RASMAG/31
Airspace Safety Seminar

SEASMA
29 June 2026

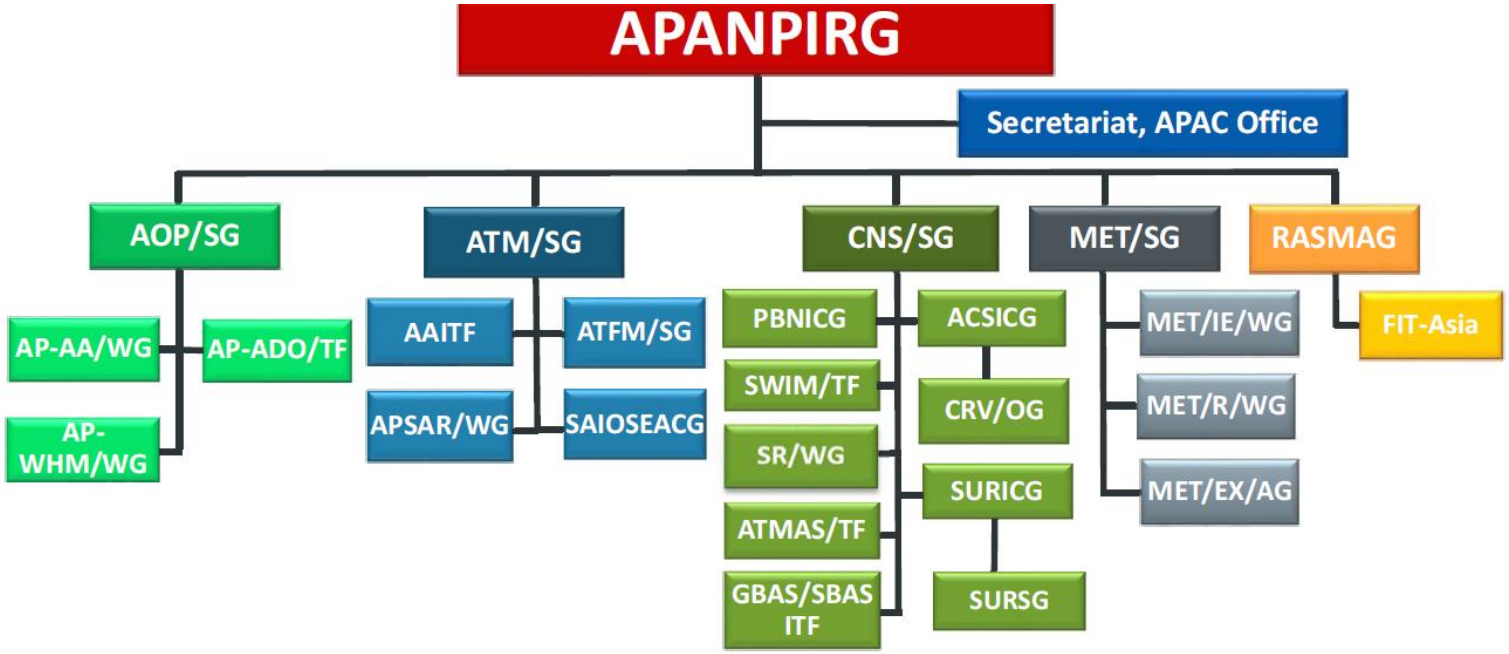
Scope

1. Overview of the regional airspace safety monitoring structure

2. Reduced horizontal separation minima
   - Evolution
   - Key benefits
   - Performance-Based Navigation (PBN) and Performance-Based Communication and Surveillance (PBCS)

3. Implementation of Performance-Based Horizontal Separation Minima (PBHSM) and monitoring works
   - Implementation steps
   - Monitoring of PBCS performance
   - Monitoring of horizontal plane deviations

