International Civil Aviation Organization

Europe – Asia Trans-regional Special Coordination Meeting

Beijing, China, 23 – 25 September 2013

Agenda Item 5: RVSM issues

TRANS-REGIONAL AIRSPACE SAFETY MONITORING

(Presented by the Secretariat)

SUMMARY

This paper presents information on trans-regional airspace safety monitoring, including Large Height Deviations (LHD) presented to the Asia/Pacific 18th Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/18, Bangkok, Thailand, 27 March – 04 April 2013).

This paper relates to –

Strategic Objectives:

A: ***Safety*** *– Enhance global civil aviation safety*

C: ***Environmental Protection and Sustainable Development of Air Transport*** *– Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment*

Global Plan Initiatives:

GPI-2 Reduced vertical separation minima
GPI-3 Harmonization of level systems
GPI-8 Collaborative airspace design and management
GPI-10 Terminal area design and management
GPI-12 Functional integration of ground systems with airborne systems
GPI-13 Aerodrome design and management
GPI-16 Decision support systems and alerting systems
GPI-18 Aeronautical information
GPI-19 Meteorological Systems
GPI-22 Communication infrastructure

1. INTRODUCTION

1.1 The Eighteenth Meeting of the Asia/Pacific Regional Airspace Safety Monitoring Advisory Group (RASMAG/18) was held from 1-4 April 2013 at Bangkok, Thailand. The primary task of the RASMAG is to monitor the system safety performance related to the application of ATC separation minima such as Reduced Vertical Separation Minimum (RVSM) and Required Navigation Performance (RNP) horizontal separations, particularly those associated with data-link communications. RASMAG/18 was held in conjunction with the Second Meeting of the Future Air Navigation Systems Interoperability Team-Asia (FIT-Asia/2, 28-29 March 2013) which provided analysis of data-link performance and systems.

2. DISCUSSION

FIT-Asia

2.1 The meeting discussed information on apparent deficiencies in data-link problem reporting (PRs) among FIT-Asia States and airspace users, and the lack of arrangements between States and competent Central Reporting Agencies (CRAs) for the analysis of technical performance of data-link systems. The FIT-Asia Terms of Reference (TOR) required that it support FIT-Asia States' compliance with ICAO Annex 11 – Air Traffic Services and Global Operational Data-Link Document (GOLD) requirements for data-link performance.

2.2 There was a considerable lack of data-link problem reporting among FIT-Asia States and airspace users, and few FIT-Asia States (Figure 1) had arrangements in place for the analysis of PRs by a competent CRA.

