



*International Civil Aviation Organization*

**The Second Meeting of the Regional Airspace Safety Monitoring Advisory Group  
(RASMAG/2)**

Bangkok, Thailand, 4 – 8 October 2004

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**Agenda Item 4: Review the airspace safety monitoring arrangements in the Asia/Pacific Region and the activities of regional airspace safety monitoring agencies**

**REPORT OF RMA ACTIVITIES BY AIRSERVICES AUSTRALIA WITH RESPECT TO  
RVSM**

(Presented by the Australia)

**SUMMARY**

This paper presents information regarding a limited review undertaken by Airservices Australia of the airspace safety related to reduced vertical separation minimum (RVSM) within the Australian RMA area of responsibility.

**1. INTRODUCTION**

1.1 At the first meeting of RASMAG in April 2004 it was agreed that given Australia's responsibilities and prior work in relation to the safety assessment of oceanic airspace in the Indian Ocean, that it should be approved as a Regional Monitoring Agency (RMA). As a result the work of the RMA has been undertaken by Airservices Australia for that international airspace in the Brisbane or Melbourne FIRs west of a line 12nm east of the east coast of Australia (ie that international airspace where PARMO is not the approved RMA).

1.2 This paper provides information regarding a limited review undertaken by Airservices Australia of the airspace safety related to reduced vertical separation minimum (RVSM) within the Australian RMA area of responsibility. The review is limited to an assessment of operational errors only as resource constraints have prevented quantitative assessment of the risk in terms of the required target level of safety. A more detailed annual review that includes an assessment of the TLS and covering the period 1 January to 31 December 2004 will be provided to RASMAG at its next meeting.

**2. POST-IMPLEMENTATION REVIEW OF RVSM SAFETY ASSESSMENT**

2.1 The meeting is reminded that RVSM was implemented across the whole of the Brisbane and Melbourne FIRs on 1 November 2001 using a unique non-exclusive airspace model which has since been vindicated operationally. In June 2002, Airservices Australia undertook a post-implementation review of RVSM within the Brisbane and Melbourne FIRs that computed the technical risk as 1.46E-10, and the overall weighted risk as 4.17E-09, which meets the required target level of safety of 5.0E-09.

2.2 The June 2002 review identified that for the portion of the Brisbane and Melbourne FIRs covering the international airspace in the Indian Ocean (North West), there were 65 minutes of operational errors for an estimated 2063 flights of average duration 1.4 hours, resulting in a risk estimate due to operational errors of 7.36E-08. The majority proportion of these operational error

times were caused by two operational errors of significant duration which were not directly related to the application of RVSM. Had a conventional vertical separation minimum (CVSM) been applied, it is unlikely that the target level of safety would have been met because of the higher occupancies in CVSM airspace.

### 3. REVIEW OF OPERATIONAL ERRORS

3.1 As stated previously, resource limitations have not permitted Airservices Australia to undertake a recent comprehensive quantitative review of the airspace within the Brisbane and Melbourne FIRs where RVSM has been implemented. Given that Australia was keen to provide some information to this meeting of RASMAG with regards to safety within its RVSM airspace, a review of operational errors was undertaken covering the 6 month period from 1 January 2004. Attachment 1 shows the results of a review of Australian ATC incident data related to specific classifications of Failure to Comply with ATS Instruction or Procedure, Breakdown of Coordination, Information Delivery and Display Errors, Breakdown of Separation, TCAS and Miscellaneous (including Pilot Report). The review covered reports filed for the period 1 January to 30 June 2004.

3.2 The operational errors were assessed to determine the time periods where an aircraft was not at its correct level within RVSM airspace and ATC was not aware of the deviation. These indicate that for the subject period, the total time was 37 minutes. With the exception of the incident report 2004 425 (5 minutes) which occurred in Australian continental airspace, all the reports related to Australia's Indian Ocean airspace.