Regional Airspace Safety Monitoring Structure



AOP/SG	-	Aerodrome Operations and Planning Sub Group
AP-AA/WG	-	APAC Aerodrome Assistance Working Group
AP-ADO/TF	-	APAC Aerodrome Design and Operations Task Force
AP-WHM/WG	-	APAC Wildlife Hazard Management Working Group

ATM/SG	-	ATM Sub Group
AAITF	-	AIS - AIM Implementation Task Force
APSAR/WG	-	APAC Search and Rescue Working Group
ATFM/SG	-	ATFM Steering Group
SAIOSEACG	-	South Asia Indian Ocean and South East Asia ATM Coordination Group

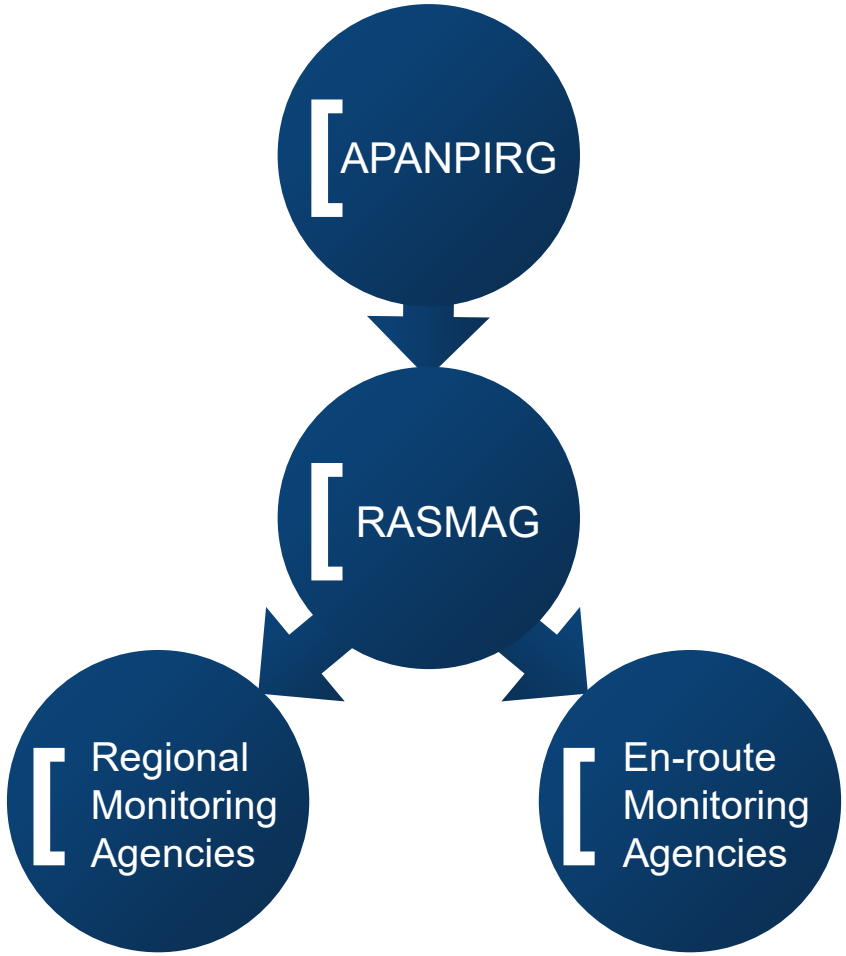
CNS/SG	-	CNS Sub Group
PBNICG	-	PBN Implementation Coordination Group
SWIM/TF	-	System-Wide Information Management Task Force
SR/WG	-	Spectrum Review Working Group
ATMAS/TF	-	ATM Automation System Task Force
GBAS/SBAS ITF	-	GBAS/SBAS Implementation Task Force
ACSICG	-	Aeronautical Communication Services Implementation Coordination Group
• CRV/OG	-	Common Regional Virtual Private Network (VPN) Operations Group
SURICG	-	Surveillance Implementation Coordination Group
• SURSG	-	Surveillance Study Group