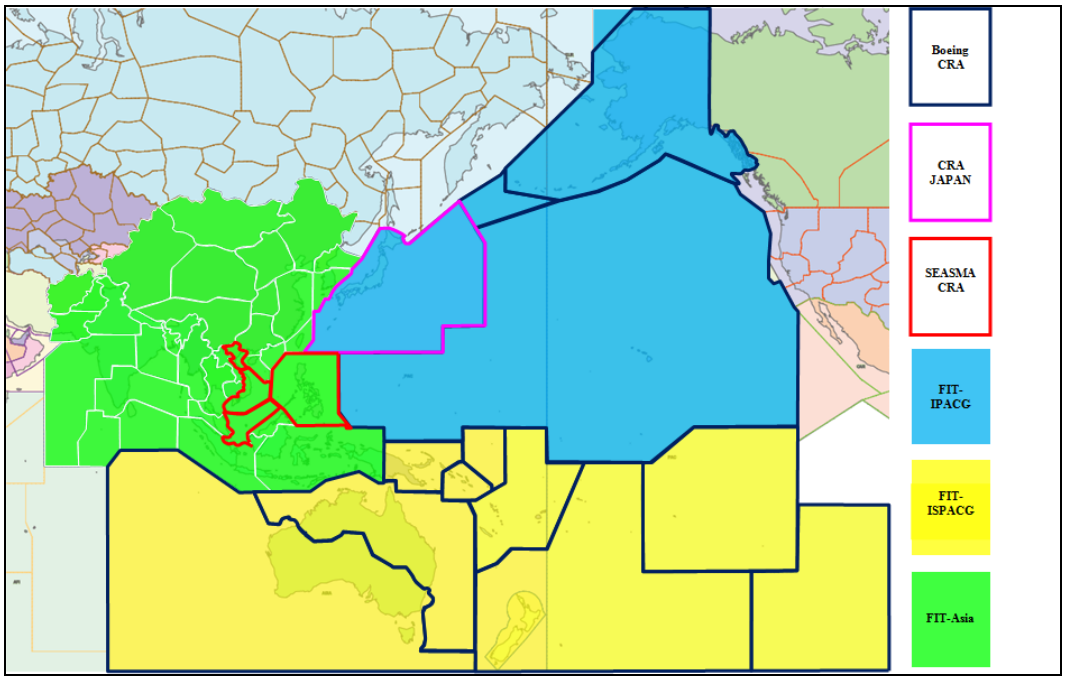

Figure 1: Asia/Pacific Central Reporting Agencies and FITs (Data-Link)

2.3 The meeting was reminded of Decision FIT-Asia/1-2:

Decision FIT-Asia/1-2: Data-Link Performance Monitoring Information

That, States should collect, process and present data-link performance information:

a) in accordance with Global Operational Data-Link Document (GOLD) requirements, and for consistency, with any FIT-Asia template;

b) where possible, by utilising an appropriate automated tool for processing (such as that available from the United States' Federal Aviation Administration); and

c) utilising the Informal South Pacific Air Traffic Services (ATS) Coordinating Group Central Reporting Agency (ISPACG CRA) website Problem Reporting and analysis process.

2.4 The meeting was further informed that improvements to the ISPACG website (http://www.ispacg-cra.com/) would soon be made to include FIT-Asia as a participating body, and enabling the filtering of region-specific PRs. The meeting noted that the results of problem report analysis were provided to the originator as well as being posted on the CRA web site. Accordingly, the meeting agreed to a draft Conclusion regarding Automatic Dependent Surveillance-Contract (ADS-C) and Controller Pilot Data-Link Communications (CPDLC) problem reporting and analysis, later endorsed by RASMAG and APANPIRG:

Conclusion 24/24: ADS/C and CPDLC Problem Reporting and Analysis

That, FIT-Asia States are requested to:

- register on the FIT-Asia website (http://www.ispacg-cra.com), and report their registration to the ICAO Asia/Pacific Regional Office by 31 December 2013;
- report problems relating to Automatic Dependent Surveillance-Contract (ADS-C) and Controller Pilot Data-Link Communications (CPDLC) services to the Central Reporting Agency (CRA) for analysis, utilizing the FIT-Asia website; and
- ensure the CRA analysis is reported to FIT-Asia.

Data-Link Performance Monitoring

2.5 Information was provided to the meeting about China's effort in developing technical ability for data-link performance monitoring. Observed performance analysed and was presented as specified in the GOLD, from operational ADS/C and CPDLC data collected along the section of ATS route L888 within China, from October 2012 to end January 2013.

2.6 China had provided data-link services on ATS route L888 in remote western China since 2001. Analysis was conducted utilizing the FAA's G-PAT software. ADS-C and CPDLC performance were measured against the Required Communication Performance 400 (RCP400) specification. The first useable data became available from 1 October, 2012, and data up to January 2013 was used in this report. China developed a data-link performance monitoring local database and several filter and analysing software tools to support the performance measurement from four Flight Information Regions (FIRs): ZLLL, ZPPP, ZUUU, ZWWW). There were 2105 Satellite Communication (SATCOM), 955 VHF (Very High Frequency), and 18 HF (High Frequency) data-link messages.

2.7 **Figure 2** provides information on CPDLC Actual Communications Performance (ACP) measurement for the messages in aggregate and by media (Satellite, VHF, and HF). **Figure 3** provides the CPDLC ACP by operator (de-identified).

