

**INTERNATIONAL CIVIL AVIATION ORGANIZATION  
ASIA AND PACIFIC OFFICE**



**REPORT OF THE TWENTY-EIGHTH MEETING OF THE ICAO  
REDUCED VERTICAL SEPARATION MINIMUM IMPLEMENTATION  
TASK FORCE (RVSM/TF/28)  
– REVIEW OF FLIGHT LEVEL ORIENTATION SCHEMES (FLOS)**

BANGKOK, THAILAND

24 – 28 APRIL 2006

The views expressed in this Report should be taken as those of the  
Task Force and not the Organization

Published by the ICAO Asia and Pacific Office, Bangkok

RVSM/TF/28  
Table of Contents

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	Page
<b>History of the Meeting</b>	
Introduction.....	i
Attendance .....	i
Officer and Secretariat .....	i
Opening of the Meeting .....	i
Documentation and Working Language .....	ii
<b>Report on Agenda Items</b>	
Agenda Item 1: Adoption of Agenda .....	1
Agenda Item 2: Operational Considerations .....	1
– Transition issues relating to the use of the modified single alternate FLOS and the single alternate FLOS	
– Review of States studies of proposed change(s) to existing FLOS	
Agenda Item 3: Review proposed change to level allocation developed by the RVSM/TF/22 meeting.....	10
Agenda Item 4: Review of safety assessments by MAAR on proposed change(s) to existing FLOS .....	12
Agenda Item 5: Implementation management considerations .....	17
Agenda Item 6: Any other business .....	18
<b>Appendices</b>	
Appendix A: List of Participants .....	A-1
Appendix B: List of Papers.....	B-1
Appendix C: Agenda .....	C-1
Appendix D: Assignment of RVSM Levels Developed by RVSM/TF/22 .....	D-1
Appendix E: Transition Areas in the SCS Area Identified by Thailand.....	E-1
Appendix F: Proposed RVSM FLAS within Ha Noi and Ho Chi Minh FIR.....	F-1
Appendix G: Summary of LHD Report Received by MAAR .....	G-1

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## 1.1 Introduction

1.1.1 The Twenty-eighth Meeting of the ICAO Reduced Vertical Separation Minimum Implementation Task Force (RVSM/TF/28) – Review of Flight Level Orientation Schemes (FLOS) was held at the Kotaite Wing of the ICAO Asia and Pacific Office, Bangkok, Thailand from 24 to 28 April 2006.

1.1.2 The Terms of Reference for the Task Force are as follows:

- To develop strategic, benefits-driven implementation plans (based on cost benefit studies), in concert with airspace users, for RVSM operations within selected areas and airspace of the Asia/Pacific Region, ensuring inter-regional harmonization;
- To consider any amendments to RVSM guidance material that may be proposed by States and international organizations;
- To address any other matters as appropriate and relevant to the implementation of RVSM;
- The Task Force will include participation from States and International Organizations that are considering or involved with the implementation of RVSM; and
- The Task Force will report to the ATS/AIS/SAR Sub-Group.

*(Adopted by the 10<sup>th</sup> Meeting of the ATS/AIS/SAR Sub-group, 2000)*

## 1.2 Attendance

1.2.1 The meeting was attended by 42 participants from Brunei Darussalam, China, Hong Kong China, India, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, Nepal, Philippines, Singapore, Thailand, Viet Nam, IATA, IFALPA and IFATCA. A complete list of participants is at **Appendix A**.

## 1.3 Officer and Secretariat

1.3.1 Mr. Kuah Kong Beng, Chief Air Traffic Control Officer, Civil Aviation Authority of Singapore, served as Chairperson of the Task Force. Mr. Kyotaro Harano, Regional Officer ATM served as the Secretary for the meeting.

## 1.4 Opening of the Meeting

1.4.1 Mr. Kuah Kong Beng welcomed the participants and opened the 28th Meeting of the ICAO RVSM Implementation Task Force. He said that the implementation of RVSM operations in the South China Sea area in 2002 had reaped benefits for the air navigation service providers and the users. The flight level allocation scheme (FLAS) had enhanced safety and increased efficiency as well as airspace capacity with significant reduction in ground delays at major airports. The successful implementation of RVSM operations was the result of the excellent cooperation and coordination among the States, ICAO, IATA, IFALPA and IFATCA. He hoped that the same camaraderie spirit would continue to be displayed as all concerned review the FLAS for the South China Sea area.

1.4.2 Mr. Kyotaro Harano, on behalf of Mr. Lalit Shah, Regional Director of the ICAO Asia and Pacific Office, welcomed the participants. He highlighted that the purpose of this meeting

was to review operational issues relating to the modified single alternate FLOS that had been implemented for the Western Pacific/South China Sea (WPAC/SCS) area since 2002. The modified single alternate FLOS was adopted to cater for the crisscrossing traffic movements in the area. However, as a result of the different FLOS implemented in the areas north of the Himalayas and over the Bay of Bengal and beyond (Bay of Bengal and Beyond) area in 2003, there was a need for aircraft to be transitioned from one FLOS to another. Mr. Harano mentioned that the modified single alternate FLOS had resulted in enhancements to the safety, efficiency and regularity of operations in the WPAC/SCS area. However, due to the transition requirements, some States had proposed to change the FLOS for the WPAC/SCS area. In this context, all concerned were urged to work together to review related issues and ensure that any recommendation for change would enable air traffic service providers to continue to apply safe RVSM. He wished good outcomes from the meeting.

## 1.5 **Documentation and Working Language**

1.5.1 The working language of the meeting as well as all documentation was in English.

1.5.2 Thirteen Working Papers and five Information Papers were presented to the meeting. A list of papers is included at **Appendix B** to this Report.

## **Agenda Item 1: Adoption of Agenda**

1.1 The meeting reviewed the provisional agenda and adopted for the meeting. The agenda is at **Appendix C** to the Report.

## **Agenda Item 2: Operational Considerations**

### Review of RVSM/TF/22 and the Special ATS Coordination Meeting to Finalize Arrangements for RVSM/TF Review of the WPAC/SCS FLOS (SCM RVSM FLOS)

2.1 The meeting recalled that RVSM/TF22 (September 2004, Bangkok) was requested by RVSM/TF/20 (October 2003, Delhi), which had decided to go ahead with the RVSM implementation in the Bay of Bengal and Beyond area on 27 November 2003, to review the FLOS for WPAC/SCS area. The meeting was informed that SCM RVSM FLOS (September 2005, Bangkok) was held to progress the review of the flight level assignment and prepare for the RVSM FLOS Review meeting.

#### *RVSM/TF/22*

2.2 The meeting recalled that RVSM/TF/22 reviewed the basic principles which had been adopted for the implementation of RVSM in the WPAC/SCS area. Being unable to attend RVSM/TF/22, the Philippines had submitted a detailed proposal on changes to the flight level assignment for No-pre-departure Coordination (No-PDC) flight levels in the WPAC/SCS area. This would allow for better match of the levels in the Bay of Bengal and Beyond RVSM airspace where a single alternate FLOS would be adopted.

2.3 For the purpose of the Philippine's study and presentation of the proposal, ATS routes in the WPAC/SCS area were categorized as follows:

Class I	Parallel routes (uni-directional)
Class II	Routes crossing the parallels (bi-directional)
Class III	Routes not crossing the parallels but crossing Class II routes (bi directional)
Class IV	Routes not crossing the parallels or Class II routes (bi-directional)

2.4 RVSM/TF/22 recognized the considerable effort made by the Philippines and additional work completed by Thailand to develop this proposal and agreed that it would be a suitable basis for consideration. RVSM/TF/22 reviewed the Philippine and Thailand proposals for flight level assignment in detail, taking into account comments from States and international organizations. Recognizing the need to maintain safety, efficiency and regularity of operations in the WPAC/SCS area, RVSM/TF/22 developed a provisional revised plan for the flight level assignment and corresponding No-PDC procedures. The proposed flight level assignment and No-PDC levels for each route category as agreed to by RVSM/TF/22 were as follows:

Class I	Both ways: FL 310, FL 320, FL 350, FL 360, FL 390 and FL 400
Class II	Eastbound: FL 290, FL 330, FL 370 and FL 410 Westbound: FL 280, FL 300, FL 340 and FL 380

Class III	Eastbound: FL 310, FL 350 and FL390 Westbound: FL 320, FL 360 and FL400
Class IV	All flight levels in the RVSM flight level band subject to bilateral agreement between FIRs to avoid 'bunching effect'

2.5 The proposed assignment of flight levels for the large scale weather deviations (LSWD) on the parallel routes agreed to by RVSM/TF/22 was as follows:

Northbound: FL 310, FL 350 and FL 390  
Southbound: FL 320, FL 360 and FL 400

2.6 The FLAS developed by RVSM/TF/22 are depicted in **Appendix D** to this Report.

2.7 RVSM/TF/22 emphasized that in accordance with ICAO's safety management provisions in Annex 11 – *Air Traffic Services*, detailed safety assessments would need to be carried out by the States concerned. Also, the Monitoring Agency for Asia Region (MAAR) would be required to undertake a safety assessment of the proposed FLAS for RVSM operations.