3.3 A review of the reports shows a significant problem regarding boundary coordination with adjacent FIRs in the international airspace to the north-west of Australia. However, the highest proportion of the time (14 minutes) applicable to operational errors is for those incidents classified as OTHER in Attachment 1, which generally comprise single events of specific characteristics. Conclusions regarding the affect of these operational errors on the target level of safety will be determined in the short term with a comprehensive assessment being undertaken at the end of December 2004 and reported to RASMAG in early 2005.

### 4. ACTION PROPOSED

4.1 The meeting is invited to:

- a) review the operational error data provided in the working paper; and
- b) note the work of Australia in relation to re-assessing the safety of its airspace where RVSM has been implemented.

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**Brisbane and Melbourne FIRs – RVSM Review Data Operational Errors Oct 2004**

**A. Contingency action due to engine fault**

| ESIR No.                | ESIR Description | Justification for time allocation | Estimated Time (Minutes) |
|-------------------------|------------------|-----------------------------------|--------------------------|
|                         |                  |                                   |                          |
| <b>Total Error Time</b> |                  |                                   |                          |

**B Contingency action due to pressure failure**

| ESIR No.                | ESIR Description | Justification for time allocation | Estimated Time (Minutes) |
|-------------------------|------------------|-----------------------------------|--------------------------|
|                         |                  |                                   |                          |
| <b>Total Error Time</b> |                  |                                   |                          |

**C Contingency action due to other cause**

| ESIR No.                | ESIR Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Justification for time allocation                  | Estimated Time (Minutes) |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|--------------------------|
| 2004 940                | Coord from Bali QFA132 SATNA 1832 FL350 up to 50nm left of track. Report from BN HF advises QFA132 SATNA position report, but aircraft now on descent from FL350 to FL330 due turbulence. Back coordinated level change with Bali - not a problem. When established on VHF comms, pilot was asked reason for descent and if he obtained clearance. Replied he tried to obtain clearance on both Bali and BN HF but could not establish comms and required descent due turbulence. No BOS, however was in the vicinity of QFA70 FL360 A1041 (11 minutes crossing at IDOTO). Note this is in the vicinity of Tropical cyclone FAY centred 1806S 13240E. FDR's cut below. | Allowing for HF coordination after SATNA position. | 2                        |
| <b>Total Error Time</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                    | 2                        |

**APPENDIX**

**D Aircraft failed to climb or descend to correct level as cleared before arriving at next waypoint**

| ESIR No.                | ESIR Description | Justification for time allocation | Estimated Time (Minutes) |
|-------------------------|------------------|-----------------------------------|--------------------------|
|                         |                  |                                   |                          |
| <b>Total Error Time</b> |                  |                                   |                          |

**E Aircraft climbed or descended to incorrect level without ATC clearance after leaving waypoint**

| ESIR No.                | ESIR Description                                                                                                                                                                                                                                                                                                                                | Justification for time allocation                       | Estimated Time (Minutes) |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|--------------------------|
| 2004 425                | N83TY departed Scone and was cleared to climb to FL230. At approximately time 0620 the Cessnock sector controller noticed the CLAM alert had been activated for the aircraft. After being queried, N83TY reported leaving FL275 for FL280. The pilot advised that he thought he had a clearance to FL280. There was no breakdown of separation. | Calculated from 0615 given assumed climb at 1000ft/min. | 5                        |
| <b>Total Error Time</b> |                                                                                                                                                                                                                                                                                                                                                 |                                                         | 5                        |

**F Aircraft entered RVSM airspace (Above FL285) at incorrect level**

| ESIR No.                | ESIR Description                                                                                                                                                                                                                                                                                                    | Justification for time allocation             | Estimated Time (Minutes) |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|--------------------------|
| 2004 1084               | Aircraft crossed FIR boundary at level different to that coordinated<br>Approx 1250, Jakarta coord estimate QFA78 LAMOB 1344 FL350<br><br>QFA78 reports LAMOB 1343 FL370.<br>Level confirmed with aircraft as FL370<br>Coordination checked with Jakarta - confirmed FL350.<br>There was no breakdown in separation | Allowance for report after boundary position. | 2                        |
| <b>Total Error Time</b> |                                                                                                                                                                                                                                                                                                                     |                                               | 2                        |

