International Civil Aviation Organization

The Combined Meetings of the Fifth FANS Implementation Team – Bay of Bengal (FIT-BOB/5), the Second FANS Implementation Team – South East Asia (FIT-SEA/2), the First Air Traffic Flow Management Task Force (ATFM/TF/1) and ADS/CPDLC Seminar

Bangkok, Thailand, 18 - 22 April 2005

Agenda Item 6: Air traffic flow management plan and implementation

PROPOSAL TO DEVELOP AND IMPLEMENT AN AIR TRAFFIC FLOW MANAGEMENT (ATFM) SYSTEM IN THE BAY OF BENGAL AND WESTWARDS FOR AIRCRAFT TRANSITING THE KABUL FIR

(Presented by Thailand)

SUMMARY

This working paper gives details including a Concept of Operations for an AEROTHAI proposal to develop an ATFM system to cater for westbound flights departing Southeast Asia and Southern Asia who transit the Kabul FIR during the busy nighttime period.

1. INTRODUCTION

1.1 Several ICAO meetings have focused on the provision of ATFM in the Bay of Bengal and westwards since the implementation of the EMARSSH revised ATS route structure, which came into force on 28 November 2002. With the additional routes which were then available plus the introduction of more available flight levels when RVSM was implemented on 27 November 2003, there were several occasions where these initiatives actually contributed to delays or re-routing due to the restricted movement through the Kabul FIR caused by military requirements in this airspace. Another impediment was the need for aircraft to transfer to a conventional flight level allocation system prior to entering the Kabul FIR.

1.2 Due to the steady increase in air traffic over this area and in an endeavour to overcome these issues, an ICAO Special Coordination Meeting (SCM) took place on 31 January-1 February 2005 to discuss ways of introducing an ATFM system to effectively manage flights who intended to transit the Afghanistan airspace. This meeting developed the following Terms of Reference for the ATFM Task Force for the Bay of Bengal and South Asia region:

Objectives

The objectives of the Task Force are:

a) To enhance and facilitate the orderly and efficient flow of Air Traffic across the Bay of Bengal and South Asia;
b) To minimize ground and enroute delays;
c) To maximize capacity and optimize the flow of air traffic within the area;

d) To plan for and manage future ATS workload in the light of forecast increased traffic flow within the area; and

e) To assess the economic and environmental impact of the implementation of the ATFM system.

Phased Implementation

To meet these objectives the Task Force shall adopt a phased implementation programme as per the following:

Phase One: Flights planning to transit the Kabul FIR

Phase Two: Other international flights crossing the Bay of Bengal and/or South and South East Asia areas

Phase Three: Future planning for increased traffic within the Bay of Bengal and South and South East Asia areas
(For the purposes of the ATFM/TF, South Asia includes, India, Nepal, Pakistan and Sri Lanka

1.3 The meeting would recall that Thailand advised the SCM that, realizing a flow management need, they would be prepared to take an active lead role in developing an appropriate ATFM system in coordination with States and the airlines with a Target Date for implementation of AIRAC date 29 September 2005. It was further stated that any ATFM system should not only be practical and robust, but also have the flexibility to adapt to changing circumstances including Phase 2 and 3 of the implementation programme agreed to at the SCM. In addition contingency procedures would need to be developed to cater for adverse weather conditions, especially during the tropical cyclone season, as well as procedures in the event of a withdrawal of one or more ATS routes or levels which may occur in Afghanistan airspace due to military requirements.

1.4 The meeting is reminded that the SCM agreed to support the initiative of Thailand to develop and operate an automated ATFM system to cater for Phase 1 of the project, with a target date for implementation of AIRAC date 29 September 2005.

2. **DISCUSSION**

2.1 The meeting may care to note that Thailand was also actively involved in the Mini Working Group (MWG) meeting, held in Singapore on 14-15 March 2005. At this meeting a more detailed framework for ATFM was developed which gave certain parameters in achieving an efficient and robust system.

2.2 The meeting should also note that the MWG Report identified the following steps to assist in the implementation of ATFM Phase 1:

a) complete an analysis of the traffic data including Departure/Arrival data;

b) identify bottleneck areas;

c) develop an ATFM tool to optimize the usage of all ATS routes and levels available through the Kabul FIR;

d) Undertake a series of trials and demonstrations of the ATFM tool; and

e) Develop an Action Task List.

2.3 Notwithstanding the importance of all of these above steps, items b) and c) are considered very significant in development of the ATFM model.

