



Agenda Item 5: RVSM issues

TRANS-REGIONAL AIRSPACE SAFETY MONITORING

(Presented by the Secretariat)

SUMMARY

This paper presents relevant outcomes of the Nineteenth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/19) held from 27-30 May 2014 in conjunction with the Third Meeting of the Future Air Navigation Systems Interoperability Team-Asia (FIT-Asia/3, 26 May 2014), at Pattaya, Thailand.

1. INTRODUCTION

1.1 A total of 45 participants attended either or both the FIT-Asia/3 and RASMAG/19 meetings from Bangladesh, Cambodia, China, India, Indonesia, Japan, Lao PDR, Malaysia, Republic of Korea, Thailand, the United States, Viet Nam, IATA, and IFATCA. Australia, New Zealand, Singapore and Boeing provided papers for the meeting (which were presented by the Secretariat), but were unable to attend due to the political uncertainty in Thailand at the time.

2. DISCUSSION

Data-link Performance

2.1 India, China and Singapore presented information on the observed Automatic Dependent Surveillance – Contract/Controller Pilot Data Link Communications (ADS/CPDLC) data link performance within their Flight Information Regions (FIRs) measured against the Required Communication Performance (RCP) and Required Surveillance Performance (RSP) guidelines contained in the Global Operational Data Link Document (GOLD). It was noted by FIT-Asia/3 that the Actual Communications Performance (ACP) for CPDLC per media type (Satellite, Very High Frequency - VHF and combined) met the 180 second transaction completion target (95% of transactions) but did not always meet the 99.9% target. Further expert opinion would be sought relating to the operational implications of the 99.9% criteria, the possible causes of failure to meet it by only small margins, and solutions.

2.2 Analysis by China identified a number of data link problem areas:

- failure of automatic CPCLC transfer functions caused by a mismatch between the operator's ICAO 3 letter designator and that registered in the CSP's operator list;
- non-replies to CPDLC requests in the Kunming FIR due to the availability of Very High Frequency (VHF) coverage and ATC preference;
- use of free text messages by ATC instead of the standardized practices recommended in the GOLD.

Regional Supplementary Procedures Supporting ADS-C/CPDLC Mandates

2.3 At RASMAG/19, ICAO presented a Proposal for Amendment (PfA) to Regional Supplementary Procedures (ICAO Doc 7030) to support State mandates for ADS-C and CPDLC equipage in aircraft operating outside territorial airspace, within the area of responsibility of the State. PfAs had been drafted that related to mandates for CPDLC (Serial No. APAC-S 14/07), and for ADS-B, ADS-C, ACAS II and Mode S SSR transponders (14/09), to provide a framework for Asia/Pacific States to establish performance-based airspace by enabling States to promulgate equipage mandates in airspace over the High Seas. A parallel PfA relating to Performance-Based Navigation (PBN) had also been drafted.

2.4 The proposed amendments were in accordance with the concept of Seamless ATM and performance-based approaches, the Aviation System Block Upgrade (ASBU) initiative and Global Air Traffic Management Operational Concept (ICAO Doc 9854).

China RMA Safety Report

2.5 China presented the results of the airspace safety oversight for the RVSM operation in the airspace of Chinese FIRs and the Pyongyang FIR (Democratic Republic of Korea – DPRK) from 01 January 2013 until 31 December 2013. The estimates of technical and total risks for the airspace of Chinese FIRs satisfied the agreed TLS value of no more than 2.5×10^{-9} and 5.0×10^{-9} fatal accidents per flight hour, with an overall risk estimate of **2.99×10^{-9}** .

2.6 China RMA noted the continued problems they had experienced with the interface between Urumqi and Lahore (Pakistan) FIRs. They stated that China had proposed enhancements to communications and ATS surveillance near the border, but had encountered difficulties in establishing the facilities, which might best be sited in Pakistan (but this posed questions regarding ownership and maintenance). China again requested ICAO to work with Pakistan to resolve the problem, as they were concerned about the safety risks at the PURPA crossing point. The Secretariat informed the RASMAG/19 meeting that there was an outstanding task regarding the need for a Special Coordination Meeting between Pakistan and China to address this high risk situation.

2.7 Based on the data from the DPRK, no LHD had occurred during 2013 within the Pyongyang FIR. Considering the long-term nil LHD reports, to make a conservative estimate for the operational risk, China RMA used the operational risk value of Chinese FIRs, and the technical risk was calculated from the Traffic Sample Data (TSD) data collected in December 2013 from the Pyongyang FIR. The estimate of the overall vertical collision risk for the Pyongyang FIR was **1.58×10^{-9}** fatal accidents per flight hour, which satisfied the globally agreed TLS value of 5×10^{-9} fatal accidents per flight hour.