MET/SG	-	Meteorology Sub Group
MET/IE/WG	-	Meteorological Information Exchange Working Group
MET/R/WG	-	Meteorological Requirements Working Group
MET/EX/AG	-	Meteorological Exercises Advisory Group

RASMAG	-	Regional Airspace Safety Monitoring Advisory Group
• FIT-ASIA	-	FANS Interoperability Team-Asia

Regional Airspace Safety Monitoring Structure

RMAs and EMAs

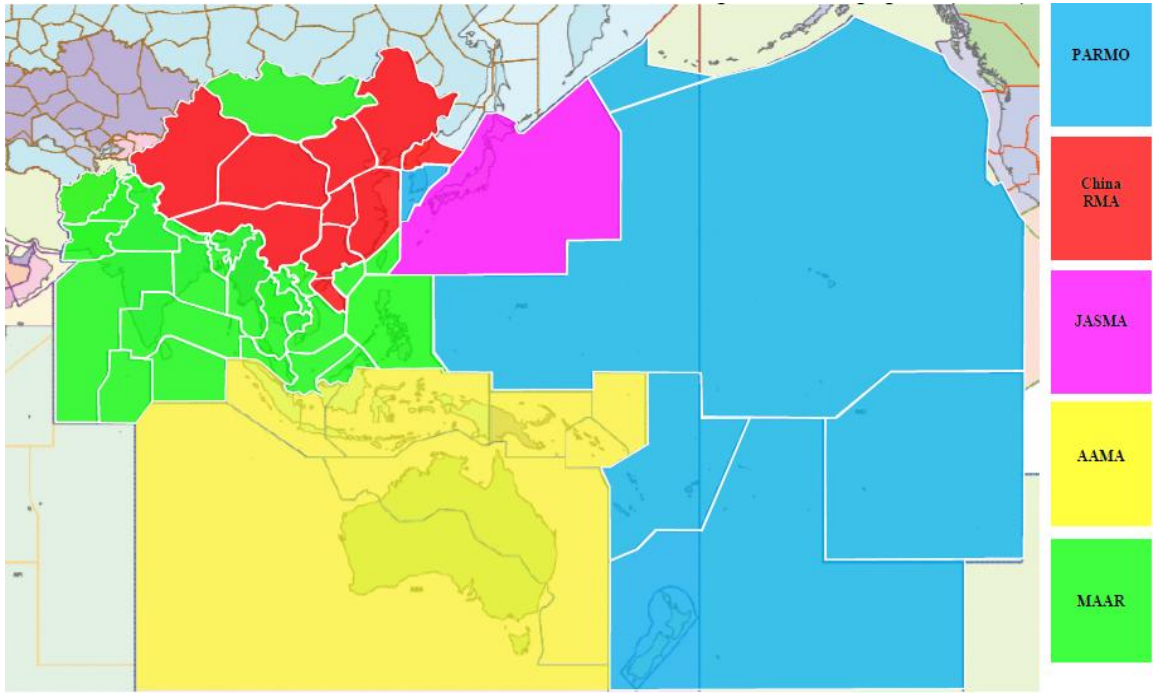


- RASMAG was established by APANPIRG to achieve a regional approach for coordination and harmonisation of airspace safety monitoring activities
- Regional Monitoring Agencies (RMAs) and En-route Monitoring Agencies (EMAs) established to support the work of RASMAG
  - RMAs – for reduced vertical separation
  - EMAs – for reduced horizontal separation

