International Civil Aviation Organization

Fifteenth Meeting of the APANPIRG ATM/AIS/SAR Sub-Group (ATM/AIS/SAR/SG/15)

Bangkok, Thailand, 25 – 29 July 2005

Agenda Item 3: Review and progress the tasks assigned to the ATM/AIS/SAR/SG by APANPIRG

1st QUARTER 2005 SAFETY MONITORING REPORT FROM THE PACIFIC APPROVALS REGISTRY AND MONITORING ORGANIZATION (PARMO)

(Presented by the United States of America)

(Prepared by the PARMO)

SUMMARY

This information paper contains the 1st Quarter 2005 safety monitoring report from the Pacific Approvals Registry and Monitoring Organization (PARMO). The purpose of this quarterly report is to compare actual performance to safety goals related to the reduced vertical separation minimum (RVSM) implementation in Pacific airspace. This report contains a summary of large height deviation reports received by the PARMO for the most recent 12-month period of April 2004 – March 2005. In addition, an update of the vertical collision risk for Pacific airspace is presented. The vertical collision risk estimate for this period is roughly 67 percent below the target level of safety (TLS) value of 5.0×10^{-9} fatal accidents per flight hour.

1. Introduction

1.1. The Pacific Approvals Registry and Monitoring Organization (PARMO) has developed a report which is distributed on a regular basis to Pacific air traffic service (ATS) providers and airspace users. The report fulfils the ICAO emphasis on safety management systems, such reporting for international airspace is a component of safety management systems.

2. Discussion

2.1. This information paper contains the 1st Quarter 2005 safety monitoring report from the PARMO. It contains a summary of large height deviation reports and an estimate of vertical risk for the airspace.

3. Conclusions

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

Pacific Airspace
RVSM Safety Monitoring Report
1st Quarter 2005

Prepared by:
Pacific Approvals Registry and Monitoring Organization (PARMO)

Summary

The purpose of this quarterly report is to compare actual performance to safety goals related to the reduced vertical separation minimum (RVSM) implementation in Pacific airspace. This report contains a summary of large height deviation reports received by the PARMO for the most recent 12-month period of April 2004 – March 2005. There are a total of eighteen reported large height deviations that occurred during this 12-month period inside Pacific airspace which is restricted to aircraft operating using RVSM. In addition, an update of the vertical collision risk for Pacific airspace is presented. The vertical collision risk estimate for this period is roughly 67 percent below the target level of safety (TLS) value of 5.0×10^{-9} fatal accidents per flight hour.

1. Introduction

1.1. The Pacific Approvals Registry and Monitoring Organization (PARMO), a service provided by the U.S. Federal Aviation Administration's Technical Center, serves as the regional monitoring agency (RMA) for Pacific airspace.

1.2. This report contains an update to the large height deviations reports received by the PARMO. There are a total of eighteen large height deviations contained in this report. This report also contains an update to the vertical collision risk estimate. A full description of the data sources used in this report is provided in reference 1.

2. Large Height Deviations Report Summary

2.1. Appendix A of this report contains the status of large height deviation reporting to the PARMO for the period April 2004 – March 2005. This table presents a list of the FIRs in Pacific airspace that provided the PARMO with large height deviation reports each month, including 'NIL reports'.

2.2. ATS providers should continue to forward the reports of large height deviations of 300 ft or more to the PARMO on a monthly basis. The email address for the

PARMO is: aparmo@faa.gov. The website address for the PARMO is http://www.tc.faa.gov/acb300/PARMO/.

2.3. The large height deviation reports are separated by categories based on the details provided for each deviation. There are three categories created for this report, they are; risk-bearing large height deviations not involving whole numbers of flight levels, risk-bearing large height deviations involving whole numbers of flight levels, and large height deviations occurring outside of exclusive RVSM airspace in the Pacific.

2.4. Appendix B contains the details of all risk-bearing large height deviations not involving whole numbers of flight levels reported to the PARMO during the period April 2004 – March 2005. There are four such large height deviations. The causes of the first three deviations listed in the table were due to pilot responses to Traffic Alert and Collision Avoidance System (TCAS) or Airborne Collision Avoidance System (ACAS) resolution advisories. The cause of the last deviation listed in Appendix B was reported to be turbulence or another weather-related cause.

