INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

REPORT OF THE SECOND MEETING OF THE AIR TRAFFIC FLOW MANAGEMENT TASK FORCE (ATFM/TF/2)

Delhi, India, 28 June – 1 July 2005

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

Approved by the Meeting
and Published by the ICAO Asia and Pacific Regional Office

Page

History of the Meeting

Report on Agenda Items

Appendices

……

1.1 **Introduction**

1.1.1 The Second Meeting of the Air Traffic Flow Management Task Force (ATFM/TF/2) was held in the Hotel Ashok located at Chanakyapuri, New Delhi, India from 28 June to 1 July 2005.

1.2 **Attendance**

1.2.1 The meeting was attended by 48 participants from Afghanistan, Australia, India, Indonesia, Malaysia, Singapore, Sri Lanka, Thailand and IATA. A complete list of participants is at **Appendix A** to this Report.

1.3 **Officers and Secretariat**

1.3.1 Mr. Ron Rigney, ATM International Liaison Manager, Airservices Australia, continued as Chairman of the Task Force. As an ICAO official had been unable to attend the meeting, Mr. Rigney also acted as the Secretary for the meeting, assisted by other delegates.

1.4 **Opening of the Meeting**

1.4.1 The Airports Authority of India opened the meeting with an Inauguration Ceremony in which Mr. Ajay Prasad, India Administrative Service (IAS), Secretary, Ministry of Civil Aviation was the Chief Guest. Mr. K. Ramalingam, Chairman Airports Authority of India (AAI), Mr. K. Gohain, Joint Director General of Civil Aviation, India and Mr. Ron Rigney, Chairman ATFM Task Force and representing Mr. L.B. Shah, ICAO Regional Director, Asia and Pacific Regional Office were also present.

1.4.2 Mr. Ajay Prasad, IAS, commended the delegates of the ATFM Task Force meeting on their initiative and cooperative efforts in seeking to develop and implement an ATFM system for the Bay of Bengal. He expressed the view that it was a privilege and honor for India to host this important meeting and extended a warm welcome to all delegates.

1.4.3 Mr. Ramalingam in his address welcomed the members of the ICAO ATFM Task Force to Delhi for this important meeting. He referred to the Bay of Bengal airspace as one which encompassed a huge stretch of oceanic airspace that catered for the flow of traffic between South and Southeast Asian airports and Europe through the Gulf countries. It also catered for the crossing traffic between Southern Indian cities, Sri Lanka, the Maldives, Malaysia, Indonesia, Singapore, Hong Kong China, Thailand and beyond.

1.4.4 Mr. Ramalingam outlined the efforts being made by the AAI to upgrade and expand India's CNS/ATM infrastructure, including the implementation of MSSR at Bhubaneshwar, RCAG VHF facilities at Vishakapatnam and Port Blair, as well as ADS/CPDLC at Kolkata and Chennai to improve communication and surveillance capability. These initiatives together with planned additional Radar installations will provide seamless radar coverage throughout the continental airspace even at lower levels. The AAI had also successfully installed and tested ADS/CPDLC facilities at Mumbai and Delhi and these were expected to be operational in the near future. Mr. Ramalingam also informed the meeting that a dedicated Satellite Communication System was being installed and once operational, would enhance VHF coverage of Indian airspace through the RCAG system. The meeting was also informed of AAI's continuing programme to network and upgrade the ATM automation system, to augment the overall ATM system within India.

1.4.5 During his opening address, Mr. Ramalingam also provided details of AAI's recent collaborative efforts with the Indian Space Research Organisation (ISRO), to develop and implement the GPS and GEO augmented Navigation system (GAGAN). This is an augmentation system designed to improve the accuracy and integrity of GPS signals for operations over India, the Bay of Bengal, Southeast

Asia, and the Middle East region, extending up to Africa. GAGAN is expected to fill the gap between the European EGNOS and the Japanese MSAS to offer seamless global navigation. In regard to additional surveillance capabilities, Mr. Ramalingam informed the meeting that a study into the implementation of ADS-B over India had recently been undertaken.

1.4.6 In regard to improved airspace capacity, Mr. Ramalingam referred to the implementation of multiple parallel ATS routes in November 2002, under the EMARSSH Project. This was followed in November 2003 by the introduction of six additional flight levels through the implementation of RVSM throughout the region. However, while these measures had significantly improved airspace capacity, traffic operating between airports in South and Southeast Asia and Europe had continued to experience ground delays and difficulties due to a lack of available levels and ATS routes across Afghanistan caused by the existing ATS infrastructure and airspace limitations within the Kabul FIR.

1.4.7 Mr. Ramalingam took the opportunity to remind the meeting that there was still scope for improvement in the flow of traffic throughout the region and that one of the contributing factors was the under-utilization of several ATS routes, due to a preference by Operators to flight plan and operate on a particular route, which often created a bottleneck at the exit point of the preferred route. Evenly distributed traffic on all available ATS routes would not only enhance the capacity but also eliminate the bottlenecks at the exit points. Mr. Ramalingam further informed the meeting of several recent pro-active initiatives undertaken by AAI to assist and support the re-establishment of the Airport infrastructure and ATM facilities in Afghanistan through a Memorandum of Understanding (MOU).

1.4.8 In conclusion, Mr. Ramalingam assured the meeting of the AAI's full cooperation and support to the ATFM Task Force in all of its activities associated with the planning and implementation of an ATFM system in the Bay of Bengal.

1.4.9 Mr. Ron Rigney, on behalf of Mr. L.B. Shah, Regional Director, ICAO Asia and Pacific Regional Office in his address thanked the AAI for their warm and generous hospitality in hosting this very significant meeting of the ICAO ATFM Task Force. He also conveyed an apology on behalf of the ICAO Regional Director in regard to the inability of Mr. Andrew Tiede (Regional Officer ATM) to attend this meeting, due to an unforseen commitment that Mr. Tiede had with ICAO Universal Safety Oversight Audit Program (USOAP) which was currently conducting an audit in Thailand.

1.4.10 Mr. Ron Rigney commented on the significant growth that was currently being experienced within India's civil aviation industry and expressed the view that the arrival of new start-up carriers together with the fleet expansion plans of existing government and non-government carriers would translate into significant increases in air traffic movements throughout India and across the region. From an ATM perspective, the management of these expected increases in traffic levels would be best provided through a robust ATFM system and in this regard, India was a key Stakeholder in the development of the Bay of Bengal ATFM system.

1.5 **Documentation and Working Language**

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

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

……

Agenda Item 1: Adoption of Agenda

1.1 The meeting reviewed the provisional agenda presented by the Chairman and agreed to amend the title of Agenda Item 3 to read Operational Trial Considerations. The meeting agreed to the revised agenda.

Agenda Item 1: Adoption of Agenda

Agenda Item 2: Automated System Tool

Agenda Item 3: Operational Trial Considerations

Agenda Item 4: Flow Management Handbook

Agenda Item 5: Review and Update ATFM/TF Task List

Agenda Item 6: Develop a Coordinated Plan for implementation of actions agreed by the Task Force

Agenda Item 7: Any other business

Agenda Item 8: Date and venue for the next meeting

Agenda Item 2: Automated System Tool

Review of ATFM history and activities

2.1 The meeting recalled that the EMARSSH realignment of ATS routes was implemented across Asia and the Middle East regions on 28 November 2002. This initiative was followed by the implementation of RVSM on 27 November 2003.