MAAR Safety Report

2.8 The Monitoring Agency for Asia Region (MAAR) provided the results of the airspace safety oversight for the RVSM operation in the Bay of Bengal (BOB), Western Pacific/South China Sea (WPAC/SCS), and Mongolian airspace for the period from 01 January 2013 until 31 December 2013.

2.9 MAAR noted the distinctive group of LHDs prevalent within the Kabul FIR. Since the Kabul FIR had military level restrictions, most LHDs involved a neighbouring ACC (Samarkand, Uzbekistan, at position AMDAR) releasing aircraft at flight levels that were not allowed as specified in the Air Traffic Service (ATS) Letter of Agreement (LOA).

2.10 The Mongolian Reduced Vertical Separation Minimum (RVSM) airspace total risk was estimated at 7.63×10^{-9} , which did not meet the Target Level of Safety (TLS). **Figure 1** presented collision risk estimate trends from January to December 2013.

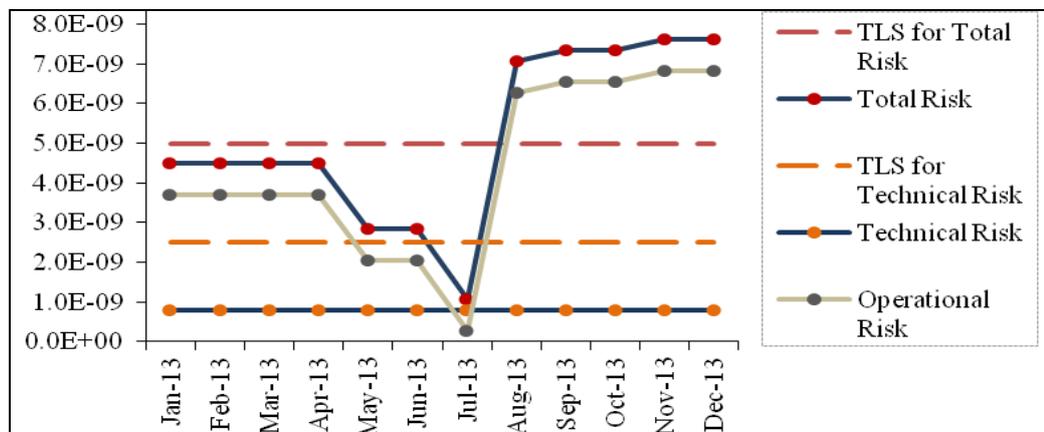


Figure 1: Mongolian Airspace RVSM Risk Estimate Trends

2.11 A monthly LHD risk value is determined to provide real-time information on actual risk without reliance on historical high-time errors resident within the 12 month data sample. The data in **Figure 2** shows the monthly risks for the month of July 2013 are above the average monthly risk of 5.0×10^{-9} (red line in Figure 2 below, which is approximately 0.4167×10^{-9} fatal accidents per flight hour).