2.4 Thailand wishes to advise the meeting that, since the SCM held in early February 2005, AEROTHAI has been very active in continued development of a computerized ATFM system under the Terms of Reference mentioned above, to accommodate the requirements of aircraft and States associated with this project.

2.5 At the present time, an average of 46 aircraft each evening plan to transit the Kabul FIR between the hours of 1900 and 2359 UTC (5 hour period). From a theoretical point of view, 4 available routes through Kabul with 3 levels available on 3 routes (L750, N644 and A466) and 2 levels available on G792/V390, gives a capacity of 66 aircraft per hour spaced at 10 minutes MNT between each aircraft. This does not include FL390 on all routes which is also available but not often used due to aircraft operational limitations.

2.6 Unfortunately, not all routes transiting the Kabul FIR are being shared equally thus causing a bunching of aircraft on particular routes during certain times of the 5 hour period. This bunching not only affects entry into the Kabul FIR, but also the management of enroute aircraft within the Indian and Pakistan FIRs.

2.7 The meeting should note that Thailand has taken these issues mentioned into consideration in the development of their ATFM model for this airspace.

2.8 A proposed option to overcome this imbalance would be to introduce preferred routes for aircraft departing from particular airports to alleviate these bottlenecks. The meeting would appreciate that, as we continue to have a steady growth of traffic over this area, we need to formulate solutions by judicious and cooperative ATC management. This will then allow us to put together an ATFM system which will accommodate these matters to the benefit of users and providers alike.

2.9 The meeting is informed that Thailand has recently had encouraging and cooperative discussions on these matters along with other ATFM topics with representatives from the Airports Authority of India and the Indian Department of Civil Aviation during a visit to Delhi by senior AEROTHAI personnel.

AEROTHAI *ATFM Concept of Operations*

2.10 The AEROTHAI AFTM Concept of Operations focuses on many important subjects which will provide possible solutions to ATS users and providers, not only through the Kabul FIR but also to reduce bottlenecks as aircraft transit over the Bay of Bengal and domestic airspace of India and Pakistan. A Draft Concept of Operations Document is at Attachment 1 to this Working Paper.

3. SUMMARY

3.1 The meeting is invited to note that the number of aircraft operating across the Bay of Bengal and through the Kabul FIR is increasing at a rate that could double today's aircraft movements over the next 6-8 years. We have already seen new schedules come into force over this area and the growth continues. It is appropriate that we continue the work to have all three phases of the ATFM project implemented as soon as possible

3.2 As an illustration of these predicted traffic increases, information has been received which indicated that agreements have been reached by Britain and India to double the amount of flights between both countries, mentioning that it is expected that the number will rise from 40 weekly

flights to Delhi and Mumbai to 56 weekly flights by late 2006, 14 to both Bangalore and Chennai and 7 from Britain to any other Indian city. From India, there will be 56 flights from Delhi and Mumbai and unlimited flights from other parts of India.

3.3 Further it was noted that the USA and India signed an agreement on 15 April allowing each other's carriers to operate unlimited flights between the two countries. With other countries within the Asia region investing in many more aircraft, we can expect this traffic growth to continue.

3.4 The meeting is advised that Thailand is committed to the air traffic flow management process due to our geographical location. It is worth noting that more aircraft depart Bangkok transiting the Kabul FIR than any other airport in the area under consideration. Thailand also considers that we are well placed to monitor and react to present and future trends in aviation activity.

3.5 The meeting can be assured that Thailand has the ability to put in place a reliable and robust ATFM system to handle these needs. We are confident that, with the cooperation from States and the airline industry, the ATFM system developed by AEROTHAI will be capable of overcoming all obstacles and enable a smooth flow of traffic in an expeditious manner across this area.

4. ACTION BY THE MEETING

4.1 The meeting is invited to:

a) In agreeing to an ATFM model, consider the overall flight plan from departure point to Kabul FIR entry point to ensure a smooth and expeditious flow of air traffic;

b) Implement a mechanism to overcome bottlenecks along the route structure;

c) As air traffic increase, give consideration to introduce proportionate sharing of all routes through the Kabul FIR; and

d) Support the AEROTHAI Draft ATFM Concept of Operations Document attached to this Working Paper;

……..

CONCEPT OF OPERATION

AIR TRAFFIC FLOW MANAGEMENT

for

WESTBOUND AIRCRAFT TRANSITING

the

KABUL FIR

Presented by AEROTHAI

Draft Version 1.0

1. PURPOSE

- The purpose of this Document is to set out a Concept of Operation for the provision of an Air Traffic Flow Management System to cater for the westerly nighttime rush period of aircraft proceeding to European destinations who plan to transit the Kabul FIR.