Regional Airspace Safety Monitoring Structure

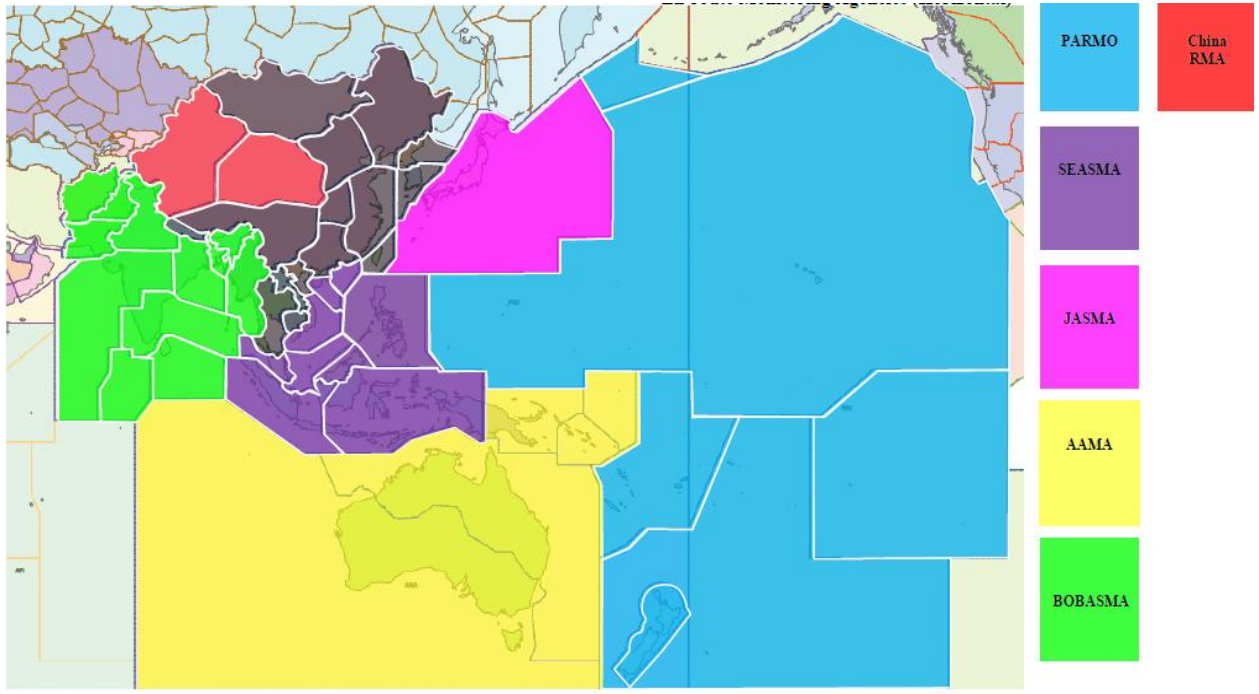
RMAs and EMAs

Regional Monitoring Agencies



PARMO - Pacific Approvals Registry and Monitoring Organization
JASMA – Japan Airspace Safety Monitoring Agency
AAMA – Australian Airspace Monitoring Agency
MAAR – Monitoring Agency for Asia Region

En-route Monitoring Agencies



BOBASMA – Bay of Bengal Arabian Sea Indian Ocean Safety Monitoring Agency
SEASMA – Southeast Asia Safety Monitoring Agency

SEASMA

Reduced Horizontal Separation Minima

Evolution (with PBN and PBCS)

Early Navigation & Conventional Separation

- Relied on ground-based navigation aids (VOR, DME, NDB)
- Horizontal separation minima were large
- Safe but restricted airspace capacity and efficiency

Introduction of Performance-Based Navigation (PBN)

- Based on Area Navigation (RNAV) and Required Navigation Performance (RNP)
- Aircraft could fly precise, repeatable tracks
- Progressive reductions in separation minima
- Increasing efficiency and reducing delays

Emergence of Performance-Based Communication and Surveillance (PBCS)

- Required Communication Performance (RCP) and Required Surveillance Performance (RSP)
- Technologies ensured reliable communication and surveillance
- Separation minima could be further reduced

Performance-Based Horizontal Separation Minima (PBHSM)

- PBN navigation accuracy with PBCS communication / surveillance reliability
- Tightening of separation standards, maintaining safety through performance monitoring

Each step reduced separation minima by leveraging better navigation accuracy, communication reliability, and surveillance capability.