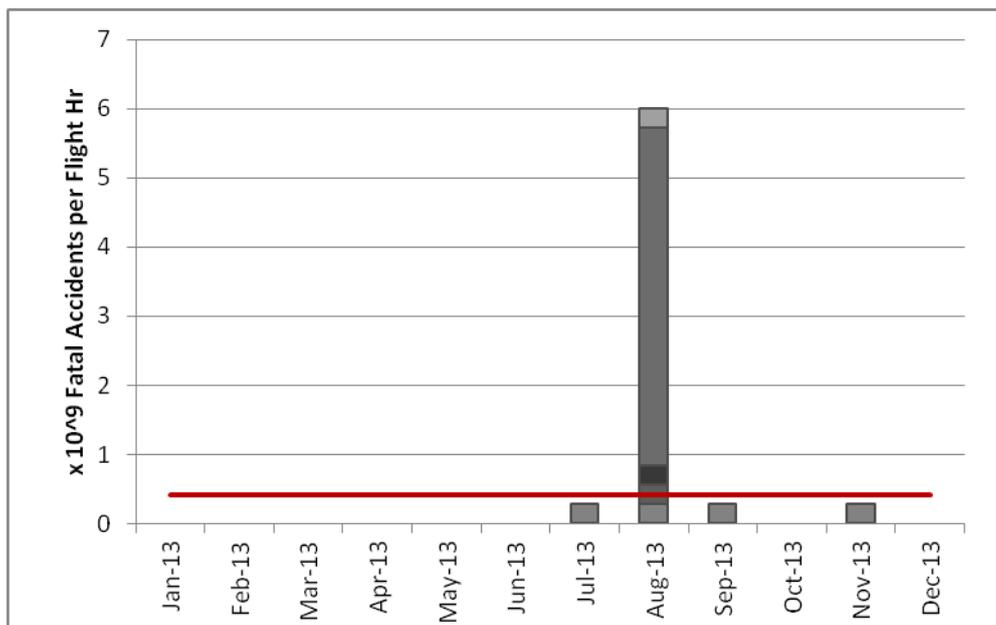


Figure 2: Monthly LHD Risk Estimates for Mongolia Airspace

2.12 **Figure 3** depicts geographic location of risk bearing LHDs and hot spots in Mongolia airspace based on LHD reports from January to December 2013 where:

- the navy dotted line represents the frequency of occurrences at the labeled waypoint,
- the color of each circle represents the sum of minutes at incorrect flight level and the number of flight levels crossed without clearance (darker orange represents higher value) associated with LHDs occurring at or near the labeled waypoint, and
- the area of the circle represents the sum of operational risk associated with LHDs occurring at or near the labeled waypoint.

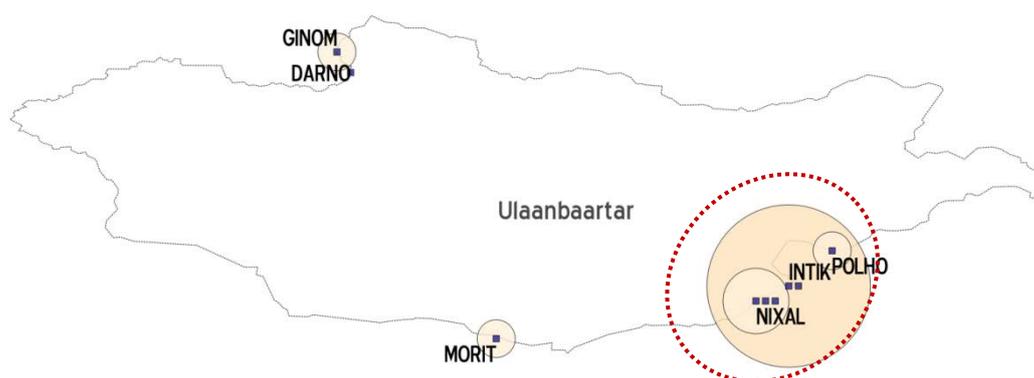


Figure 3: Geographical Location of LHDs in Mongolian Airspace

2.13 MAAR observed that the main hot spot within Mongolian airspace was the southwest boundary of the Ulaanbaatar FIR with the Beijing FIR at positions NIXAL and INTIK, where the main risk-bearing Large Height Deviation (LHD) event of 14 minutes' duration occurred. China observed that this event had not been reported by Beijing ACC so they would make enquiries as to the process followed in this instance.

PARMO Vertical Safety Report

2.14 The Pacific Approvals Registry and Monitoring Organization (PARMO) presented a safety assessment of RVSM in portions of Pacific and North East Asia (Republic of Korea - ROK) airspace for the most recent reporting period of 01 January to 31 December 2013.

2.15 The Incheon FIR RVSM total risk during the period from 01 January 2013 to 31 December 2013 was estimated to be 0.60×10^{-9} .

China RMA Assessment of Non-RVSM Approved Aircraft

2.16 China RMA provided the results of once-a-month comparison between the RMAs' approval databases and flight plans operated within the RVSM airspace of Chinese FIRs and Pyongyang FIR using flight plan data up to March 2014. DPR Korea started to provide monthly flight plan data from the beginning of 2014, and the data was shared on a three-month basis. Thus the China RMA was able to conduct the check for this region using the flight plan data for the whole year, not just the data of each December.

2.17 The China RMA assessment of Chinese FIRs and the Pyongyang FIR up until March 2014 identified a total of **33** non-RVSM approved aircraft, compared with a total of 43 airframes during the period December 2011 until February 2013.

MAAR Assessment of Non-RVSM Approved Aircraft

2.18 The MAAR assessment of non-RVSM approved aircraft for RASMAG/19 was 130 (RASMAG/18 was 118). The annual update of RVSM Approval Data for the period ending 2013 was not provided by Brunei Darussalam, India, Lao PDR, Malaysia, Maldives, Myanmar, Nepal and Vietnam, although periodic RVSM approvals updates and the TSD for all FIRs was received except for the Kuala Lumpur TSD.