2.5. Details of all risk bearing large height deviations involving whole numbers of flight levels reported to the PARMO during the period April 2004 – March 2005 are contained in Appendix C. There are fourteen such deviations.

2.5.1. The cause of seven of the errors listed in Appendix C are reported to be an error in the air traffic control (ATC)-unit-to-ATC-unit transition message. The time spent at an incorrect flight level was not reported for all of these errors. The PARMO assumes 5 minute duration for this error type if the duration is not provided in the report.

2.5.2. Three of the errors listed in Appendix C were reported caused by an aircraft climb/descent without ATC clearance. The report dated 29 November 2004 describes an incident which took place in Pacific RVSM airspace however, the events occurred in portions of the reporting flight information region (FIR)'s airspace which is far removed from the volume of airspace where significant traffic density exists. The time spent at incorrect flight level for this vertical deviation was estimated to be less 60 minutes. The report dated 2 July 2004 did not involve another aircraft; the time spent at an incorrect flight level was estimated to be 44 minutes. The third report caused by aircraft climb/descent without ATC clearance, dated 28 September 2004, involved another aircraft and the estimated time spent at incorrect flight level was given as 18 minutes.

2.5.3. Three reported incidents were caused by an ATC clearance that resulted in a loss of vertical and longitudinal separation with other traffic. The report dated 17 September 2004 involved three aircraft in total and the estimated time spent at incorrect flight level was given as 5 minutes. The reports dated 3 October 2004 and 7 January 2005 each involved two aircraft and the estimated time spent at the incorrect flight level was given as 3 and 1 minutes, respectively.

2.5.4. The cause of the incident occurring on 29 March 2005 is still under investigation at this time.

2.6. Appendix D contains the details of all reported large height deviations occurring outside of exclusive Pacific RVSM airspace during the period April 2004 – March 2005. These large height deviations do not affect the risk estimate for Pacific airspace but are presented in this report for completeness. There are eight such large height deviations. The report dated 7 August 2004 is excluded from the estimate of risk because the incorrect flight level was realized in the Manila FIR, not in exclusive Pacific RVSM airspace. The remaining deviations listed are excluded from the estimate of risk because the flights involved were operating in Australian domestic airspace.

3. Estimate of Vertical Collision Risk for Pacific Airspace

3.1. The vertical collision risk is estimated to determine whether the TLS continues to be met in Pacific airspace. This activity is performed to support the ongoing safe use of the Pacific RVSM airspace.

3.2. The estimate of vertical collision risk has been updated in the same manner used in reference 2. Figure 1 provides the 12 calendar-month vertical collision risk estimates by type (e.g. technical, operational, and total). Each monthly risk estimate is 'weighted' by the estimated number of flight hours in each Pacific airspace flow. Table 1 provides the definitions used for each Pacific airspace flow.

