INTERNATIONAL CIVIL AVIATION ORGANIZATION

REPORT OF THE SECOND TASK FORCE MEETING ON A REVISED ATS ROUTE STRUCTURE – ASIA TO MIDDLE EAST/EUROPE, SOUTH-OF-THE-HIMALAYAS (EMARSSH TF/2)

BANGKOK, THAILAND, 12 – 16 MARCH 2001

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

Adopted by the Task Force
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PART I – HISTORY OF THE MEETING

1. Introduction

1.1 The Second Task Force Meeting on a Revised ATS Route Structure – Asia to Middle East/Europe, South-of-the-Himalayas (EMARSSH TF/2) was held at the ICAO Asia and Pacific Regional Office, Bangkok, Thailand from 12-16 March 2001.

2. Attendance

2.1 The meeting was attended by 44 participants from 14 States and 2 International Organizations. A list of participants is at Appendix A to this report.

3. Opening of the Meeting

3.1 The meeting was opened by Mr. Lalit B. Shah, Regional Director, ICAO Asia and Pacific Office who welcomed all participants to Bangkok. He emphasized the importance of the EMARSSH project to both the ATS users and providers. He advised the meeting that this project was unique in that it required the coordinated efforts of three ICAO regions, namely Asia and Pacific, Europe and the Middle East. Endorsement had been obtained from various forums including APANPIRG and the Regional Directors of the three ICAO regions. Mr. Shah noted the work already achieved by EMARSSH TF/1 and wished the meeting success in continuing the work onwards from the Pacific Rim to the Middle East and Europe.

4. Officers and Secretariat

4.1 Mr. John E. Richardson, ICAO Asia/Pacific Regional Officer and Chairman of the Task Force, introduced the members of the Core Team, who will lead the EMARSSH project through to implementation. Mr. Mohamed Khonji, Deputy Regional Director, ICAO Middle East Office was welcomed to the Core Team. Other members were Mr. Ron Rigney, Airservices Australia, Mr. Joseph Cheuk, Civil Aviation Department of Hong Kong China, Mr. P.C. Goel, Airports Authority of India, Mr. Mervyn Fernando, Civil Aviation Authority of Singapore, Mr. David Behrens, IATA, Asia/Pacific Office. Mr. K.P. Rimal and Mr. Li Peng, Regional Officers CNS, ICAO Asia and Pacific Office, assisted the Core Team in CNS matters.

4.2 Mr. Richardson particularly welcomed participants from Islamic Republic of Iran (I. R. of Iran) and Bahrain, who had traveled to Bangkok from the Middle East to take part in this meeting.

5. Documentation and Working Language

5.1 All discussions were conducted in English. Documentation was issued in English. A total of 10 Working Papers and 6 Information Papers were considered by the meeting. A list of the Working and Information Papers is at Appendix B.

PART II - REPORT ON AGENDA ITEMS

Agenda Item 1: Adoption of the Agenda

1.1 The meeting reviewed the provisional agenda presented by the Secretariat and adopted it as the agenda for the meeting. The Agenda is at Appendix C.

Agenda Item 2: Principles for the design of ATS routes for EMARSSH

2.1 The meeting was given a presentation on the background and creation of the EMARSSH Project. It was noted that due to delays incurred to airlines and the subsequent workload caused to air traffic controllers caused by the present route structure, parallel routing wherever possible needed to be created to cater for the forecast increase in international as well as domestic traffic operating in the area under consideration. Taking into account existing aircraft navigation capabilities and new CNS/ATM technologies, it was considered appropriate that a revised route structure to the Middle East and Europe be put in place. In developing this route structure, the needs of domestic and regional operations would also need to be considered.

2.2 Utilizing Area Navigation (RNAV), the introduction of Required Navigation Performance (RNP), radar coverage and the 2003 introduction of Reduced Vertical Separation Minimum (RVSM) in the Western Asia and Middle East regions, it was considered appropriate to re-look at how air traffic services are being provided, especially with regard to the long-haul inter-regional operations.

2.3 The meeting noted that States as well as the aviation industry were investing significant amounts of money to purchase and install modern ground and airborne equipment and train their staff in the use of this new technology. It was agreed that the opportunity should be taken to use these resources to the best advantage. This in turn will allow States to maximise the use of their airspace and give greater flexibility to aircraft operations.

2.4 When looking at any changes to a route structure, it was necessary to consider the whole flight from departure to destination. The meeting was advised that as the project moved through further Task Force meetings, States from adjoining regions should also participate. It will be necessary to involve these States and their respective ICAO regional offices in any changes to the route structure.

2.5 The meeting noted that the concept of EMARSSH had already been discussed and endorsed by various Asia/Pacific regional meetings over the last 12 months. It was also noted that an ICAO Inter-Regional Co-ordination Group Meeting comprising Regional Directors from Paris, Cairo and Bangkok assisted by the Chief of the Regional Affairs Office in ICAO Headquarters, further endorsed the EMARSSH Project. From these meetings, EMARSSH Principles were developed and are produced at Appendix D to this report.

2.6 It was noted that working guidelines for the construction of ATS routes were developed by APANPIRG/5 some years ago. These guidelines were considered to be helpful tools when considering changes to the route structure under consideration. The guidelines are described in Appendix E to this report.

Agenda Item 3: Identify the area to be considered by EMARSSH TF/2

3.1 **Area Reviewed**

3.1.1 The meeting decided to address the route structure bounded by the following FIRs:

Eastern border: Bangkok, Jakarta, Kuala Lumpur and Singapore
Southern border: Colombo
Western border: Mumbai
Northern border: Calcutta, Delhi, Kathmandu and Yangon

3.1.2 ATS routes in Pakistan were not reviewed as Pakistan was not represented. However, the meeting noted the proposed route structure that has been addressed by Afghanistan, Iran, Pakistan and IATA in the IATA Joint Route Development Group (JRDG) in developing the routes proposed by EMARSSH TF/2.

3.2 **EMARSSH Route Structure**

3.2.1 The meeting considered the proposed routes, based on major South East Asia / Europe city pairs developed by IATA, as a starting point in developing a new EMARSSH route structure. The proposed routes adopted by the meeting are listed in Appendix F. A chart showing these routes is at Appendix G. The meeting noted that the routes interfacing with Middle East Region over the Arabian Sea are subject to further discussion at EMARSSH TF/3 meeting. On the eastern shoreline of the Bay of Bengal, additional work will be required on transitions between the new routes and the existing route network.

3.2.2 Routes that diverged from common points were drawn to diverge by at least 15° in order to satisfy separation requirements for aircraft transitioning into airspace where a greater lateral separation minimum applies. There was considerable discussion on how this separation criteria was to be applied and the meeting concluded that the States would benefit if ICAO would organise a seminar that would go through all the provisions of procedural separation that is found in PANS-RAC and the Regional SUPPS.

3.3 **Follow-up Actions**

3.3.1 In discussing the proposed route structure, the meeting identified some matters, which require follow up action. These are listed in Appendix H to this report.

Agenda Item 4: Factors to take into account in the route structure design

4.1 The meeting discussed the following factors to be taken into account in the development of the revised route structure.

4.2 **Safety assessment and monitoring program**

4.2.1 In order to implement RNP10, a Safety Assessment is required, together with the establishment of an Aircraft Navigational Error monitoring program. The meeting decided to refer the appointment of a Central Monitoring Agency (CMA) and the completion of a Safety Case Analysis to the ICAO Asia/Pacific Regional Office, for further action. Letters of Agreement (LOA) for the Monitoring of Aircraft Navigation Errors within the airspace concerned will be required between implementing States, and that there will be a requirement to forward completed monthly returns to the CMA, including “Nil Returns”. The establishment of an Aircraft Navigational Error monitoring program is covered under the Implementation Work Program.

4.2.2 It was decided that the methodology and the format relating to data required shall be determined in co-ordination with the CMA and the Safety Analyst. States will be informed through separate advice from the ICAO Asia/Pacific Office.

4.2.3 The meeting was informed that the MID Region was implementing RNP5 on selected priority routes on 22 March 2001 as phase 1, and further implementation of phase 2 RNP5 would take place on 22 March 2002. The United Arab Emirates (UAE) had offered to be the designated Air Navigation Error Monitoring Agency for the MID Region, which had been accepted by the MID RNP/RNAV Task Force meeting.

