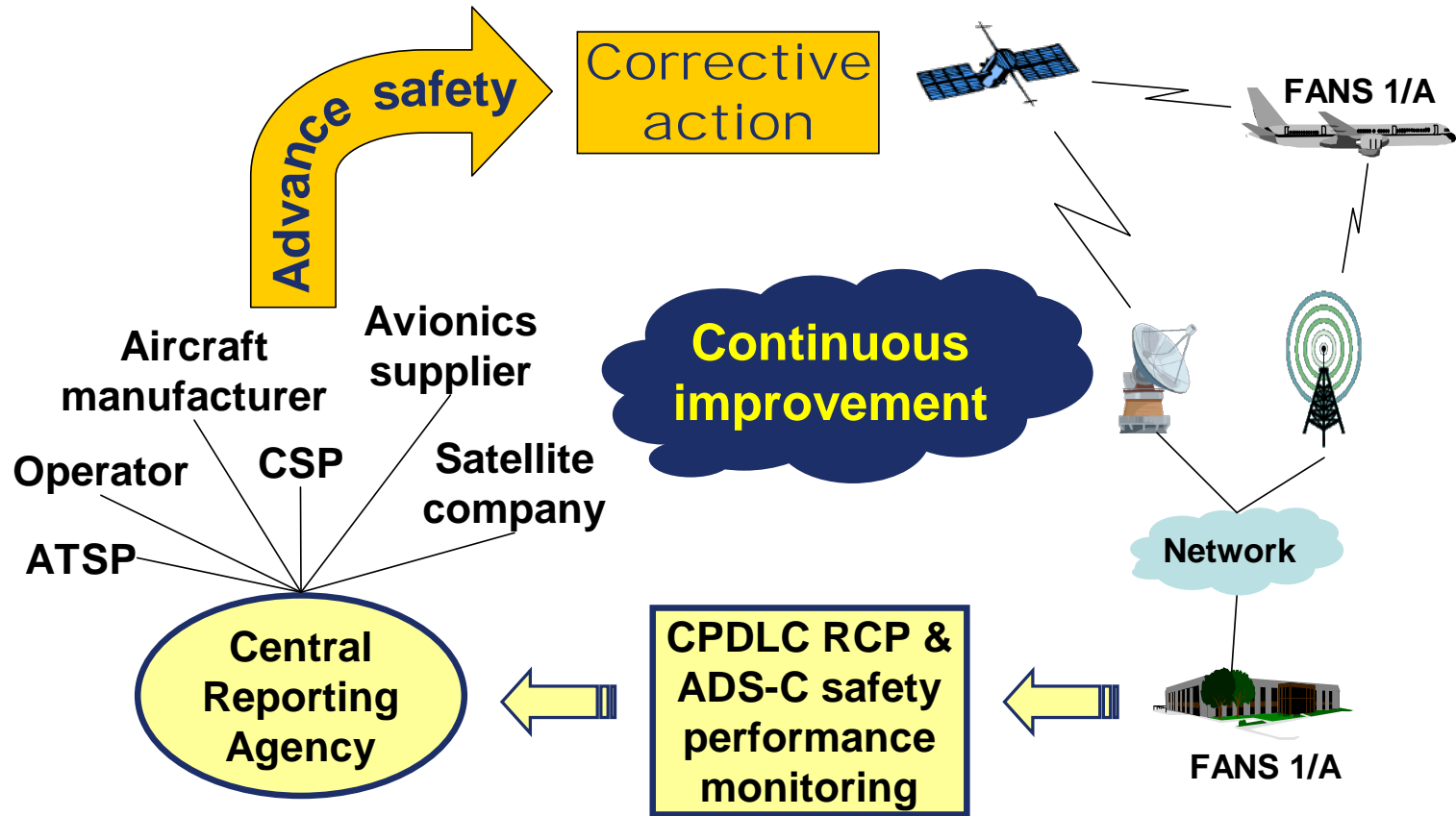


A performance based approach

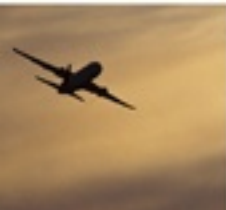
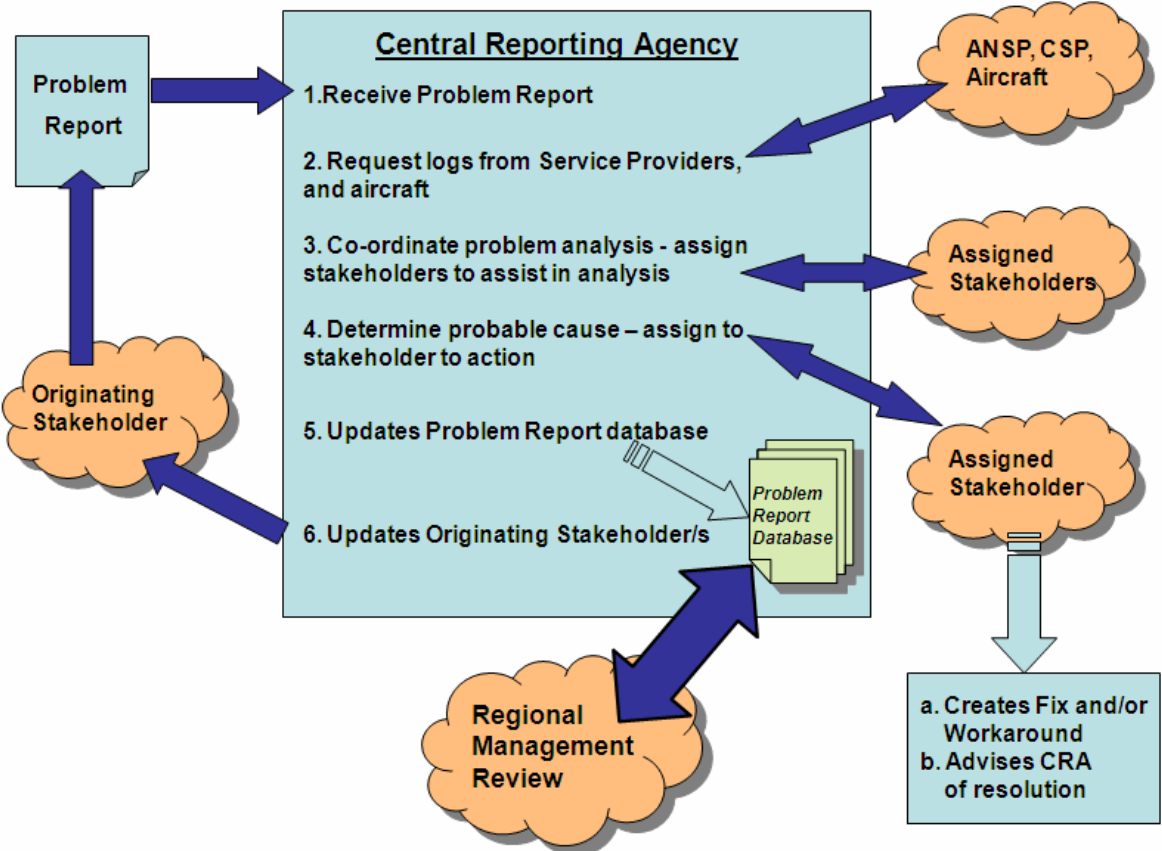
- **Doc 9883 Manual on Global Performance of the Air Navigation System**
 - Notion of a performance based air navigation system emanated from industry practices that have evolved for many years outside of aviation.
 - Based on following principles:
 - Strong focus on desired/required results through adoption of performance objectives and targets
 - Informed decision making, driven by the desired/required results; and
 - Reliance on facts and data for decision making.
 - Assessment is periodically checked through performance review, which requires adequate performance measurement and data collection capabilities.
 - Performance based approach is a pragmatic tool in
 - Planning changes
 - Developing changes
 - Optimising the System (Continuous Performance Improvement)



Data link - A Performance Based System?



Data link - Continuous performance improvement



RCP - Annex 6 – Operation of Aircraft

“7.1.3 For flights in defined portions of airspace or on routes where an RCP type has been prescribed, an aeroplane shall in addition to the requirements specified in 7.1.1

- a) be provided with communications equipment which will enable it to operate in accordance with the prescribed RCP type(s); and**
- b) be authorized by the state of the operator for operations in each airspace”**

Note: provides reference to Doc 9869 RCP Manual



2.8 Required communication performance (RCP)

2.8.1 RCP types shall be prescribed by states. When applicable, the RCP type(s) shall be prescribed on the basis of regional air navigation agreements.