2.2 As a result of these capacity improvements, respective meetings of the Bay of Bengal ATS Coordination Group (BBACG) and the RVSM Task Force recognized that there was a continuing need to further improve the overall management of traffic flows across the Bay of Bengal. Accordingly, APANPIRG/15 (August 2004) noted the considerable efforts that had been made by States to collaborate together with IATA to improve the flow of traffic and encouraged all parties to continue their efforts and to take into account the benefits to be derived from ATM automated systems.

2.3 Subsequently, the RVSM/TF/24 meeting (November 2004), considered the ongoing problems surrounding the implementation of effective ATFM in the Bay of Bengal and noted that as well as the RVSM Task Force and BBACG meetings that had considered the issue, several Special Coordination Meetings (SCM) had taken place during 2003/2004 in an effort to develop an ATFM system or traffic orientation scheme to overcome these serious issues. In particular, the meeting noted the work that had been undertaken to identify suitable ATFM system tools to support an ATFM service in the area.

2.4 Accordingly the RVSM/TF/24 meeting invited the FAA to deliver a presentation on the FAA Dynamic Ocean Track System Plus (DOTS+) automated system and concluded that the DOTS+ system or a similar system could be used to streamline the flow of traffic and alleviate congestion, as well as reduce ground delays.

2.5 The RVSM/TF/24 meeting also agreed that a special coordination meeting should be convened to study the matter in greater detail, taking into account current operational requirements and future increases in traffic flows. RVSM/TF/24 also considered that an operational trial should be conducted to enable the States concerned to assess the effectiveness of the system and the corresponding ATFM plan. To this end, the meeting agreed that the SCM should report its findings and recommendations to the next ATM/AIS/SAR Sub-group meeting (July 2005).

SCM-BOB

2.6 In order to progress the work in this regard, a Special Coordination Meeting – Bay of Bengal (SCM-BOB) was subsequently held in conjunction with the BBACG/16 meeting which was convened at the ICAO Regional Office in Bangkok from 31 January to 4 February 2005.

2.7 Thailand presented the SCM-BOB with a Working Paper entitled "Air Traffic Flow Management (ATFM) in the Bay of Bengal and Westwards" and informed the meeting that AEROTHAI had commenced work on developing an ATFM computer model for possible deployment in the Bay of Bengal and South Asia region. Thailand also informed the meeting that it was prepared to take a proactive role in the establishment of an effective ATFM system for the area under consideration. Thailand also expressed interest in working with partners to share ideas and workload for the purpose of putting in place a system or systems to meet present and future airspace management requirements and allow for a smooth flow of traffic for the foreseeable future.

2.8 The SCM-BOB agreed to support Thailand's initiative to develop and operate an automated ATFM system to address the westbound traffic flow problems. The meeting also agreed that in the longer term**,** it would be necessary to put in place a more comprehensive ATFM system to cater for the increasing traffic.

2.9 A representative from the United States also provided the SCM-BOB meeting with an update on the FAA's plans to develop an ATFM system tool for the Bay of Bengal, based on the DOTS+ system, utilizing the Online Track Advisory function.

2.10 The SCM-BOB meeting concluded that a dedicated Air Traffic Flow Management Task Force should be established under BBACG to progress the establishment of a sub-regional ATFM plan and implementation of ATFM automated systems for the Bay of Bengal and South Asia traffic flows, and drafted Terms of Reference accordingly.

Singapore 'Mini' Meeting

2.11 In accordance with the request from the SCM-BOB that discussions continue "off-line" in preparation for the ATFM/TF/1 meeting, an informal 'mini' working group meeting of several South East Asia task force members and industry stakeholders was held at the Singapore Aviation Academy on 14 & 15 March 2005. The meeting was attended by the task force Chairman (Mr. Ron Rigney, Airservices Australia) and representatives from Singapore, Thailand, and IATA officers and airline representatives.

2.12 The meeting commenced work on a draft framework for the proposed ATFM/TF activities to be considered by the full ATFM/TF/1 meeting in April. During the informal working group meeting, Thailand reaffirmed its decision to develop and operate an automated ATFM system to address the westbound traffic flow problems and confirmed that work had already commenced on developing an ATFM computer model, with a target date to complete testing, acceptance and completion by the third quarter of 2005.

2.13 The informal working group was also presented with an updated presentation on the DOTS+ system as an alternative ATFM system tool for the Bay of Bengal. In the light of the revised DOTS+ presentation, the informal working group agreed to recommend to the ICAO Secretariat that the FAA be invited to present their amended DOTS+ proposal, including a detailed financial proposal, to the ATFM/TF/1 meeting.

2.14 The informal working group also agreed to recommend that ATFM/TF/1 be urged to fully consider the options available for the delivery of an ATFM system tool for use in the Bay of Bengal and South Asia and that a decision be taken as to which system tool was to be adopted by the ATFM TF. This would provide the nominated organization with sufficient time to develop the ATFM system and associated management arrangements for implementation by AIRAC date 29 September 2005 as well as finalization of funding arrangements for the provision of the ATFM service.

ATFM/TF/1

2.15 The first meeting, comprising approximately 2 days, of the Air Traffic Flow Management Task (ATFM/TF/1) was held at the ICAO Asia and Pacific Regional Office, Bangkok between 18 to 22 April 2005, in conjunction with the combined meetings of the Fifth FANS Implementation Team – Bay of Bengal (FITBOB/5) and the Second FANS Implementation Team – South East Asia (FIT-SEA/2).

2.16 Both Thailand and the United States FAA gave presentations to the ATFM/TF/1 meeting on the development of their respective ATFM system tools. However, the meeting was unable to make a final decision on the selection of the ATFM system tool due to insufficient detail being made available to the meeting. Further, the meeting expressed concerns regarding the ability of all parties to effectively meet the proposed implementation target date of 29 September 2005. Accordingly, the meeting agreed that the selection of an ATFM system tool be deferred until ATFM/TF/2, at which time the AEROTHAI and FAA systems would be evaluated by way of "Proof of Concept" demonstrations.

Thailand proposal to develop, trial and implement an Air Traffic Flow Management (ATFM) automated advisory system tool (BOBCAT)

2.17 Thailand recalled that at several previous ICAO forums they had stated that they would be prepared to take an active lead role in developing and implementing an appropriate ATFM system in coordination with States and the airlines, to cater for the present traffic operating westbound through the Kabul FIR during the hours of 1900 – 2359UTC.

Comparison between route distance from each departure point

2.18 The meeting noted that three out of the four available routes which transit the Kabul FIR, i.e. N644, L750 and G792/V390 all come together at ABEKO in Turkmenistan, close to the Caspian Sea. The following Table compares approximate route lengths from departure points of Bangkok and Singapore to ABEKO:

Dep. Point	Bay of Bengal route	Kabul FIR	Dist. Dep Pt to ABEKO (Ashgabat/ Turkmenbashi FIR)	Remarks
Singapore	M770	N644	3561	Intersecting route with P646/L507
Singapore	L759	L750	3566	
Singapore	L759/KKJ/Delhi	N644	3594	Intersecting route with A466/N644
Singapore	P628	G792/V390	3565	
Bangkok	L507	N644	2864	
Bangkok	P646	N644	2858	
Bangkok	P646/Delhi/G452/ TIGER	L750	2874	Intersecting route with L759
Bangkok	L301/URKOK/P628	G792/V390	2977	Crossing route BOB – also intersecting route with Sing/KL traffic on P628

2.19 The meeting however recognized that track distance to a common point is not the only factor which airlines have to take into consideration when flight planning. Other factors which could influence the performance and economics of the flight may also include:

a) flight level allocation;

b) weather conditions; and,

c) air navigation charges through FIRs on the flight plan.

