



International Civil Aviation Organization

The 18th Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/18)

Bangkok, Thailand, 01 – 04 April 2013

Agenda Item 5: Airspace Safety Monitoring Activities/Requirements in the Asia/Pacific Region

REGIONAL SAFETY MONITORING ASSESSMENT

(Presented by the Secretariat)

SUMMARY

This paper presents an overview of safety assessment results from a regional perspective.

This paper relates to –

Strategic Objectives:

A: *Safety – Enhance global civil aviation safety*

Global Plan Initiatives:

- GPI-2 Reduced vertical separation minima
- GPI-8 Collaborative airspace design and management
- GPI-9 Situational awareness
- GPI-16 Decision support systems and alerting systems
- GPI-17 Data link applications
- GPI-21 Navigation systems
- GPI-22 Communication infrastructure

1. INTRODUCTION

1.1 Since APANPIRG/22, RASMAG has provided APANPIRG with an overall assessment of Asia/Pacific FIR RVSM TLS Compliance in order to meet Asia/Pacific Objective 1 (*Airspace Safety Monitoring to Achieve Regional TLS*).

1.2 At RASMAG17, the meeting agreed to focus much more on operational issues than technical capability. The following is an extract from the RASMAG/17 report:

The United States noted that it was important to consider an emphasis on risk mitigation procedures such as Strategic Lateral Offset Procedure (SLOP), which had been inconsistently applied in the Asia/Pacific. The Secretariat stated that this would be considered as part of the Seamless ATM development. He emphasized the need for RASMAG to support key infrastructure Seamless ATM improvements such as AIDC, ATS surveillance (particularly ADS-B), and data sharing.

IATA expressed support for the operational emphasis and requested RMAs to provide material that could be used to assist pilot education. The meeting noted that ANSP education and information on detailed recommended operational responses was also necessary to reduce this form of risk. The meeting agreed that a strengthened focus on the minimization of operational risk was appropriate. AAMA and PARMO agreed to undertake an analysis on this matter and report to RASMAG.

1.3 RASMAG/17 agreed to a new task (17/4), which required AAMA, PARMO, IATA, and IFALPA to conduct an analysis of material and processes required from RMAs to assist airline/ATC education and responses on minimisation of operational errors, including information on hot spots¹ and recommended operational responses. This WP also endeavours to assist that task by identification and analysis of ‘hot spots’ where operational errors appear to be relevant.

2. DISCUSSION

Regional RVSM TLS Compliance

2.1 The state of Asia/Pacific regional RVSM Target Level of Safety (TLS) compliance is indicated as follows:

- **Figure 1** is as reported to APANPIRG/22;
- **Figure 2** is as reported to RASMAG/16;
- **Figure 3** is as reported to RASMAG/17; and
- **Figure 4** is as reported to RASMAG/18.