Reduced Horizontal Separation Minima

Key Benefits

1

Airspace Capacity

- Traditional wide separation standards limited the number of aircraft that could safely operate in a given corridor.
- Reduced minima allow more parallel routes and denser traffic flows, increasing overall capacity.

2

Operational Efficiency

- Aircraft can fly preferred trajectories closer to optimal flight paths.
- Leads to shorter routes, reduced delays, and improved scheduling flexibility.

3

Fuel Saving

- More direct routing reduces fuel burn and CO_2 emissions.
- Airlines benefit from lower operating costs, while contributing to sustainability goals.

4

Safety Assurance

- Reduced minima are only implemented when navigation, communication, and surveillance performance is proven reliable.
- Continuous monitoring ensures risk remains acceptably low despite tighter spacing.

5

Global Harmonisation

- ICAO's PBN and PBCS frameworks provide standardised criteria across regions.
- Ensures interoperability and consistent safety levels worldwide.

6

Scalability For Future Growth

- Air traffic demand continues to rise.
- Reduced minima provide a scalable solution to accommodate growth without building new infrastructure.

PBN and PBCS

Concepts

Performance-based Navigation

Framework: Navigation performance requirements for aircraft rather than specific equipment

Core Elements: Area Navigation (RNAV) and Required Navigation Performance (RNP)

Key Role: Provides precise, repeatable flight paths

Impact on Separation: Enables reduction from traditional 100 NM to 50 NM lateral minima

Applied primarily to the aircraft capability and operator, including real-time monitoring and alerting functions within the aircraft systems to maintain navigation accuracy

Performance-based Communications & Surveillance

Framework: Required performance standards for communication and surveillance systems

Core Elements: Required Communication Performance (RCP) and Required Surveillance Performance (RSP)

Key Role: Provides communication and surveillance reliability

Impact on Separation: Enables further reduction to 30 NM lateral and longitudinal minima

Applied to air traffic service provision, aircraft capability, and operator, including post-implementation monitoring programs to maintain safety and efficiency

PBN and PBCS

Concepts

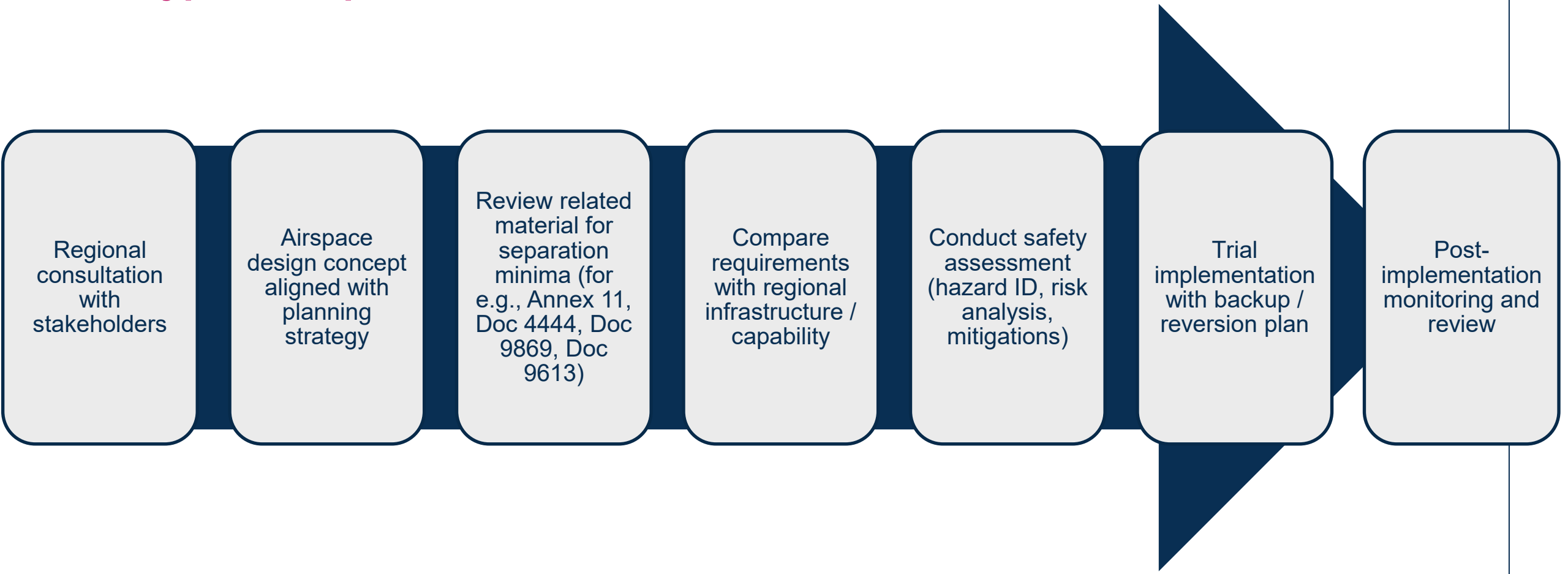
PBN	PBCS
Focuses on navigation accuracy	Focuses on communication and surveillance reliability
Defines RNAV/RNP specifications	Defines RCP/RSP specifications
Ensures aircraft can fly precise tracks	Ensures controllers can monitor and communicate effectively
Reduces separation by improving positional accuracy	Reduces separation by ensuring safe coordination and monitoring