Crossing and intersecting points associated with Kabul FIR transit routes prior to entering the Kabul airspace

2.20 Thailand advised the meeting that, after studying a sample of Kabul transit flight plans, there appears that various alternatives routings are used no matter from where the aircraft departs. As an example, the following combinations had been observed:

a) an aircraft from Bangkok tracking via P646 to Delhi, then via TIGER to L750;

b) an aircraft from Singapore tracking via L759 to KKJ – Delhi, then SAMAR and N644;

c) an aircraft from Singapore tracking via M770 to JJS, then Delhi – SAMAR to N644; and,

d) an aircraft from Bangkok tracking via L301 to URKOK (intersection with P628), then P628 to G792/V390;

2.21 The meeting concluded that on most routes between departure points east of the Bay of Bengal joining routes through Kabul FIR, there will need to be at least two gateway fixes to be taken into consideration. From these observations, it became obvious that various scenarios and combinations of overall routings to entry points into Kabul FIR will need to be taken into consideration when allocating slot times at gateways for aircraft enroute to the Kabul FIR.

Aircraft using Kabul transit tracks from departure point but not flying through Kabul FIR

2.22 The meeting also observed that some aircraft depart from Southeast Asia or South Asia to other westbound destinations using primary planned routes across the Bay of Bengal and/or India. These aircraft could be in competition for flight levels with aircraft who plan to transit the Kabul FIR.

2.23 These aircraft would also need to be considered in the slot allocation system at selected gateway points. This may not be the case regarding aircraft departing from South Asia (India/Pakistan) ports as they should be satisfactorily managed by the ACCs concerned.

Overcoming present bottlenecks on transit routes leading to Kabul FIR

2.24 The meeting noted that bottlenecks in Indian and Pakistan airspace have been identified as having been caused by route and level restrictions and limitations within the Kabul FIR. As a result, the traffic entering into Kabul FIR could not obtain a slot to enter Kabul FIR and, as a consequence, were diverted via I.R. Iran.

2.25 Of major concern are transit routes from Singapore, Kuala Lumpur, Bangkok, China, Hong Kong China and Kathmandu which join at various locations in India prior to the route section, SAMAR/DI. These bottlenecks occur at:

a) M770 intersecting with P646 at JJS;

b) P646 intersecting with L507 at Varanasi;

c) Combination of this traffic mentioned in a) and b) above with A201 from China via Myanmar and B345 from Kathmandu intersecting with R460 at Lucknow;

d) L759 intersecting with R460 over Delhi and joining other traffic proceeding via SAMAR to DI.

e) B209 from JJS to KKJ intersecting with L333 to TIGER

2.26 There are further routes joining other main transit routes in India/Pakistan airspace which may cause conflictions. These are:

a) L301 joining with P628 at URKOK;

b) G452 intersecting with L759/L333 at TIGER and P628 at RK respectively.

2.27 The meeting was further informed that 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 air traffic management of enroute aircraft within the Indian and Pakistan airspace.

Gateway and intermediate fixes in India and Pakistan

2.28 The terms **"**Gateway Fix" and "Intermediate Fix**"** are part of Thailand's computer model and define positions where agreed metered spacing is applied, in order to:

a) ensure a smooth flow of enroute traffic at the same level where routes across the Bay of Bengal join over Indian airspace;

b) enable India and Pakistan to manage the traffic for transition into the Kabul FIR

Transition from RVSM to CVSM for entry into Kabul FIR

2.29 The meeting recalled that, at the RVSM/TF20 meeting which was held in Delhi on 27 – 31 Oct 2003, agreement was reached between India and Pakistan for the ATS routes through the Kabul FIR with pairs of levels FL300/320, FL340/360 and FL380/400 to be treated as same level for CVSM transition to FL310, FL350 and FL390 respectively. This would also facilitate in avoiding confliction during transition from RVSM to CVSM with traffic on reciprocal track at FL330 and FL370.

2.30 In regard to A466 and N644, it was also agreed at the RVSM/TF20 meeting that special flow arrangement would provide for three aircraft with two at FL310 and one at FL350 operating on A466 and N644. This would be implemented only to accommodate traffic departing from Delhi that may enter the Lahore FIR via SAMAR at FL280. Delhi ACC would sequence the traffic at FL300 and FL320 in a manner that there would be no less than 5 minutes longitudinal separation between two aircraft diverging at "DI" on ATS routes A466 and N644 at FL310. This traffic arrangement would require Lahore ACC radar to monitor these aircraft and to effect the appropriate level change from RVSM to CVSM.

2.31 The meeting noted that this procedure was to be by a letter of Agreement between Delhi and Lahore ACCs and would be operated on a one month trial basis. Since this procedure was still in place, the AEROTHAI ATFM model will take account of this agreement to effect appropriate spacing of the aircraft concerned.

2.32 The meeting agreed that the items above which Thailand had taken into consideration in developing the ATFM system tool were provisional in nature and needed further analysis by the ATFM Task Force.

Bay of Bengal Cooperative ATFM Advisory System (BOBCAT)

2.33 Taking all of these matters into consideration, Thailand presented the meeting with a Concept of Operations for the Bay of Bengal Cooperative ATFM Advisory System (BOBCAT), a copy of which is provided in **Appendix C**. Thailand advised the meeting that it was their intention to absorb the initial development costs of the BOBCAT system, however, if the BOBCAT system was selected by States for implementation, it was likely that cost-recovery funding arrangements would be required for ongoing operations.

2.34 The purpose of BOBCAT was to regulate the flow of air traffic departing airports from East Asia, Southeast Asia and South Asia which planned to transit the Kabul FIR between the hours of 1900UTC and 2359UTC. Additional to this requirement, the automated programme will also take into account the present bottlenecks caused by merging routes by applying appropriate spacing between aircraft wishing to cross intermediate Gateways enroute to Kabul FIR. A presentation (**Appendix D** refers) on the abilities of BOBCAT was given to the meeting, detailing the various capabilities of the system.

2.35 The meeting was advised that BOBCAT was not intended to "control" aircraft nor take away any of the responsibilities of the ATS providers concerned. The major benefits of the system were expected to be as follows:

a) using flight plan data supplied by airlines on aircraft wishing to enter Kabul FIR during the critical times mentioned in paragraph 2.17 above, sorting will be applied by BOBCAT to ensure a smooth flow of aircraft from departure point to the Kabul Gateways;

b) airlines will be offered several alternative options if their first choice is not successful. These could include alternative levels, alternative ATS routes or a delayed/advanced departure time to meet the requirements of their first option;

c) BOBCAT has the ability to selectively meter all enroute gate times in accordance with requirements decided upon by the ATS provider concerned, however the final Gateways entering Kabul FIR will be metered to ensure that aircraft at the same level transit this airspace with not less than the required longitudinal separation minimum.

d) BOBCAT has the flexibility to manage the flow during contingency conditions given sufficient notice. For example, if a particular or several ATS routes were affected by extreme weather conditions, on request the system would use alternative routing in its selection process;

e) BOBCAT will provide airlines with the final allocation to all aircraft who have submitted slot requests for the nominated period prior to the cut-off time. In other words airlines and other stakeholders would be able to view an overall picture in tabulated form of slot allocation for this period.