4.3 **Required Navigation Performance (RNP) – Airworthiness and Operational Approval**

4.3.1 The meeting noted that the Manual on RNP (Doc 9613) was available for States to assist in the implementation of RNP. It was also noted that the South Pacific Operations Manual (SPOM) addresses RNP and is available on the Internet. This material also forms a part of ICAO's Guidance Material on CNS/ATM Operations in the Asia/Pacific Region.

4.3.2 It was further noted that there was currently no ICAO guidance material relating to airworthiness and operational approval for specific RNP operations. However States could use the procedures developed and published by other States such as the Federal Aviation Administration (FAA), USA, Civil Aviation Safety Authority of Australia (CASA) and the Civil Aviation Authority (CAA) of New Zealand. The guidance material for FAA and CASA are available and the web sites listed below:

http://www.faa.gov/ats/ato/rnp.htm
http://www.casa.gov.au/avreg/rules/download/caaps/ops/rnp10.pdf.

4.4 **RNP Routes/Airspace**

4.4.1 Separation Criteria

4.4.1.1 The meeting noted that 50NM Lateral Separation is achievable in RNP10 airspace without any further enhancements to communication or surveillance. However, for application of 50NM Longitudinal Separation, Direct Controller Pilot Communication (DCPC) is required. That can be satisfied by voice or CPDLC. If DCPC is not available, then the appropriate longitudinal separation standard should be applied. This, however, would not prohibit the implementation of RNP10 with 50NM lateral separation. To achieve the full benefit of RNP10, States are encouraged to consider the provision of DCPC in their future modernization plans.

4.4.2 Exclusive/Non-Exclusive RNP Airspace

4.4.2.1 The meeting considered the issue of whether RNP Designated Airspace should be Exclusive or Non-Exclusive. Where airspace cannot be designated as exclusive, the States may consider introduction of a vertical limit to define exclusive and non-exclusive airspace.

4.5 **Publication of Aeronautical Information Circular (AIC) and other documentation**

4.5.1 The meeting recognized the need for early notification of the introduction of RNP Routes/Airspace, through publication of an AIC to give sufficient advance notice of intent to the airline operators and other users. It was agreed that State AICs, should be published as soon as possible, but in any case no later than 1 July 2001.

4.5.2 The meeting considered the two AIC models (Australia & RNP10 – Nov 97; and Bahrain RNP5 July 2000), for the issue of AIC pertaining to the introduction of RNP Routes/Airspace. It was agreed that the Australian model, with some modification, would be more suitable within the Asia/Pacific Region, and that the amended model will be distributed for use by States concerned.

4.5.3 The meeting noted the requirement for documentation that would need to be in place as per the Implementation Work Program. This documentation includes:

a) AIC
b) Operational Letters of Agreement
c) AIP Supplement
d) Amendment of DOC 7030
e) Charts (including SIDs and STARs)
f) Training syllabus
g) ATC Procedures

4.5.4 The meeting agreed to adopt the Navigational Error Monitoring Letters of Agreement used by the South China Sea Task Force which is at Appendix I.

4.6 **Contingency Procedures**

4.6.1 The meeting considered that appropriate Contingency Procedures should be published in relevant documentation, in addition to that published in ICAO DOC 7030.

4.6.2 Contingency procedures which should be considered, include:

a) Weather Deviations
b) Navigational errors
c) Environmental factors (e.g. Volcanic activity)

4.7 **Training considerations**

4.7.1 The meeting considered the list of training considerations developed by the South China Sea Task Force. These are shown at Appendix J.

4.8 **Other considerations**

4.8.1 The meeting deliberated upon various other issues, related to the implementation of the revised Route Structure and introduction of RNP criteria. Some of the issues are listed below.

4.8.2 <u>Military considerations</u>

4.8.2.1 Within the area of consideration, there are many military areas, which may affect EMARSSH implementation.

4.8.2.2 The meeting considered the benefits that could be achieved through the application of reduced lateral separation standards associated with ATS Routes within designated RNP10 airspace and adjacent military airspace.

4.8.2.3 The meeting was advised of an example where I. R. of Iran had reported an improvement to airspace management and efficiencies through the establishment of a permanent Civil/Military Co-ordination Committee.

4.8.3 HF congestion

4.8.3.1 The meeting appreciated that HF congestion was a problem in the area. It was noted that HF congestion could be reduced through several means, including:

a) reduction in the number of mandatory reports, by ensuring that Reporting Points are appropriately spaced (i.e. not too close)
b) the adherence to standard R/T Procedures and Phraseologies
c) a review of R/T requirements for aircraft entering neighbouring FIRs. (e.g. Inbound Reports prior to the FIR Boundary)
d) judicious use of the available MWARA frequencies.

4.8.3.2 The meeting acknowledged that HF congestion is expected to reduce through the increased use of CPDLC/ADS and enhancement of VHF coverage by installation of appropriate RCAG stations.

4.8.3.3 Further, the meeting suggested that the possibility of using existing CPDLC facilities for traffic operating on adjacent ATS routes may be explored.

4.8.4 RVSM

4.8.4.1 The meeting also considered that the implementation of RVSM will further enhance the airspace capacity available under the EMARSSH Route Structure.

4.8.5 Mach Number Technique (MNT)

4.8.5.1 The meeting was given a presentation on Mach Number Technique and its application including different scenarios and how it can be applied, including faster in front and faster behind. A sample generic Letter of Agreement was also presented detailing how Mach Number Technique can be documented and applied by air traffic control, and it is attached at Appendix K. The meeting agreed to further discuss Mach Number Technique, including defining exit points and recommended acceptable faster behind criteria in the next BBACG/13, which will meet approximately 6 months prior to the November 2002 implementation of the EMARSSH routes in the Bay of Bengal.

Agenda Item 5: Develop a co-ordinated action plan for the implementation of actions agreed by the meeting

5.1 The meeting discussed the implementation plan of actions required for the development of the EMARSSH Route Structure and the introduction of RNP10 routes/airspace. The meeting agreed on the following Task List and schedules:

5.2 Task List and Schedule

No	Task	Action by	Target Date (not later than)	Date Start	Date Finish	Remarks
1	AIC Publication	Implementing States	01 Jul 2001			
2	Nav error monitoring – LOAs	Implementing States, ICAO	30 Apr 2001			
3	Central Monitoring Agency appointed	ICAO (Asia/Pacific Regional	30 Apr 2001			
4	Nav error monitoring procedures	Central Monitoring Agency	30 Apr 2001			
5	Implementation of Navigation Error Monitoring	Implementing States	30 Apr 2001			
6	Produce Draft AIC on intension to introduce RNP10 Airspace	ICAO APAC	20 Apr 2001			
7	Investigate implementation of special EMARSSH page on ICAO web-site	ICAO APAC	30 Apr 2001			
8	RNP10 approval procedures developed	Operators, Users and Implementing States	01 Dec 2001			
9	Completion of Safety Assessment	CMA, Safety Analyst, Implementing States and ICAO	Oct 2001 (Delhi meeting)			
10	Arrange Seminar on Provisions of Procedural Separation	ICAO	Apr 2002			
11	AIP Maps and Charts	Implementing States	28 May 2002			
12	AIP SUPPS	Implementing States	28 May 2002			
13	ATC Procedures	Implementing States	28 May 2002			
14	ATC Letters of Agreement	Implementing States	28 May 2002			
15	Staff Training	Implementing States and Operators	28 Nov 2002			
16	RNP10 implementation	Implementing States	28 Nov 2002			

5.3 **Implementation dates**

5.3.1 The meeting noted that implementation is planned for 28 November 2002, however States may consider implementing EMARSSH Routes on a Sub-regional basis at an earlier date. e.g. Southeast Asia – Australia/New Zealand.

5.4 **EMARSSH Web-site**

5.4.1 The meeting emphasized the benefit of establishing a Web Site for facilitating inter-State co-ordination, documentation and Project Management.

5.4.2 It was recommended that the ICAO Regional Office (Asia/Pacific) investigate the possibility of establishing a specific EMARSSH Folder on the regional web-site.

Agenda Item 6: Other Business

6.1 The meeting was presented an overview of CNS/ATM development for Indonesia which is attached at Appendix L.

Agenda Item 7: Date and Venue of the next Meeting

7.1 The meeting was advised that EMARSSH TF/3 will convene in Cairo, Egypt on 7 – 11 May 2001. This meeting will concentrate its work on the ICAO Middle East region as well as interface issues with the APAC Region.