#### *SCM RVSM FLOS*

2.8 The meeting recognized that MAAR provided SCM RVSM FLOS with three scenarios for the FLAS review as follows:

- a) Base Case: Current FLAS in WPAC/SCS;
- b) Scenario 1: FLAS change proposed at RVSM/TF/22; and
- c) Scenario 2: Scenario 1 with minor FLAS change on A1 and P901.

2.9 The meeting was informed that Scenario 2 was essentially the same as Scenario 1 but with minor FLAS change on A1 and P901. In order to eliminate existing transition issues while achieving acceptable capacity and risk level on A1 and P901, the following FLAS on these particular routes had been proposed by MAAR for further consideration by the Task Force:

- a) Classes I, II and III: same as in Scenario 1
- b) Class IV: Eastbound: FL 290, FL 310, FL 330, FL 370 and FL 410  
Westbound: FL 300, FL 340, FL 380 and FL 400.

2.10 MAAR clarified to the meeting that in Scenario 2, two flight levels were taken out for each direction of flight-to accommodate flights on crossing routes to A1 and P901 in a State. It was noted that the decision on flight levels to be removed could be left to States concerned.

2.11 At SCM RVSM FLOS, the Chairman of RVSM/TF noted that not all the States concerned were present at RVSM/TF/22 which developed Scenario 1. In light of this, the Regional Office had agreed to advise States by State Letter of the different scenarios and to request that States complete required safety study and simulation of the scenarios as soon as possible in preparation for RVSM/TF/28.

2.12 The meeting recognized the effort of RVSM/TF/22 in developing the FLAS scenarios in an attempt to reduce transition tasks and harmonize the flow of RVSM traffic between the SCS area and the Bay of Bengal and Beyond area as well as the Pacific area.

2.13 With regard to the review of RVSM/TF/22 and SCM RVSM FLOS, IFATCA expressed serious concerns over the safety issue in relation to controllers' workload brought upon by the task of transition from one FLAS to another and strongly urged the meeting to take the necessary measures to alleviate this predicament.

Study on Base Case and Scenario 1 for the Singapore FIR

2.14 Singapore informed the meeting that a simulation had been only conducted on the proposed FLAS based on Scenario 1 to assess the impact on safety, capacity and efficiency as the proposed FLAS in Scenario 2 was similar to Scenario 1 except for the modifications in the FLAS on the ATS routes A1 and P901 which were well outside the Singapore FIR.

2.15 Singapore provided the meeting with the assessments on the Base Case and proposed FLAS based on Scenario 1 as follows:

a) Safety

The current and proposed FLAS based on Scenario 1 would provide at least 1,000 ft vertical separation at the intersections between the crossing and parallel routes. The flight levels allocated in the current FLAS would be easily remembered as even flight levels were used for the parallel routes and odd flight levels were used on the crossing routes. In the proposed Scenario 1 FLAS, there would be a mixture of even and odd flight levels allocated for the various route categories. As such, there could be a higher risk of human factor error.

b) Capacity

As the number of flight levels available for air traffic utilisation in the current and proposed Scenario 1 FLAS would be the same, there would not be any impact on the airspace capacity.

c) Efficiency

The flight levels allocated to the crossing routes were different from those allocated on the parallel routes in the proposed Scenario 1 FLAS. The same numbers of No-PDC flight levels would be made available for both the crossing and parallel routes in the current and proposed Scenario 1 FLAS, hence there would not an increase in ground delays. In the current FLAS, the flight levels allocated to the parallel routes were at 2,000 ft intervals whereas the flight levels allocated on the proposed Scenario 1 FLAS would be at either 1,000 ft or 3,000 ft intervals. As such, there could be an impact on the operating efficiency as aircraft might not be able to operate at or close to optimum flight level.

d) Transition/Workload

In the current FLAS, transition to the single alternate FLOS would have to be effected on three out of the six parallel routes as well as the westbound flights on the crossing routes whereas in the proposed Scenario 1 FLAS, transition would be effected for aircraft operating on three flight levels on all six parallel routes. Transition within radar coverage would be effected for aircraft operating between the Singapore and Kuala Lumpur FIRs for both the current and the proposed Scenario 1 FLAS.

2.16 Malaysia echoed that transitions in the Kuala Lumpur FIR were effected within radar cover and there were no difficulties encountered.

2.17 The meeting was informed that although Singapore had no objection to the adoption of the proposed Scenario 1 FLAS, the rationale for the adoption should consider safety, capacity, efficiency and controller's workload.

2.18 Hong Kong, China expressed concern on the transition tasks of any kind. With the anticipated increase of traffic, the transition task would increase the workload on air traffic controllers whether the task was carried out in radar cover or not.

2.19 The Philippines reported to the meeting that the proposed FLAS would require all the aircraft operating on even levels bound for Northeast Asia to be transitioned to the single alternate FLOS.

2.20 IFATCA expressed that any transition activities increase safety and efficiency issue. When transition is required, controllers' workload would increase. Sometimes, this would lead to the air traffic flow regulations, thus limiting the level of airspace capacity.

2.21 Thailand expressed that more flight levels should be available to the routes other than those of Class I. With regard to the capacity in Paragraph 2.15 b) above, which reported that either FLAS had the same number of flight levels available for traffic utilisation, Thailand noted the new FLAS would increase route capacity in the adjacent FIR. With regard to the capacity of the crossing routes, IATA suggested that parallel routes be established for crossing routes as these routes would increase the number of flight levels available.

2.22 Responding to the establishment of the parallel routes suggested by IATA, Thailand supported the view in the long run; however the establishment of the parallel routes for the crossing routes was not an immediate solution to the problem and would not address the transition issue.

2.23 Singapore informed the meeting that all RVSM flight levels were currently available for flights operating between the Singapore and Jakarta FIRs on four routes and such routes would be considered as Class IV routes.

2.24 IATA informed the meeting that flight levels allocated on the parallel routes in the proposed FLAS did not take into account operational requirements of ultra-long haul aircraft.

#### Revised FLAS Based on Modified Single Alternate FLOS

2.25 Thailand was of view that the transition issue had significant impact on existing RVSM operations and also affects the controller's mind-set which could cause human error easily. Several States that deal with transition issue were looking forward to the improvement of situation. Thailand reported that the new FLAS would also expand the RVSM benefit in the wider scale with more flexibility to the overall ATM enhancement in this area.

2.26 The meeting was informed that the adoption of the new FLAS in the present modified single alternate FLOS was aimed for the following objectives.

- a) Minimized transition activities and reduced operational workload as well as optimum flight profile.
- b) Harmonized and standardized RVSM application with the neighboring RVSM areas.



- c) To alleviate congestion on international traffic flow where flight levels assignment being limited with CVSM cruising table.
- d) Improve traffic flow within domestic route network of each FIR, especially FIRs where transition task being carried out.

2.27 In light of the foregoing, Thailand summarized the FLAS developed by RVSM/TF/22 as follows:

- a) FLAS for the parallel routes L642, M771, N892, L625, N884 and M767

Present FLA	New FLA
<b>FL300</b> , FL320	<b>FL310</b> , FL320
<b>FL340</b> , FL360	<b>FL350</b> , FL360
<b>FL380</b> , FL400	<b>FL390</b> , FL400

- b) FLAS for the crossing routes L628, M768, M765, A583, A461, N891 and M758

Present FLA		New FLA	
Eastbound	Westbound	Eastbound	Westbound
FL290	FL280	FL290	FL280
FL330	<b>FL310</b>	FL330	<b>FL300</b>
FL370	<b>FL350</b>	FL370	<b>FL340</b>
FL410	<b>FL390</b>	FL410	<b>FL380</b>

- c) FLAS for ATS routes A1 and P901

Present FLA		New FLA	
Eastbound	Westbound	Eastbound	Westbound
FL290	FL280	FL290	FL280
FL330	<b>FL310</b>	<b>FL310</b>	<b>FL300</b>
FL370	<b>FL350</b>	FL330	<b>FL340</b>
FL410	<b>FL390</b>	FL370	<b>FL380</b>
		FL410	<b>FL400</b>

2.28 Transition areas in the Bangkok, Manila and Vientiane FIR were identified by Thailand as in **Appendix E** to this Report. Thailand reported to the meeting that some of the transition problems could be resolved with the new FLAS.

2.29 No-PDC arrangement and coordination procedure would be required for more flexible use of all flight level assignment on all routes categories.