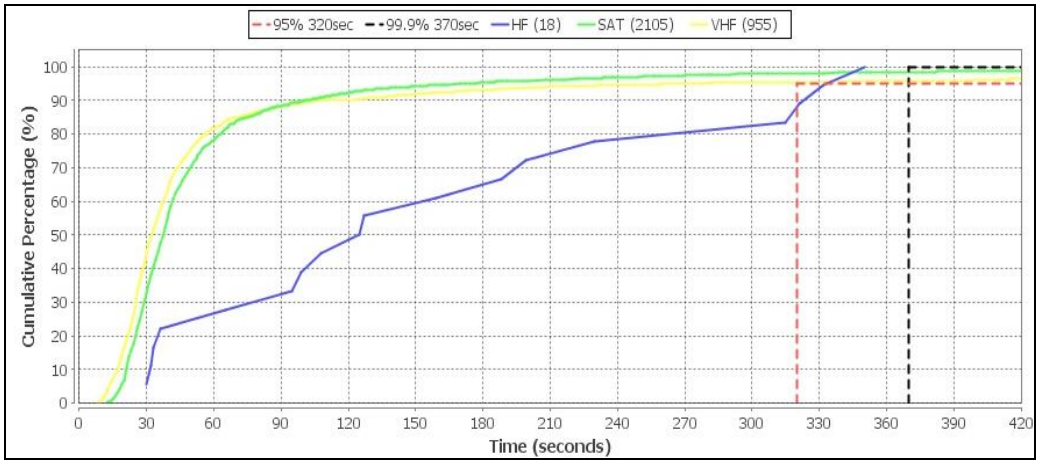

Figure 2: China CPDLC ACP by Media

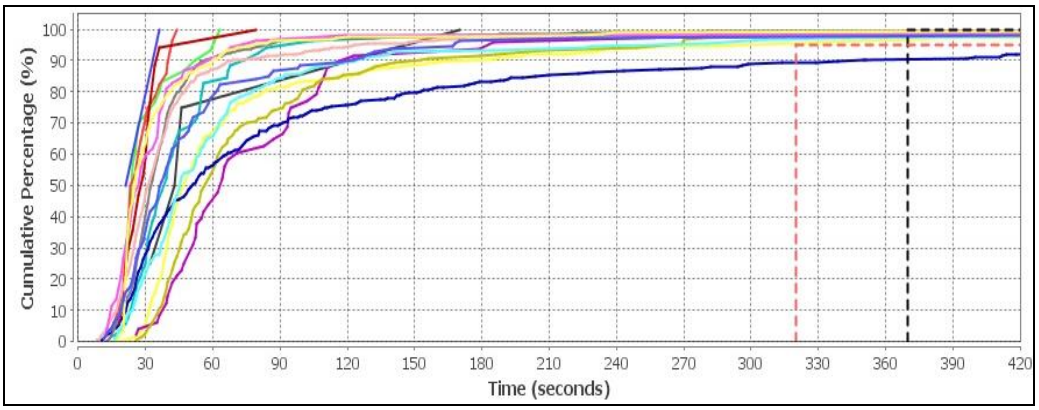

Figure 3: China CPDLC ACP by airline

2.8 **Figure 4** presents observed ADS-C downlink latency by media (satellite, VHF and HF). **Figure 5** provides the observed ADS-C Downlink Latency by operator.