BOBCAT System Prototype Demonstration

2.36 A prototype demonstration of the BOBCAT system was presented to the meeting to show the ability of the computer model. The prototype set up several gateways points along major ATS routes through Bay of Bengal and Kabul FIR. For the purpose of the demonstration, only departures from Bangkok, Kuala Lumpur and Singapore were used. The longitudinal spacing parameter for routes over Bay of Bengal and Kabul FIR was assumed to be 10 minutes, while the parameter for routes over continental India was assumed to be 5 minutes. Kabul FIR's flight levels were assumed to be CVSM flight levels with the remaining areas using RVSM flight levels with exception of FL300 on crossing routes over the Bay of Bengal. The demonstration showed an airline dispatcher interface that allowed the dispatcher to input up to three alternate choices of gateways an aircraft would like to take in transit from departing airports through Kabul FIR. In addition, dispatchers have an option of selecting one alternate flight level for each of the gateways. During the demonstration approximately 10 slot requests were inputted into the system, the cut-off time was introduced followed by the system generating the slot allocation and sending the information to dispatchers.

2.37 The meeting noted that, in an effort to gather further advice in display design from the users of the system, AEROTHAI was proposing to visit a number of airline dispatchers to seek input into the development of the final interface between the dispatcher and the BOBCAT system.

Airservices Australia and the FAA DOTS+ System

2.38 The meeting was informed that Airservices Australia had recently acquired the DOTS+ system under a technical assistance agreement with the FAA. The DOTS+ platform had been installed at the Melbourne Centre and was being used to generate daily Flex Tracks for the Australian Organized Track Structure (AUSOTS). Under AUSOTS, and within the Australian FIR, aircraft are permitted to operate on daily Flex Tracks between Singapore, Brisbane, Melbourne and Sydney.

2.39 The meeting noted that the first phase of AUSOTS was successfully implemented on 27 June 2005 and that Airservices Australia was currently conducting a number of post-implementation activities, including a busy ongoing training programme.

2.40 The meeting was also informed that although the Melbourne DOTS+ platform was specifically acquired for Flex Track generation, it was also capable of serving as an automated ATFM system tool, using the "Track Advisory" functionality that currently resides within the DOTS+ core system. However there were certain administrative and operational arrangements that would need to be put in place prior to Airservices Australia being in a position to provide an operational trial using the DOTS+ platform. Further, the meeting was informed that due to other operational priorities within Airservices Australia, it was unlikely that an operational trial could be arranged prior to the beginning of 2006.

The FAA DOTS+ System

2.41 As suitable representation from the FAA was not available to attend the meeting, the attention of the meeting was drawn to the two previous DOTS+ presentations that had been delivered by the FAA at the RVSM/TF/24 meeting (8 – 12 November 2004) and the ATFM/TF/1 meeting (18 – 22 April 2005). In both instances, the FAA had proposed that the web based "Online Track Advisory" function would be utilised in a DOTS+ ATFM system for the Bay of Bengal, however it was emphasised that the "Online Track Advisory" function existed in prototype only at this stage.

2.42 The meeting recalled that the DOTS+ automated flow management system had been in operational use in the United States for more than 10 years. The system had been developed by the FAA, but could be owned and operated by a State ATS provider(s) or by IATA and its member airlines, and the software provided by the FAA under a licensing arrangement.

2.43 During the ATFM/TF/1 meeting, the FAA provided a comprehensive technical, business and financial presentation in relation to a DOTS+ application for the Bay of Bengal. DOTS + could be readily adapted to provide flow management in the Bay of Bengal area, with an implementation time frame in the order of three months.

2.44 The FAA had highlighted the willingness of the FAA to work with the States of the Bay of Bengal in regard to improving the flow of traffic in the area, and advised that the FAA was ready to answer any questions and enter into further discussions at any time. During ATFM/TF/1, the FAA representative cautioned that if a decision to adopt DOTS+ was delayed until the second task force meeting scheduled in June, then it was likely that the FAA would have difficulty meeting the proposed implementation date of 29 September 2005.

2.45 In respect to funding of DOTS+, during ATFM/TF/1 both Singapore and India had offered that, if DOTS+ was selected by the States concerned, they expected to be able to assist with some of the establishment costs. In addition, Australia informed the ATFM/TF/2 meeting the FAA was willing to work with Airservices Australia and others to provide a web-based automated ATFM system tool for deployment in the Bay of Bengal. However there were a number of arrangements that would need to be

made, including the drafting of a suitable technical services agreement, approval by the FAA to use the Melbourne installation in the Bay of Bengal and staffing issues at Airservices Australia.

2.46 The meeting thanked Airservices Australia for its update on the DOTS+ system in Melbourne and noted both the FAA and Airservices Australia present positions on this matter.

AFTM Operational Trial for the Bay of Bengal and South Asia

2.47 In light of the above, the meeting considered available options for the conduct of an ATFM Operational Trial in accordance with Phase One of ATFM across the Bay of Bengal and South Asia. In this regard, the meeting noted Thailand's readiness to proceed to an operational trial and accordingly, the meeting requested Thailand to continue to develop BOBCAT to the stage of an operational trial in close cooperation with concerned States and IATA.

2.48 In response, Thailand advised the meeting that their target date to be ready for this operational trial would be the end of 2005. The meeting agreed to commence an operational trial on AIRAC date 22 December. The results of the trial would be analyzed by the ATFM/TF. Arrangements for the operational trial would be confirmed during the ATFM/TF/3 meeting scheduled in September, 2005.

2.49 The meeting thanked Thailand for its comprehensive presentation on BOBCAT and noted the obvious amount of work that had been undertaken since ATFM/TF/1. The meeting encouraged Thailand to continue this work in the lead-up to the operational trial for BOBCAT.

Flexibility in the choice of routes for the proposed Bay of Bengal ATFM system

2.50 The meeting was informed of IATA's view that there was an imbalance in the distribution of flights on the four routes available through the Kabul FIR. However, given the fact that many of these flights are operating at their maximum range or close to their maximum range, and the fact that operators might have little leeway in making the required adjustments to the fuel or payload carried, the imposition of system preferred routes as opposed to user preferred routes could be difficult for operators to comply with.

2.51 IATA advised the meeting to understand these constraints in developing an ATFM model for this area. Flight Planning options should be available to all airline operators within the ATFM system to enable aircraft to have flexible choices, including delaying their flights in order to flight plan on their most preferred route from departure point to the Kabul FIR.

Outcomes of study into existing constraints and limitations on air traffic flow in the Bay of Bengal by the Airports Authority of India

2.52 India provided the meeting with a detailed report on recent studies undertaken into the following items:

a) Various traffic flows through Bay of Bengal and Indian Airspace and bottlenecks and choke points which adversely affect smooth flow of traffic;

b) Uneven distribution of traffic on all available ATS routes;

c) Options for the decongestion of the traffic flow at all exit points based on the analysis of approved schedule; and

d) Plans to incorporate strategies to alleviate bottlenecks and traffic issues by the ATFM system tool.