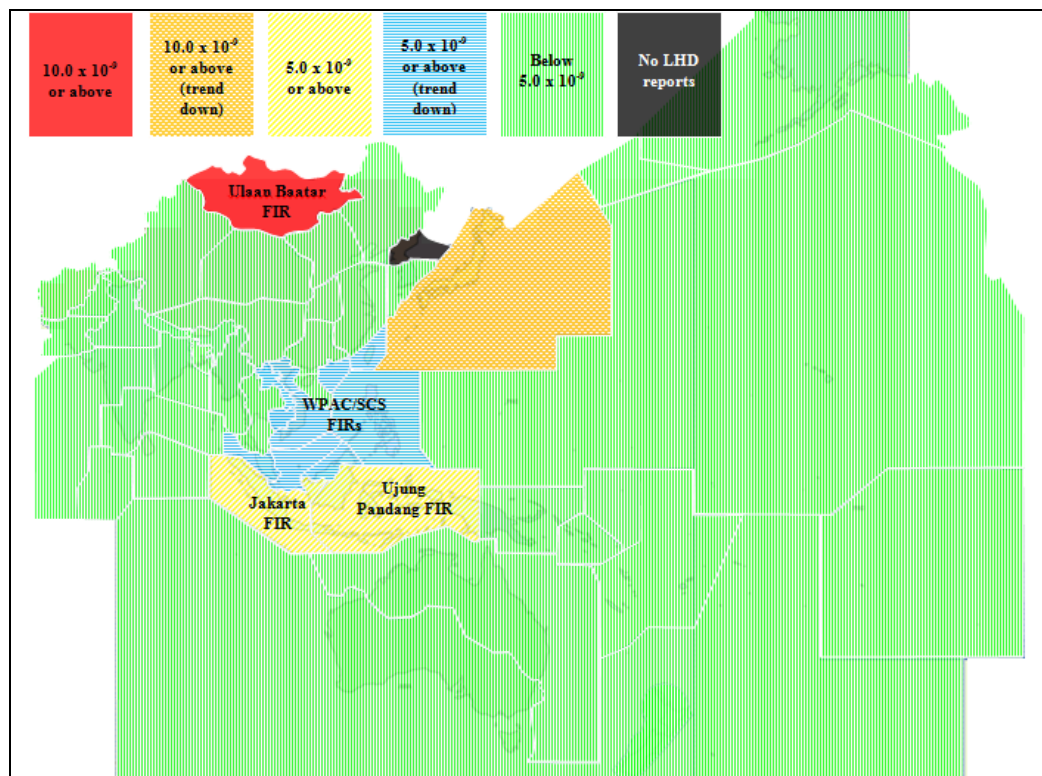


Figure 1: Asia/Pacific TLS compliance reported to APANPIRG/22

¹ Defined for the purposes of this paper as areas where there were more than one proximate (100NM or less) risk bearing occurrence.