2.8.2 The prescribed RCP type shall be appropriate to the air traffic services provided in the airspace concerned.

Note: provides reference to Doc 9869 RCP Manual



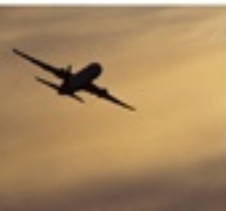
RCP - Annex 11 – Air Traffic Services

6.1 Aeronautical Mobile Service (air-ground)

6.1.1.2 Where RCP types have been prescribed by states for ATM functions, ATS units shall, in addition to the requirements specified in 6.1.1.1 be provided with communication equipment which will enable them to provide ATS in accordance with the prescribed RCP types.

6.2 Aeronautical Fixed Service (ground-ground)

6.2.1.2 Where RCP types have been prescribed by states for ATM functions, ATS units shall..... (as per 6.1.1.2)



2.27 Safety Management

2.27.5 Any significant safety related change to the ATS system, including the implementation of a reduced separation minima or a new procedure, shall only be effected after a safety assessment has demonstrated that an acceptable level of safety has been met. When appropriate, the responsible authority shall ensure that adequate provision is made for post implementation monitoring to verify that the defined level of safety continues to be met.

3.3 Operation of air traffic control service

3.3.5.2 Arrangements shall be put in place, through inter-regional agreement, for the sharing between regions of data from monitoring programs.



4.4.1.4 An operator shall, prior to departure:

(c) ensure that, where the flight is intended to operate where an RCP type is prescribed, the aircraft has an appropriate RCP approval, and that all conditions applying to that approval will be satisfied.