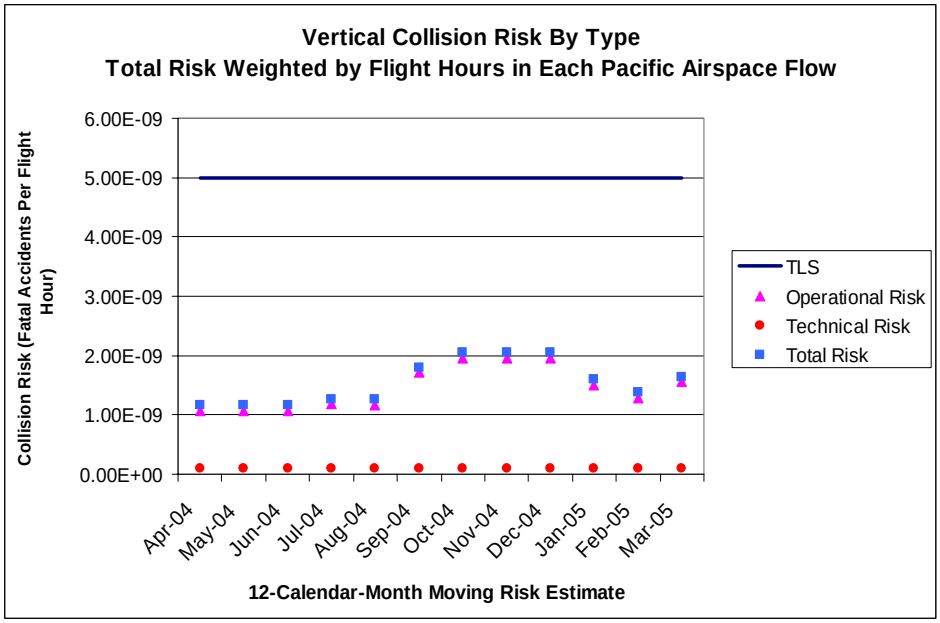

Figure 1. Vertical Collision Risk for Pacific RVSM Airspace

Sub-Region of Pacific	Flow	Description of Flow
North Pacific	NOPAC	North America west to Japan/Korea/beyond plus Japan/Korea to and from Alaska and beyond
	Central Pacific (CENPAC)	Japan/Korea/other Asian origins east to North America
	Central East Pacific (CEP)	North American mainland to and from Hawaii
	Hawaii/Japan	Japan/Korea to and from Hawaii
	Japan/Guam	Japan/Korea to and from Guam/Saipan/other proximate destinations
	Other	All other North Pacific flights not covered above
South Pacific and Pacific trans-equatorial	Australia/New Zealand/South Pacific States	Australia to and from New Zealand; Australia to and from South Pacific island states; New Zealand to and from South Pacific states
	Nadi	Fiji to and from all airports except those in Australia or New Zealand
	Australia-New Zealand/Japan	Australia to and from Japan/Korea; New Zealand to and from Japan/Korea
	SOPAC	Australia to and from airports in northern hemisphere; New Zealand to and from airports in northern hemisphere

Table 2. Traffic Flows Used in Pacific Vertical Collision Risk Estimate

3.3. The technical risk remains unchanged with a value of $9.32.x\ 10^{-11}$ fatal accidents per flight hour. The operational risk estimate is 1.55×10^{-9} fatal accidents per flight hour. The estimate of the overall vertical collision risk is 1.64×10^{-9} fatal accidents per flight hour. This estimate is roughly 67 percent below the TLS value of 5.0×10^{-9} fatal accidents per flight hour. This new estimate is representative of a complete calendar year of large height deviation reporting. However, this estimate is based on a composite of old parameters, such as vertical occupancy values, which have not been re-estimated. The traffic counts used in the risk calculations were formed from the recent April 2004 traffic samples received from the Anchorage, Auckland, Naha, Oakland, and Tokyo FIRs and previous traffic samples received from the remaining Pacific FIRs.

3.4. The estimate of vertical collision risk presented in Figure 1 demonstrates the ability of the PARMO to continually update risk estimates for Pacific RVSM airspace. Future reports will contain estimates of risk based on PARMO expansion of automated analysis tools used in estimating the collision risk model parameters.

4. Summary and Conclusions

4.1. This report has presented a summary of large height deviation reports received by the PARMO for the period April 2004 – March 2005. It presents an update of the vertical collision risk for Pacific airspace. This activity is performed to determine whether the TLS continues to be met in support of the ongoing safe use of the RVSM in Pacific airspace. The estimate of the overall vertical collision risk is 1.64×10^{-9} fatal accidents per flight hour. This estimate is approximately 67 below the TLS value of 5.0×10^{-9} fatal accidents per flight hour. This new estimate is representative of a complete calendar year of large height deviation reporting. However, this estimate is based on a composite of old parameters, such as vertical occupancy values which have not been re-estimated. The traffic counts used in the risk calculations were formed from the recent April 2004 traffic samples received from a few of the Pacific FIRs and previous traffic samples received from the remaining Pacific FIRs.

4.2. There were eighteen reported large height deviations that occurred inside Pacific airspace which is restricted to aircraft operating using RVSM. One of the deviations was caused by turbulence or some other weather related cause. Three of the deviations were caused by pilot responses to a TCAS/ACAS Resolution Advisory.