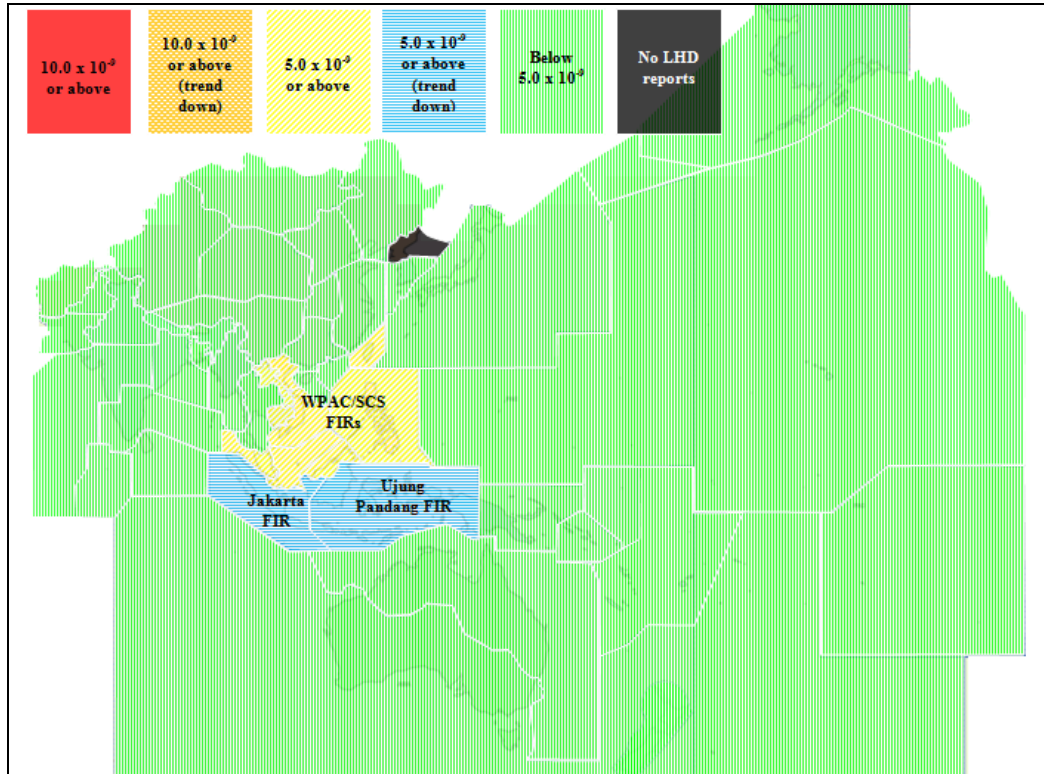


Figure 2: Asia/Pacific TLS compliance reported to RASMAG/16

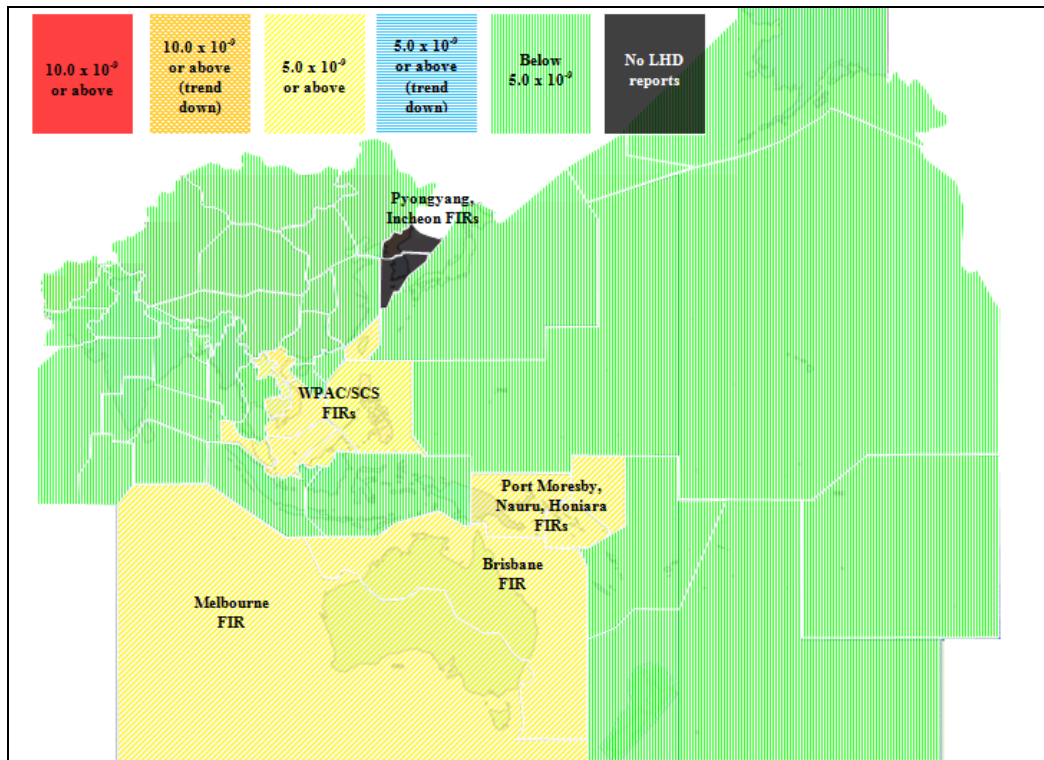


Figure 3: Asia/Pacific TLS compliance reported to RASMAG/17

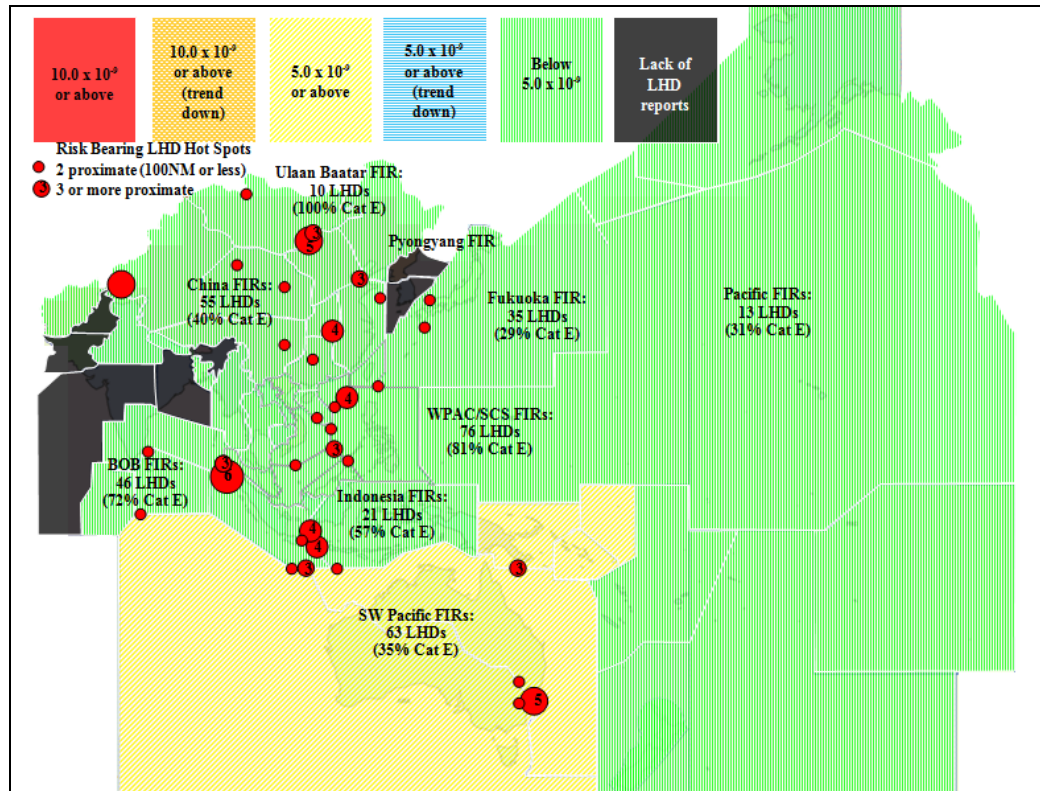


Figure 4: Asia/Pacific TLS compliance reported to RASMAG/18

2.2

Figures 1-4 indicated the following sub-regional regional trends.

- **South Asia** continued to operate below the TLS, although there were hot spots evident at the interface between Indian, Indonesian and Malaysian airspace. India had previously noted potential lack of reporting of safety issues by ATC, and this was evident by the lack of LHD reports from within the Mumbai and Kolkata FIRs. In addition, there appears to have been a lack of reporting within the Karachi and Lahore FIRs (Pakistan airspace).
- **Southeast Asia** had dropped below the TLS after some years not meeting the target, indicating that some of the corrective and preventive actions taken had been effective. However, the overall positive result tended to mask continuing problems associated with the Manila FIR, which saw a large number of LHD hot spots close to the FIR boundary with adjacent States.
- **East Asia** (particularly Mongolia and Japan) had made improvements, and the overall assessment met the TLS. However, there were a number of LHD hot spots at the interface between Mongolia and China, Pakistan and China, and internally within China near Wuhan and Beijing. The continued lack of reporting over many years from the Pyongyang FIR was also a concern.
- **Southwest Pacific** had maintained an upwards trend from RASMAG/17 to be consistently above the TLS. However, the prime driver for the high risk figure was a single LHD from March 2012 that remains within the data sample used for calculations. The AAMA reports a monthly risk value in an attempt to provide real-time information on actual risk without reliance on historical high-time errors resident within the 12 month data sample. This data shows the monthly risk for the Southwest Pacific airspace is well below the average monthly risk which gives an annual risk of 5.0×10^{-9} . There were a number of LHD hot spots, including the interface between Australia and Indonesian airspace (particularly Jakarta FIR), and also between Australia and Papua New Guinea airspace.