Bottleneck Areas

2.53 The traffic flow from Bangkok, Kuala Lumpur and Singapore, using the existing ATS route structure over the oceanic area has some prominent and busy crossing points on various ATS routes viz:

a) Port Blair VOR :- crossing of P762 vs P628
b) North East of Port Blair VOR :- Crossing of L759 vs. P762
c) SADUS crossing of L301 vs. M770
d) MABUR :- Crossing of L301 vs. L759
e) URKOK :-Crossing L301 vs. P628
f) BUBKO :- Crossing of N895 vs. M770

2.54 The ATS route structure in the continental airspace of India is also dotted with crossing points and traffic merging points viz.

a) VIZAG VOR :- Crossing of L301 vs. N877
b) Bhubaneshwar VOR :- crossing of N895 vs. L759
c) Kolkata VOR :- Crossing / merging of L507 vs. A462 / B465 /A791
d) Jamshedpur VOR :- Crossing G450 / A791 / M770 / P646 / B209
e) Khajuraho VOR :- Crossing / merging of L759 / B209
f) Varanasi VOR :- merging of P646/M770 and R460 /M770A
g) Nagpur VOR :- Crossing of G450 vs. N895 / N877
h) Paratapgarh VOR :- Merging of A791 and N877

2.55 The meeting was also advised that the ACCs at Kolkata, Nagpur, Varanasi and Delhi do provide radar services for the crossing traffic but in case of merging traffic procedural separation minimum is applied as such traffic is to be released to subsequent ACC.

ATS Systems serving Bay of Bengal Airspace

2.56 India informed the meeting that ADS/CPDLC was available in Kolkata and Chennai Oceanic airspace but that the number of aircraft logging onto the system was less than forecast. In addition, there were a number of coordination issues with neighbouring FIRs which limits the effective management of crossing traffic within the Kolkata FIR.

2.57 With regard to the RNAV /RNP system of EMARSSH routes, the application of 15 minutes longitudinal separation minimum for the crossing tracks further limits this capacity.

Merging and crossing traffic

2.58 At Khajuraho, Varanasi, TIGER and SAMAR two or more streams of traffic merge into one and proceed further to the west. Invariably one or the other long haul flight gets lower uneconomic level at Varanasi VOR and thus is trapped at a lower level for a long time. Situation is almost similar at TIGER and SAMAR also where traffic flows merge. The meeting was advised that it has also been observed that some airlines are using different routes and different exit points through Indian FIRs, while still operating their flights between the SAME city pairs **(Appendix E** refers). Some flights from Singapore fly via M770 and B209 and exit the Delhi FIR at TIGER. Such flights can also flight plan via P628, which is a much shorter route to RK VOR in Pakistan. In addition, it had been observed that during

peak traffic periods at SAMAR and TIGER, there was very little traffic transiting VIKIT (**Appendix F** refers).

2.59 The meeting was further advised that there are some flights between the Far East and Middle East that operate during the peak traffic period in Kolkata FIR. In addition, flights also depart from Dhaka during the night time for the Middle East and conflict with the peak hour traffic for Europe via the Kabul FIR. The presence of these flights operating from east to west also has to be accounted for in the ATFM service.

Possible solutions

2.60 India advised that, in order to overcome some of the operational difficulties experienced within Indian airspace, the meeting was asked to consider various Short Term and Long Term solutions

Short Term

a) Mandatory provision of ADS/CPDLC in Bay of Bengal airspace to facilitate the implementation of reduced Longitudinal and Lateral separation.

b) Consideration to having some aircraft flight plan on P628 in lieu of L759 based on the current schedule.

c) Proposal to suspend operations on B209 on a trial basis for a few weeks to achieve two clear streams of traffic without conflicts over Khajuraho 'KKJ' VOR.

d) Revival of a previous operational trial of air traffic flow enhancements across the Bay of Bengal area.

Note 1: With regard to item c), the meeting noted India's proposal to temporarily suspend operations on B209.

Note 2: With regard to item d), the meeting was informed that Malaysia, Singapore and Thailand had previously agreed to continue with the trial on air traffic flow enhancement from July to Sept 2005.

Long Term

a) Early implementation of a suitable ATFM tool incorporating operational requirements of various States;

b) Early implementation of appropriate ATC system in Afghanistan;

c) Implementation of RVSM in Kabul FIR; and

d) Release of FL 280 on 24 Hour basis by Kabul on all four ATS Routes transiting the Kabul FIR

2.61 The meeting was advised that India had trained several Afghanistan Air Traffic Controllers and is providing further assistance in the provision of Air Traffic Services within the Kabul FIR.

Agenda Item 3: Operational Trial Considerations

Establishment of an AFTM Project Management Team

3.1 In considering the number of specialized tasks that would be required before the implementation of an Operational Trial, the meeting formed the view that these matters would be best progressed through the establishment of an ATFM Project Management Team. It was further agreed that the Project Management Team would comprise members of the Core Team as well as designated Subject Matter Experts (SMEs).

3.1.1. Amongst other tasks, the project management team would define the parameters to be applied in the ATFM system tool to facilitate the application of the required longitudinal spacing between aircraft operating at the same flight level transiting the Kabul FIR.

Special cooperative arrangements between India and Thailand

3.2 The meeting also recognized that there were a number of unique and important operational issues that would need to be discussed between India and Thailand in close coordination and partnership basis in preparation for the implementation of the ATFM Operational Trial. In this regard the meeting encouraged both States to enter into special coordination and liaison activities to resolve these matters. It was requested that the parties report progress in these matters to the ATFM Project Management Team.

ICAO Guidance Material on ATFM system implementation

3.3 The attention of the meeting was drawn to the various references within the ICAO annexes and documents which related to the planning and implementation of ATFM services and agreed that these references should be taken into consideration in the continued development of an ATFM service for the Bay of Bengal and South Asia.

3.4 These references are:

Regional Air Navigation Agreements	Annex 11 Ch3.7.5 PANS-ATM Ch3.2.1 BANP Part V.II EUR ANP Part V.III EUR ANP FASID PV.III
Cooperation and Coordination	Doc 9426-2 Ch 1.1 Doc 9426-2 Ch 1.2.4.9 Doc 9750-2 Ch 12.14 - 32
Strategic and tactical functions	Doc 9426-2 Ch 1.2.4.10
Acceptance rates	Doc 9426-2 Ch 1.2.4.13
ATFM Central Unit	Annex 11 Ch 3.7.5 PANS-ATM Ch 3.2.1 Doc 9426-2 Ch1.2.4.16 Doc 9750 Ch 4 APDX B

ATFM Procedures, Planning & Operations & Including Traffic Orientation Scheme (TOS)		PANS-ATM Ch 3.2.3 – 6
Exemptions from flow control measures		Doc 9426-2 Ch1.2.4
Start-up Procedures and		PANS-ATM Ch 7.3
Control of departing aircraft		PANS-ATM Ch 7.8
Legal issues:	Respect of State sovereignty	Doc 9750-2 Ch 1-I-11.16 & 17
	Liability	Doc 9750-2 Ch I-11-26

Agenda Item 4: Flow Management Handbook

4.1 The meeting recalled the guidance provided under ICAO DOC 4444 (PANS-ATM) chapter 3.2.1.5 and noted that the First Meeting of the Bay of Bengal and South Asia Air Traffic Flow Management Task Force (ATFM/TF/1) had agreed that an ATFM Operations Handbook of some kind should be developed as a Task List item. The meeting also recalled that the ATFM/TF/1 meeting had agreed that the ATFM Handbook should include the operating procedures and associated guidance material for the ATFM Unit, ATS Providers and Airline operators.