2.30 Thailand informed the meeting that under the current FLAS, transition would be required for all westbound flights operating on A1 and P901 due to the implementation of single alternate FLOS in the Bangkok FIR. Although the transitions were effected within radar cover, these increased controller's workload. Hence, the proposed FLAS would reduce controller's workload as transition would be minimised.

2.31 IATA highlighted that the proposed FLAS would raise the following issues which would need to be addressed:

- a) Hong Kong – Jakarta crossing routes;
- b) The use of odd/even flight levels on the parallel routes which would add complexity; and
- c) The possibility of an adjacent flight level not being available for transition purposes on the six parallel routes.

#### RVSM Implementation within the Ha Noi and Ho Chi Minh FIRs

2.32 Viet Nam reported that Civil Aviation Administration of Viet Nam (CAAV) had developed a comprehensive plan for the RVSM implementation within the Ho Chi Minh and Ha Noi FIRs.

#### *Implementation Status*

2.33 Viet Nam reported that the implementation of RVSM within the Ha Noi and Ho Chi Minh FIRs had been carried out in a phased manner.

2.34 In the phase 1, the flight level spectrum was FL 310 – FL 410. The meeting noted that an RVSM-CVSM transition area had been established in the Ho Chi Minh FIR on routes L642 and M771 between Ho Chi Minh ACC and Sanya ACC.

2.35 In the phase 2, in addition to the phase 1, the flight level spectrum was expanded to FL 290 – FL 410. The meeting was informed that FLOS on ATS domestic routes W1 and W2 (main trunk routes between Ha Noi and Ho Chi Minh City) was the single alternate with FL 290, FL 310, FL 330, FL 350, FL 370, FL 390 and FL 410 for the northbound, and FL 300, FL 320, FL 340, FL 360, FL 380 and FL 400 for the southbound.

2.36 The meeting noted that traffic volume on the above ATS routes was expected to increase. With the RVSM implementation, there had been a greater number of flight levels used in the area. The meeting recognized that the current FLOS accommodated the traffic volume on each ATS/RNAV route and most of the traffic had been cleared to fly at an optimum flight level. The delays had been reduced. Separations have been established strategically at crossing points, thus enhancing flight safety as well as reducing ATC coordination and ATC workload.

2.37 The meeting was informed that the RVSM procedures were successfully implemented within the FIRs during the phases 1 and 2, and subsequent operations were being smooth. The most traffic (96%) was being operated in RVSM level spectrum and the remaining (4%) was being operated at lower levels because of not meeting RVSM or RNP 10 requirements.

2.38 The meeting also noted that there were many operational advantages for ATC provision within the Ha Noi and Ho Chi Minh FIRs with the current RVSM FLOS. It was recognized that the significant overall improvement in operations and air traffic management over the area had been achieved as a result of the RVSM introduction.

2.39 On the other hand, it was noted that there were some issues over the areas as follows:

- a) Complexity of FLOS between the single and the modified single alternate FLOS in the area.
- b) Differences of the FLOS in the WPAC/SCS/Bay of Bengal and Beyond areas.
- c) A number of RVSM-CRVM transition areas in certain FIRs in the area (There are also a number of Feet system/Metric system transition areas).

- d) Other issues such as the LSWD procedure activation, safety monitoring/assessment, etc.

*Proposed Changes to FLAS*

2.40 Viet Nam supported the efforts made by States concerned and the Regional Office for the proposed changes to the current FLAS and expressed that Scenario 2 FLAS would be more preferable. Modifications were suggested for No-PDC levels. The details of the proposed FLAS as in **Appendix F** to this Report were presented to the meeting for consideration and discussion.

Revised FLAS Based on Single Alternate FLOS by the Philippines

2.41 The Philippines reported that the Manila FIR was bounded in the north and the east by FIRs implementing the single alternate FLOS. Also, typhoon would occur for almost half of the year in the Manila FIR.

2.42 The Philippines had studied the Scenario 2 FLAS and their findings were as follows:

a. Transition

All eastbound flights operating at even flight levels entering the Fukuoka and Taipei FIRs would be in conflict with westbound flights from these FIRs operating at even flight levels, thus requiring flight level changes.

b. Crossing Tracks

Built-in separation would be provided on crossing tracks using limited flight levels.

c. Deviations

With deviating flights operating at the same flight levels from a parallel route, safety would not be ensured.

2.43 In view of the above, the Philippines proposed a new FLAS which would establish a quadrant separation utilizing different flight levels allocated to the northwest-, southwest-, northeast- and southeast-bound flights respectively, hence no transition would be required since odd flight levels would be used for the flights operating on the uni-directional parallel routes from the Singapore FIR to the Fukuoka and Taipei FIRs and even flight levels for the opposite flights operating on the uni-directional parallel routes.

2.44 IATA noted that the FL 290, FL 330, FL 370 and FL 410 would be assigned to the northeast-bound, and FL 280, FL 320, FL 360 and FL 400 to the southwest-bound on the six trunk routes with the Philippine's proposal. If these flight levels could be used regardless of the direction on the unidirectional six parallel routes, the airspace capacity would be increased. The Philippines responded that the quadrant level assignment was to avoid the traffic coming from the Fukuoka and Taipei FIRs and all the assigned flight levels could not be allocated to the trunk routes. IATA was of view that with 4,000 ft separation within the unidirectional route, efficiency and capacity would be significantly affected.

2.45 The meeting recognized that the Philippines had some difficulties in carrying out the transition with the Scenario 1 FLAS. The meeting also noted that the Philippines would prefer to continue with the current FLAS if the revised Philippines' proposal was not considered by the RVSM/TF because of the further need for safety study and simulation by the States. Although the

RVSM/TF had been tasked to consider the adoption of the FLAS as proposed by the Philippines and Thailand at RVSM/TF/22, it would not be fruitful to continue discussions on the proposed FLAS.

Overview on the Proposed Change to the Current SCS FLAS by IATA

*SCS FLOS*

2.46 IATA reported that the Special ATS Coordination Meeting on Transition Procedures (SCM/Transition, September 2003) recognized that some States had expressed concerns over possible transition problems when RVSM was implemented in the Bay of Bengal and Beyond area on 27 November 2003 using the single alternate FLOS, as the SCS area used the modified single alternate FLOS.

2.47 The meeting recalled that MAAR provided RVSM/TF/22 with an update of reported Large Height Deviations (LHD) occurrences in the RVSM airspaces. The most common contributing factor to the LHD in the WPAC/SCS airspace were the "Error in the ATC-unit to ATC-unit transition message (Category M)", followed by the "Negative transfer received from the transitioning ATC-unit (Category N)".

*A1/P901*

2.48 In relation to A1 and P901, IATA noted that MAAR had provided the rationale to delete two flight levels for each direction.

2.49 MAAR confirmed that the four flight levels were taken out to accommodate traffic crossing the Class IV routes. As a result, the passing frequency was reduced due to that change in flight level allocation. In addition, MAAR advised the meeting that the capacity under the new FLAS would be increased compared to the current FLAS as there would be nine flight levels. This would be an increase of two flight levels in addition to the seven flight levels under the current FLAS.

2.50 IATA recognized the evolution of change that would be required in a dynamic aviation environment. IATA supported the change that would provide greater safety, efficiency and regularity in air traffic flow in the airspace of the region. IATA requested that any change in the FLAS over the SCS area be very carefully thought through and planned, to ensure that the significant benefits in the current arrangements would not be diminished.

2.51 On the issue of improving the capacity on the routes A1 and P901, Hong Kong, China informed the meeting that even though the total number of movements of 100 to 110 flights might not seem to be very significant, the fact that these flights were concentrated on a particular period of the day which had raised concerns for the need to increase the capacity of these routes. The meeting was informed that China was considering the possibility to re-position the danger areas as well as re-aligning the two routes into one in the near future.

2.52 As an alternate means of increasing the capacity and to reduce the passing frequencies on these routes, IATA suggested that the routes be kept parallel and unidirectional. China agreed to take this idea back to their headquarters for considerations.

2.53 IFATCA also raised the transitioning workload issue and advised the meeting that the FLAS to be utilized should be error tolerant and should not require controller's intervention to de-conflict the traffic.

2.54 Hong Kong, China informed the meeting that at present they were relying on the neighboring FIRs to perform the transitioning task but there was no guarantee on the length of time that the adjacent FIRs would continue their supports. At some point in time when the transitioning

became unfeasible, they might be forced to impose a measure to limit the number of aircraft entering the FIR, thus constraining route capacity. Hong Kong, China strongly urged the meeting to consider this matter seriously.

2.55 The meeting noted Hong Kong, China's concern on the transition issue and agreed to take a few steps back to view a bigger picture of RVSM structure in the region and how the difference in the FLAS could affect the overall system.

