



Agenda Item 5: RVSM issues

LHD REDUCTION REPORT OF MONGOLIA

(Presented by Mongolia)

SUMMARY

This paper presents a brief summary of LHD reports received from 2011 to 2012 and recent Civil Aviation Authority of Mongolia (CAAM) activities regarding Large Height Deviation (LHD) reduction.

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-16 Decision support systems and alerting systems

1 INTRODUCTION

3.1 LHD reporting was a core element in assessing the safety of Reduced Vertical Separation Minimum (RVSM) airspace.

3.2 Mongolia analysed LHD reports to determine the causes of the LHD to improve the equipment for the airspace, provide reliable training for ATC, and enhance agreements with neighboring countries in order to reduce the causes.

2 DISCUSSION

LHD Reports 2010-2011

2.1 Based on the received LHD reports, the LHD occurrences between January 2010 and April 2011 in the airspace of Mongolia are summarized in **Table 1** as follows.

Month-Year	No. of LHD Occurrences	Associated LHD Duration (Minutes)	12-month Cumulative Occurrences	12-month Cumulative Duration
January 2010	0	0	0	0
February 2010	0	0	0	0
March 2010	1	5	1	5

April 2010	0	0	1	5
May 2010	0	0	1	5
June 2010	1	20	2	25
July 2010	0	0	2	25
August 2010	1	34	3	59
September 2010	0	0	3	59
October 2010	0	0	3	59
November 2010	3	55	6	114
December 2010	1	3	7	117
January 2011	2	26	9	143
February 2011	0	0	9	143
March 2011	1	0	9	138
April 2011	1	1	10	139

**Table 1:** Summary of LHD Occurrences and Duration

2.2 In light of the above, the LHD occurrences in the Mongolia airspace are summarized as follows:

- There were a total of 11 LHD occurrences accounting for 144-minute duration between January 2010 and April 2011.
- The total duration was mainly driven by four long-duration LHD occurrences.
- The four longest duration occurrences (50, 34, 21 and 20 minutes) account for 87 percents of the total duration (125 of 144 minutes).

LHD Locations and Radar Availability

2.3 Three radars were installed in March 2011. A three-month trial period has been initiated since the end of May 2011 to reduce the longitudinal separation from 150 km (80 nm) to 90 km (50 nm) under procedural control.

2.4 With availability of Radar coverage, the LHD durations are expected to improve. Nonetheless, it is important that radar targets are regularly monitored to avoid long duration LHD occurrences to improve safety. Based on the reports, there has not yet been any long duration LHD since the installation of the three radar sites.

2.5 In addition, for the airspace where Radar targets are not available, it is recommended that communication between ATC and flight crews is established regularly where possible to avoid any long duration LHD occurrences.

Risk Assessment Results

2.6 **Table 2** summarizes the results of the risk assessment in terms of technical, operational, and total risks for the RVSM implementation in the airspace of Mongolia.

Source of Risk	Lower Bound Risk Estimation	TLS	Remarks
Technical Risk	0.51 x 10 <sup>-9</sup>	2.5 x 10 <sup>-9</sup>	Below Technical TLS
Operational Risk	10.69 x 10 <sup>-9</sup>	-	-
Total Risk	11.20 x 10 <sup>-9</sup>	5.0 x 10 <sup>-9</sup>	Exceeds Overall TLS

**Table 2:** Risk Estimates for the RVSM Implementation in the Airspace of Mongolia

2.7 Based on the collision risk estimate, the technical risk satisfies the agreed technical risk target level of safety value of no more than  $2.5 \times 10^{-9}$  fatal accidents per flight hour. However, the overall risk estimate exceeds its target level of safety of  $5.0 \times 10^{-9}$  fatal accidents per flight hour. This is mainly a result of long duration LHDs occurred before the availability of Radars.

2.8 To further assist in decision making process, another risk estimation is provided based on the assumption that Radar is an effective preventive measure for long duration LHD occurrences. In this regard, the risk estimate is based on the actual number of LHD occurrences during May 2010 – April 2011 with duration being capped at 3 minutes as an effect from radar target availability. The adjusted risk estimate is calculated at  $2.20 \times 10^{-9}$  fatal accidents per flight hour due to all causes.

LHD reports 2011-2012

2.9 Based on the received LHD reports, the LHD occurrences between May 2011 and April 2012 in the airspace of Mongolia are summarized in **Table 3** as follows.

Month-Year	No. of LHD Occurrences	Associated LHD Duration (Minutes)	12-month Cumulative Occurrences	12-month Cumulative Duration
May 2011	0	0	10	139
June 2011	1	1	10	120
July 2011	1	1	11	121
August 2011	2	2	12	89
September 2011	0	0	12	89
October 2011	1	1	13	90
November 2011	2	2	12	37
December 2011	3	3	14	37
January 2012	1	1	13	12
February 2012	0	0	13	12
March 2012	0	0	12	12
April 2012	0	0	11	11

**Table 3:** Summary of LHD Occurrences and Duration

2.10 The LHD occurrences in the Mongolian airspace are summarized as follows:

- There were a total of 11 lhd occurrences accounting for 11 minute duration for 12-month period ending April 2012
- The number of 12 month LHD duration was reduced from 37 minutes to 11 minutes compared to the last assessment period /November/ 2011/The improvement in mainly a result of the exclusion of two LHD occurrences with relatively long duration, which occurred on January 2011.
- Since March 2011, duration of all LHD occurrence was less than one minute.
- All of the LHD occurrences are Category E.