- **Pacific** airspace had been consistently below TLS.

2.3 **Table 1** provides a comparison of Asia/Pacific RVSM risk as a measure against the TLS, either by RMA ‘sub-region’², or by FIRs. There had been significant improvement overall, particularly with a reduction of LHDs in the West Pacific/South China Sea (WPAC/SCS), although the 94 occurrences in WPAC/SCS still constituted 28% of all Asia/Pacific LHDs within a dense traffic area. Moreover, the measurement of TLS by ‘sub-region’ tended to mask poor results by better performing or more capable FIRs, so there needed to be significant focus on the LHD hot spots that remained. This information has been copied to the Performance Framework Form (**Appendix 1**)

	2011	2012	2013
RMA ‘sub-regions’	67%	78%	89%
FIRs	73%	73%	90%

Table 1: Comparison of Sub-Regional and Regional RVSM TLS Achievement

2.4 Stemming from the analysis of hot spots, there appeared to be an urgent need for prioritisation of AIDC (ATS Inter-facility Data-link Communications) implementation as a risk mitigation measure at the following interface hot spots. These hot spots were also where category E LHDs (ATC to ATC transfer errors as a result of human factors issues) formed a significant portion of the total reports:

- Jakarta – Chennai/Ujung Pandang/Brisbane/Melbourne FIRs (Indonesia 57% E);
- Chennai – Kuala Lumpur FIRs (Bay of Bengal 72% E);
- Manila – Fukuoka/Taibei/Hong Kong/Sanya/Ho Chi Minh/Singapore/Kota Kinabalu/ Ujung Pandang FIRs (WPAC/SCS 81% E);
- Beijing– Shanghai/Shenyang/Ulaan Baatar FIRs (Mongolia 100% E);
- Urumqi – Lahore FIRs (China 40% E); and
- Wuhan – Guangzhou FIRs (China 40% E).

2.5 The meeting is invited to discuss the following Draft Conclusion for APANPIRG’s consideration:

Draft Conclusion RASMAG/18-XX: Prioritisation of AIDC Implementation

Considering that ATS Inter-facility Data-link Communications (AIDC) is an important means of minimising Large Height Deviations (LHD), Asia/Pacific States should support the expedition of AIDC through collaborative projects at the following significant LHD interface areas:

- Indonesia: between Jakarta and Chennai/Ujung Pandang/Brisbane/Melbourne FIRs;
- India: between Chennai and Kuala Lumpur FIRs;
- Philippines: between Manila and Fukuoka/Taibei/Hong Kong/Sanya/Ho Chi Minh/Singapore/Kota Kinabalu/ Ujung Pandang FIRs; and
- China: between –
 - Urumqi and Lahore FIRs;
 - Beijing and Shanghai/Shenyang/Ulaan Baatar FIRs; and
 - Wuhan and Guangzhou FIRs.

² (1) Melbourne, Brisbane, Nauru, Honiara FIRs (AAMA); (2) Port Moresby FIR (AAMA); (3) Indonesian FIRs (AAMA); (4) Sovereign airspaces of China (China RMA); (5) Fukuoka FIR (JASMA); (6) Bay of Bengal FIRs (MAAR); (7) Western Pacific/South China Sea FIRs (MAAR); (8) Pacific Area (PARMO); and (9) North-East Asia Incheon FIR (PARMO).

LHD Reporting

2.6 **Table 2** provides a comparison of the estimated flight hours for airspace analysed by an RMA divided by the reported LHDs at RASMAG/17 (R17) and RASMAG/18 (R18), in order to assess the levels of occurrence reporting that might be expected.