4.3. There were seven reported deviations caused by an error in the ATC-unit-to-ATC-unit transition message, the times spent at an incorrect flight level were either provided or estimated by the PARMO.

4.4. There were three reported large height deviations that occurred due to an aircraft climb/descent without ATC clearance. One of these reports involved another aircraft, the time spent at incorrect flight level was given as 18 minutes. Another of the reported incidents caused by an aircraft climb/descent without ATC clearance took place in Pacific RVSM airspace however, the event occurred in portions of the reporting FIR's airspace which is far removed from the volume of airspace where significant traffic density exists. Another reported error caused by aircraft climb/descent without ATC clearance did not involve another aircraft; the time spent at an incorrect flight level was estimated to be 44 minutes.

4.5. Three reported incidents were caused by an ATC clearance that resulted in a loss of vertical and longitudinal separation with other traffic. The estimated times spent at incorrect flight level were given as 5, 3, and 1 minutes, respectively.

4.6. One reported large height deviation is still under investigation.

4.7. ATS providers should continue to forward the reports of large height deviations of 300 ft or more to the PARMO on a monthly basis. A 'NIL report' (where applicable) is as valuable as a report containing actual incidents. Therefore, if zero events occur during a calendar month, it is still necessary to submit a 'NIL report' to the PARMO. The email address for the PARMO is: aparmo@faa.gov. The website address for the PARMO is http://www.tc.faa.gov/acb300/PARMO/.

References

1. "Pacific Airspace RVSM Safety Monitoring Report October – December 2004", Draft Version 1.0, Prepared by the PARMO, February 2004.
2. "Update of Pacific Reduced Vertical Separation Minimum (RVSM) Safety Assessment", WP/3, Tenth Meeting of the ICAO Reduced Vertical Separation Minimum (RVSM) Implementation Task Force (RVSM TF/10), Honolulu 29-30 January 2001.

Appendix A

Monthly Large Height Deviations Reports Received by the PARMO

STATE	AUSTRALIA	FIJI	JAPAN		NEW ZEALAND	TAHITI	UNITED STATES		PAPUA NEW GUINEA
FIR	*Brisbane*	*Nadi*	*Naha*	*Tokyo*	*Auckland*	*Tahiti*	*Anchorage*	*Oakland*	*Port Moresby*
Apr-04	X		X	X	X	X		X	
May-04			X	X	X	X	X		
Jun-04	X		X	X	X	X			
Jul-04	X		X	X	X	X			
Aug-04	X		X	X	X	X			
Sep-04			X	X	X	X	X		
Oct-04			X	X	X		X		
Nov-04	X		X	X	X		X		
Dec-04	X		X	X	X		X		
Jan-05			X	X	X		X	X	
Feb-05	X		X	X	X			X	
Mar-05	X		X	X	X				

X = Large Height Deviation Report was received for the specified month (including reports indicating "NIL" events)

Appendix B

Risk-Bearing Height Deviation Incidents Not Involving Whole Numbers of Flight Levels between FL290 and FL390 in Pacific Airspace Reported to the PARMO from April 2004 – March 2005

Event date	Source	Location of deviation	AC Type	Time	Assigned FLVL	Observed / Reported FLVL	Duration at incorrect FLVL	Cause	Other traffic
2 July 2004	Brisbane FIR	YMMM	B747	0110	290	285	unknown	TCAS RA	1
4 November 2004	Tokyo FIR	UKATA / B586	B767	1433	340	345	unknown	TCAS RA	3 VFR
18 December 2004	Brisbane FIR	MISLY / B580	B737	0405	320	315	1 minute	False TCAS warning	Nil
25 December 2004	Brisbane FIR	unknown	B747	1530	380	384	1 minute	Deviation due to turbulence or other weather related cause	Nil

Appendix C
Risk-Bearing Height Deviation Incidents Involving Whole Numbers of Flight Levels between FL290 and FL390 in Pacific Airspace Reported to the PARMO from April 2004 – March 2005