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Mr. David Charles Behrens	Assistant Director Operations & Infrastructure – Asia/Pacific International Air Transport Association (IATA) 71 Robinson Road #05-00, SIA Building Singapore 068896	Tel: 65-239 7267 Fax: 65-536 6267 E-mail: behrensd@iata.org

LIST OF WORKING PAPERS (WPS) and INFORMATION PAPERS (IPS)

WORKING PAPERS

WP No.	Agenda Items	Presented by	Subject
1	1	Secretariat	Provisional Agenda
2	2	Secretariat	EMARSSH Background and Principles Developed
3	3	Secretariat	Area under Consideration for the Implementation of the EMARSSH Route Structure
4	4	Secretariat	Design of the EMARSSH Route Structure – Considerations
5	4	Secretariat	RNP Designated Airspace And User Preferred Routes: Issues For Consideration
6	4	Secretariat	Design of the EMARSSH Route Structure – CNS/ATM
7	5	Secretariat	Implementation Strategy
8	3	IATA	IATA's Wish List of Routes for EMARSSH TF/2
9	4	Secretariat	Establishment of a Regional Navigation Error Monitoring System in the MID Region
10	5	Secretariat	List of Training Considerations

INFORMATION PAPERS

IP No.	Agenda Items	Presented by	Subject
1	1	Secretariat	List of Working and Information Papers
2	2	Secretariat	EMARSSH TF/1 Report
3	2	Secretariat	Implementation of RNP 5 and RNAV in the MID Region
4	5	Secretariat	SCS/TF/4 Meeting – LOA & AIP SUPP
5	5	Iran	Civil/Military Co-ordination in Tehran FIR
6	-	Indonesia	Activities to support EMARSSH Programme

AGENDA

Agenda Item 1:	Adoption of the Agenda
Agenda Item 2:	Principles for the design of ATS routes for EMARSSH
Agenda Item 3:	Identify the area to be considered by EMARSSH TF/2
Agenda Item 4:	Factors to take into account in the route structure design
Agenda Item 5:	Develop a co-ordinated action plan for the implementation of actions agreed by the meeting
Agenda Item 6:	Other Business
Agenda Item 7:	Date and Venue of the next meeting

PRINCIPLES TO BE USED IN THE DEVELOPMENT OF THE ROUTE NETWORK

1. That, using the advantages of existing aircraft capabilities and new CNS/ATM technology and procedures, a revised ATS trunk route structure between Asia and Europe/Middle East will be developed in order to provide safe and efficient air traffic management with the least impact to environmental concerns;

2. That, these ATS trunk routes be developed primarily for international long-haul and medium-haul flights, however they may also be used where necessary for other regional and domestic operations;

3. That, as much as possible planning of ATS trunk routes will be on the basis that each route is laterally separated from each other;

4. That, the development of these route structures will be fully co-ordinated amongst the involved Asia/Pacific ATS Providers and airlines. Also due to the length of these trunk routes, harmonisation is required with both MID and EUR Regions; and,

5. That co-operation is required between all concerned States and the aviation industry, to ensure an efficient flow of international aircraft operations between Asia, Europe and the Middle East.

…….

GUIDELINES FOR THE DEVELOPMENT OF ATS ROUTES

1. ATS routes will satisfy appropriate ICAO SARPS;

2. Where possible, routes should be established to increase efficiency, reduce complexity and provide additional benefits to users;

3. Separation assurance principles should apply;

   3.1 Routes should be established with sufficient separation to operate independently:
   3.2 Where possible, routes in a radar environment should be procedurally (laterally) separated; and
   3.3 Segregated tracks should be established on medium/high density routes and determined by set criteria;

4. Where required, routes should be constructed to support terminal area management procedures, e.g. SIDS/SRDS/STARS and flow management techniques, as applicable;

5. Holding patterns should be laterally separated from other tracks and tolerances captured within a single sector;

6. A maximum of two routes containing high density should be blended at a single point. Inbound tracks should be blended at <90 degrees. Up to three low density traffic routes may be blended at a single pint;

7. Multiple crossing points involving major traffic flows should be avoided;

8. Enroute crossings should be minimized. Where crossings are inevitable they should, where possible, be established for cruise configuration. Such crossings should occur, where possible, within radar coverage;

9. Airspace sectorization should take account of the route structure and workload considerations. If necessary, airspace should be re-resectorized to accommodate changes to the air route configuration;

10. Routes should be constructed so as to reflect the optimum navigational capabilities of the principal users (e.g. RNAV or conventional);

11. The prime determinant should not be the minimum number of track miles. A small increase in track miles may optimise traffic flows, avoid unpredicted delays or avoid holding requirements;

12. Due allowance should be given to existing and future Flight Data Processing (FDP)/Radar Data Processing (RDP) capability (i.e. notification of messages for auto hand-off) etc);

13. A periodic safety audit and review process of routes should be conducted to test traffic demand against capacity criteria, and the guidelines. This should ideally be done in parallel with an annual sectorization review; and

14. Routes that can no longer be justified should be deleted.

S/N	EMARSSH ROUTE	DESCRIPTION	REMARKS
1	BB1	SIN – MABIX – R461 – Colombo – TVM – AS1 – 1940N 05946E*	*Coordination required with MID Region at EMARSSH TF/3
2	BB2	MDN – 0434N 9400E – MDI – CLC – AS2 – 2016N 06033E*	*Coordination required with MID Region at EMARSSH TF/3
3	BB3	MDN – BBG – AS3 – 2055N 06120E	*Coordination required with MID Region at EMARSSH TF/3
4	BB4	PUGER – MDN – ANSAX – MMV – B466 – BBI – B457 - BBM – AS4	AS4 is B457
5	BB5	PUT – Colombo	existing route R203
6	BB6	GUNIP – 0700N 09630E – Mumbai	
7	BB7	0700N 09630E – VVZ – NNP – G472	
8	BB8	VPL – 0700N 09800E – JB – RK	
9	BB9	PUT – BBS – KKJ – TIGER	PUT to KKJ is UM501
10	BB10	RAN – 2045N 08718E – 2550N 08040E – OSRAM – DI	
11	BB11	RAN – CEA	Part time route, hours to be defined
12	BB12	DWI – Colombo	Existing route G465
13	*BB13	DWI – BBM – HAI	DWI has been identified as a choke point; Route is to support SEA to Haima; *Not an immediate requirement; to be implemented after introduction of RVSM and after coordination with ICAO MID Region
14	BB14	DWI – VVZ	Existing route R468
15	BB15	DWI - 2045N 08718E – BB10	
16	BB16	BBK – G463 – BETNO – JJS – BBN – LLK – Delhi	to: DI; Tiger/RK/ZAH; Islamabad
17	BB17	BKK – A1 – CEA – NGJ	

18	BB18	BKK – A464 – 1530N 10000E MAKAS (1649.7N 09830.0E) – IKUGI (1834.1N 09623.8E) – AVLAD – G463 – DAC - KAT	
19	AS5	MAROB – CBH	Currently being addressed by IATA
20	AS6	BILAT – CBH	Currently being addressed by IATA
21	AS7	BILAT – PG	Currently being addressed by IATA
22	AS8	SAPNA – 2210N 06830E – 1950N 07100E	Currently being addressed by IATA
23	AS9	Mumbai – XXN XXXE - SAPNA	
24	R325	between PUT and Calcutta	delete
25	B579	between VVZ and PUT	delete
26	A330	between AKIDA and MDI	delete
27	B466	between MMV and GUNIP	delete
28	R209	between TATOX and Langkawi	delete
29	Himalaya 1	Kathmandu - Nepalgunj (NGJ) - Islamabad	
30	Himalaya 2	Kathmandu - Kunming	This propose route is being addressed outside the EMARSSH Task Force and is not part of the November 2002 implementation
31	Himalaya 3	NGJ – Delhi	