4.2 In this regard, the meeting was presented with a first draft of the Bay of Bengal and South Asia ATFM Users manual (V1.0) for consideration and amendment by the meeting. The attention of the meeting was also drawn to the structure of the Manual, which provided for a two-part format, under which Part I was assigned to the "Traffic Management Plan" and Part II assigned to the "ATFM System Tool & Operations".

4.3 The meeting agreed that the words "Users Manual" were not the most appropriate in this context and agreed that the document would be titled the "Flow Management Handbook".

Agenda Item 5: Review and Update ATFM/TF Task List

5.1 The meeting reviewed and updated the Task List in light of the inputs and discussions that occurred during the ATFM/TF/2 meeting. The revised Task List is shown as **Appendix G**.

Agenda Item 6: Develop a Coordinated Plan for implementation of actions agreed by the Task Force

6.1 The meeting had insufficient time to address this agenda item. Further actions on this item will be dealt with at subsequent meetings.

Agenda Item 7: Any Other Business

Air Traffic Growth- Challenges and Solutions

7.1 IATA advised the meeting that the rate of growth in air traffic, especially within the Asia and Pacific region is posing a challenge to Air Traffic Services providers in developing their air traffic management infrastructure, systems and procedures in conformity with the demand, to ensure a safe, secure and expeditious flow of air traffic.

7.2 The meeting was informed that airspace capacity in the Bay of Bengal and South Asia is not being utilized in accordance with CNS/ATM expectations. Parts of this airspace at present are not under surveillance and there are areas where communications for air traffic services is not reliable. IATA advised that there were several areas within South Asia which would require improvement to cater for the present and forecast increase in aircraft movements.

7.3 IATA informed the meeting that serious consideration should be given to address these issues especially in regard to the overall management of traffic in the Bay of Bengal and South Asia area and at international airports in the region through the development of infrastructure, systems and procedures to streamline the flow of traffic, alleviate congestion and reduce ground delays at international airports.

Afghanistan Report on present and future air traffic operations

7.6 The Manager of the Kabul ACC provided the meeting with an update on the Kabul ACC services as per changes which were implemented on 15 May 2005. Under these new arrangements, Air Traffic is controlled under authority of the Afghanistan Government Ministry of Communication and Tourism (MOCAT) in collaboration with the United States Military CENTAF forces.

7.7 The meeting noted that Class A airspace now exists along those ATS routes which are approved for use by civil aircraft, between FL310 and FL430 (inclusive). Class E airspace now exists at or below FL290 along the same ATS routes. All other airspace within the Kabul FIR remains as Class G.

7.8 The meeting was also requested to note that the ATS routes were restricted to only 10NM either side of centerline track. More details are provided on the May 2005 publication of charts for Afghanistan.

7.9 In addition to these airspace changes, the Manager of the Kabul ACC also informed the meeting of recent and proposed improvements to ATS facilities, including VSAT voice coordination channels, VHF, and AFTN communications.

Agenda Item 8: Date and Venue for the next meeting

8.1 The meeting agreed that the ATFM/TF/3 would be held on 6 – 9 September 2005, at a venue yet to be determined.

Closing of the meeting

8.2 The Chairman thanked all participants for their active participation and cooperation which had contributed significantly to the successful outcome of the meeting. The Chairman also expressed his sincere appreciation to the Airports Authority of India for hosting the ATFM/TF/2 meeting and for its support in providing full support to the meeting.

……

LIST OF PARTICIPANTS

STATE/NAME	DESIGNATION/ADDRESS	CONTACT DETAILS
AFGHANISTAN		
Mr. Arthur Gumtau	Afghanistan	Tel: +9370239899 E-mail: ARTgumt@gmail.com
AUSTRALIA		
Mr. Ron Rigney	ATM International Liaison Manager Airservices Australia Locked Bag 747 Eagle Farm QLD Australia 4009	Tel: +61 7 3866 3487 Fax: +61 7 3866 3402 Email: ron.rigney@airservicesaustralia.com
INDIA		
Mr. Srikrishan	Executive Director [ATM] Airports Authority of India Rajiv Gandhi Bhavan Safdarjung Airport New Delhi 110003 India	Tel: ++91 11 24631684 Fax: ++91 11 24611078 E-mail: edatmchqnad@aai.aero
Mr. Somasundaram	General Manager [ATM] Airports Authority of India Rajiv Gandhi Bhavan Safdarjung Airport New Delhi 110003 India	Tel: ++91 11 24652648 Fax: ++91 11 24611078 E-mail : gmatmchqnad@aai.aero
Mr. S.K. Saha	General Manager [AIS] Airports Authority of India Rajiv Gandhi Bhavan Safdarjung Airport New Delhi 110003 India	Tel: ++91 11 24615508 Fax: ++91 11 24615508 E-mail: gmais@aai.aero
Mr.A.K.Dutta	Dy.General Manager [Ops] Airports Authority of India Rajiv Gandhi Bhavan Safdarjung Airport New Delhi 110003 India	Tel: ++91 11 24652649 Fax: ++91 11 24611078 E-mail : akdutta@aai.aero
Mr. M C Dangi	Dy.General Manager [Ops] Airports Authority of India Rajiv Gandhi Bhavan Safdarjung Airport New Delhi 110003 India	Tel: ++91 11 24652649 Fax: ++91 11 24611078 E-mail : mcdangi@aai.aero & mcdangi@yahoo.co.in
Mr. B.V.K. Pillai	Dy.General Manager [S&P] Airports Authority of India Rajiv Gandhi Bhavan Safdarjung Airport New Delhi 110003 India	Tel: ++ 91 11 25071231 E-mail : bvinodpillai@rediffmail.com

STATE/NAME	DESIGNATION/ADDRESS	CONTACT DETAILS
Mr.N.S.Dagar	Dy.General Manager [Av.Safety] Airports Authority of India Rajiv Gandhi Bhavan Safdarjung Airport New Delhi 110003 India	Tel: ++ 91 11 11 24610516 E-mail: nsdagar@rediffmail.com
Mr. R.R. Saxena	Asst.General Manager [Ops] Airports Authority of India Rajiv Gandhi Bhavan Safdarjung Airport New Delhi 110003 India	Tel: ++ 91 11 24632950 Ext.2230 Fax: ++ 91 11 24611078 E-mail
Mr. B. Singh	General Manager [Aero] Airports Authority of India New ATS Complex IGI Airport New Delhi India	Tel: ++91 11 25654367 Fax: ++91 11 25654368 E-mail : gmatmpalam@aai.aero
Mr. Jyoti Prasad	Addl.General Manager [ATC] Airports Authority of India New ATS Complex IGI Airport New Delhi India	Tel: ++ 91 11 25654372 Fax: + +91 11 25654367 E-mail : jyotiprasad511@rediffmail.com
Mr. P. K. Mishra	Dy.General Manager [ATC] Airports Authority of India New ATS Complex IGI Airport New Delhi India	Tel: ++91 11 25653471 Fax: ++91 11 25653286 E-mail : pkm_aai@rediffmail.com
Mr. S.K.Oberoi	Dy.General Manager [ATC] Airports Authority of India New ATS Complex IGI Airport New Delhi India	Tel: ++91 11 25653283 Fax: ++91 1125653284 E-mail:suniloberoi59@rediffmail.com
Mr. Kanahya Lal	Dy.General Manager [ATC] Airports Authority of India New ATS Complex CSI Airport Mumbai India	Tel: ++91 22 26828088 Fax: ++91 22 26828066 E-mail:jaiswalkl@yahoo.co.in
Mr. A. K. Meena	Dy.General Manager [ATC] Airports Authority of India New ATS Complex CSI Airport Mumbai India	Tel: ++91 22 26828088 Fax: ++91 22 26828066 E-mail:anil_meena@indiatimes.com
Mr. Sarangapani	Dy.General Manager [ATC] Airports Authority of India New ATS Complex Chennai Airport Chennai India	Tel: ++91 44 22561538 Fax: ++91 44 22340885 E-mail: sarankan@rediffmail.com