2. BACKGROUND

- Over the past 3 years since the introduction of EMARSSH and RVSM in this area, there has seen many occasions where an uncoordinated flow of air traffic, planning to transit the Kabul FIR, has resulted in bottlenecks along routes flown and, on occasions, resulting in aircraft being diverted via I.R. Iran due to insufficient separation over Afghanistan. This has caused unscheduled technical stops enroute to the original destination, resulting in severe financial penalties to the international airlines, coupled with significant inconvenience to passengers.

- Several ICAO meetings have been devoted to this subject in an effort to overcome the matter. Finally it was agreed that an Air Traffic Flow Management (ATFM) procedure should be introduced. Not only are there problems today, but with the rapid increase of air traffic forecast to take place in this area in the not too distant future, it was deemed necessary to have in place an ATFM system to accommodate these forecasts.

3. PRESENT TRAFFIC STATISTICS

- A survey was conducted for one week from 3 – 9 April 2005 for aircraft planning to transit the Kabul FIR westbound during the period 1900-2359 UTC. The following Chart using statistics from Lahore FIR gives a breakup of aircraft using the four available routes through the Kabul FIR during this period:

Traffic Statistics through Kabul FIR

Date	G792/V390	L750	N644	A466	Total
3-4-05	4	14	19	2	39
4-4-05	10	9	15	9	43
5-4-05	1	16	17	3	37
6-4-05		23	24	7	54
7-4-05		26	19	8	53
8-4-05		16	25	9	50
9-4-05	2	13	17	12	44
Total	**17**	**117**	**136**	**50**	**320**

- These statistics highlighted some relevant points of interest in the present day operations over Afghanistan:

  - The present requirements require that both A466 and N644 need to be treated as one route from position SAMAR (near Delhi/Lahore FIR Boundary) to their respective Kabul entry points. This makes their combined total of 186 movements over the 7 day period, far in access of the other two routes of G792/V390 and L750 which are 17 and 117 respectively;

  - Although considerable work and effort has been undertaken by both India and Pakistan in opening a shorter route leading to the entry point ASLUM on G792/V390 from Rahim Yar Khan (RK) at the request of international airlines, the route is still under-utilized compared to other routes through Kabul FIR;

  - There is an average of 6 aircraft departing Delhi during the nighttime rush period, mostly proceeding over the Kabul FIR on N644/A466;

  - There are no statistics on aircraft leaving Pakistan airports transiting the Kabul FIR. Most, if not all aircraft departing Pakistan have Islamabad as their departure point. This city is very close to the Afghanistan border with Pakistan and perhaps they now plan to proceed via I.R. Iran;

  - Lufthansa now has a daily service out of Guangzhou in China which normally operates via N644;

  - Some aircraft plan via N644 from Kuala Lumpur and Singapore, increasing the burden on this heavily populated route;

- Some aircraft from Bangkok and Vietnam plan via L750;

- There are several aircraft which use the same routes over the Bay of Bengal and Indian sub-continent but do not proceed through Afghanistan. Nevertheless they do occupy flight levels used by aircraft proceeding through the Kabul FIR so they need to be taken into consideration in any computer modeling;

4. **EN-ROUTE BOTTLENECKS**

- With regard to aircraft planning via N644 and A466 through the Kabul FIR from airports to the east of the Bay of Bengal, there are potential enroute bottlenecks which need to be taken into consideration in order to effectively manage ATFM from departure to their entry points into Kabul FIR. It is recommended that close coordination between the ATFM unit and India/Pakistan would assist a smoother flow of aircraft through these areas of congestion;

- As an example, aircraft departing or overflying Bangkok have the opportunity of tracking by either L507 or P646. These laterally separated routes come together at Varanasi, approximately 330NM east of Delhi. Aircraft then proceed via R460 to Jalalabad – Delhi A466 – SAMAR or via R460 to Jalalabad – M890 – SAMAR causing a further potential bottleneck at SAMAR;

- Another example occurs when aircraft departing from Kuala Lumpur or Singapore choose to transit Kabul FIR via A466. These aircraft normally plan via M770 over the Bay of Bengal and join P646 at either LEGOS or Jamshedpur east of Varanasi. This is a further impediment to the Varanasi bottle neck issue;

- A similar scenario occurs for flights planning to transit the Kabul FIR on N644/A466 tracking via SAMAR to Dera Ismail Khan (DI) where A466 splits from N644. This large number of aircraft, coupled with aircraft out of Delhi which normally flight plan one of these routes, have caused delays and/or diversions in the past over Indian and Pakistan airspace.