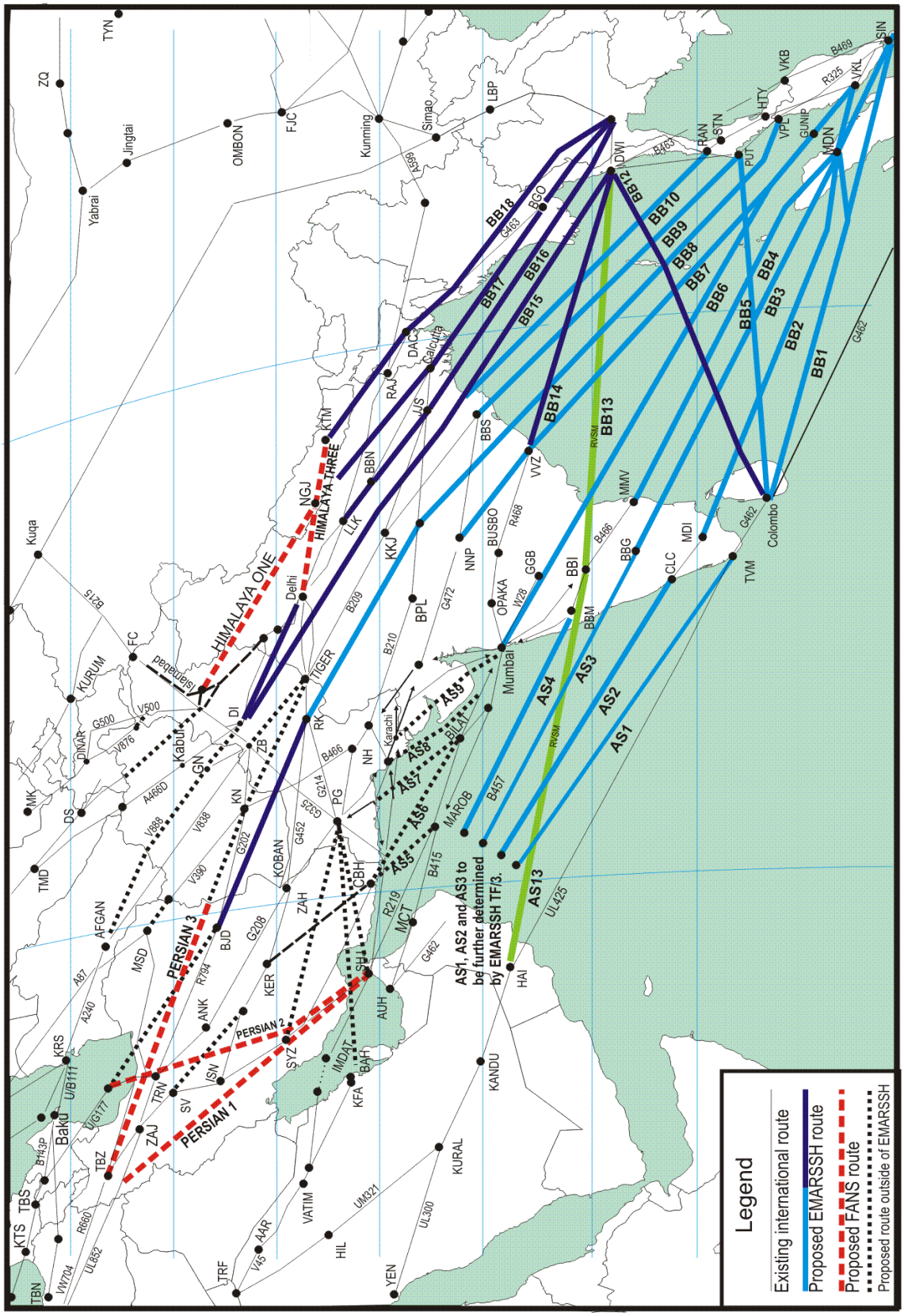
Legend

AS	Proposed route over the Arabian Sea
BB	Proposed route over the Bay of Bengal
BBM	Belgaum
BBG	Bangalore
BBS	Bhubaneswar
BGO	Bago
CEA	Calcutta
CLC	Calicut
DAC	Dhaka
DI	Dera Ismail Khan

DWI	Dawei
HAI	Haima
JB	Jabalpur
JJS	Jamshedpur
KKJ	Khajuraho
KTM	Kathmandu
LLK	Lucknow
MDI	Madurai
MDN	Medan
MMV	Chennai
NGJ	Nepalgunji
NNP	Nagpur
PUT	Phuket
RAN	Ranong
RK	Rahim Yar Khan
TVM	Trivandrum
VPL	Langkawi VOR
VVZ	Vishakhapatnam

……..

Appendix G
ATS Route Structure Considered by EMARSSH TF/2



PROPOSED CHANGES TO CURRENT ROUTE STRUCTURE – TASKS ASSIGNED

	ACTION ITEM	Complete by	ACTION BY	REMARKS
1.	Consider feasibility of making some EMARSSH routes unidirectional during specific hours	May 2002	India	
2.	Study impact on ETOPs operations	May 2001	IATA	
3.	Data Collection for traffic operating between Dawei and Heima to support route BB12	May 2001	Thailand, India, IATA	BB12 may be implemented after introduction of RVSM and following coordination with ICAO MID Region
4.	Link up of EMARSSH routes with regional routes on the eastern shoreline of the Bay of Bengal area.	Immediate	Malaysia, Thailand, Singapore	
5.	Continuation of routes AS1, AS2 & AS3 into the Mid East Region	Immediate	EMARSSH TF/3	Pending EMARSSH TF/3 (MID) outcome
6.	Implementation of Himalaya 1 and 3	June 2001	India, Nepal	
7.	Assessing RNP 10 capabilities for aircraft operating over the Bay of Bengal and Arabian Sea	June 2001	IATA	

OPERATIONAL LETTER OF AGREEMENT

BETWEEN

General Administration of Civil Aviation of China	China
Directorate General of Air Communications	Indonesia
Department of Civil Aviation	Malaysia
Air Transportation Office	Philippines
Civil Aviation Authority	Singapore
Aeronautical Radio of Thailand Ltd	Thailand
Civil Aviation Department	Hong Kong, China
Civil Aviation Administration	Viet Nam

for

Monitoring of Aircraft Navigation Errors

in the

South China Sea

Operational Letter of Agreement

Document Management

Table of Contents

Checklist of Effective Pages

Subject	Pages	Issue Date
Letter of Agreement	1 - 10	1 Nov 2001
Appendix A-Navigation Error Report	A1 - 6	1 Nov 2001

Operational Letter of Agreement

Overview

Introduction

The following document is a Letter of Agreement (LOA) between those Air Traffic Service (ATS) authorities shown on page one of this document. The letter of agreement details monitoring procedures between the following ATS units:

Bangkok ACC
Hanoi ACC
Ho Chi Minh ACC
Hong Kong ACC
Jakarta ACC
Kota Kinabalu ACC
Kuala Lumpur ACC
Manila ACC
Sanya ACC
Singapore ACC

Objective

The objective of this Letter of Agreement (LOA) is to define agreed procedures for the monitoring, notification, investigation, analysis and reporting of aircraft navigation errors in respect of aircraft to which the 60NM lateral separation standard and a 10 minute or 80NM RNAV longitudinal separation minima is applied when operating on the following designated RNAV routes:

L642	M771	N892
L625	M767	N884

Scope

The procedures contained in this LOA implement the performance monitoring requirements associated with the introduction of the 60NM lateral separation standard, and for the reporting and monitoring of gross lateral and longitudinal navigational errors.

For the purposes of this LOA, the term ‘Service Providers’ refers to organisations which are responsible for the provision of Air Traffic Control (ATC) services.

The term ‘Regulatory Authority’ refers to those organisations responsible for the investigation of navigational errors. In some cases, the Regulatory Authority may be the same as the Service Provider.

Effective Date

This letter of agreement becomes effective on 1 Nov 2001

Operational Letter of Agreement

Overview, Continued

Background

The use of these lateral and longitudinal separation standards is restricted to aircraft which meet the requirements detailed in the respective States' AIP Supplements. This includes a requirement for Required Navigation Performance (RNP) 10 approval and it is the responsibility of the operator to ensure that such requirements are satisfied when so declared.

RNP 10 approval includes operators meeting certain requirements with regard to crew training and in-flight operating procedures. The responsibility for approval for such operations rests with the State of Registry of the Operator.

Monitoring navigation errors is a joint responsibility between the aircraft operators, the States of Registry, and the ATC providers. There are established requirements for the operators to monitor navigation performance under the terms of their RNP 10 approval. This document sets out the responsibilities and procedures to be followed by staff of the signatory organisations to this LOA.

Area of Applicability

The procedures outlined in this LOA shall be applied to all aircraft operating on the following designated RNAV routes:

L642	M771	N892
L625	M767	N884

Operational Letter of Agreement

Monitoring Procedures

Lateral Deviations

Monitoring shall be based on radar observations.