Risk Assessment Results

2.11 **Table 4** summarizes the results of the risk assessment in terms of technical, operational, and total risks for the RVSM implementation in the airspace of Mongolia

<b>The airspace of Mongolia- estimated annual flying hours = 94,132 hours</b> (note: estimated hours based on December 2011 traffic sample data)			
<b>Source of Risk</b>	<b>Lower Bound Risk Estimation</b>	<b>TLS</b>	<b>Remarks</b>
Technical Risk	$0.45 \times 10^{-9}$	$2.5 \times 10^{-9}$	Below Technical TLS
Operational Risk	$1.02 \times 10^{-9}$	-	-
Total Risk	$1.47 \times 10^{-9}$	$5.0 \times 10^{-9}$	below Overall TLS

**Table 4:** Risk Estimates for the RVSM implementation in the Airspace of Mongolia

2.12 Based on the collision risk estimate for April 2012 assesment period, the technical risk satisfies the agreed technical risk target level of safety value of no more than  $2.5 \times 10^{-9}$  fatal accidents per flight hour. The overall rick estimate is below the overall target level of safety of  $5.0 \times 10^{-9}$  fatal accidents per flight hour.

LHD reports 2012

2.13 Based on the received LHD reports, the LHD occurrences and durrations are summarized in **Table 5** as follows:

<b>Month-Year</b>	<b>No. of LHD Occurrences</b>	<b>Associated LHD Duration (Minutes)</b>	<b>12-month Cumulative Occurrences</b>	<b>12-month Cumulative Duration</b>
January 2012	1	1	13	12
February 2012	0	0	13	12
March 2012	0	0	12	12
April 2012	0	0	11	11
May 2012	4	4	15	15
June2012	0	0	14	14
July 2012	5	5	18	18
August 2012	0	0	16	16
September 2012	0	0	16	16
October 2012	0	0	15	15
November 2012	0	0	13	13
December 2012	0	0	10	10

**Table 5:** Summary of LHD Occurrences and Duration

2.14 The LHD occurrences in the mongolian airspace are summarized as follow:

- There was no significant change for LHD occurences in the Mongolian airspace as there were 10 occurrences accounting for 10 minutes of LHD duration compared to 11 occurrences reported at the previous meeting;
- All of the LHD occurrences were Category E and had duration of less than one minute as they occurred within radar coverage area; and
- There was no LHD report since August 2012.

Safety Oversight for the RVSM operation in Mongolian Airspace

2.15 **Table 6** summarizes the results of the airspace safety oversight, as of December 2012 in terms of technical, operational, and total risks for the RVSM operation in the airspace of Mongolia

<b>The airspace of Mongolia- estimated annual flying hours = 112,297 hours</b> (note: estimated hours based on December 2012 traffic sample data)			
<b>Source of Risk</b>	<b>Lower Bound Risk Estimation</b>	<b>TLS</b>	<b>Remarks</b>
Technical Risk	$0.56 \times 10^{-9}$	$2.5 \times 10^{-9}$	Below Technical TLS
Operational Risk	$1.00 \times 10^{-9}$	-	-
Total Risk	$1.56 \times 10^{-9}$	$5.0 \times 10^{-9}$	below Overall TLS

**Table 6:** Risk Estimates for the RVSM implementation in the Airspace of Mongolia

2.16 Based on the risk estimates, both the technical and total risks satisfy the agreed TLS value of no more than  $5.0 \times 10^{-9}$  fatal accidents per flight hour, respectively (**Table 7**).

<b>LHD report</b>	<b>Lower Bound Risk Estimation/Total risk</b>	<b>Flying Hours</b>	<b>Remarks</b>
Jan 2010- Apr 2012	$11.20 \times 10^{-9}$		Exceeds Overall TLS
May 2011- Apr 2012	$1.47 \times 10^{-9}$	94,132	below Overall TLS
Jan 2012- Dec 2012	$1.56 \times 10^{-9}$	112,297	below Overall TLS

**Table 7:** Risk Estimates for the RVSM implementation in the Airspace of Mongolia

2.17 Most cases of LHD reports were about coordination errors with the neighbouring ATC regarding transfer or control responsibility as a result of human factors issues (e.g late or non-existent coordination, incorrect time estimate/ actual, flight level, ATS route etc not in accordance with agreed parameters). We have taken measures to reduce LHD, such as organizing a meeting with Russian and Chinese ATC Centers and involving air traffic controllers in training.

### 3 ACTION BY THE MEETING

3.1 The meeting is invited to note the information contained in this paper.

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