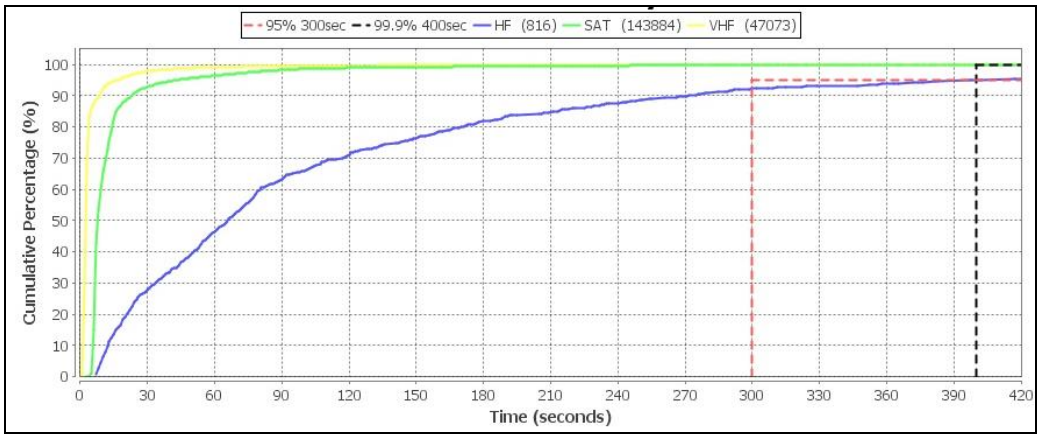

Figure 4: China ADS-C Performance by Media

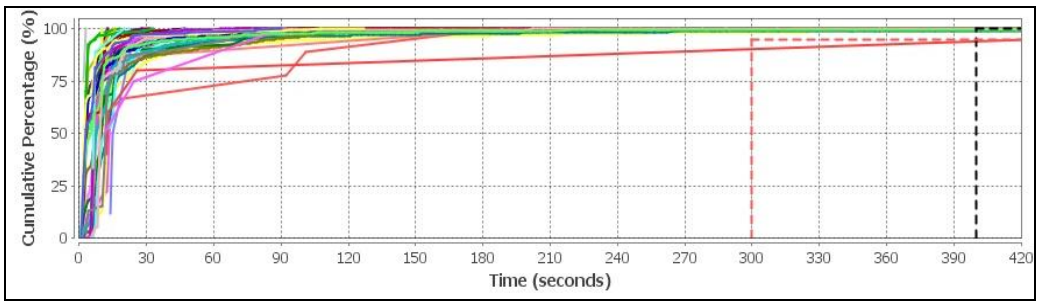

Figure 5: China ADS-C Downlink Performance-by operator

2.9 The meeting discussed the apparently low numbers of CPDLC messages, which was due to the relatively low number of flights along the L888 route. As for the problems of the data-link service reported in the problem reporting system, China advised that they would be conducting further investigation by analysing the CPDLC data to find and resolve problems. Operational ATS units would also be involved in improving the data-link service.

2.10 China's data-link transfer process was not yet automated, and ADS-C/CPDLC were understood to be conducted from stand-alone positions, independent from the ATC workstation for the relevant sector.

Monitoring Agency for Asia Region (MAAR) Safety Report

2.11 The Monitoring Agency for Asia Region (MAAR) provided the results of the airspace safety oversight for the RVSM operation in Mongolian airspace. The Mongolian RVSM airspace total risk was estimated at **1.56 x 10^{-9}**. **Figure 6** presents collision risk estimate trends during the period from January 2012 to December 2012.