✈️ Complementary Frameworks

- PBN provides the precision: Aircraft stay on track with minimal deviation
- PBCS provides the assurance: Controllers can reliably communicate and monitor aircraft
- Together, they form the foundation for reduced horizontal separation minima and the monitoring responsibilities of enroute agencies

Implementation of PBHSM

Typical Steps



Examples of Monitoring Works

PBCS Performance

This email contains a notice of performance-based communication and surveillance (PBCS) non-compliance report for the following aircraft within the attached.

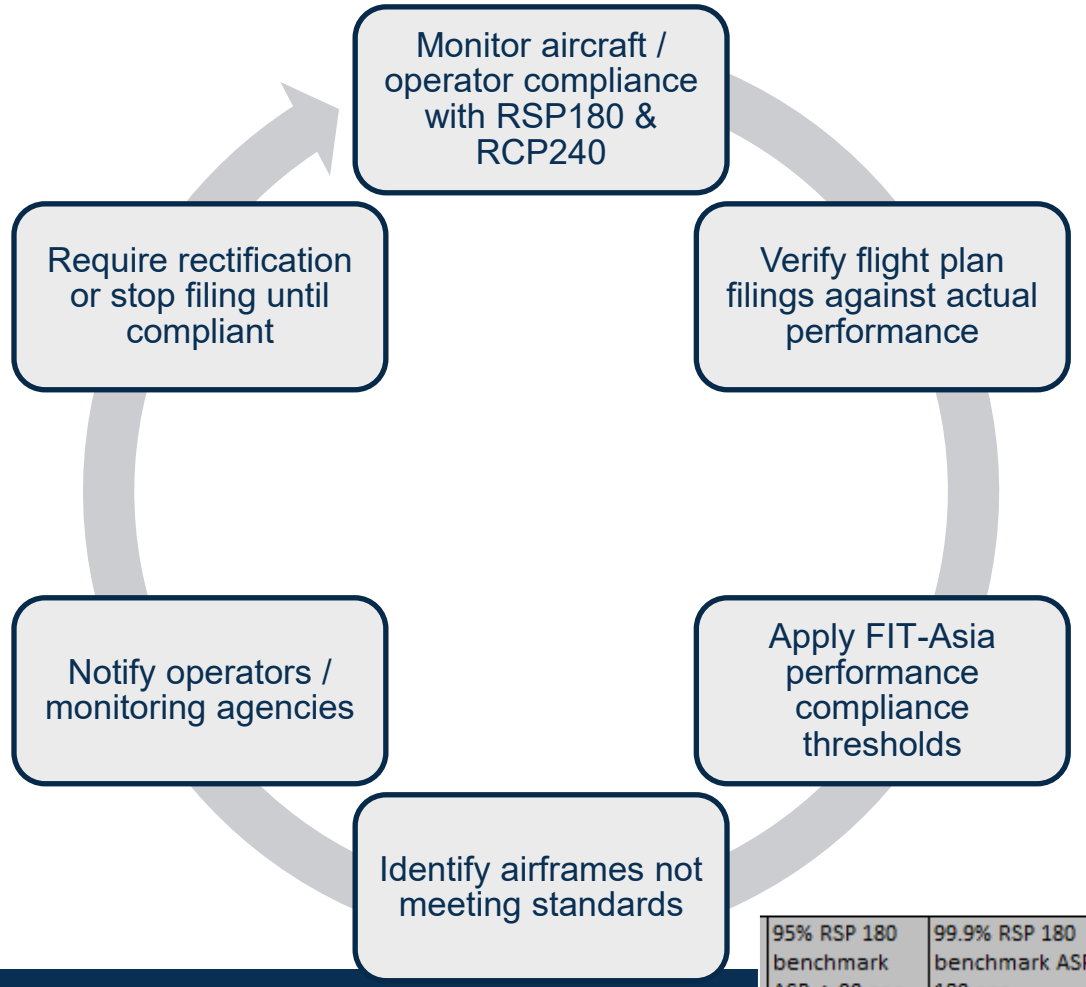
It is part of Southeast Asia Monitoring Agency (SEASMA) duties for the South China Sea region, in the support of PBCS implementation, to monitor the PBCS approvals against PBCS operations.