- AEROTHAI is taking all of these issues mentioned above in consideration in the development of their ATFM system.

5. **PROPOSED ATFMU EQUIPMENT REQUIREMENTS**

- A study will be made to ensure that a Web-Based system is capable of carrying out all of the required functions in the area under

consideration as it requires all participants to have the reliability to transfer, receive and monitor the mandatory data. A further study will also be made on the use of AFTN to alternatively achieve this requirement;

- Compatible communications between the ATFMU, airlines and ACCs concerned needs to be arranged.

- It is proposed that an ADS type monitor will be incorporated within the ATFMU to observe aircraft tracking details, especially over the Bay of Bengal. This information may be relayed to ACCs concerned to assist them in tactical solutions if required, especially where bottlenecks may occur;

- All equipment will be operated using operational power supplies and communications.

6. **TECHNICAL AND STAFFING REQUIREMENTS OF THE AEROTHAI ATFM UNIT (ATFMU)**

- The ATFMU will be staffed by qualified operational and technical staff trained in the necessary procedures to operate, make decisions and maintain the necessary equipment to coordinate with States and airlines involved;

- ATFMU staff will be required to be on duty in sufficient time to input data well in advance of the Kabul entry time, taking into account the length of time from departure to the entry point into the Kabul FIR;

7. **OPERATIONAL PROCEDURES**

- Aircraft are required to submit their preferred route and level to transit the Kabul FIR, plus two alternatives to the ATFMU. It is also proposed that they submit their intermediate level and routing if proceeding across the Bay of Bengal. This information should be submitted in sufficient time to allow the ATFMU to analyze and select the optimum solution;

- To assist Indian ACCs, where most route bottlenecks occur, it is proposed that the ATFMU on receiving flight plan information from aircraft, will calculate if traffic bunching is likely to occur and liaise with the appropriate ACC in finding a solution. This may require a new Kabul FIR entry time and a subsequent amended departure time or propose an alternative route;

- Aircraft may plan to transit the Kabul FIR on any one of the four available routes. Notwithstanding this procedure, each departing airport will be allocated preferred routing(s) through the Kabul FIR. If aircraft select other than their departure airport preferred route(s), it may require a change to routing if traffic dictates The preferred Kabul FIR routing(s) for each airport are listed below.

Preferred Routing over Kabul FIR and Bay of Bengal

Departure Point	Preferred Route(s) Kabul FIR	Over Bay of Bengal
Bangkok and overhead	N644 and A466	L507 and P646
Singapore and Kuala Lumpur	L750, G792/V390 A466	L759 P628 M770
China and Hong Kong	N644 and A466	via Yangon FIR Nth. sector
Delhi, Mumbai and Chennai	L750 and A466	
Islamabad	N644 and A466	
Others departure points		

8. **CONTINGENCY PLANNING**

- Contingency measures will be devised in coordination with States to cater for ATS route outages due to tropical cyclones over the Bay of Bengal.

- Contingency arrangements will be formulated in coordination with States due to closures of ATS routes or levels within the Kabul FIR caused by military requirements.

9. **SUMMARY**

- This Concept of Operation is intended to be broad by nature until discussions have taken place with States and Users concerned.

- It is considered that satisfactory entry into the Kabul FIR involves other enroute issues which will dictate this entry time. For this reason, we consider that a smooth flow of aircraft across the Bay of Bengal and through India and Pakistan plays a crucial role in achieving the end target.

Air Traffic Flow Management for Westbound Aircraft Transiting the Kabul FIR

Presented by Thailand

Purpose of the Working Paper

- To explain a proposed AEROTHAI ATFM system to accommodate air traffic transiting the Kabul FIR during the busy nighttime period

- To take into consideration the route structure from all departure aerodromes to Kabul entry point so as to allow a safe, economical and smooth flow for all aircraft

Traffic in Bay of Bengal area

Traffic Forecast – next 15 years

- It looks like we may have got our traffic forecasts wrong!!
- On present indications, rather than a doubling of traffic in 13 years, we may be looking at 6-9 years.
- The question is? Are we ready under our present system.
- Suggest the answer is no.