When the radar controller observes a lateral deviation of 15NM or more, the controller shall:

- immediately advise the pilot in command; and
- provide the 'duty supervisor' with the necessary information to enable **Part 1** of the *Navigation Error Investigation Form* (as shown in Appendix A) to be completed.

Where an aircraft is off-track as the result of an ATC approved diversion (e.g. due weather), no notification under the terms of this Letter of Agreement need be submitted.

Longitudinal Deviations

Monitoring of longitudinal errors shall be accomplished by reporting occurrences where the observed longitudinal separation, following a check, is either less or more than the expected longitudinal separation as detailed below.

Where a time standard is being used, this check will follow the receipt of a routine position report. Notification, in accordance with Appendix A, shall be submitted in all cases where:

- the separation standard is infringed; or
- the expected time between two aircraft varies by 3 minutes or more, even if the applicable separation standard is not infringed; or
- a pilot estimate varies by 3 minutes or more from that advised in a routine position report.

Where a distance standard is being used, the check may be based on ADS, radar observations, or it may be the result of a specific request for RNAV distance reports. Notification, in accordance with Appendix A, shall be submitted in all cases where:

- the separation standard is infringed; or
- the expected distance between two aircraft varies by 10NM or more, even if the applicable separation standard is not infringed.

Operational Letter of Agreement

Notification Procedures

Action by ATC Unit

The duty supervisor, when advised of the deviation, shall be responsible for completion and submission of a *Navigation Error Investigation Form*.

A copy of the aircraft's flight plan shall be attached to the *Navigation Error Investigation Form*, and forwarded to the Chief of ATC.

The Chief of ATC shall forward copies of the *Navigation Error Investigation Form* (Parts 1 to 4) to the aircraft operator and the State of Registry of the aircraft or the State of the Operator, as considered appropriate.

In addition, the copy for the aircraft operator shall be sent with a covering letter (as provided in Appendix A) requiring the operator to complete the *Navigation Error Investigation Form* and to provide reasons for the error.

Operational Letter of Agreement

Investigation Procedures

Investigation Procedures

The investigation of errors notifiable under this Letter of Agreement is a joint responsibility of the operator, the ATC Authority of the airspace in which the error occurred, and the State of Registry or State of the Operator of the aircraft involved.

The initial investigation shall be undertaken by the aircraft operator, who is responsible for supplying all data and comments needed to complete the form at Appendix A. The completed reports are to be returned by the operator to the originating ATC Authority. For aircraft registered in States not included in this LOA, these reports are also to be forwarded to the State of Registry of the aircraft or the State of the Operator.

Further action by States other than signatories to this LOA is outside the scope of this agreement, and shall be at the discretion of that State.

On receipt of the completed report from the aircraft operator, the relevant ATC Authority will first check that all information required has been supplied and, if necessary, the ATC Authority shall request any further information from either the operator, the State of the Operator, or the State of Registry of the aircraft.

If the completed form from the aircraft operator is not received within 14 days of the date of dispatch, the ATC Authority will contact the operator and request the completed form.

Once the completed information has been received, the ATC Authority will complete Part 5 of the *Navigation Error Investigation Form* as detailed in Appendix A. The cause of the error is to be classified in accordance with the criteria specified in Part 5.

The decision as to whether any further investigation is warranted will be taken by the ATC Authority based on their assessment of the seriousness of the error.

Operational Letter of Agreement

Analysis of Errors & Reporting

At the end of each month, Service Providers shall forward to the Operations Division, Civil Aviation Authority of Singapore (CAAS), a copy of all completed *Navigation Error Investigation Forms* (Parts 1 to 5) covering reported errors or nil reports for that month, together with data on the number of movements on the routes being monitored as recorded by the relevant Flight Data Processing System, or other auditable means.

CAAS shall be responsible for calculation of the frequency of the errors, in accordance with Doc 7030.

Each six months, the Monitoring Authority should prepare an assessment schedule setting out the results of the monitoring for the preceding six-month period and forward a copy of this schedule to:

a. all signatory States to the Monitoring Letter of Agreement; and
b. The Chairman of the APANPIRG ATS/AIS/SAR Sub-Group, through the ICAO Bangkok Office.

Permitted Error Rate Exceeded

Where the summary statistics show a long term trend which could result in the Permitted Error Rate being exceeded, ATC Authorities of the States concerned, in conjunction with the ICAO Regional Office, will jointly consider the causes, to determine if the problems can be eliminated, and to take appropriate remedial action.

Revision

This LOA shall remain in force until it is cancelled or superseded.

For any reason, which might make it advisable to change this agreement and its associated attachments, the interested State shall propose the pertinent revision.

Operational Letter of Agreement

Authority

China	Mr Chen Haiju Director General of Air Traffic Management Bureau of General Administration of Civil Aviation of China
Indonesia	Mr Mohamad Iksan Tatang Director of Aviation Safety Directorate General of Air Communications
Malaysia	Mr Noordin Bin Haji Saad Director of Air Traffic Services Division Department of Civil Aviation
Philippines	Mr Anacleto V Venturina Director, Air Traffic Service Air Transportation Office Department of Transportation and Communications

Continued on next page

Operational Letter of Agreement

Authority, Continued

Singapore	Mr Goh Sin Heng Head (ATC Operations) Civil Aviation Authority of Singapore
Thailand	Mr Kumtorn Sirikorn Vice President Air Traffic Service Operations Department Aerothai
Hong Kong, China	Mr Shung-Man Norman Lo Assistant Director General of Civil Aviation (Air Traffic Management) Air Traffic Management Division Civil Aviation Department
Viet Nam	Mr Nguyen The Hung Chief of Air Navigation Division AN & AT Department Civil Aviation Administration of Viet Nam

Operational Letter of Agreement

Appendix A

NAVIGATION ERROR REPORT

Dear

Air Traffic Control service providers are monitoring traffic on routes in the South China Sea area, as part of the implementation of reduced separation minima on those routes.

These procedures require the reporting and investigation of:

i) lateral tracking errors of 15NM or more;

ii) variations of longitudinal separation of three minutes or more; or

iii) variations of longitudinal separation of 10NM or more.

A ***Navigation Error Investigation Form*** relating to one of your aircraft is enclosed.

An investigation of this occurrence is required. A detailed explanation should be provided **within 10 days**, using the attached ***Navigation Error Investigation Form***. In your reply, you are also requested to indicate any corrective action taken to prevent future occurrences.

Yours faithfully,

NAVIGATION ERROR INVESTIGATION FORM

Instructions for Service Provider responsible officer:

Please ensure that **Part 1** of this form has been completed to the maximum extent possible, and distribute according to the requirements of the Letter of Agreement on monitoring of aircraft navigation errors in the South China Sea airspace.

Instructions for aircraft owner/operator:

Please supply any details required in **Part 1** of this form which have not already been completed, together with the information requested in **Parts 2, 3 and 4** (if applicable), and return to:

[*appropriate Regulatory Authority*]

Instructions for Investigating Agency (Regulatory Authority) :

Please complete **Part 5** of this form and return to:

[*appropriate Service Provider*]

NAVIGATION ERROR INVESTIGATION FORM

PART 1

To be completed by responsible officer in the Service Provider (and aircraft owner/operator if needed)

ATC Unit Observing Error:		
Date/Time (UTC):		
Type of Error: (tick one) ❑ LATERAL ❑ LONGITUDINAL		
Details of Aircraft		
	First Aircraft	**Second Aircraft** (When longitudinal deviation observed)
Aircraft Identification:		
Name of Owner/Operator:		
Aircraft Type:		
Departure Point:		
Destination:		
Route Segment:		
Cleared Track:		
Position where error was observed: (BRG/DIST from fixed point or LAT/LONG)		
Extent of deviation - magnitude and direction: (NM for lateral, min/NM for longitudinal)		
Flight Level:		
For All Errors		
Action taken by ATC:		
Other comments:		

****(Please Attach ATS Flight Plan)**

NAVIGATION ERROR INVESTIGATION FORM

PART 2 **Details of Aircraft, and Navigation and Communications Equipment Fit** **(To be completed by aircraft owner/operator)**			
LRNS	**Number of Systems (0,1,2 etc.)**	**Make**	**Model**
INS			
IRS			
GNSS			
FMS			
Other (please specify)			
COMS			
HF			
VHF			
SATCOM			
CPDLC			
Which navigation system was coupled to the autopilot at the time of observation of the error?			
Which NAV MODE was selected at the time of observation of the error?			
Which coms system was in use at the time of observation of the error?			
Aircraft registration and model/series			
Was the aircraft operating according to RNP 10 requirements?		❑ Yes ❑ No	

NAVIGATION ERROR INVESTIGATION FORM

PART 3 - Detailed description of incident

(To be completed by owner/operator - use separate sheet if required)

Please give your assessment of the actual track flown by the aircraft, and the cause of the deviation:

Corrective action proposed:

PART 4 -To be completed by owner/operator, only in the event of partial or total navigation equipment failure.