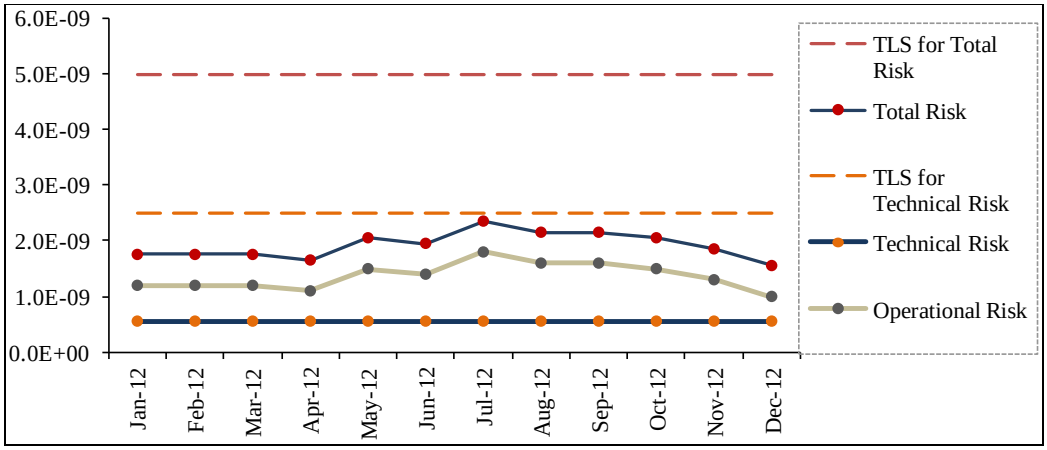

Figure 6: Mongolian Airspace RVSM Risk Estimate Trends

2.12 All of the Mongolian LHD occurrences were Category E(ATC transfer of control coordination errors due to human factors), but occurred within radar coverage; thus ATC intervention ensured durations of less than one minute in each case. The meeting noted the effectiveness of the ATS surveillance within Mongolian airspace in to limit the duration of LHDs reported there to short duration events. **Figure 7** presents the locations and numbers of the LHD occurrences between January 2012 and December 2012.

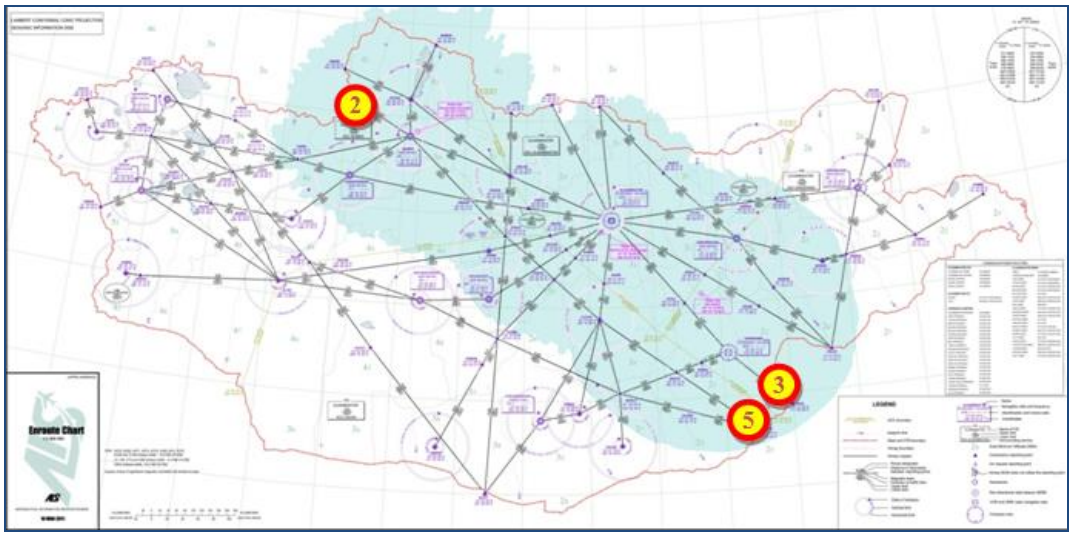

Figure 7: LHD Locations

China Regional Monitoring Agency (RMA) Safety Report

2.13 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 2012 until 31 December 2012. The estimates of technical and total risks for the airspace of Chinese FIRs satisfy the agreed Target Level of Safety (TLS) value of no more than 2.5 x 10^{-9} and 5.0 x 10^{-9} fatal accidents per flight hour, with an overall risk estimate of **3.38 x 10^{-9}**.

2.14 China RMA noted that a significant portion of LHDs (22 of 55) were attributable to Category E. Significant long duration Category E LHDs occurred in the Sanya FIR. **Figure 8** presents collision risk estimate trends for the Chinese FIRs.