**G ATC cleared aircraft to incorrect level after leaving waypoint. That is, aircraft was incorrectly cleared to a level which subsequently resulted in loss of longitudinal separation with another aircraft.**

| ESIR No.         | ESIR Description | Justification for time allocation | Estimated Time (Minutes) |
|------------------|------------------|-----------------------------------|--------------------------|
|                  |                  |                                   |                          |
| Total Error Time |                  |                                   |                          |

**H Deviation was due to TCAS**

| ESIR No.         | ESIR Description | Justification for time allocation | Estimated Time (Minutes) |
|------------------|------------------|-----------------------------------|--------------------------|
|                  |                  |                                   |                          |
| Total Error Time |                  |                                   |                          |

**I Aircraft was unable to maintain level**

| ESIR No.         | ESIR Description | Justification for time allocation | Estimated Time (Minutes) |
|------------------|------------------|-----------------------------------|--------------------------|
|                  |                  |                                   |                          |
| Total Error Time |                  |                                   |                          |

**J ATC failed to co-ordinate change in cleared level with next sector**

| ESIR No.  | ESIR Description                                                                                                                                                                                                                                                                                                                                                                                   | Justification for time allocation               | Estimated Time (Minutes) |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|--------------------------|
| 2004 1049 | Coordination received from Jakarta that UAE404 was to be transferred to Melbourne at F320. In addition to readback, confirmation of the level was requested by Melbourne. Jakarta confirmed the level as F320. The aircraft was ADS equipped . Approximately 10 minutes north of the boundary the track level was observed as F330, not F320 as coordinated. Jakarta confirmed the level was F330. | Deviation identified north of the FIR boundary. | 0                        |

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|           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                     |   |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|---|
| 2004 1253 | <p>At 1621, TRT received coord from UJUNG PANDANG on QFA128 (VHHH - YSSY), estimating GUTEV at 1744 FL330. The TRT controller advised there was no further coordination received from UJUNG regarding QFA128.</p> <p>At approximately 1735, after QFA128 had coupled as an ADS track, it was noticed that his ADS Level was FL350. UJUNG was then asked to confirm QFA128's level which he advised was FL350.</p> <p>The original coordination was confirmed by tape replay. QFA128 advised he received the change to FL350 at 1630 between BONDA (which he passed at 1620) and AMN (which he passed at 1706)</p> | Deviation identified prior to the FIR boundary.                     | 0 |
| 2004 1268 | The Australian controller requested preferred FIR boundary level from HVN782. HVN782 responded FL380. The controller then coordinated with Ujung Pandang - HVN782 estimating ELBIS 0529 FL360 (the aircraft's current level). The controller entered into the label C380 (indicating coordination completed at FL380). In a subsequent handover the controller advised coordinated but not yet assigned. The on coming controller assigned HVN782 FL380.                                                                                                                                                          | Not an issue for ATC in Brisbane FIR.                               | 0 |
| 2004 1406 | UAE421 was Dogar 1944 FL360. ML ADS label issued a CLAM alert as acft left FL360. At approximately 1950 acft was observed to have a PRL of FL380. No back coord was received from VCCC prior to level change as per TLI03/270                                                                                                                                                                                                                                                                                                                                                                                     | Aircraft already passed boundary but within coordination parameter. | 0 |
| 2004 1569 | Coordination received from Colombo that UAE420 was maintaining F350. An AFTN message was received containing the level F370. Shortly later, following ADS activation, the track displayed F370. When queried, Colombo stated that Male had changed the level after Colombo had passed coord to Melbourne, without notifying Colombo.                                                                                                                                                                                                                                                                              | Deviation identified prior to the FIR boundary.                     | 0 |
| 2004 1640 | MAS130 was enroute NZAA for WMKK via A464. The aircraft was datalink equipped and logged on the YBBB. The aircraft passed KIKEM at 0806, outbound from the FIR, and at 0809 the Territory controller received a CLAM alert as the aircraft was climbing to FL400. The controller checked with BALI and it was confirmed they had climbed MAS130 without back coordination.                                                                                                                                                                                                                                        | Aircraft already passed boundary but within coordination parameter. | 0 |