STATE/NAME	DESIGNATION/ADDRESS	CONTACT DETAILS
Mr. N. Ganesh	Dy.General Manager [ATC] Airports Authority of India New ATS Complex Chennai Airport Chennai India	Tel: ++91 44 22560251 Fax: ++91 44 22561364 E-mail: narayannganesh@rediffmail.com
Mr. Ashok Kumar	Dy.General Manager [ATC] Airports Authority of India New ATS Complex Chennai Airport Chennai India	Tel: ++91 44 22561365 Fax: ++91 44 22561365 E mail: mashokdgm@yahoo.co.in
Mr. Yudhistir Sahoo	Dy.General Manager [ATC] Airports Authority of India New ATS Complex NSCBI Airport Kolkata India	Tel: ++91 33 25111886 Fax: ++91 33 25130134 E-mail: ysahoo2002@yahoo.co.in
Mr. Amit Bhaumik	Asst.General Manager [ATC] Airports Authority of India New ATS Complex NSCBI Airport Kolkata India	Tel: ++91 33 25119520 Fax: ++91 33 25130134 E-mail : bhaumikraja@yahoo.com
Mr. S.C.Hota	Dy. General Manager [ATC] Airports Authority of India Ahmedabad Airport Ahmedabad India	Tel: ++91 79 22885374 Fax: ++91 79 22863561 E-mail : schota@indiatimes.com
Mr. Pradip Kandoth	Dy.General Manager [ATC] Airports Authority of India Varanasi Airport Varanasi India	Tel: 9444012108 [Mob] Fax: ++91 542 2623671 E-mail : pkandoth@rediffmail.com
Mr. Nageshwara Rao	Dy.General Manager [ATC] Airports Authority of India Nagpur Airport Nagpur India	Tel: ++91 712 2288003 Fax: ++91 712 2288007
Mr. K.Gohain	Jt.Director General of Civil Aviation DGCA Opp. Safdarjung Airport New Delhi110003 India	Tel: ++ 91 11 24629539 Fax: ++91 11 24629539
Mr. J.S.Rawat	Director [Ops] DGCA Opp. Safdarjung Airport New Delhi110003 India	Tel: ++ 91 11 24641435 Fax: ++ 91 11 24641435 E-mail: doas@dgca.nic.in
Mr. A K Sardana	Deputy Director [Ops] DGCA Opp. Safdarjung Airport New Delhi110003 India	Tel: ++91 11 24644768 Fax: ++91 11 24644764 E-mail : ffoi@dgca.nic.in

STATE/NAME	DESIGNATION/ADDRESS	CONTACT DETAILS
Mr. A K Bhardwaj	Deputy Director [Ops] DGCA Opp. Safdarjung Airport New Delhi110003 India	Tel: ++91 11 24622495 Ext. Fax: ++ 91 11 24629221
Mr. Bharat Bhushan	Deputy Director [Ops] DGCA Opp. Safdarjung Airport New Delhi110003 India	Tel: ++91 11 24641435 Fax: ++91 11 24641435 E-mail : bbbharat@yahoo.com
Mr. V P Singh	Asst. Director [Ops] DGCA Opp. Safdarjung Airport New Delhi110003 India	Tel: ++91 11 24641435 E-mail : vpslodhi@yahoo.com
Mr. D C Sharma	Senior Air Safety Officer DGCA Opp. Safdarjung Airport New Delhi110003 India	Tel: ++91 11 24615070 Fax: ++91 11 24690321
Mr. R.P. Kashyap	Operation Officer DGCA Opp. Safdarjung Airport New Delhi110003 India	Tel: ++91 11 24620273 Fax: ++91 11 2433140 E-mail : rpkashyap1929@rediffmail.com
INDONESIA		
Mr. M. Nasir Usman, SSIT	Chief of ATC Section Directorate General of Air Communications Jl. Medan Merdeka Barat No.8 Gedung Karya Lt.23 Jakarta Indonesia	Tel: 62-21-3506451, 3506617 Fax: 62-21-3507569 E mail:
MALAYSIA		
Mr. Mohd Salihin Yahya	Assistant Director Department of Civil Aviation 47200 Subang Airport Selangor Malaysia	Tel: 603-7846 5233 Fax: 603-7847 2997 E-mail: salihin@atsdca.gov.my
Mr. Kachat Din Mee	Deputy Director Department of Civil Aviation 47200 Subang Airport Selangor Malaysia	Tel: 603-7847 3573 Fax: 603-7847 3572 E-mail: chatdinmee@yahoo.com
SINGAPORE		
Mr. Kuah Kong Beng	Head (ATC Operations) Civil Aviation Authority of Singapore Singapore Changi Airport P.O. Box 1 Singapore 918141	Tel: 65-6541 2405 Fax: 65-6545 6516 E-mail: kuah_kong_beng@caas.gov.sg

STATE/NAME	DESIGNATION/ADDRESS	CONTACT DETAILS
Mr. Heng Cher Sian, Edmund	Project Officer (Airspace) Civil Aviation Authority of Singapore Singapore Changi Airport P.O. Box 1 Singapore 918141	Tel: 65-6541 2457 Fax: 65-6545 6516 E-mail: Edmund_heng@caas.gov.sg
Mr. Tai Kit	ATC Manager Civil Aviation Authority of Singapore Singapore Changi Airport P.O. Box 1 Singapore 918141	Tel: 65-6541 2668 Fax: 65-6545 6252 E-mail: tai_kit@caas.gov.sg
SRI LANKA		
Mr. D.M.P. Dissanayake	Deputy Director (Aeronautical Services) Civil Aviation Authority of Sri Lanka No. 64, Galle Road Colombo 03 Sri Lanka	Tel: 94 11 2436324 Fax: 94 11 2440231 E-mail: parad@sri.lanka.net
THAILAND		
Mr. Tinnagorn Choowong	Air Traffic Control Manager Aeronautical Radio of Thailand Ltd. 102 Ngamduplee, Rama4 Rd. Sathorn, Bangkok Thailand 10120	Tel: +66-2-285 9975 Mobile: +66-9-8166486 Fax: +66-2-287 8424 E-mail: tinnagorn.ch@aerothai.co.th
Mr. John Richardson	Air Traffic Management Consultant Aeronautical Radio of Thailand Ltd. 102 Ngamduplee, Rama4 Rd. Sathorn, Bangkok Thailand 10120	Tel: +66-2-285 9975 Fax: +66-2-287 8424 Mobile: 66-01-8242467 E-mail: jricho282@yahoo.com
Mr. Piyawut Tantimekabut	Air Traffic Service Engineer Research and Development Dept. AEROTHAI 102 Ngamduplee Thungmahamek Bangkok 10120, Thailand	Tel: +66-2-287 8616 Fax: +66-2-287 8620 E-mail: piyawut.ta@aerothai.co.th
IATA		
Mr. Soon Boon Hai	Assistant Director, Safety Operations & Infrastructure – Asia/Pacific International Air Transport Association 71 Robinson Road #05-00, SIA Building Singapore 068896	Tel: 65-6239 7267 Fax: 65-6536 6267 E-mail: soonbh@iata.org
Capt. Aric Oh	Deputy Chief Pilot (Technical) Singapore Airlines Flight Operations Technical (SIN-STC 04-C) SIA Training Centre 04-C 720 Upper Changi Road East Singapore 486852	Tel: +65-6540 3694 Fax: +65-6542 9564 E-mail: aric_oh@singaporeair.com.sg