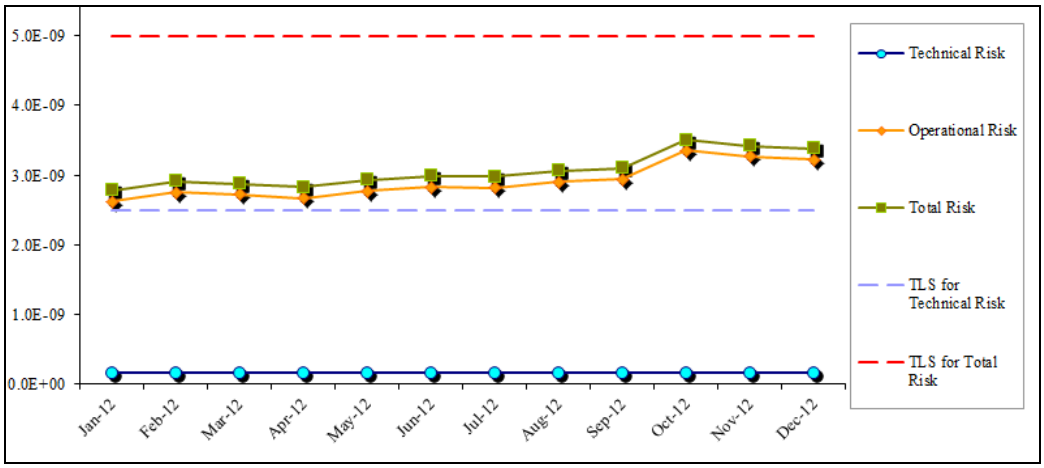

Figure 8: Airspace of Chinese FIRs RVSM Risk Estimate Trends

2.15 Based on the data from the DPRK, no LHD had occurred during 2012 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 TSD data collected in December 2012 from the Pyongyang FIR.

2.16 The estimate of the overall vertical collision risk for the Pyongyang FIR was **3.43 x 10^{-9}** fatal accidents per flight hour, which satisfied the globally agreed TLS value of 5 x 10^{-9} fatal accidents per flight hour. **Figure 9** presents collision risk estimate trends for DPRK airspace.

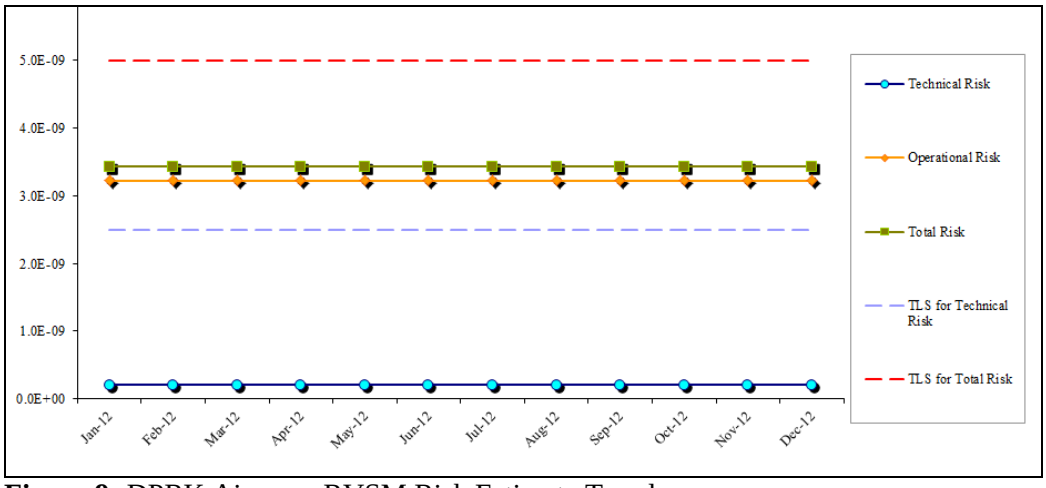

Figure 9: DPRK Airspace RVSM Risk Estimate Trends

China RMA Assessment of Non-RVSM Approved Aircraft

2.17 The China RMA assessment of Chinese FIRs and the Pyongyang FIR during the period December 2011 until February 2013 for non-RVSM approved aircraft revealed a total of 43 airframes. The assessment results up until December 2012 identified a reduction to 26 airframes, which is shown in **Figure 10**. This reflects the worldwide reduction that occurred after September 2012 (**Figure 11**), mainly due to enhanced cross-checking and follow-up of aircraft approval status.