FLAS in the Fukuoka FIR

2.56 Japan reported to the meeting that RVSM was implemented in the oceanic airspace of the former Tokyo and Naha FIRs (Fukuoka FIR as of 16 February 2006) in February 2001, and subsequently implemented in the domestic airspace at 1900 UTC on 29 September 2005 in conjunction with the implementation in the Incheon FIR of the Republic of Korea.

2.57 ATC specialists present at an IFATCA meeting confirmed their common understanding that the use of the single alternate FLOS would be most preferable for ATC operations at Hong Kong, Manila, Naha and Taipei ACCs when RVSM was implemented in the Naha FIR on 29 September 2005. RVSM/TF/28 recognized that Hong Kong ACC could not apply a single alternate FLOS due to complicated traffic flows within the Hong Kong FIR. Therefore, Taipei ACC was required to undertake transition of the altitude for westbound flights to the current FLAS in the Taipei FIR. Consequently, Taipei ACC requested Naha ACC to undertake transition activities for the westbound flights on G581.

2.58 The meeting was informed that Naha ACC requested Taipei ACC in November 2005 to modify the FLAS on G581 to be aligned with the single alternate FLOS. However, the segment of "G581 HCN G86 –" remained unchanged due to the transition for Hong Kong ACC.

*Changes of FLAS on G581*

2.59 The meeting noted that FLAS for G581 after 16 March 2006 was as follows:

For westbound:	G581 HCN G86/B348	FL 310, FL 350 and FL 390
	G581 HCN N892	FL 300, FL 320, FL 340, FL 360, FL 380 and FL 400
	G581 HCN G581	FL 320, FL 360 and FL 400
For eastbound:	FL 290, FL 330, FL 370 and FL 410	

2.60 The meeting recognized that ATS for the westbound flights on G581 via IGURU had been expected to become smooth and efficient after 16 March 2006. The flights via G581 HCN N892 did not have a problem because no transition was required. On the other hand, it was noted that transition was still required for the flights via G581 HCN G86, and the transition problems remained unresolved.

2.61 It was further noted that a few westbound aircraft would be compelled to fly below FL 280 due to the limited three usable flight levels, i.e. FL 310, FL 350 and FL 390 against inbound FL 300, FL 320, FL 340, FL 360, FL 380 and FL 400. In order to streamline the traffic flow and increase the capacity and efficiency on G581, Japan considered it essential to modify FLAS on G581 to allow for all the levels available in line with the single alternate FLOS, and subsequently to revise the recently agreed FLAS in the letter of agreement between Naha and Taipei ACCs.

2.62 The meeting noted the bottleneck problem for the westbound flights via G581 HCN G86. This problem could be resolved when FLAS in the SCS area was reviewed.

**Agenda Item 3: Review proposed change to level allocation developed by the RVSM/TF/22 meeting**

3.1 States and international organizations present provided their views as below on the current RVSM FLAS, Scenarios 1 FLAS proposed by the Philippines and Thailand at RVSM/TF/22, and Scenario 2 FLAS suggested by MAAR.

*China*

3.2 China supported Scenario 2 as it would increase capacity and efficiency on A1 and P901. In addition, China informed the meeting that RVSM introduction to China was being considered, however the definitive plan was not finalized yet.

*Hong Kong, China*

3.3 Hong Kong, China expressed their support of Scenario 2 as there would be no impact on efficiency and would minimize transition activities to further enhance safety, It was also expected that Scenario 2 would increase capacity.

*Japan*

3.4 Japan reported to the meeting that flight levels available to the westbound flight on ATS route G86 was not enough, thus supporting Scenario 2.

*Lao PDR*

3.5 Lao PDR reported that the transition task on A1 in the Vientiane FIR was carried out by Thailand. Lao PDR supported Scenario 2.

*Malaysia*

3.6 Malaysia informed the meeting that the current FLAS had brought benefits to flights operating in the Kinabalu and Kuala Lumpur FIRs. However, Malaysia was open to either option.

*Philippines*

3.7 The Philippines, who had proposed Scenario 1 FLAS at RVSM/TF/22, reported to the meeting that they had reviewed it and decided to withdraw their FLAS proposal. The Philippines was against changing the FLAS.

*Singapore*

3.8 Singapore informed the meeting that the current FLAS had reaped benefit in terms of safety, capacity and efficiency. Although the Scenario 2 FLAS could increase human factor error due to the flight level allocated to the parallel routes, Singapore was open to either option.

*Thailand*

3.9 Thailand, who had jointly proposed Scenario 1 FLAS with the Philippines at RVSM/TF/22, highlighted the transition problems in the Bangkok FIR, particularly on A1 and P901. Thailand supported Scenario 2.

*Viet Nam*

3.10 Viet Nam noted the Scenario 2 FLAS would increase capacity and efficiency for flights operating on international routes in the Hanoi and Ho Chi Minh FIRs, and eliminate certain transition areas in the adjacent FIR. Viet Nam supported Scenario 2.

*IATA*

3.11 IATA was not requesting a change to the current FLAS, but would be willing to consider any FLAS which could be proven to provide equivalent level of safety, efficiency and regularity.

*IFALPA*

3.12 IFALPA did not see any problem in transition activities and supported the current FLAS.

*IFATCA*

3.13 IFATCA highlighted that all the surrounding areas had adopted the single alternate FLOS, and the flight level assignment should be reconsidered to cater for the traffic in/out of the areas. IFATCA supported Scenario 2.

Summary of the Discussion

3.14 The Philippines withdrew its support for proposed Scenario 1 that was developed jointly with Thailand at RVSM/TF/22. The Philippines expressed the desire to continue to operate with the current FLAS. Furthermore, the Philippines advised the meeting of its desire to adopt the single alternate FLOS without any modification in the Manila FIR. With the withdrawal of the support, it was felt that a consensus could not be reached to adopt the new FLAS proposed by the Philippines and Thailand at RVSM/TF/22. After deliberation on the current and proposed FLAS in terms of safety, capacity, regularity, transition workload, operations and harmonization, the meeting noted that the Philippines, despite undertaking an initiative to propose the changes in the FLAS during RVSM/TF/22, had disagreed with the adoption of proposed FLAS.

3.15 It was agreed that the endeavor to address the concerns expressed by several States should be continued. In this regard, with the completion of the one-year review for the WPAC/SCS airspace, SEACG/12 noted that the RVSM/TF was no longer involved with RVSM operations in this area, therefore, SEACG was required to continue to provide oversight of RVSM matters. SEACG/13 would be kept up to date on the RVSM issues. The meeting was of view that the new FLAS proposal could be raised at SEACG or, if necessary, at ATM/AIS/SAR Sub-group.

3.16 The meeting expressed appreciation to MAAR for the tireless work to conduct the safety assessment for the new FLAS in the SCS area. To facilitate MAAR in conducting the safety assessment on the proposed FLAS in the future, the meeting agreed that the States concerned should finalize and agree the details of the proposed FLAS before requesting MAAR to conduct the safety assessment.

3.17 Hong Kong, China suggested that a dedicated body be established under the auspices of ICAO to pursue measures/options to address concerns of several States in relation to the transition and capacity under the current FLAS arrangement in the SCS area. In light of the foregoing, the Secretariat advised that the States consult each other, and when the States concerned agree on a finalized FLAS, the meeting could be called.

**Agenda Item 4: Review of safety assessments by MAAR on proposed change(s) to existing FLOS**

4.1 MAAR provided the results of airspace safety assessment supporting the review of FLAS in the WPAC/SCS airspace. The meeting was advised that the safety assessment was conducted based on a one-month traffic sample data (TSD) collected in December 2005 and monthly LHD reports in 2005 - 2006 submitted by the concerning States in the WPAC/SCS region.

WPAC/SCS States Concerning the FLAS Review

4.2 Based on the FLAS review of the WPAC/SCS RVSM airspace, the concerning States and FIR were summarized below in Table 1:

WPAC/SCS States	FIRs/AOR
Cambodia	Phnom Penh
China	Sanya AOR
Hong Kong	Hong Kong
Indonesia	Bali (as of 7 July 2005)
	Jakarta
	Ujung Pandang
Lao PDR	Vientiane
Malaysia	Kuala Lumpur
	Kota Kinabalu
Philippines	Manila
Singapore	Singapore
Thailand	Bangkok
Vietnam	Hanoi
	Ho Chi Minh

Table 1: States and FIRs under FLOS Review



Data Inquiry for the RVSM Airspace Safety Assessment

4.3 As APANPIRG has adopted December every year as the standard sample period for vertical and horizontal TSD collection, commencing from December 2005, December 2005 TSD of aircraft operating in the WPAC/SCS airspace was used to assess the safety of RVSM airspace under the different FLOS.

4.4 **Appendix G** to this Report provides the summary of monthly LHD reports received by MAAR since January 2005.