Nav System Type	**INS**	**IRS/FMS**	**Other (Please specify)**
Indicate the number of units of each type which failed			
Indicate position at which failure(s) occurred			
Give an estimate of the duration of the equipment failure(s)			
At what time were ATC advised of the failure(s)?			

NAVIGATION ERROR INVESTIGATION FORM

PART 5 - To be completed by investigating agency

Have all required data been supplied?	❑ Yes	❑ No
Is further investigation warranted?	❑ Yes	❑ No
Will this incident be the subject of a separate report?	❑ Yes	❑ No

General comments:

Classification: (please circle) A B C D E F G H I

CLASSIFICATION OF GROSS NAVIGATION ERRORS

Class	Cause
A	Aircraft not approved to RNP 10
B	ATC system loop error
C	Waypoint insertion error, due to correct entry of incorrect position or incorrect entry of correct position
D	Other navigation errors, including equipment failure notified to ATC in time for action
E	Other navigation errors, including equipment failure notified to ATC too late for action
F	Other navigation errors, including equipment failure of which notification was not received by ATC
G	Mode select error
H	Weather deviation (other than approved)
I	Other (please specify):

Procedures for the Assessment of Aircraft Navigation Errors in Support of the Implementation of a Revised ATS Route Structure (60NM Route Spacing) in the South China Sea Area

1. Introduction

1.1 This document provides guidance on the methodology to be adopted in the assessment of navigation errors associated with the implementation of a revised route structure, and a revised lateral separation minimum of 60NM, in the South China Sea.

1.2 This document should be read in conjunction with the Letter of Agreement between States of the South China Sea area, entitled *"Letter of Agreement for the Monitoring of Aircraft Navigation Errors in the South China Sea"*.

2. Data Gathering Responsibility

2.1 The States responsible for the gathering and onwards forwarding of data relating to the monitoring letter of agreement, and the monitoring areas identified in paragraph 4, shall be Hong Kong China, the Philippines, and Singapore.

2.2 Data gathering requirements are detailed in paragraph 5.

3. Monitoring Authority

3.1 Until such time as a permanent monitoring authority is established by APANPIRG, the organisation responsible for the collation and reporting of navigation error data will be the Civil Aviation Authority of Singapore (CAAS).

4. Designated Monitoring Areas

4.1 In order to validate the monitoring requirements supporting the reduction in lateral separation to 60NM, it is necessary to assess the track keeping ability of aircraft operating on the route structure, whilst they have been using on-board RNAV navigation systems only, for a maximum period of time, relative to the route being flown.

4.2 It is also essential that observation of the navigation of the aircraft, using radar, occurs before the on-board navigation systems have been able to "up-date" using ground-based navigation aids, such as DME/DME, or VOR/VOR.

4.3 In assessing navigation errors on the 6 core routes - ie L642, M771, N892, L625, N884 and M767 - there are only four appropriate areas at which the required monitoring may be undertaken, given the extensive ground-based navigation aid coverage in the South China Sea.

4.4 These areas are the route segments between:

a) DULOP and DUMOL on M771
b) AKOTA and AVMUP on L625

c) LULBU and LEGED on N884
d) MELAS and MABLI on N892

4.5 Monitoring of aircraft on these route segments should be undertaken as soon as possible after the aircraft enters radar coverage.

4.6 It should be noted that navigation error reports relating to areas other than those stated above, should also be processed and reported on, in order to support data gathering for future reductions in lateral and longitudinal separation. Details on the processing of these reports are given at paragraph 7.

5. Collection and Forwarding of Data

5.1 Those States identified in Paragraph 2, are required, at the end of each month, to collect the following data:

a) recorded navigation errors at the required monitoring areas, by way of the "Navigation Error Investigation Form", as detailed in the Letter of Agreement on the Monitoring of Navigation Errors; and

b) total monthly movement statistics relating to air traffic passing the designated monitoring areas within the designated monitoring height band.

Note: The recording of monthly traffic movement statistics in the monitoring areas should be auditable - in other words, some formal method of recording the movements - eg copies of flight progress strips or data from Flight Data Processing Systems - should be available for audit if required.

5.2 After collection, the required data should be forwarded to the Monitoring Authority (CAAS), for assessment, to arrive not later than 15 days from the end of the month within which the data was collected. This will allow time for the Navigation Error Investigation Forms relating to occurrences near the end of a month, to be processed and returned as detailed in that form.

5.3 In respect of paragraph 5.1.a), if there have been no error reports submitted, a "Nil Return" should be submitted to the monitoring authority.

6. Assessing of Navigation Errors

6.1 The monitoring requirements associated with the introduction of the reduced lateral separation minima of 60NM will be in accordance with the requirements for RNP 10 navigation performance, i.e. aircraft navigation performance shall be such that the standard deviation of lateral track errors shall be less than 8.7 km (4.7 NM).

6.2 The requirements will be met, if the number of navigation errors by approved flights, measured in the monitoring areas, divided by the total number of approved flights over those monitoring points, is less than the required parameters, over a period of time for RNP 10 navigation performance. (see Appendix B).

6.3 The assessments for each month should be recorded separately, and also cumulatively, on a month-to-month basis. If the assessment in any particular month exceeds the required parameter, a check should be made to ensure that the cumulative assessment does not also exceed the required parameter.

6.4 If a trend is identified, which indicates that the required parameter is being exceeded regularly, or the cumulative assessment indicates an upwards trend, the Monitoring Authority should notify, through the ICAO Bangkok Office, the APANPIRG ATS/AIS/SAR Sub-Group, which should then investigate the need for a review of the applicable procedures.

6.5 An example of an assessment schedule is shown at Appendix B.

7. Processing of Navigation Error Reports Relating to Areas Other Than Required Monitoring Areas

7.1 The Letter of Agreement on the Monitoring of Navigation Errors requires all participating States to notify all appropriate navigation errors to the monitoring authority. This data should be collated and assessed in the following manner.

7.2 If the navigation error report relates to aircraft tracking on RNAV routes M771, L625, N884, or N892, the error should be assessed and processed in accordance with paragraph 6 above.

7.3 If the report relates to aircraft tracking on other routes, the errors should be assessed, and recorded separately. This information should be assessed by the APANPIRG ATS/AIS/SAR Sub-group meeting, for appropriate action.

8. Reporting Procedures

8.1 The Monitoring Authority should prepare an assessment schedule (refer to Appendix B), and forward a copy of this schedule, at least every 6 months, to:

a) all signatory States to the Monitoring Letter of Agreement; and

b) The Chairman of the APANPIRG ATS/AIS/SAR Sub-Group, through the ICAO Bangkok Office.

8.2 In addition, a report should be prepared on those errors reported in accordance with paragraph 7.3 above.

9. Attachments

Appendix A - Assessment Schedule Process
Appendix B - Sample Assessment Schedule

Appendix A

Assessment Schedule Process For Designated Monitoring Areas

Step 1.

Hong Kong, Philippines and Singapore carry out a total monthly traffic count for approved traffic at FL290 and above, over the points:

a) DULOP and DUMOL on M771
b) AKOTA and AVMUP on L625
c) LUBLU and LEGED on N884
d) MELAS and MABLI on N892

Step 2.

Hong Kong, Philippines, and Singapore collate all Navigation Error Investigation Forms.

Step 3.

Not later than the 15th day of each month, send the statistics gathered in Steps 1 and 2, to the Monitoring Authority (CAAS).

Step 4.

The Monitoring Authority collates the information into an assessment schedule.

Step 5.

Each 6 months, the assessment schedule is sent to:

a) all signatory States to the Monitoring Letter of Agreement; and

b) The Chairman of the APANPIRG ATS/AIS/SAR Sub-Group, through the ICAO Bangkok Office.

Step 6 (if required).

If the trend in errors is increasing, notify, through the ICAO Bangkok Office, the APANPIRG ATS/AIS/SAR Sub-Group, for appropriate action.