Regional Safety Monitoring Assessment

2.19 **Figure 2** indicated the regional Asia/Pacific regional RVSM TLS compliance as reported to RASMAG/18, and **Figure 3** indicated the status as reported to RASMAG/19.

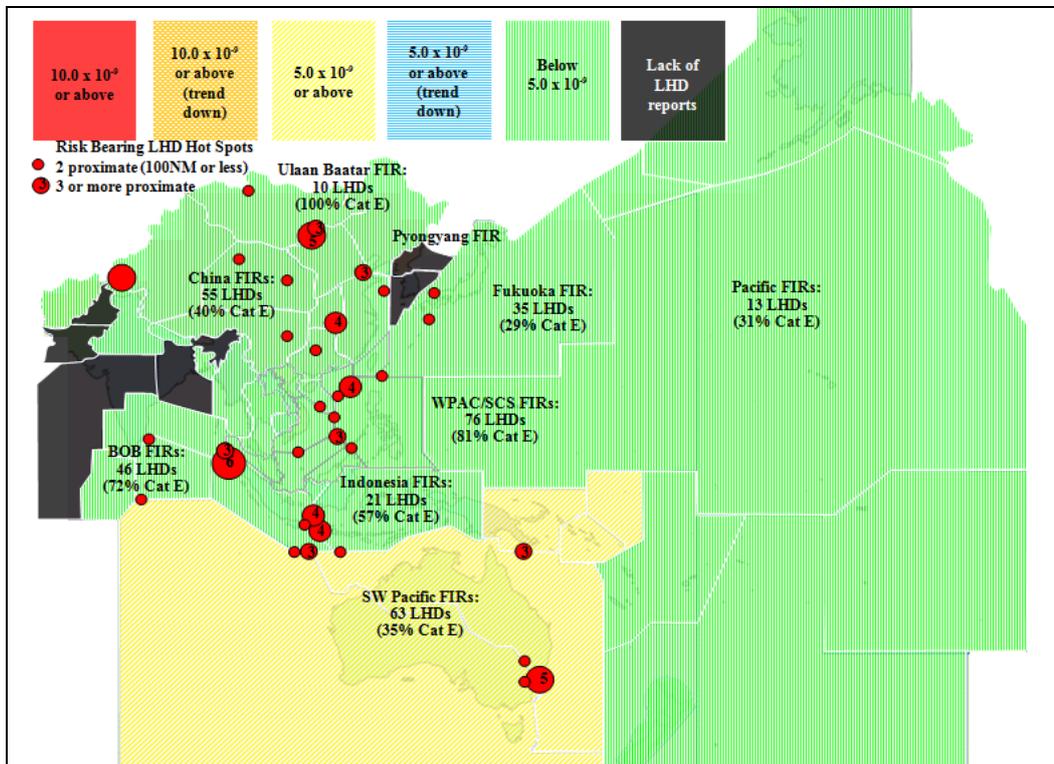


Figure 2: Asia/Pacific TLS compliance reported to RASMAG/18

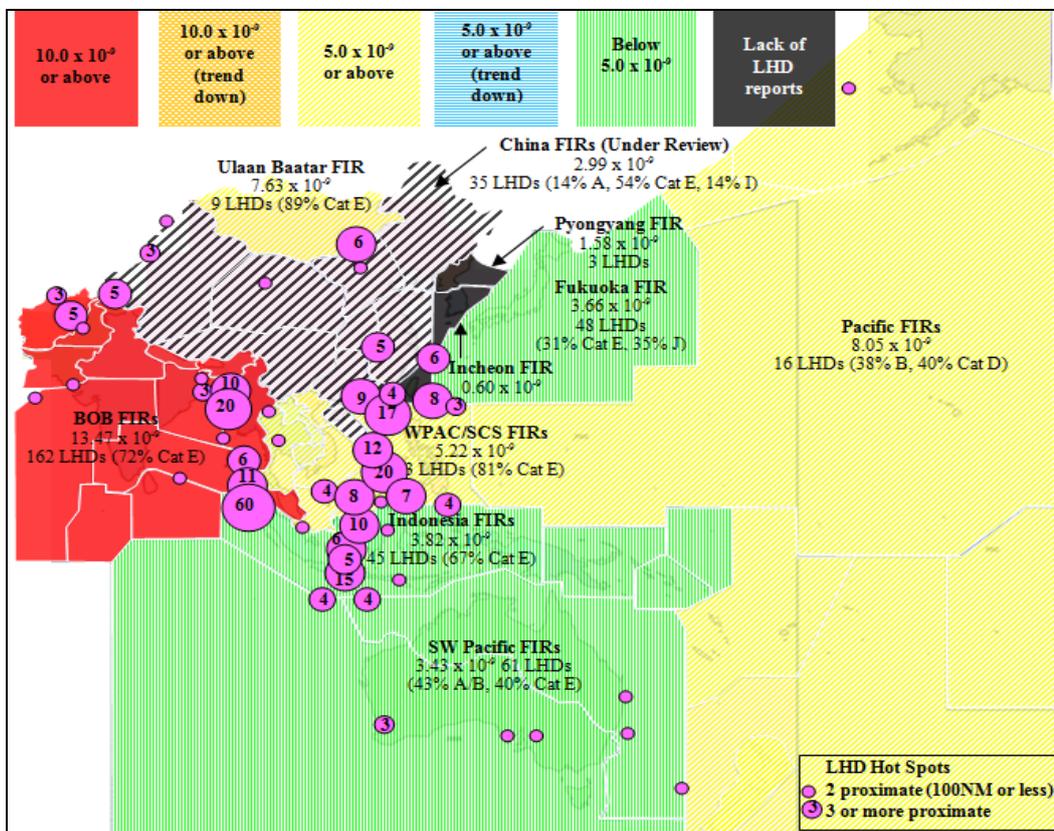


Figure 3: Asia/Pacific TLS compliance reported to RASMAG/19

2.20 **Figure 3** indicated that in East Asia, Mongolia had not met the TLS, largely because of the interface between Mongolian and Chinese airspace. This could be discussed at a forthcoming Eurasia Special Coordination Meeting. Japan had met TLS, as had the ROK and China. However, there was concern regarding the lack of LHDs from the DPRK (although their flight hours were very low), ROK and China.

2.21 **Table 1** provided a comparison of Asia/Pacific RVSM risk as a measure against the TLS, either by RMA ‘sub-region’, or by FIRs. There had been significant deterioration in the region meeting the TLS overall, which has been partially caused by improved reporting.

	RASMAG16	RASMAG17	RASMAG18	RASMAG19
RMA ‘sub-regions’	67%	78%	89%	22%
FIRs	73%	73%	90%	16%

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

2.22 **Table 2** provided a comparison of the estimated flight hours for airspace analysed by an RMA, divided by the reported LHDs at RASMAG/18 and RASMAG/19, in order to assess the levels of occurrence reporting ratio that might be expected.