Summary of LHD Occurrences

4.5 MAAR provided the summary of the LHD occurrences associated with the RVSM implementation in WPAC/SCS airspace. The data gathered from the LHD reports are used to estimate risk from operational errors.

4.6 Figure 1 below summarizes the number of LHD occurrences and associated LHD duration (in minutes) by month in the WPAC/SCS RVSM airspace since January 2005.

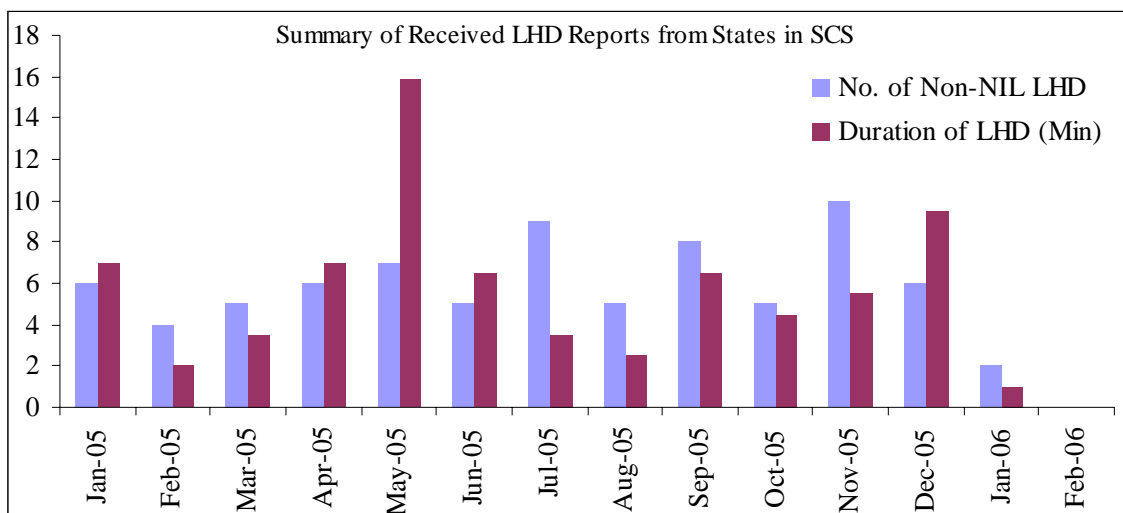


Figure 1: Summary of LHD Occurrences (by Month) in the WPAC/SCS RVSM Airspace

4.7 Figure 2 summarizes the number of LHD occurrences and associated LHD duration (in minutes) by State in the WPAC/SCS RVSM airspace Since January 2005.

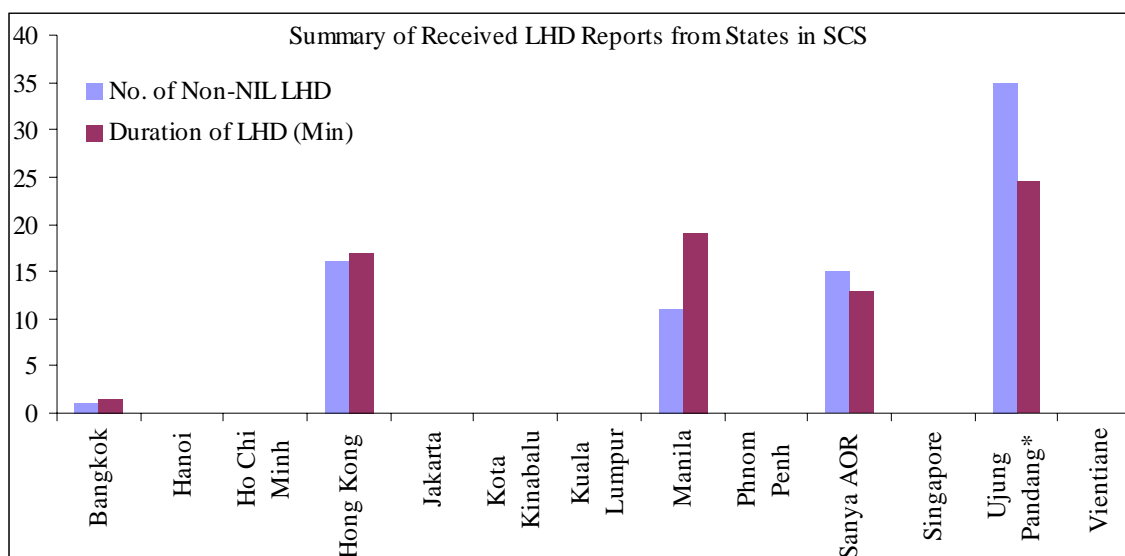


Figure 2: Summary of LHD Occurrences (by State) in the WPAC/SCS RVSM Airspace

4.8 Table 2A below presents the summary of the total number of LHD occurrences by the cause of deviation, using the LHD letter-coding scheme in Table 2B.

Code	No. of LHD Occurrences					Total	
	FIR	Sanya AOR	Hong Kong	Ujung Pandang	Manila		Bangkok
A						0	
B				2		2	
C						0	
D			1			1	
E						0	
F						0	
G				1		1	
H						0	
I			1	1	1	3	
J						0	
K						0	
L						0	
M		15	10	31	8	1	65
N			3		2		5
O			1				1
<b>Sum</b>		<b>15</b>	<b>16</b>	<b>35</b>	<b>11</b>	<b>1</b>	<b>78</b>

Table 2A: Cause of LHD Occurrences in WPAC/SCS RVSM Airspace

Code	Cause of Large Height Deviation
A	Failure to climb/descend as cleared
B	Climb/descend without ATC Clearance
C	Entry into airspace at an incorrect flight level
D	Deviation due to turbulence or other weather related cause
E	Deviation due to equipment failure
F	Deviation due to collision avoidance system (TCAS) advisory
G	Deviation due to contingency event
H	Aircraft not approved for operation in RVSM restricted airspace
I	ATC system loop error; (e.g. pilot misunderstands clearance message or ATC issues incorrect clearance)
J	Equipment control error encompassing incorrect operation of fully functional FMS or navigation system (e.g. by mistake the pilot incorrectly operates INS equipment)
K	Incorrect transcription of ATC clearance or re-clearance into the FMS
L	Wrong information faithfully transcribed into the FMS (e.g. flight plan followed rather than ATC clearance or original clearance followed instead of re-clearances)
M	Error in ATC-unit-to ATC-unit transferred/transition message
N	Negative transfer received from transferring/transition ATC-unit
O	Other

Table 2B: Codes Defining Causes of LHD Occurrences

4.9 In light of the above, the LHD occurrences in the WPAC/SCS RVSM airspace are summarized as follows:

- a) Total of 78 LHD occurred in the WPAC/SCS RVSM airspace
- b) Total LHD duration in 2005 was 73.9 minutes in 2005
- c) 65 of 78 LHD occurrences (83%) are subject to Error in ATC-unit to ATC-unit transferred/transition message (Category M)

Analysis Scenarios

4.10 The meeting noted that MAAR had conducted the safety assessments for each scenario for the FLAS review in the WPAC/SCS RVSM airspace. To further assess the risk in greater details, MAAR had proposed the more descriptive scenario of FLAS to be analyzed, which had been reviewed at SCM RVSM FLOS.

Risk Assessment

4.11 MAAR provided the results of safety assessment for the WPAC/SCS RVSM airspace, considering three scenarios of flight level assignment. The meeting recognized that the internationally accepted collision risk methodology was applied in assessing the safety of implementing the RVSM in the WPAC/SCS airspace.

4.12 Table 3 below summarizes the results of the airspace safety oversight in terms of the technical, operational, and total risks for the RVSM implementation in the WPAC/SCS airspace.

Source of Risk	Lower Bound Risk Estimation	TLS	Remarks
<b>Base Scenario: Current FLOS (Modified Single Alternate FLOS)</b>			
Technical Risk	$3.48 \times 10^{-10}$	$2.5 \times 10^{-9}$	Below Technical TLS
Operational Risk	$1.71 \times 10^{-9}$	-	
Total Risk	$2.05 \times 10^{-9}$	$5.0 \times 10^{-9}$	Below Overall TLS
<b>Scenario 1: Philippines and Thailand Proposals</b>			
Technical Risk	$8.20 \times 10^{-10}$	$2.5 \times 10^{-9}$	Below Technical TLS
Operational Risk	$4.21 \times 10^{-9}$	-	
Total Risk	$5.03 \times 10^{-9}$	$5.0 \times 10^{-9}$	Infringed Overall TLS
<b>Scenario 2: MAAR Proposals</b>			
Technical Risk	$5.78 \times 10^{-10}$	$2.5 \times 10^{-9}$	Below Technical TLS
Operational Risk	$3.38 \times 10^{-9}$	-	-
Total Risk	$3.95 \times 10^{-9}$	$5.0 \times 10^{-9}$	Below Overall TLS

Table 3: Risk Estimates for the RVSM Implementation in WPAC/SCS Airspace

4.13 Figures 3 and 4 present the trends of collision risk estimates for each month using the appropriate 12-month interval of LHD reports since January 2005.