Appendix B

Example of Navigation Error Assessment Schedule For Designated Monitoring Areas

a. Example of Monthly Total - Single Area

Month/ 1997	Total traffic at DULOP/DUMOL	Errors Category 1	Errors Category 2	Error Ratio Category 1	Error Ratio Category 2
April	3105	1	0	3.22×10^{-4}	0
May	3042	2	0	6.57×10^{-4}	0
June	2810	0	0	0	0
July	2995	1	1	3.34×10^{-4}	3.34×10^{-4}

Category 1 = >30NM Category 2 = 50 - 70 NM

b. Example of Cumulative Monthly Total - Single Area

Month/ 1997	Total traffic at DULOP/DUMOL	Errors Category 1	Errors Category 2	Error Ratio Category 1	Error Ratio Category 2
April	3105	1	0	3.22×10^{-4}	0
May	6147	3	0	4.88×10^{-4}	0
June	8957	3	0	3.35×10^{-4}	0
July	11952	4	1	3.45×10^{-4}	8.36×10^{-5}

Category 1 = >30NM Category 2 = 50 - 70 NM

c. Example of Monthly Total - All Four Areas

Month/ 1997	Total traffic All Areas	Errors Category 1	Errors Category 2	Error Ratio Category 1	Error Ratio Category 2
April	7852	2	0	2.55×10^{-4}	0
May	8311	2	0	2.41×10^{-4}	0
June	8263	1	0	1.21×10^{-4}	0
July	7678	1	1	1.30×10^{-4}	1.30×10^{-4}

Category 1 = >30NM Category 2 = 50 - 70 NM

d. Example of Cumulative Monthly Total - All Four Areas

Month/ 1997	Total traffic All Areas	Errors Category 1	Errors Category 2	Error Ratio Category 1	Error Ratio Category 2
April	7852	2	0	2.55×10^{-4}	0
May	16163	4	0	2.47×10^{-4}	0
June	24426	5	0	2.05×10^{-4}	0
July	32104	6	1	1.87×10^{-4}	3.11×10^{-5}

Category 1 = >30NM Category 2 = 50 - 70 NM

REVISED SOUTH CHINA SEA ATS ROUTE STRUCTURE IMPLEMENTATION

Suggested Training Considerations:

a) Theory

- A short background on the development of RNP routes
- A description of RNP10 routes
- Understanding of RNP10 – Qualities
- Useable levels along the parallel routes
- What are the parallel routes
- What are RNAV routes
- What are the qualities of RNAV routes
- What is the difference between RNAV and RNP10 routes
- What are the other routes (ATS)
- Deviation procedures
- Navigation error reporting procedure
- Monitoring agency
- Action when not able to fly RNP10 routes
- Separation Minima
- LOA, Transfer points
- When do the RNP10 routes become inoperative – all routes some routes

b) Practical

- Exercises in assigning all levels since the RNP10 routes are laterally separated routes
- Exercises concerning deviations
- Exercises on Non RNP approved aircraft flying along the RNP10 routes
- Exercises on co-ordination procedures
- No PDC/MNT
- What happens when the direct line fails

****

[**INSERT NAME**] Area Control Centre
and
[**INSERT NAME**] Area Control Centre

LETTER OF AGREEMENT

Effective: [**INSERT DATE]**

SUBJECT: INTER AREA CONTROL CENTRE CO-ORDINATION PROCEDURES

1. PURPOSE: To establish procedures to be used for the transfer of control and the forwarding of pertinent aircraft movement information between the [**INSERT NAME**] and [**INSERT NAME**] Flight Information Regions (FIR's).

2. SCOPE: This Letter of Agreement (LOA) between [**INSERT NAME**] Area Control Centre (ACC) and [**INSERT NAME**] ACC is supplementary to the procedures contained in pertinent ICAO documents. Revision to this Agreement shall be made only with the concurrence of both parties.

3. CANCELLATION: The [**INSERT NAME**] and [**INSERT NAME**] LOA, same subject, dated [**INSERT DATE**] is cancelled.

4. CONTROL PROCEDURES:

4.1 Route Assignment:

4.1.1 Except for prior co-ordination effected individually for each flight off airways, the air traffic between the [**INSERT NAME**] and [**INSERT NAME**] FIR's shall be routed along Air Traffic Service (ATS) routes outlined in the respective Aeronautical Information Publications (AIPs).

4.1.2 Aircraft may deviate from the established ATS routes in case of potential hazards which may affect the safety of flight (severe meteorological conditions, failure of aircraft equipment, etc.).

4.2 Separation:

4.2.1 Vertical: Each ACC shall assign a single flight level that is appropriate for its direction of flight as specified in ICAO Annex 2, Appendix 3.

4.2.2 Longitudinal:

4.2.2.1 During the transfer of control, the minimum longitudinal separation to be used between aircraft assigned the same altitude shall be ten (10) minutes, continuous or increasing.

4.2.2.2 Mach Number Technique: When using the Mach Number Technique, the minimum longitudinal separation between turbojet aircraft shall be as follows:

a) 10 minutes between aircraft when the leading aircraft is assigned a Mach Number clearance that as a minimum is the same or greater than the following aircraft. For example, *assigning the lead aircraft to maintain Mach 0.84 or greater, and assigning the following aircraft to maintain Mach 0.84 or less.*

b) 9 minutes between aircraft when the leading aircraft is assigned a Mach Number of 0.02 faster than the following aircraft

c) 8 minutes between aircraft when the leading aircraft is assigned a Mach Number of 0.03 faster than the following aircraft

d) 7 minutes between aircraft when the leading aircraft is assigned a Mach Number of 0.04 faster than the following aircraft

e) 6 minutes between aircraft when the leading aircraft is assigned a Mach Number of 0.05 faster than the following aircraft

f) 5 minutes between aircraft when the leading aircraft is assigned a Mach Number of 0.06 faster than the following aircraft.

g) When the aircraft in back is assigned a Mach Number faster than the leading aircraft, the minimum longitudinal separation at the common FIR boundary is defined in the following table:

Difference in Mach Number	Separation (in minutes) required at the Transfer of Control Point
0.01	12
0.02	14
0.03	16
0.04	18
0.05	20

For example, assigning the lead aircraft to maintain Mach 0.84, and assigning the following aircraft to maintain Mach 0.87 requires 16 minutes longitudinal separation at the transfer of control point.

The assigned Mach Number shall be included in the transfer of control co-ordination.

4.3 Transfer of Control Points

4.3.1 This LOA establishes the transfer of control point at the common FIR boundary. Prior agreement shall be reached between [**INSERT NAME**] ACC and [**INSERT NAME**] ACC if the need arises for transferring the aircraft at unspecified reference points.
[*Note: States may elect to list the ATS route and the intersection that is the transfer of control point]*

4.4 Co-ordination Procedures

4.4.1 Transfer-of-control messages shall be transmitted in sufficient time to permit reception by the receiving control centre at least thirty (30) minutes prior to the time the flight is estimated to enter the receiving Control Centre's area.

4.4.2 The primary method of coordination shall be via direct voice. All co-ordination shall be conducted in English.

4.4.2.1 In the event of failure of the voice circuit between [**INSERT NAME**] ACC and [**INSERT NAME**] ACC, all flight data and movement messages shall be forwarded to the receiving Center via Aeronautical Fixed Telecommunications Network (AFTN) teletypewriter circuit on circuit priority "FF" or "DD" as applicable. All information concerning transfer of control and aircraft movement received by teletype must be confirmed by an acknowledgment message. The teletype addresses of the facilities to be utilized are as follows:

[insert AFTN address] - [**INSERT NAME**] ACC
[insert AFTN address] - [**INSERT NAME**] ACC

4.4.3 The transfer-of-control message shall contain the following information:

a) the word "transfer",
b) the aircraft call-sign,
c) aircraft type,
d) transfer of control point,
e) estimated time over the transfer of control point,
f) the aircraft's altitude,
g) assigned Mach Number and call sign of each aircraft that Mach Number Technique is being applied with (if assigned),
h) SSR/transponder code (if assigned),
i) Any pertinent remarks.

Example phraseology: "Transfer Air France 273, Boeing 777, estimate DERBO at 1415, Flight level 310, maintaining Mach point 84 reference Singapore 611 maintaining Mach point 82, squawking 2611."

4.4.4 Confirmation and acceptance by the accepting Centre shall contain the following data:

a) the word "roger",
b) aircraft call-sign,
c) transfer of control point,
d) time over transfer of control point,
e) the aircraft's altitude,
f) assigned Mach Number and call sign of each aircraft that Mach Number Technique is being applied with (if assigned),
g) SSR/transponder code (if assigned).