• We would kindly request the airline operator to investigate and fix the issue.

• The airline operator should not file PBCS indicators in the flight plan until the observed communication and surveillance performance for this airframe is able to meet the required communication performance (RCP) criteria.

• The operator can continue to use the ADS-C and CPDLC equipment on their aircraft for data link communications.

Thank you for the assistance.



COLOUR KEY
Meet Criteria
99.0% - 99.89%
Under Criteria
No Data

95% RSP 180 benchmark ASP <=90 sec	99.9% RSP 180 benchmark ASP <= 180 sec
Fleet Performance	
90.87%	95.51%
92.42%	95.91%

SEASMA

Examples of Monitoring Works

Horizontal Plane Deviations

Deviation Code	Cause of Deviation
A	Flight crew deviate without ATC Clearance in the horizontal dimension
B	Incorrect estimate or route provided due to incorrect operations or interpretation of airborne equipment
C	Flight crew waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position
D	ATC system loop error (e.g. ATC issues incorrect route clearance, Flight crew misunderstands route clearance message, etc.)
E	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues
F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues
G	Navigation errors due to airborne equipment failure leading to deviation in the Horizontal dimension of which notification was not received by ATC or notified too late for action
H	Turbulence or other weather-related causes (other than approved)
I	Aircraft provided with reduced horizontal separation minima but did not meet the RNP/RSP/RCP specifications
J	Others
R	GNSS RFI (Note: Conclusion RASMAG/30-1)

Large Lateral Deviation (LLD)

- Any deviation of 10 NM or more to the left or right of the current flight-plan track for lateral separation minima of 50 NM or more, and any deviation of 5 NM or more for lateral separation minima less than 50 NM.
  - Conclusion RASMAG/30-2

Large Longitudinal Error (LLE)

- Any unexpected change in longitudinal separation between an aircraft pair, or for an individual aircraft the difference between an estimate for a given fix and the actual time of arrival over that fix, as applicable.