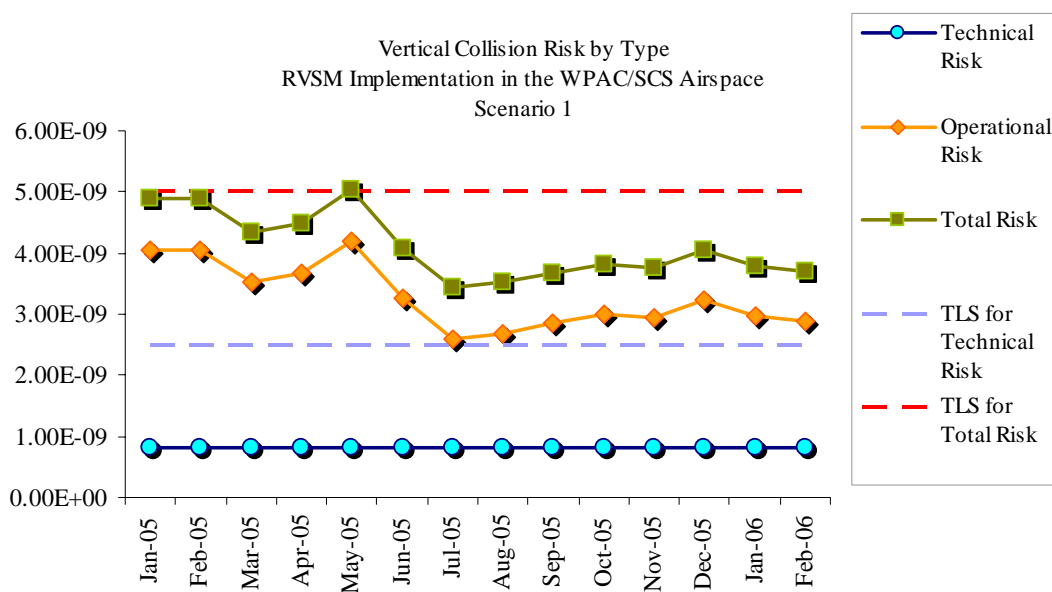


Figure 3: Trends of Risk Estimates for Scenario 1 of FLOS in WPAC/SCS RVSM Airspace

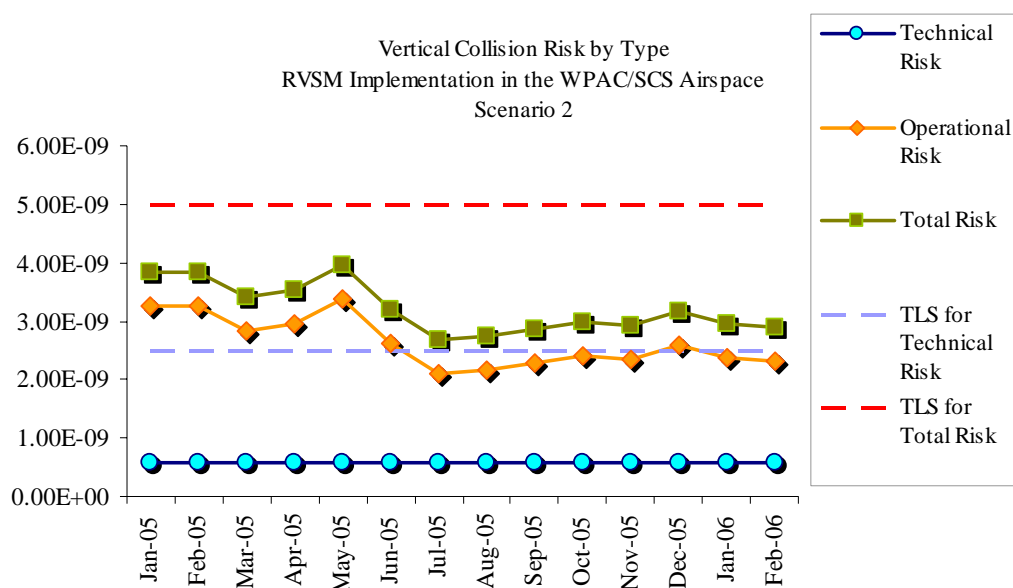


Figure 4: Trends of Risk Estimates for Scenario 2 of FLOS in WPAC/SCS RVSM Airspace

4.14 The meeting noted that both technical and total risks for the Base Case and Scenario 2 estimated from the received TSD and LHD reports satisfied the TLS of no more than  $2.5 \times 10^{-9}$  and  $5.0 \times 10^{-9}$  fatal accidents per flight hour due to the loss of a correctly established vertical separation standard of 1,000 ft and to all causes, respectively.

4.15 IATA recalled that MAAR had provided RVSM/TF/22 with an update of LHD occurrences in the RVSM airspaces. It had been found that the LHD were more significant in the WPAC/SCS area. The most common contributing factor to the LHD in the Asia region, especially in the WPAC/SCS airspace, were the “Error in the ATC-unit to ATC-unit transferred/transition message (Category M)”, followed by the “Negative transfer received from the transitioning ATC-unit (Category N)”. RVSM/TF/22 also considered that the Categories M and N description should be amended to reflect that errors were attributed to the transition. In this regard, MAAR was requested to review the matter and to coordinate with the Pacific Aircraft Registry and Monitoring Organization (PARMO) and the Regional Airspace Safety Monitoring Advisory Group (RASMAG). RVSM/TF/22 requested MAAR to examine the LHDs in greater detail with a view to establishing the primary cause of the operational errors. IATA further noted that there were a large number of LHD in the Ujung Pandang FIR which had implemented the single alternate FLOS and these LHD should not be attributed to transition errors. IATA remarked that the LHD in the Hong Kong FIR and the Sanya AOR were also not caused by transition errors as there were no transitions effected in both areas.

### Agenda Item 5: Implementation Management Considerations

5.1 As the meeting could not reach a consensus to implement the new FLAS, the implementation management was not considered. Consequently, two Working Papers and one Information Paper were not discussed.

**Agenda Item 6: Any Other Business**Review of the 16<sup>th</sup> Meeting of the APANPIRG (APANPIRG/16)

6.1 APANPIRG/16 noted that five Task Force meetings, two special coordination meetings and one RVSM seminar had been held since the activities of the RVSM/TF were reported to APANPIRG/15 (August 2004, Bangkok). APANPIRG/16 also noted that RVSM/TF/22 reviewed the operation of RVSM in the airspace concerned and the effects of applying different FLOS requiring transition areas to be operated.

6.2 The Chairperson informed the meeting that the Task Force will be dissolved by the end of this year and commended the members of the Task Force for their extensive contribution and the outstanding achievements in the long and laborious road to the implementation of RVSM in both the Bay of Bengal and Beyond, and South China Sea areas.

Review of the 12<sup>th</sup> Meeting of the South-East Asia ATS Coordination Group (SEACG/12)*Review Current Operations across South-East Asia and Identify Problem Areas*

6.3 The meeting noted that SEACG/12 (May 2005, Bangkok) was informed of the technical and operational risks assessed by APARMO for the 2002 implementation, i.e. the risk due to all causes being equal to  $1.2 \times 10^{-9}$  fatal accidents per flight hour, which was well below the TLS of  $5 \times 10^{-9}$  fatal accidents per flight hour. SEACG/12 was updated on the progress made by RVSM/TF to address the application of the different RVSM FLOS in the WPAC/SCS airspace. Recognizing the need to maintain safety, efficiency and regularity of operations in the WPAC/SCS airspace, RVSM/TF/22 developed a provisional revised plan for the assignment of RVSM levels and corresponding No-PDC procedures. RVSM/TF/22 agreed that key issues relating to the FLAS for the WPAC/SCS airspace would have to be addressed before any change could be made. Also, SEACG/12 was informed that MAAR would be required to undertake a safety assessment of the proposed FLOS for RVSM operations.

6.4 With the RVSM FLOS meeting which had been scheduled shortly before the Japan and the Republic of Korea implementation on 29 September 2005, Hong Kong, China considered that it would not be viable to complete all activities relating to the RVSM FLAS change. It was suggested that any change to the SCS FLAS should be delayed until after the 90-day review meeting of the Japan and the Republic of Korea RVSM implementation.