Airspace	RASMAG 18 LHDs	RASMAG 19 LHDs	RASMAG 19 Flight Hours	RASMAG 18 Ratio	RASMAG 19 Ratio
SW Pacific	63	61	599,990	1: 9,524	1: 9,835
Mongolia	10	9	-3% 108,773	1: 11,230	1: 10,876
India/BOB	46	162	+51% 1,869,508	1: 26,917	1: 11,540
WPAC/SCS	94	133	+34% 1,581,192	1: 12,590	1: 11,889
Indonesia	21	45	+5% 761,390	1: 34,508	1: 18,570
Japan	35	48	+8% 1,195,776	1: 24,495	1: 22,947
China	55	35	+6% 2,537,923	1: 43,436	1:72,512
ROK	0	3	*492,360	0	1:164,120
Pyongyang	0	0	+85% 5,970	0	0
Total	324	496	+54% 11,323,399	1: 22,684	1:22,829
Pacific	13	16	+7% 1,250,084	1: 89,536	1: 78,130

Table 2: Comparison of Estimated Flight Hours and Reported LHDs (*2012 figure)

2.23 From the comparison in **Table 2** (separating the Pacific portion of airspace because it was largely oceanic in nature and not directly comparable), the average LHD occurred approximately every 22,829 flight hours.

2.24 RASMAG/19 noted that it was unlikely that the Asia/Pacific would have ratios greater than this and the true rate of LHDs in Chinese and ROK airspace was probably much more than was currently being reported. In particular, the reports for Beijing, Incheon, Sanya, and Shenyang FIRs appear to be well below what would be expected, given the very busy traffic in those airspaces.