Example phraseology: "Roger Air France 273, DERBO at 1415, Flight level 310, maintaining Mach point 84 reference Singapore 611 maintaining Mach point 82, squawking 2611."

4.4.5 If the accepting Centre cannot accept the transfer-of-control as co-ordinated, the reply shall contain the following data:

a) the word "unable",
b) aircraft call-sign,
c) the element of the transfer that is unacceptable,
d) a suggested course of action.

Example phraseology: "Unable Air France 273, flight level 310, suggest flight level 350".

4.4.6 Except in an emergency, the transferring Control Centre shall not make a change in an aircraft's altitude and/or route after the transfer-of-control message has been transmitted without further co-ordination and approval from the receiving Control Centre.

4.4.7 Both Centres shall inform each other if a difference of three (3) minutes or more exists regarding an aircraft's estimated time over the transfer of control point.

Example phraseology: "Revised transfer, Air France 273, revised time at DERBO 1419"

5. CONTACTS

5.1 The designated persons for the coordination and management of this LOA are:

In the [list country]	name (if appropriate) title address contact information (email, fax, AFTN, etc.)
In the [list country]	name (if appropriate) title address contact information (email, fax, AFTN, etc.)

6. REVISIONS

6.1 This agreement shall be subject to revision whenever a modification of ICAO's Standards or Recommended Practices occurs which might affect the procedures contained in this agreement, or when new communications facilities, or new air traffic services which might affect these procedures are commissioned.

7. TEMPORARY DEVIATIONS

7.1 If a temporary deviation from the procedures established under this LOA becomes necessary, the parties may agree to put into effect temporary changes to the procedures contained in this LOA, provided that safety of flight is not compromised. The temporary deviation shall be clearly defined with a mutually agreed upon effective date and discontinuance date.

For [**INSERT NAME**] ACC	For [**INSERT NAME**] ACC
_____	_____
[Name]	[Name]
[Title]	[Title]
Date: _____	Date: _____

……

CNS/ATM developments in Indonesia

1. Introduction

Angkasa Pura I is responsible for major airports and associated airspace including upper airspace in the eastern part of Indonesia; Angkasa Pura II is responsible for major airports and associated airspace including upper airspace in the western part of Indonesia; smaller regional airports are under the authority of the DGAC Regional Office in each province.

2. Communication

More than 25 VHF extended range facilities have been installed in most parts of Indonesia, either at airport or remote area sites.

VSAT stations are also used extensively to support Ground-Ground services.

3. Navigation

NDB's and VOR/DME's are still used for air navigation however GNSS non precision approaches are being introduced at appropriate airports at the rate of 10 per year. This programme was commenced in April 1999.

4. WGS-84

WGS-84 transition commenced during the 1990's and will be completed and published in the Indonesian AIP in April 2001.

5. Surveillance

SSR radar at Banda Aceh and Palembang are supporting Medan ACC.

Palembang, Pontianak, Natuna, Semarang, Halim are supporting Jakarta ACC.

Balikpapan, Manado, Banjarmasin, Kendari, Ambon radars are supporting Ujung Pandang ACC.

Waingapu, Surabaya and Bali radars are supporting BALI ACC.

When all systems are integrated, 70% of Indonesian airspace will be in radar coverage. The remaining area will be supported by ADS.

6. ATM

6.1. ATC Systems

Hughes and Guardian Company including the ADS functionality support the Jakarta Advanced Air Traffic System (JAATS).

The present ADS work station is a stand-alone system and not integrated within the main ATM system. The system is ARINC 422 (ACARS only). This system will be integrated into the main ATM system in the year 2002 with ADS/CPDLC trials commencing in April 2001.

For the eastern part of Indonesia the new ATM system will be installed in Ujung Pandang/Makassar, with the program more comprehensive. The ADS/CPDLC including the AIDC will blend into one functionality at all work stations and will have the capability of

RADAR, ADS/CPDLC and Flight Plan Track information, similar to the Australian TAAATS.

The contract with the AIRSYS has been signed and according to the schedule of work the installation including the New ACC centre building, completion is expected by April 2003.

6.2. Air Space Management

Because of the geographical position of Indonesia, most international flights fly in a north/south direction while domestic flights are from west to east and vise versa. This traffic pattern causes crossing conflictions making air traffic management difficult. The introduction of RNP and RVSM together with restructuring the present ATS routes where required, will greatly assist in easing the air traffic control workload within Indonesian airspace.

In Indonesia RVSM will be implemented by reflecting the "Keep it Simple" concept. A phase by phase approach commencing from flight level band FL350 to FL 390 will be initially implemented, followed by an increase in RVSM between FL290 and FL410 at a later date to be detiremined. This approach may also be considered regarding RNP using a specified level and specified Route.

6.2.1. Data Utilizing Airspace

The following data has been collected and analyzed

a. Domestic City Pair and route utilization

Point ID_1	Point ID_Others	NEWS Route	Class.
Jakarta	Surabaya, Denpasar	W45 (East to the West)	A
	Surabaya, UjungPandang	(SE to NE vv)	A-
	Palembang, Medan	W12 (NW to SE vv)t	A
	Pontianak	W14 (North to South)	A-
	Balikpapan	W15 (East to West vv)	B
	Banjarmasin	W18 (East to West vv)	B
Surabaya	Bali, Ujung Pandang ,Manado	W33, W45 and W51 (NEWS)	A-
Bali	Ujung Pandang	North to South vv	A-

b. Domestic Major Traffic Flow

No.	ATS Route	Source and Destination								Remarks
			ID1		ID2		ID3		ID4	
1.	W11		CKG		PDG		MDN			VV
2.	W12		MDN		PKU		JMB		PLB	VV
3.	W14		CKG		TPN		PNK			OW
4.	W15		CKG		PKY		BPN		MNO	VV
5.	W16		SBY		CKG					VV
6.	W17		HLM		BND		JOG			VV
7.	W18		CKG		BDM		BPN		TRK	VV
8.	W31		SBY		BDM		PKY			VV
9.	W33		SBY		BLI					VV
10.	W38		CKG		SMG		SBY			OW
11.	W45		CKG		SMG		SBY		BLI	OW
12.	W51		CKG		MKS		MNO			VV

6.2.2. The existing saturated upper sectorization

		(Peak Days= Annual Traffic/300 & Peak Hours = Peak Days/10)					
Upper Sector (Existing)		Reflected on the Year 2000					Remarks
		Total Strip amount	Avg.Flying hours	Sector Hourly capacity	Total Peak Hours Strip	Saturated Ratio	
UTA	Max.Acft	UPPER BALI					
Bali East	16	58138	38 minutes	25	20	80%	Bali center/South
Bali West	14	96563	32 minutes	26	32	123%	
JAKARTA UTA							
Upper Kalimantan (UK)	25	80489	57 minutes	26	27	104%	Re-struc ++
Upper Palembang(UP)	14	87345	39	22	30	136%	Re-struc ++
Upper Semarang (US)	14	51933	30min	28	17	61%	
Upper Tg.Karang (UT)	16	85073	31	31	29	94%	Re-struc +
UPPER MEDAN							
Medan East (ME)	14	56772	42	20	19	95%	Re-struc +
Medan West (MW)	16	29846	30min	32	11	34%	
UJUNG PANDANG / MAKASSAR							
Ujung Pandang ACC	25	49084	59	25	16	64%	

The data shown above on table 6.2.2 considers that the saturation value is 70%, thence it means Upper Palembang, Bali Upper Control, Upper Kalimantan, Upper East Medan and Upper Tanjung Karang should be re-structured to provide a more efficient Air Space Management system.

6.2.3. The CNS/ATM implementation plan

The table below is extracted from Indonesia Task Force activity

	AIR TRAFFIC MANAGEMENT	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1.	Finalization Upper Airspace Reorganization											
2.	Development coordination tools&working method between ACC and other ATS Units											
3.	Reorganization lower airspace											
4.	GNSS procedure En-route, NPA ,Terminal											
5.	Gradually Implemented RNP10 or even better											
6.	Gradually Implemented RNP 0.3 for NPA											
7.	Gradually implemented ADS/CPDLC											
8.	Gradually Implemented RVSM											
9.	Harmonization CNS/ATM program											
10	Gradually implemented ATFM											
11	Gradually implemented RNP for precission											