Review of the Fourth Meeting of the RASMAG (RASMAG/4)*Review the Airspace Safety Monitoring Arrangements in the Asia/Pacific Region and the Activities of Regional Safety Monitoring Agencies*

6.5 The meeting noted that RASMAG/4 strongly endorsed the recommendation made to States by MAAR regarding the need to mitigate identified LHD occurrences of Category M, noting that APANPIRG/16 had established Conclusion 16/3 requiring the Regional Office to draw the attention of affected States to this situation and Conclusion 16/6 requiring that States that did not provide safety-related data in accordance with the requirements of regional safety monitoring agencies be included on the APANPIRG List of Deficiencies.

*Tripartite RMA Meeting*

6.6 The meeting was informed that the representatives from MAAR, Airservices Australia and PARMO met during RASMAG/4 in order to discharge the direction given in the Report of RASMAG/3 “for the three RMAs to meet with an aim to standardize their work methods” and to harmonize “different values being used in the [collision risk] modeling,” with special emphasis on RASMAG/3 “concerns regarding the way that TCAS reports were being included [in the risk assessment process]”.

6.7 With regard to harmonizing the different values being used in the collision risk modeling, the meeting noted that the RMA representatives agreed that the value for the parameter should not be fixed for use everywhere within the region; rather the value appropriate to a particular safety assessment should reflect the range of aircraft types and speeds characteristic of the airspace under study.

6.8 The RMA representatives recalled a change, with effect from 24 November 2005, added the following paragraph to Annex 11 – *Air Traffic Services*:

*3.3.4.1 For all airspace where a reduced vertical separation minimum of 300 m (1 000 ft) is applied between FL 290 and FL 410 inclusive, a programme shall be instituted, on a regional basis, for monitoring the height-keeping performance of aircraft operating at these levels, in order to ensure that the implementation and continued application of this vertical separation minimum meets the safety objectives. The coverage of the height monitoring facilities provided under this programme shall be adequate to permit monitoring of the relevant aircraft types of all operators who operate in RVSM airspace.*

Note. – The number of separate monitoring programmes should be restricted to the minimum necessary to effectively provide the required services for the region.

6.9 In light of the above, the RMA representatives had agreed that the new, regionally focused height-keeping performance monitoring requirements of Annex 11 required urgent attention, given their effective date of 24 November 2005.

Future RVSM/TF Meeting

6.10 The meeting tentatively agreed to the following schedule of the last meeting for the RVSM/TF:

RVSM/TF/29 (One year Review Japan/ROK)	14-16 Nov 2006	TBD
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**7. Closing of the Meeting**

7.1 In closing the meeting, Mr. Kuah Kong Beng thanked all participants for their active participation and efforts.

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Appendix A to the RVSM/TF/28 Report  
List of Participants

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Appendix A to the RVSM/TF/28 Report  
List of Participants

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Appendix A to the RVSM/TF/28 Report  
List of Participants

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Appendix A to the RVSM/TF/28 Report  
List of Participants

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Appendix A to the RVSM/TF/28 Report  
List of Participants

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Appendix A to the RVSM/TF/28 Report  
List of Participants

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Appendix A to the RVSM/TF/28 Report  
List of Participants

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Appendix A to the RVSM/TF/28 Report  
List of Participants

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Appendix B to the RVSM/TF/28 Report  
List of Papers

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**LIST OF WORKING PAPERS (WPs) AND INFORMATION PAPERS (IPs)**

**WORKING PAPERS**

<b>NUMBER</b>	<b>AGENDA</b>	<b>TITLE</b>	<b>PRESENTED BY</b>
WP/1	1	Provisional Agenda	Secretariat
WP/2	2	Review of RVSM/TF/22 Meeting and the Special Coordination Meeting to Finalize Arrangements for RVSM/TF Review of Western Pacific/South China Sea Flight Level Orientation Scheme (SCM RVSM FLOS)	Secretariat
WP/3	5	Review of Action Plan	Secretariat
WP/4	6	Review of the 16th Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/16)	Secretariat
WP/5	5	Switchover Date and Time and Procedures for the Change to RVSM Flight Level Assignment (FLAS)	Secretariat
WP/6	2	Flight Level Allocation Scheme (FLAS) in the Fukuoka FIR	Japan
WP/7	6	Review of the Twelfth Meeting of the South-East Asia ATS Coordination Group (SEACG/12)	Secretariat
WP/8	2	Overview on the proposed change to the current SCS FLOS	IATA
WP/9	2	Study on current and proposed Flight Orientation Schemes (FLOS) in the Singapore FIR	Singapore
WP/10	2	Revise Flight Level Allocation Base on Modified Single Alternate Flight Level Orientation Scheme (FLOS)	Thailand
WP/11	4	Airspace Safety Assessment Supporting the Flight Level Orientation Scheme Review of the RVSM Implementation in Western Pacific/South China Sea	MAAR
WP/12	2	RVSM Implementation within Ha Noi and Ho Chi Minh FIRs	Viet Nam
WP/13	2	Revised Flight Level Allocation Based on Single Alternate Flight Level Orientation Scheme	Philippines

**INFORMATION PAPERS**

<b>NUMBER</b>	<b>AGENDA</b>	<b>TITLE</b>	<b>PRESENTED BY</b>
IP/1	-	List of Working Papers (WPs) and Information Papers (IPs)	Secretariat
IP/2	5	Terms of Reference of RVSM/TF	Secretariat
IP/3	5	Terms of Reference of RVSM/TF Work Groups	Secretariat
IP/4	6	Review of the Fourth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/4)	Secretariat
IP/5	5	AIP Amendment	Secretariat

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Appendix C to the RVSM/TF/28 Report  
Agenda

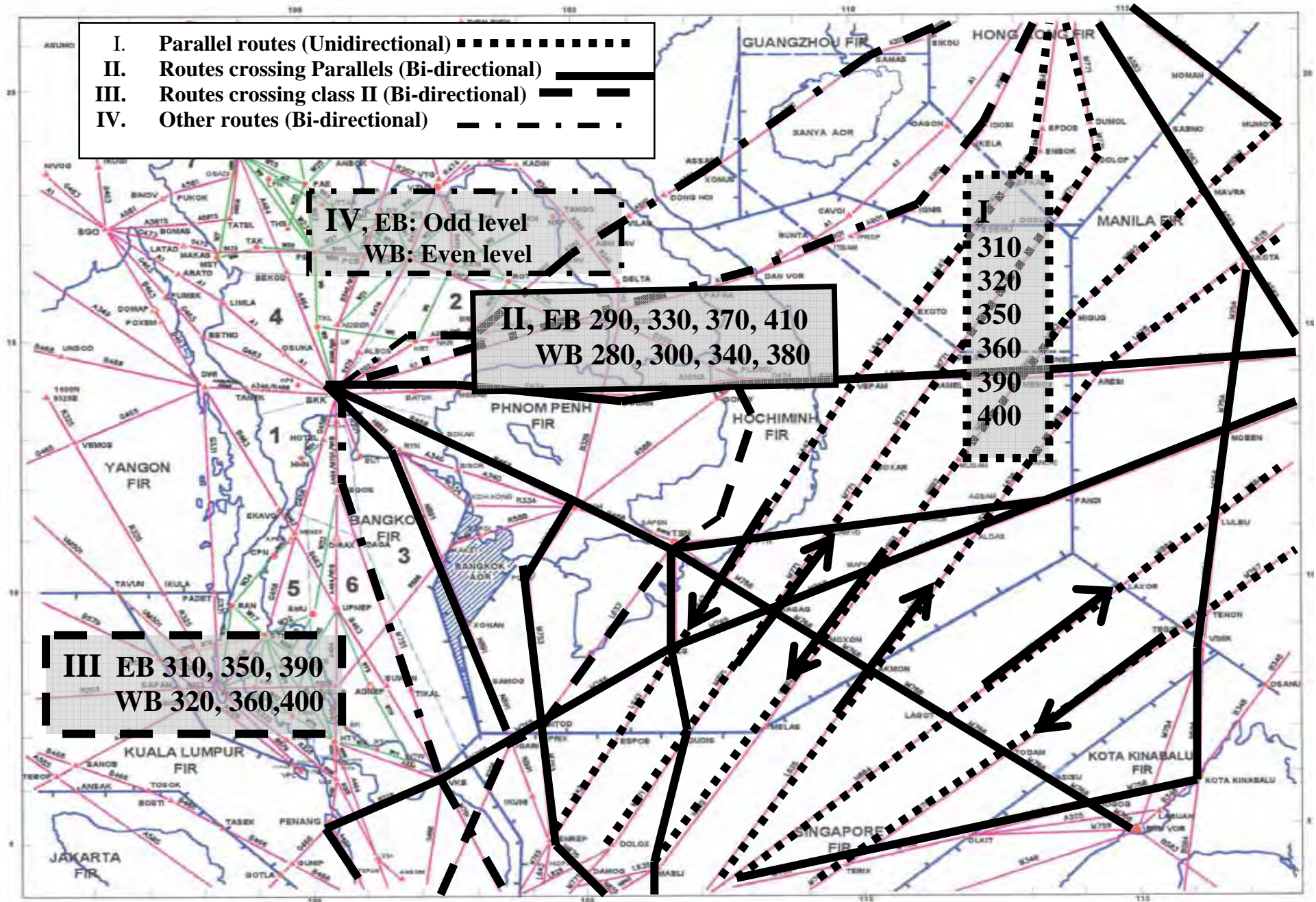
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**AGENDA**