2.25 China acknowledged that, relative to the flight hours, the LHD reporting ratio of China and DPRK was quite low, with possible existence of underestimation in these regions. The meeting urged China to improve its mechanism of LHD reporting and develop a plan to establish an open reporting culture as part of a ‘just culture’ element of its safety management system by conducting a review, and requested China to report to APANPIRG/25 any progress made.

Non-RVSM Approved Aircraft

2.26 The meeting noted that Asia/Pacific States with the majority of non-RVSM airframes identified by the Asia/Pacific RMAs to be operating within the RVSM stratum without proof of RVSM approval, were from China, India, Indonesia, Pakistan and the Philippines. **Table 3** compares the number of non-RVSM airframes reported by each RMA:

Report	AAMA	China RMA	JASMA	MAAR	PARMO
RASMAG/18	98	43	47	118	15
RASMAG/19	90	33	40	130	19

Table 3: Trend of Non-RVSM airframes Observed by Asia/Pacific RMAs

2.27 Overall, the number of non-RVSM aircraft had marginally reduced by 3% in the past year. This indicated that there was considerable work to do and APANPIRG Conclusion 24/6 *Repetitive Non-RVSM Approved Aircraft Operating as RVSM Approved Flights* which encouraged States to deny entry to operate within RVSM airspace for aircraft that have been confirmed as non-RVSM approved over a significant length of time, or by intensive checking, except where a specific non-RVSM operation was authorized, had not yet been effective.

Long Term Height Keeping Monitoring Burden

2.28 **Table 4** compares the outstanding monitoring burden reported by each RMA:

Report	AAMA	China RMA	JASMA	MAAR	PARMO
RASMAG/18	102	141	29	189	118
RASMAG/19	79	87	16	200	37

Table 4: Outstanding Monitoring Burden of Asia/Pacific RMAs

2.29 **Table 5** indicates that all the RMAs had managed to reduce their monitoring burden, except for MAAR, which may require collaborative assistance from States to share ADS-B data to help reduce the burden for States/operators effectively. The overall total remaining Asia/Pacific regional monitoring burden had decreased from 579 (RASMAG/18) to 419 as reported to RASMAG/19, a 38% reduction, which followed a 32% reduction since 2009.

2.30 The following Asia/Pacific En-route Monitoring Agencies (EMAs) reported horizontal risk assessments as follows, which all satisfied the TLS of 5.0×10^{-9} (**Table 5**). The lateral risk for 50NM separation as calculated by JASMA is notably lower than other implementations.

Separation Standard	EMA	Estimated Risk
50NM Lateral Risk	BOBASMA	0.76×10^{-9}
	JASMA	0.000006×10^{-9}
	PARMO	0.97×10^{-9}
	SEASMA	0.055×10^{-9}
30NM Lateral Risk	PARMO	0.26×10^{-9}
50NM Longitudinal Risk	BOBASMA	4.02×10^{-9}
	PARMO	2.32×10^{-9}
	SEASMA	1.18×10^{-9}
30NM Longitudinal Risk	JASMA	0.13×10^{-9}
	PARMO	3.74×10^{-9}

Table 5: Comparison of Horizontal Risk Assessments

RVSM Approvals and Authorisations

2.31 New Zealand presented RASMAG19/WP30, which provided information on the need for coordination between military and civil authorities for authorisation of flights by State aircraft within RVSM airspace, and on the importance of ensuring that States maintain up-to-date details of RVSM approvals with their responsible RMA. The 55th Meeting of the European Air Navigation Planning Group (EANPG) raised several points of interest regarding RVSM approvals, resulting in EANPG Conclusion 55/27 - *Flights in RVSM Airspace by non-approved State designated aircraft*, and EANPG Conclusion 55/28 - *Validation of RVSM Approvals and Confirmation of RVSM Points of Contact*.

2.32 Asia/Pacific RMAs had reported instances of State aircraft operating in RVSM airspace without authorisation and, as in Europe, a consistent policy within the Asia/Pacific Region would help to alleviate this problem. Greater coordination between civil and military authorities, particularly on RVSM operational requirements, would support such a policy. Accordingly, RASMAG/19 agreed to the following Draft Conclusion for APANPIRG's consideration:

Draft Conclusion RASMAG/19-5: Flights in RVSM Airspace by non-approved State Aircraft

That, Asia/Pacific States are urged to ensure close cooperation between civilian and military authorities, so that all RVSM operational requirements are clearly understood and complied with by State aircraft.

3. ACTION BY THE MEETING

- 3.1 The meeting is invited to:
- a) note the information contained in this paper; and
 - b) discuss any relevant matters as appropriate.

.....