Preparation for ATFM

- Several ICAO meetings dealing with the ATFM issue have already taken place
- At the Special Coordination Meeting (SCM) in early February 2005, Terms of Reference for a Task Force were developed
- Phased implementation of ATFM was agreed to
  - Phase 1 looked at westbound routing through the Kabul FIR during the busy nighttime period
- SCM agreed to support Thailand to develop and operate an ATFM system for Phase 1

Mini-Working Group Meeting – Singapore 14-15 March 2005

- Identified steps to assist implementation of Phase 1
  - **Complete an analysis of traffic data**
  - **Identify enroute bottlenecks**
  - **Develop an AFTM tool to optimize usage of all ATS routes and available levels thru Kabul FIR**
  - **Trials and demonstrations of the ATFM mechanism**
  - **Develop an Action Task List**
- AEROTHAI has continued moving forward in developing an ATFM computer model
- Target date for completion – AIRAC Date 29 Sep. 2005

Statistical Data and Ideas

- On average, 46 aircraft transit the Kabul FIR westbound each night between 1900-2359 UTC
  - theoretically, 4 routes, 11 levels (not including FL390), 10 minutes separation allows 66 aircraft in 1 hour
- One week data collection revealed
  - routes are not shared equally which causes bunching over the five hour period either enroute or entering Kabul FIR
  - Thailand has taken these issues into consideration in developing their model

Breakup of Statistics-Kabul FIR

Traffic Statistics through Kabul FIR

Date	G792/V390	L750	N644	A466	Total
3-4-05	4	14	19	2	39
4-4-05	10	9	15	9	43
5-4-05	1	16	17	3	37
6-4-05		23	24	7	54
7-4-05		26	19	8	53
8-4-05		16	25	9	50
9-4-05	2	13	17	12	44
Total	17	117	136	50	320

Liaison with other States

- AEROTHAI recently had discussions with India on these matters which proved encouraging and cooperative in coming to grips with numerous issues regarding ATFM and bottlenecks in airspace over India and leading into Pakistan
  - Further talks are expected to continue

AEROTHAI Concept of Operations for ATFM

Enroute Bottlenecks

- Have a serious effect on ATFM procedures
  - Occur in more than one locations for traffic departing east of the bay of Bengal

Proposed ATFMU Equipage

- Data transfer to/from ATFMU/Airlines/States
- Communications requirements
- Proposed ADS type monitor to observe track details
- All ATFMU equipment has similar reliability to other operational installations such as ACC

AEROTHAI Concept of Operations for ATFM

Technical and Operational staffing requirements

- ATFMU will be staffed by qualified operational and technical staff trained in the necessary procedures to operate, make decisions and maintain the necessary equipment to coordinate with States and airlines involved

- They will be on duty in sufficient time to input data well in advance of the Kabul entry time, taking into account the length of time from departure to the Kabul entry point

AEROTHAI Concept of Operations for ATFM

Operational Procedures

- Aircraft to submit their flight plan and preferred route and level plus 2 alternatives
- Aircraft crossing the bay of Bengal to advise their initial level
- Computer will calculate if traffic bunching is likely to occur and advise the State concerned for them to find solution
- Aircraft may plan on any of the four routes through Kabul FIR however
  - As each departing airport will be allocated preferred routes through Kabul FIR, this will have precedence over an aircraft from another airport if traffic dictates

Preferred routings over Kabul FIR

Preferred Routing over Kabul FIR and Bay of Bengal

Departure Point	Preferred Route(s) Kabul FIR	Over Bay of Bengal
Bangkok and overhead	N644 and A466	L507 and P646
Singapore and Kuala Lumpur	L750, G792/V390 A466	L759 P628 M770
China and Hong Kong	N644 and A466	via Yangon FIR Nth. sector
Delhi, Mumbai and Chennai	L750 and A466	
Islamabad	N644 and A466	
Others departure points		

Thailand's position on ATFM

- ATFM system should be practical and robust
- ATFM system must be flexible to adapt to changing circumstances
  - Weather conditions within the Bay of Bengal
  - Restrictions and requirements within Afghanistan
- Overall management of any ATFM system should be vested in a State or States within the area of the ATFM operation