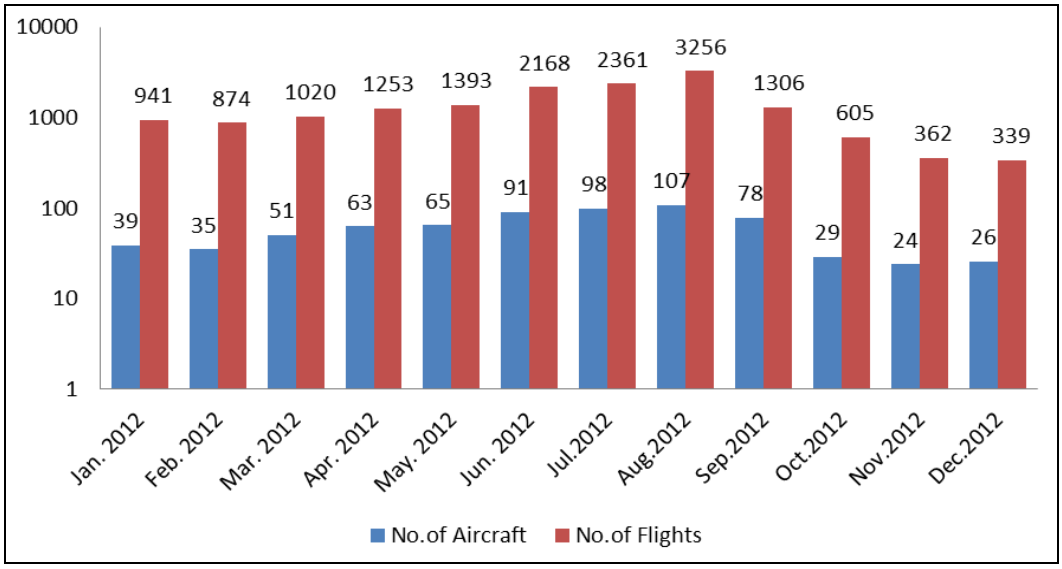

Figure 10: China RMA Assessment of Non-RVSM Approved Aircraft

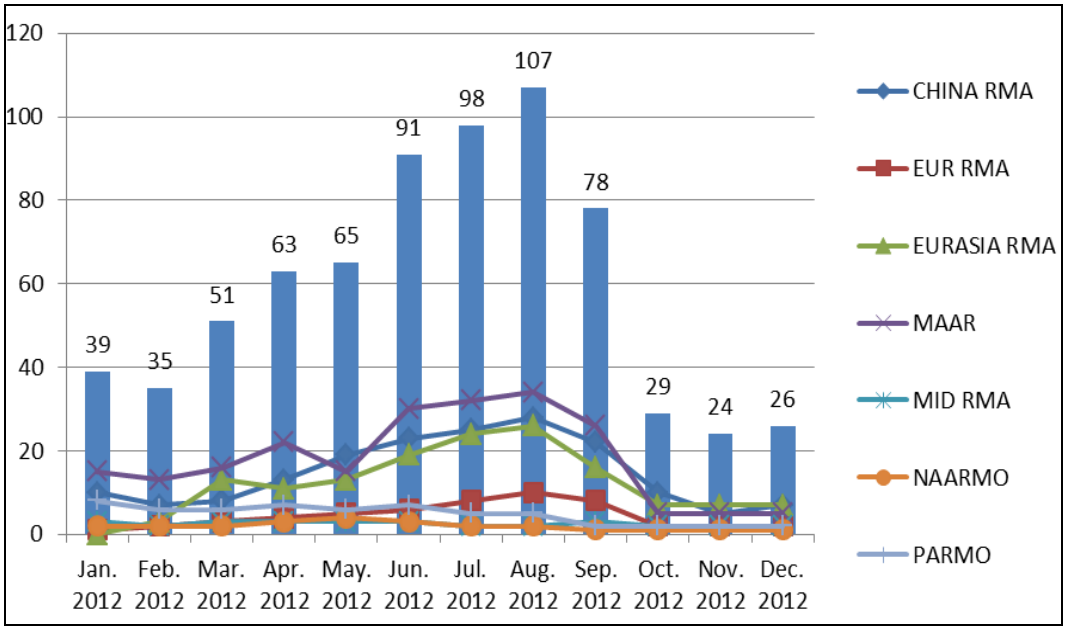

Figure 11: Traffic Scrutiny Results by RMA

Regional Safety Monitoring Assessment

2.18 The Secretariat presented an overview of safety assessment results from a regional perspective as reported to RASMAG/18 (**Figure 12**).