Event date	Source	Location of deviation	AC Type	Time	Assigned FLVL	Observed / Reported FLVL	Duration at incorrect FLVL	Cause	Other traffic
12 April 2004	NAIMS[1]	OMOTO / R580	unknown	unknown	360	370	< 5 minutes	Error in ATC-unit-to-ATC-unit message	Nil
30 April 2004	NAIMS	ADBON / A597	unknown	unknown	350	370	< 5 minutes	Error in ATC-unit-to-ATC-unit message	Nil
2 July 2004	Brisbane FIR	NFFR	B747	1616	350	360	44 minutes	Climb/Descend without ATC clearance	Nil
17 September 2004	NAIMS	unknown	B744	2023	350	350	5 minutes	ATC FL re-clearance resulted in a loss in longitudinal separation	2
28 September 2004	Naha FIR	SABGU / R583	K35R	0901	350	340	18 minutes	Climb/Descend without ATC clearance	1

[1] FAA National Airspace Information Monitoring System

Event date	Source	Location of deviation	AC Type	Time	Assigned FLVL	Observed / Reported FLVL	Duration at incorrect FLVL	Cause	Other traffic
3 October 2004	NAIMS	PIKOK	B747	1634	350	350	3 minutes	ATC FL re-clearance resulted in a loss in longitudinal separation	1
30 October 2004	Airways NZ	SADIM / R599	B737	2155	350	330	35 minutes	Error in ATC-unit-to-ATC-unit message	Nil
29 November 2004	Airways NZ	ANOPA	C130	1432	290	280	Unknown - < 60 minutes	Climb/Desc end without ATC clearance	Nil
19 December 2004	Airways NZ	54S131W	A340	0920	350	360	6 minutes	Error in ATC-unit-to-ATC-unit message	Nil
7 January 2005	NAIMS	unknown	B744	1201	330	330	1 minute	ATC FL re-clearance resulted in a loss in longitudinal separation	1
17 January 2005	NAIMS	unknown	B763	0735	380	400	1 minutes	Error in ATC-unit-to-ATC-unit message	1
24 January 2005	NAIMS	KEITH	B737	1147	320	350	1 minutes	Error in ATC-unit-to-ATC-unit message	Nil

Event date	Source	Location of deviation	AC Type	Time	Assigned FLVL	Observed / Reported FLVL	Duration at incorrect FLVL	Cause	Other traffic
20 February 2005	Airways NZ	MEGOG	unknown	1112	340	330	10 minutes	Error in ATC-unit-to-ATC-unit message	Nil
29 March 2005	Tokyo FIR	3349N/16236E	B767	1404	330	360	16 minutes	Unknown	Nil

Appendix D
Height Deviation Incidents Occurring Outside of Restricted Pacific RVSM Airspace from April 2004 – March 2005

Event date	Source	Location of deviation	AC Type	Time	Assigned FLVL	Observed / Reported FLVL	Duration at incorrect FLVL	Cause	Other traffic
27 June 2004	Brisbane FIR	Enroute BNE-CNS	B738	unknown	320	323	Unknown	Actions taken due to mechanical or equipment problems	Nil
7 August 2004	Brisbane FIR	Enroute MEL-HTI	B737	0013	310	< 303	Unknown	Aircraft unable to climb/descend to cleared flight level	1
7 August 2004	Naha FIR	MELVIN / B462	C17	1410	340	310	Unknown	Error in ATC-unit-to-ATC-unit message	Nil
11 August 2004	Brisbane FIR	Enroute SYD – MEL	B767	2116	360	376	Unknown	Deviation due to turbulence or other weather related cause	Nil
16 November 2004	Brisbane FIR	Enroute BME – PER	B737	0550	340	350	Unknown	Deviation due to TCAS RA	unknown
19 November 2004	Brisbane FIR	Enroute DRW – CNS	B737	2230	330	316	Unknown	Actions taken due to mechanical or equipment failure	Nil
10 December 2004	Brisbane FIR	Enroute ADL – MEL	B737	0735	370	375	30 seconds	Deviation due to turbulence or other weather related cause	Nil
10 December 2004	Brisbane FIR	Southbound on Route N877	B747	0824	370	374	unknown	Actions taken due to mechanical or equipment failure	Nil