Airspace	RASMAG17 LHDs	RASMAG18 LHDs	RASMAG18 Flight Hours	RASMAG18 Co-efficient
SW Pacific	61	63	599,990	1: 9,524
Mongolia	11	10	112,297	1: 11,230
WPAC/SCS	112	94	1,183,483	1: 12,590
Japan	19	35	1,101,469	1: 24,495
Bay of Bengal	29	46	1,238,166	1: 26,917
Indonesia	26	21	724,680	1: 34,508
China	40	55	2,388,992	1: 43,436
Total		324	7,349,077	1: 22,684
Pacific	15	13	1,163,968	1: 89,536
Pyongyang	0	0	3,234	0
Republic of Korea	0	0	35,303	0

Table 2: Comparison of Estimated Flight Hours and Reported LHDs

2.7 From the comparison in **Table 1** (separating the Pacific portion of airspace because it was largely oceanic in nature and not directly comparable), the average LHD occurred approximately every 22,684 flight hours. Thus at least one LHD would be expected on average from the Incheon FIR, although none have been reported in the last two RASMAG meetings. The Bay of Bengal, Indonesian and Chinese airspace indicated reports of LHDs at a significantly lower rate than the average. However this might be due to differences between ATM systems, and an increased number of reports in Bay of Bengal and Chinese airspace from RASMAG/17 was noted. The potential lack of reporting from the Mumbai and Kolkata FIRs had already been noted earlier in this paper.

2.8 There was a reasonably close relationship between estimated flight hours and departures using 2011 ICAO data respectively for airspace such as Japan (1,101,469 and 857,327) and Indonesia (724,680 and 555,694), which had a mixture of transiting and terminal traffic like the Incheon Flight Information Region (FIR). Comparing the annual departure data (2011) from the Republic of Korea of 275,774, the estimated flight hours for the Incheon FIR (35,303) appeared to be low, possibly by a factor of 10. Noting that there will always be differences between FIRs regarding transiting aircraft and the size of airspace, the estimate could be correct, but required further analysis.

Regional Horizontal TLS Compliance

2.9 The following Asia/Pacific En-Route Monitoring Agency (EMAs) reported horizontal risk assessments as follows, which all met the TLS of 5.0×10^{-9} (**Table 3**):

Separation Standard	EMA	Estimated Risk
50NM Lateral Risk	BOBASMA	0.74×10^{-9}
	PARMO	4.33×10^{-9}
	SEASMA	1.89×10^{-9}
30NM Lateral Risk	PARMO	0.45×10^{-9}
50NM Longitudinal Risk	BOBASMA	0.90×10^{-9}
	PARMO	2.32×10^{-9}
	SEASMA	0.79×10^{-9}
30NM Longitudinal Risk	PARMO	3.73×10^{-9}

Table 3: Comparison of Horizontal Risk Assessments

2.10 The application of these horizontal standards met the TLS. The lateral risk for 50NM separation as calculated by PARMO is notably higher than other implementations.

Regional Data-link

2.11 An overview of regional data-link performance issues and compliance is expected to be provided within the Second Meeting of the Future Air Navigation Systems Interoperability Team-Asia (FIT-Asia/2, Bangkok, 28-29 March 2013) report.

APANPIRG Metrics

2.12 APANPIRG/20 agreed to the following regional performance metrics Conclusions:

Conclusion 20/4 – Asia/Pacific Performance Metrics

That the following metrics be adopted as a part of Asia/Pacific regional performance monitoring and measurement:

APAC Metric 1 *Percentage of RMA sub-regions achieving the regional Target Level of Safety (TLS) for RVSM operations, referenced as of April each year.*

APAC Metric 2 *Percentage of instrument runway ends with an approach procedure with vertical guidance.*

APAC Metric 3 *Percentage of en-route and terminal PBN routes implemented on a sub-regional basis in accordance with the regional PBN plan.*

APAC Metric 4 *Average delays for departures at State's primary international airports for the busiest hour on a weekly basis.*

Conclusion 20/5 – Data Collection for Regional Metrics

That States, organizations and stakeholders collect and process data to support the regional metrics adopted by APANPIRG, leveraging to the extent possible all existing data and ongoing efforts, and provide a progress report to APANPIRG/21.