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|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------|
| 2004 1809               | <p>At 0641 QFA41 reported at KARAG maintaining Flight Level 280. The controller display indicated a CFL of F340.</p> <p>From the investigation:<br/>At 0626 the BKE controller again contacted the WEG controller seeking approval for a change of level for QFA41, this time to FL280. The level change (from FL340 to FL280) was approved by the WEG controller with a requirement to reach FL280 by time 0645 due to the opposite direction traffic. The WEG controller failed to change the CFL of QFA41 to reflect the newly coordinated level.</p> <p>At 0649 QFA41 called the WEG controller maintaining FL280, the CFL of the aircraft was FL340.</p>                                                                                  | WEG could assume aircraft at FL280 from time 0645. Deviation identified at time 0649. | 4        |
| 2004 1811               | <p>At 0749 THA992 passed KARAG on ADS at F320. The Cleared Flight Level indicated F340.</p> <p>From the investigation:<br/>At 0732 the BKE Controller again contacted the WEG Controller seeking approval for a change of level for THA992, this time to FL320. The level change (from FL340 to FL320) was approved by the WEG Controller. The controller failed to change the CFL, in the THA992 FDR, from FL340 to FL320.</p> <p>THA992 called the WEG Controller at 0749 maintaining FL320, the CFL of the aircraft was still FL340. The WEG Controller queried THA992s level. The pilot reiterated the cleared level of FL320 on two occasions and WEG Controller rectified the label of THA992 to reflect the cleared level of FL320.</p> | Deviation identified at position therefore allowance made for report time.            | 2        |
| <b>Total Error Time</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                       | <b>6</b> |

**K ATC failed to confirm flight level after aircraft crossed waypoint into sector**

| ESIR No.                | ESIR Description | Justification for time allocation | Estimated Time (Minutes) |
|-------------------------|------------------|-----------------------------------|--------------------------|
|                         |                  |                                   |                          |
| <b>Total Error Time</b> |                  |                                   |                          |

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**L Aircraft passed through flight level without ATC clearance**

| ESIR No.                | ESIR Description | Justification for time allocation | Estimated Time (Minutes) |
|-------------------------|------------------|-----------------------------------|--------------------------|
|                         |                  |                                   |                          |
| <b>Total Error Time</b> |                  |                                   |                          |

**O Other**

| ESIR No.  | ESIR Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Justification for time allocation                                                                                                                                                                                      | Estimated Time (Minutes) |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| 2004 63   | SAA281 departed PH 0307 for FAJS, coordinated from KNG to IND at approx 0315.<br>IND coordinated estimate to CCS for HF comms.<br>At 0438 airep submitted by CCS, aircraft maintaining F320 (F300 was recorded as PRL and CFL on air situation display).<br>Voice confirmation sought from CCS to aircraft, confirmed maintaining F320                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Investigation showed aircraft planned to climb at 105E to F320. did not request clearance to do so. Assumed aircraft reached 105E approx 0430 and climbed, making airep at 0438 maintaining F320. Based on worst case. | 8                        |
| 2004 1176 | At time 1508 the KIY controller received voice coordination from Bali ATC on SIA235 advising the aircraft was estimating ONOXA at 1628 FL370.<br>The KIY correctly read-back the level to Bali ATC but entered FL350 as the CFL in the Flight Data Record for SIA235. The error was undetected until TAAATS HMI initiated a CLAM alert after ADS contract was established at time 1628. There was no subsequent breakdown of separation or coordination with other traffic.<br>After receipt of the coordination from Bali, the KIY controller entered the data directly into the aircraft's FDR, and not onto a scratch-pad. Both CFL and PRL were set as FL350 by the controller.<br><br>The ADS contract and resultant HMI triggered a CLAM to another KIY controller following a hand-over take-over. The correct level was confirmed by the second KIY controller via data-link.<br><br>The second KIY controller checked the aircraft against other traffic and called back Bali ATC at time 1700 to confirm level, and FL370 was confirmed by Bali. | Time for report at position and crosscheck by controller.                                                                                                                                                              | 2                        |