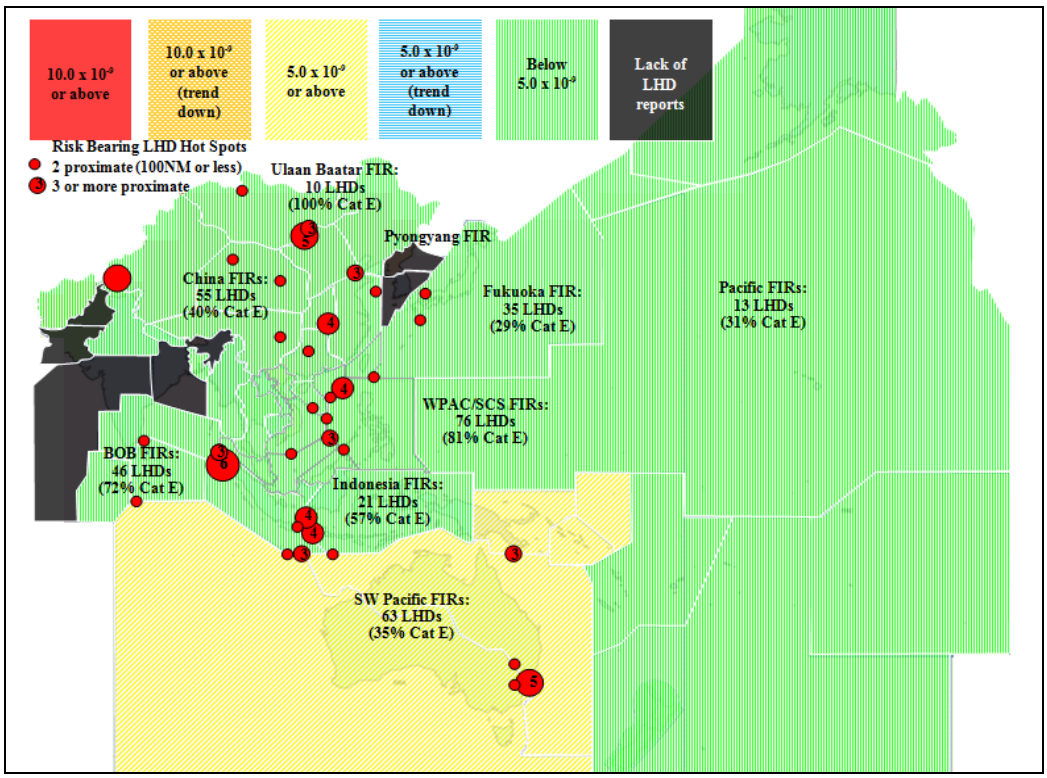

Figure 12: Asia/Pacific TLS compliance reported to RASMAG/18

2.19 RASMAG/18 noted that 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.

LHD Reporting

2.20 **Table 1** 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	492,360	0

Table 1: Comparison of Estimated Flight Hours and Reported LHDs

2.21 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 might be expected on average from the Incheon FIR, although none had 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 airspace, 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 by the meeting. The continued lack of reporting over many years from the Pyongyang FIR was also a concern.

ATS Inter-facility Data-link Communications

2.22 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 formed a significant portion of the total reports:

a) Jakarta – Chennai/Ujung Pandang/Brisbane/Melbourne FIRs (Indonesia 57% E);

b) Chennai – Kuala Lumpur FIRs (Bay of Bengal 72% E);

c) Manila – Fukuoka/Taibei/Hong Kong/Sanya/Ho Chi Minh/Singapore/Kota Kinabalu/ Ujung Pandang FIRs (WPAC/SCS 81% E);

d) Beijing – Ulaan Baatar FIRs (Mongolia 100% E); and

e) Urumqi – Lahore FIRs (China 40% E).

2.23 RASMAG/18 developed to a Conclusion which was agreed by APANPIRG/24, urging States to support the expedition and prioritization of AIDC through collaborative projects at the significant LHD interface areas identified as hot spots.

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.

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