5.4.1.2.1.6 Lateral separation of aircraft on parallel or non-intersecting tracks or ATS routes.....

b) for a minimum spacing between tracks of 55.5 km (30 NM) a navigational performance of RNP 4 shall be prescribed.

Note 2.— Guidance material for implementation of communication capability supporting 93 km (50 NM) and 55.5 km (30 NM) lateral separation is contained in the Manual on Required Communication Performance (RCP) (Doc 9869). Information regarding RCP allocations for these capabilities is contained in RTCA DO-306/EUROCAE ED-122 Safety and Performance Standard for Air Traffic Data Link Services in Oceanic and Remote Airspace (Oceanic SPR Standard).



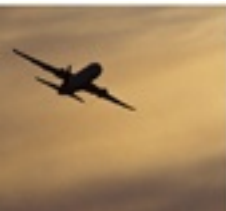
RCP/RSP - Doc 4444 – update proposal SASP

5.4.1.2.1.6 Lateral separation of aircraft on parallel or non-intersecting tracks or ATS routes. Within designated airspace or on designated routes, lateral separation between aircraft operating on parallel or non-intersecting tracks or ATS routes shall be established in accordance with the following:

- a) for a minimum spacing between tracks of 93 km (50 NM) the aircraft are approved by the State of Registry or the State of the Operator to RNAV 10 (RNP 10) or RNP 4; ~~a navigational performance of RNAV 10 (RNP 10) or RNP 4 shall be prescribed; and~~

Note.— There are no additional communication or surveillance requirements. Direct controller/pilot communications or controller-pilot data link communications (CPDLC) and/or automatic dependent surveillance – contract (ADS-C) may be desirable in certain areas, such as areas of known convective weather.

- b) ~~for~~ a minimum spacing between tracks of 55.5 km (30 NM):
- i) ~~the aircraft are approved by the State of Registry or the State of the Operator to RNP 4; a navigational performance of RNP 4 shall be prescribed~~
 - ii) ~~direct controller-pilot voice communications or CPDLC are maintained; communication services and related aircraft equipment interoperate and perform at a minimum RCP 240;~~
 - iii) ~~surveillance using ADS-C is maintained; ADS-C services and related aircraft equipment interoperate and perform at a minimum RSP 180; the following ADS contracts are established;~~



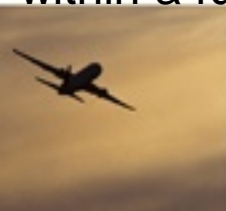
5.4.2.6.4 LONGITUDINAL DISTANCE-BASED SEPARATION MINIMA IN AN RNP RNAV ENVIRONMENT USING ADS-C

RCP240

5.4.2.6.4.3.2 The communication system provided to enable the application of the separation minima in 5.4.2.6.4.3 shall allow a controller, **within 4 minutes**, to intervene and resolve a potential conflict by contacting an aircraft using the normal means of communication. An alternative means shall be available to allow the controller to intervene and resolve the conflict within a total time of 10½ minutes, should the normal means of communication fail.

RSP180

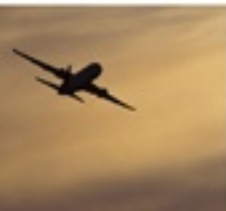
5.4.2.6.4.3.3 When an ADS-C periodic or waypoint change event report is not received **within 3 minutes** of the time it should have been sent, the report is considered overdue and the controller shall take action to obtain the report as quickly as possible, normally by ADS-C or CPDLC. If a report is not received within 6 minutes of the time the original report should have been sent, and there is a possibility of loss of separation with other aircraft, the controller shall take action to resolve any potential conflict(s) as soon as possible. The communication means provided shall be such that the conflict is resolved within a further 7½ minutes.



Doc 4444 – proposal for update SASP

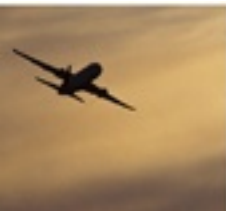
5.4.2.6.4.3 For aircraft cruising, climbing or descending on the same track, the following separation minima may be used:

<i>Separation minima (See Notes 1 and 2)</i>	<i>RNP type specification (See Note 3)</i>	<i>RCP specification (See Note 4 and 5.4.2.6.4.3.2)</i>	<i>RSP specification (See Note 4 and 5.4.2.6.4.3.3)</i>	<i>Maximum ADS-C periodic reporting interval (See Note 5)</i>
93 km (50 NM)	10	240	180	27 minutes
	4	240	180	32 minutes
55.5 km (30 NM)	4	240	180	14 minutes



PBCS – facilitate implementation in Asia/Pacific

- **ISPACG and SOCM/2 both requested APANPIRG that we progress towards PBCS.**
- **APANPIRG needs more information.**
- **ICAO PBCS seminars in Asia/Pac are scheduled.**
 - ❖ **Providing support to these.**
- **We need to facilitate implementation of PBCS through.**
 - ❖ **RASMAG**
 - ❖ **CNS**
 - ❖ **ATM**
- **Provide the framework of what needs doing and when**
 - ❖ **Use NAT material to template?**





Thank you

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