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|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------|
|                         | Console voice recorder and VSCS audio recorder were checked and confirmed that the original level coordinated by Bali was FL370 and the first KIY controller had read-back that level to them correctly.                                                                                                                                                                                                        |                           |           |
| 2004 1517               | 301452 Bali ATC coordinated SIA285 to Brisbane ATC at FL330 via KIKEM.1533 Bali ATC requested amended level FL350 for SIA285. Level request concurred by Brisbane ATC.1619 SIA285 passed KIKEM at FL330. No breakdown in separation. Details confirmed by tape replay.                                                                                                                                          | Time for report at KIKEM. | 2         |
| 2004 1903               | 1725: Bali request Change of level FL370 for AUZ7882 WSSS - YPDN (Current level was FL350)<br>Change of level approved.<br>1736: AUZ7882 reports at KIKEM at FL350.<br><br>There was no breakdown in separation<br>Bali advised (after the fact) that they had issued the Change of Level to their HF Operator.<br><br>Our International HF was experiencing communications difficulties in the adjoining areas | Time for report at KIKEM  | 2         |
| <b>Total Error Time</b> |                                                                                                                                                                                                                                                                                                                                                                                                                 |                           | <b>14</b> |

**P Radio operator transmitted or read back incorrect clearance**

| ESIR No. | ESIR Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Justification for time allocation                                                  | Estimated Time (Minutes) |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--------------------------|
| 2004 168 | Around 1700 Mauritius provided voice coordination on four aircraft to IND sector. These were written down and read back. The two pertinent aircraft were MAS204 PEDPI 1745 F370 and SIA405 PEDPI 1757 F350. Upon the readback the MAS204 time was amended to 1748 by Mauritius. Both aircraft were ADS CPDLC capable and despite having no requirement this info was passed on to Cocos, the HF operator, in case the aircraft called them and was not logged on properly. Further coord was received for weather diversion 20 left of track for MAS204. MAS204 passed PEDPI and logged on. SIA405 did not log on immediately. When HF communications were established with the aircraft he gave level F370. This was confirmed and checked with Mauritius. 10 mins between the aircraft, the required standard had been established and there was no breakdown of separation. | Assumed SIA passed PEDPI but did not log on. HF established to identify deviation. | 2                        |

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|                         |                                                                                                                                                                                                                                                                                                                   |                                                                                     |          |
|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------|
| 2004 1338               | At time 0300z coordination was received from Bali, that SIA 219 would be at ATMAP at time 0412Z, FL330.<br>At time 0417, the ARP rejected to the TFDC, because of the incorrect level.<br>At time 0413, the aircraft crossed the FIR boundary at incorrect level FL 350.<br>There was no breakdown of separation. | Allowance for time interval between aircraft crossing ATMAP and ARP being rejected. | 4        |
| 2004 2206               | 221856 Ujung coordinated to Brisbane 'CES561 estimating GUTEV 1954 FL330. Brisbane readback estimate correctly, but incorrectly read back 'Flight Level 350'Ujung replied 'That's correct Brisbane'.1954 CES561 reported GUTEV at FL330. No breakdown of Separation. Details confirmed by tape replay.            | Time for position report.                                                           | 2        |
| <b>Total Error Time</b> |                                                                                                                                                                                                                                                                                                                   |                                                                                     | <b>8</b> |