Action by the Meeting

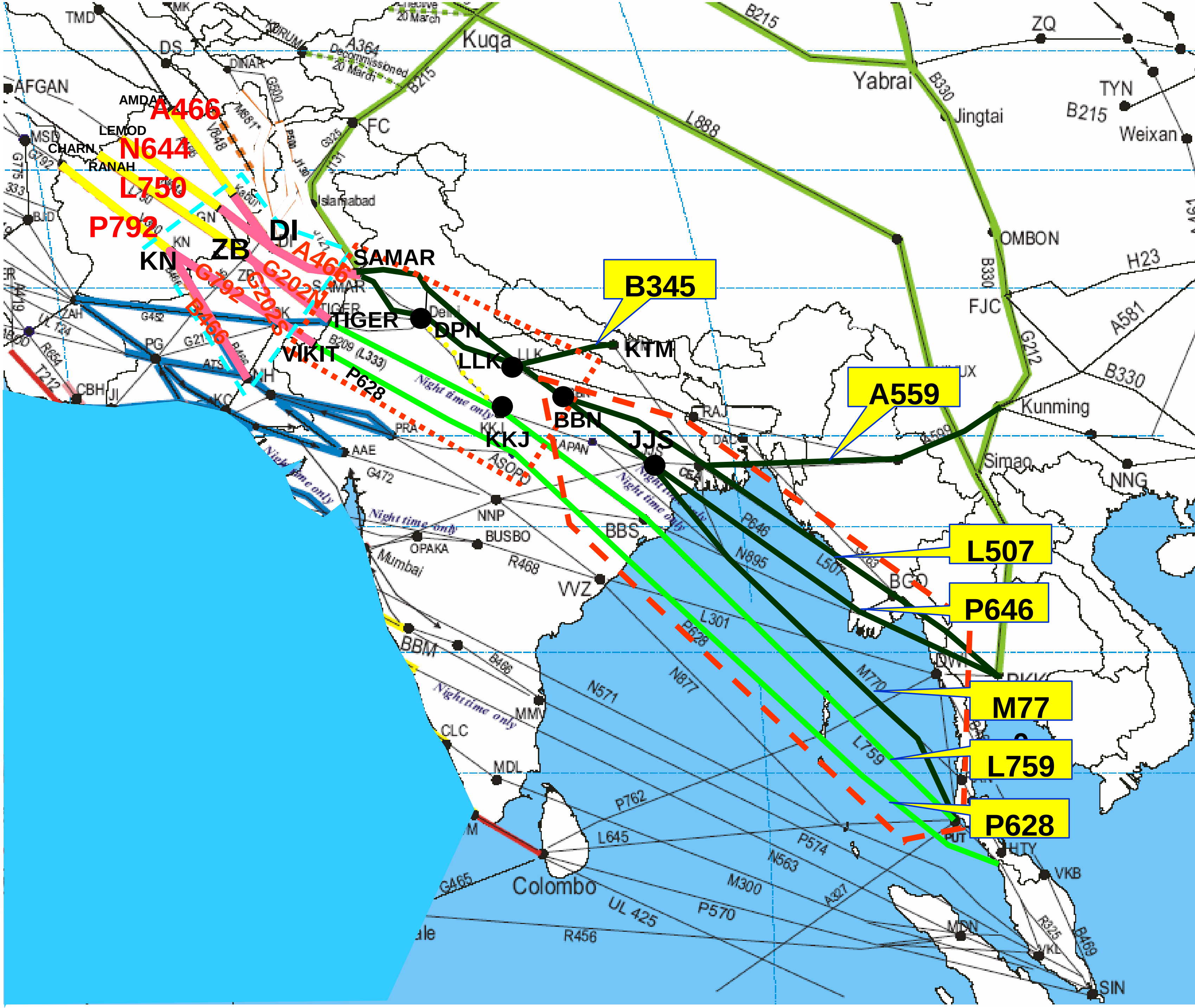
The Meeting is invited to:

a) In agreeing with an ATFM model, consider the overall flight plan from departure point to the Kabul FIR entry point to ensure a smooth and expeditious flow of air traffic

b) Implement a mechanism to overcome bottlenecks along the route structure

c) As air traffic increases, give consideration to introduce proportionate sharing of all routes through the Kabul FIR

d) Support the AEROTHAI Draft ATFM Concept of Operations Document attached to this working paper



A466
N644
L750
P792
KN
ZB
DI
SAMAR
TIGER
DPN
VIKIT
LLK
KKJ
BBN
JJS
KTM
B345
A559
L507
P646
M77
L759
P628
G792
G202N
G202S
B466
Kuqa
Yabrai
Jingtai
Weixan
TYN
ZQ
Kunming
Simao
NNG
FJC
OMBON
L888
B215
B330
Islamabad
Colombo
Mumbai
SIN