Examples of Monitoring Works

Horizontal Plane Deviations

From Deviations to Safety Assurance

Reporting Culture

Importance of reporting

- Essential for safety assurance
- Allows for identification of systemic issues early and prevent recurrence

Non-punitive approach

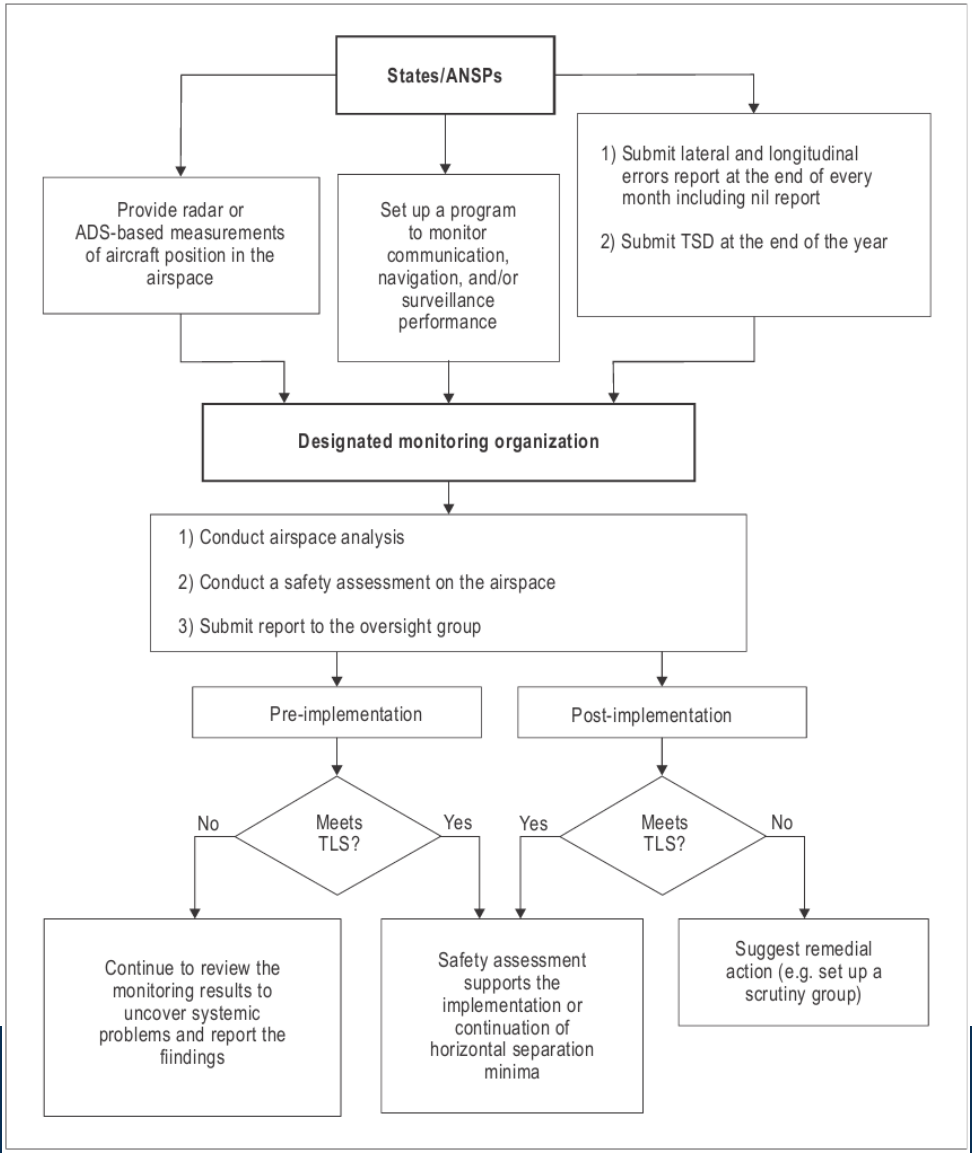
- Strong reporting culture is built on trust
- Reports are analysed to identify root causes (technical, procedural, or human factors) and to be used for safety improvement

Data sharing

- Deviations are reported to regional monitoring agencies and ICAO
- Allows for trend analysis across regions and promotes global harmonization of safety standards

Implementation & Monitoring of PBHSM

Flowchart



SEASMA

Thank You