2.13 While the division of Asia/Pacific airspace in terms of RMA responsibilities into nine 'RMA sub-regions' made assessment of risk compliance easier, this measurement was too coarse to provide a meaningful regional performance overview. Moreover, reference to flight information regions provides an opportunity for RMAs to conduct more detailed analysis of individual FIR performance when it is considered that safety risk performance is consistently near or above the TLS, instead of that specific detail being 'hidden' among a much larger group of FIRs. This has been problematic in the past within the South China Sea and West Pacific airspace, where some FIRs have performed well, and others less so, but only an overall assessment was provided.

2.14 Furthermore, the schedule for RASMAG may change from time to time as it is in 2013, so the specific reference to the month of April should be deleted. Thus the meeting is invited to discuss an amendment for APAC Metric 1 as per the following Draft Conclusion:

RASMAG Draft Conclusion 18/XX – APAC Vertical Safety Metric

APAC Metric 1: Percentage of Flight Information Regions achieving the regional Target Level of Safety (TLS) for RVSM operations.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this paper;
- b) discuss Draft Conclusion RASMAG/18-XX: Prioritisation of AIDC Implementation (Paragraph 2.5);
- c) discuss Draft Conclusion 18/XX – APAC Vertical Safety Metric (Paragraph 2.14); and
- d) discuss any relevant matters as appropriate.

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Appendix 1: Performance Framework Form

ASIA/PACIFIC REGION
PERFORMANCE FRAMEWORK FORM

(REGIONAL)

(amended 25 March 2013)

REGIONAL PERFORMANCE OBJECTIVE: <u>APAC Objective 1</u>				
AIRSPACE SAFETY MONITORING TO ACHIEVE REGIONAL TLS				
Benefits				
Safety	<ul style="list-style-type: none"> Improved safety management, Compliance with regional Target Level of Safety (TLS) 			
Strategy				
Short term/medium term (2009-2015)				
ATM OC COMPONENT S	TASKS	TIME FRAME	RESPONSIBILITY	STATUS
AOM <i>(Airspace Organization and Management)</i>	<ul style="list-style-type: none"> Facilitate cooperative arrangements between States to undertake airspace safety assessments Review airspace safety monitoring that supports reduction in vertical and horizontal aircraft separation standards 	2009-2015	RASMAG	In progress
	<ul style="list-style-type: none"> Assist States to achieve established regional Target Levels of Safety (TLS) Provide advice to States to establish aspects of ATS safety management systems that support compliance with the regional TLS 	2009-2015	RASMAG ATM/AIS/SAR/SG ATM Coordination Groups FIT-Asia	In progress. Comparison of Asia/Pacific RVSM TLS compliance, either by RMA 'sub-region' (SR) or FIR, is as follows. 2011: 67% (SR), 73% (FIR); 2012: 78% (SR), 73% (FIR); 2013: 89% (SR), 90% (FIR). The 2013 horizontal safety risk assessment met TLS in all areas assessed.
GPIs	GPI/2 Reduced vertical separation minima, GPI/5 Performance based navigation, GPI/7 Dynamic and Flexible ATS route management			
References	<ul style="list-style-type: none"> <i>Asia/Pacific Guidance Material for ADS/CPDLC/AIDC Ground Systems Procurement and Implementation;</i> <i>Guidance Material for End-to-End Safety and Performance Monitoring of Air Traffic Service (ATS) Data Link Systems in the Asia/Pacific Region</i> <i>Asia/Pacific En-route Monitoring Agency (EMA) Handbook</i> <i>Regional Monitoring Agency (RMA) Manual</i> <i>Global Operational Data Link Document (GOLD).</i> 			