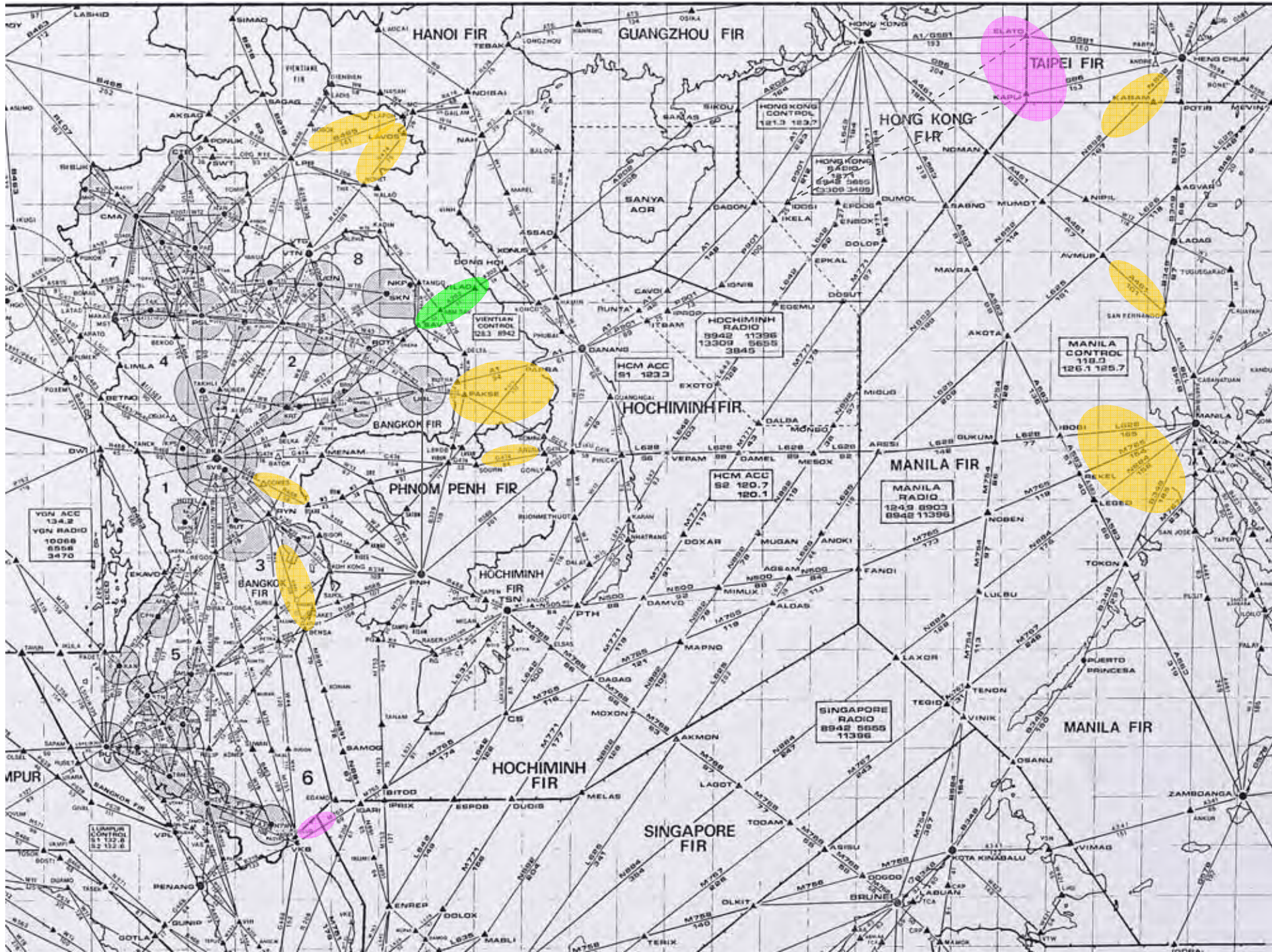
- Agenda Item 1: Adoption of Agenda
- Agenda Item 2: Operational Considerations
- Transition issues relating to the use of the modified single alternate FLOS and the single alternate FLOS
  - Review of States studies of proposed change(s) to existing FLOS
- Agenda Item 3: Review proposed change to level allocation developed by the RVSM/TF/22 meeting
- Agenda Item 4: Review of safety assessments by MAAR on proposed change(s) to existing FLOS
- Agenda Item 5: Implementation management considerations
- Agenda Item 6: Any other business

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Appendix D to the RVSM/TF/28 Report  
 Assignment of RVSM Levels Developed by RVSM/TF/22









Appendix F to the RVSM/TF/28 Report  
Proposed RVSM FLAS within Ha Noi and Ho Chi Minh FIRs

<b>Routes</b>	<b>Usable FLOS/FLs</b>	<b>No-PDC FLs</b>	<b>No-PDC FLs for large-scale WX deviations</b>
L642, M771, N892, L625 (Class I)	Modified FLOS. All usable FLs	FL310, 320, 350, 360, 390, 400	<b>EB:</b> FL310, 350, 390
			<b>WB:</b> FL320, 360, 400
L628, G474/L628 (Class II)	Single FLOS. All usable FLs	<b>EB:</b> FL290, 330, 370 <b>WB:</b> FL280, 340, 380	<b>EB:</b> FL290, 330, 370
			<b>WB:</b> FL280, 340, 380
N500 (Class II)	Single FLOS. All usable FLs	<b>EB:</b> FL330 <b>WB:</b> FL300	
M765 (Class II)	Single FLOS. All usable FLs	<b>NEB:</b> FL290, 370 <b>SWB:</b> FL300, 380	
M768, R468-M768 (Class II)	Single FLOS. All usable FLs	<b>SEB:</b> FL330, 410 <b>NWB:</b> FL280, 340	
M753, M755 (Class III)	Single FLOS. All usable FLs	<b>SB:</b> FL310, 350 <b>NB:</b> FL280, 340	
L644 (Class II)	Single FLOS. All usable FLs	<b>SB:</b> FL330, 410	
N891 (Class III)	Single FLOS. All usable FLs	<b>SEB:</b> FL330, 390 <b>NWB:</b> FL320, 360	
A1/P901, A202 (Class IV)	Single FLOS. All usable FLs	<b>EB:</b> FL290, 330, 370, 390, 410 <b>WB:</b> FL280, 300, 340, 380, 400	
W1, W2 (Class IV)	Single FLOS. All usable FLs	<b>NB:</b> FL310, 350 <b>SB:</b> FL320, 360	
A206, R474, B465 (Class IV)	Single FLOS. All usable FLs	All usable FLs	
Other domestic Routes	Single FLOS All usable FLs ( <i>In most cases, FLs are assigned below FL280</i> )		

**Note:**      **EB:** Eastbound      **SB:** Southbound      **SEB:** Southeastbound  
                 **WB:** Westbound      **NB:** Northbound      **NWB:** Northwestbound

Appendix G to the RVSM/TF/28 Report  
Summary of LHD Reports Received by MAAR since January 2005

State	Cambodia	China		Indonesia			LoaPDR	Malaysia		Philippines	Singapore	Thailand	Vietnam	
FIR	PhnomPenh	Sanya AOR	Hong Kong	Bali	Jakarta	Ujung Pandang	Vientiane	Kota Kinabalu	Kuala Lumpur	Manila	Singapore	Bangkok	Hanoi	Ho Chi Minh
<b>2005</b>														
Jan	X	X	X		X	X	X	X	X	X	X	X	X	X
Feb	X	X	X		X	X	X	X	X	X	X	X	X	X
Mar	X	X	X		X	X	X	X	X	X	X	X	X	X
Apr	X	X	X		X	X	X	X	X	X	X	X	X	X
May	X	X	X		X	X	X	X	X	X	X	X	X	X
Jun	X	X	X		X	X	X	X	X	X	X	X	X	X
Jul	X	X	X			X	X	X	X	X	X	X	X	X
Aug	X	X	X			X	X	X	X	X	X	X	X	X
Sep	X	X	X			X	X	X	X	X	X	X		
Oct	X	X	X			X	X	X	X	X	X	X		
Nov	X		X			X	X	X	X	X	X	X	X	X
Dec	X		X			X	X	X	X		X	X	X	X
<b>2006</b>														
Jan	X	X	X		X			X	X		X	X	X	X
Feb	X	X						X	X		X	X	X	X