STATE/NAME	DESIGNATION/ADDRESS	CONTACT DETAILS
Capt. Murali Katari	Management Pilot – Special Duties (Technical) Flight Operations Singapore Airlines SIA Training Centre 04-C 720 Upper Changi Road East Singapore 486852	Tel: +65-6548 1677 Fax: +65-6490 0601 E-mail: Murali_Katari@singaporeair.com.sg
Mr. Victor Yeoh	Manager Flight Operation Technical SIA Training Centre 04-C 720 Upper Changi Road East Singapore 486852	Tel: +65-6540 3406 Fax: +65-6490 0601 E-mail: victor_yeoh@singaporeair.com.sg
Mr. Owen Dell	Manager, International Operations Cathay Pacific Airways Limited International Affairs Department 9/F Central Tower, Cathay Pacific City 8 Scenic Road Hong Kong International Airport Lantau, Hong Kong, China	Tel: +852 2747 8829 Fax: +852 2141 8829 E-mail: owen_dell@cathaypacific.com
Mr. P. C. Goel	Asstt. Director, Safety Operations & Infrastructure IATA- India	Tel: ++91 11 25552806 Mob: 9810016825 E-mail:
ICAO		
No representation	Regional Officer, ATM ICAO Asia & Pacific Office P.O.Box 11 Samyaek Ladprao Bangkok – 10901 Thailand	Tel: 66-2-5378189 ext 159 Fax: 66-2-5378199 AFTN: VTBBICOX E-mail: atiede@bangkok.icao.int

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

WORKING PAPERS

NUMBER	AGENDA	WORKING PAPERS	PRESENTED BY
WP/1	1	Provisional Agenda	Secretariat
WP/2	6	History of the ATFM Task Force	Secretariat
WP/3	5	ATFM/TF Task List	Secretariat
WP/4	4	ATFM Users Manual	Secretariat
WP/5	6	ICAO Guidance Material on ATFM Service Provision	Secretariat
WP/6	2	Airservices Australia and the FAA DOTS+ System	Australia
WP/7	2	Flexibility in the choice of routes for BOB ATFM system	IATA
WP/8	2, 3	Proposal to develop, trial and implement an Air Traffic Flow Management (ATFM) Automated Advisory System Tool (BOBCAT) to manage westbound aircraft planning to transit the Kabul FIR	Thailand
WP/9	3	Constraints and Limitations on Air Traffic Flow in the Bay of Bengal airspace and Beyond, and possible solutions	India
WP/10	6	Air Traffic Growth – Challenges and Solutions	IATA

INFORMATION PAPERS

NUMBER	AGENDA	INFORMATION PAPERS	PRESENTED BY
IP/1	-	List of Working Papers (WPs) and Information Papers (IPs)	Secretariat

…….

CONCEPT OF OPERATION

BAY OF BENGAL COOPERATIVE ATFM ADVISORY SYSTEM (BOBCAT)

Presented by AEROTHAI

Draft Version 2.0

Bay of Bengal Cooperative ATFM Advisory System (BOBCAT)
Concept of Operation

1. OVERVIEW

1.1 This paper delineates the AEROTHAI Bay of Bengal Cooperative ATFM Advisory System (BOBCAT), which has been conceived and developed to manage air traffic transiting the Kabul FIR by taking into account constraints of key gateway points and route segments aircrafts transit while in en-route to the Kabul FIR. In perspective, these gateway points and route segments are resources that need to be rationed out in time, so as to satisfy minimum spacing requirements of those route segments.

1.2 Airline dispatchers will be able to request multiple choices of gateway point arrival times and route segment flight levels which an aircraft prefers to use in transit to Kabul FIR several hours ahead of actual entry time into Kabul FIR. After an agreed cutoff time for inputting requests, BOBCAT processes requests from airlines, based on past usage statistics of each flight level route segment/gateway point combination, and notifies airline dispatchers of their assigned estimated time over (ETO) on each gateway point and flight level to be used in transit between gateway points.

1.3 Airline dispatchers of flights that have not been assigned slots of gateway ETO and flight level from their requests will be provided with suggestions of available routes the flight can transit based on availability of slots within the system. Air Traffic Service Providers (ATS Providers) would have the capability to securely login to the system to view results of all slot allocations, in addition to viewing past slot allocation result. In the meantime, system ATFMU Specialist operating BOBCAT would have a similar capacity to ATS Providers in viewing results of slot assignments. In addition, on request from dispatchers, other functions could also be performed.

2. INTRODUCTION

2.1 While the recent introduction of RVSM and EMARSSH dramatically increased airspace capacity of India, airspace capacity over Kabul FIR remained unchanged. This situation caused some aircraft transiting to Kabul FIR to be redirected into Iran FIR due to insufficient spacing. Aircraft rerouting in the region has financial implications to airlines which may require unscheduled technical stops, causing delays as well as subsequent financial penalties.

Table 1: Traffic statistics through Kabul FIR
3 April 2005 – 9 April 2005, 1900UTC – 2359UTC

Date	G792/ V390	L750	N644	A466	Total
3 April 2005	4	14	19	2	39
4 April 2005	10	9	15	9	43
5 April 2005	1	16	17	3	37
6 April 2005	0	23	24	7	54
7 April 2005	0	26	19	8	53
8 April 2005	0	16	25	9	50
9 April 2005	2	13	17	12	44
Total	**17**	**117**	**136**	**50**	**320**

2.2 In analyzing the problem, statistics from Lahore FIR giving breakup of aircraft using the four available routes through Kabul FIR between 3 April 2005 and 9 April 2005 has been collected (See Table 1). The statistic from the study shows excess use of routes L750 and N644, while route G792/V390 and A466 were less used. This could imply that episodes of aircraft reroutes and unscheduled technical stops were actually caused by uncoordinated air traffic flow into the Kabul FIR.

2.3 The AEROTHAI Bay of Bengal Cooperative ATFM Advisory System (BOBCAT) has been conceived to solve the problem of transiting the Kabul FIR by taking into account constraints of key gateway points and route segments while in transit to Kabul FIR. In perspective, these gateway points and route segments are resources that need to be rationed out in time, so as to satisfy minimum spacing requirements along those route segments. In rationing these resources, we believe that flights choosing to transit less congested route segments even if the route is requested as their alternate routes exhibit flexibility in aircraft's request.

2.4 Within the context of the BOBCAT, airline dispatchers will be able to request multiple choices of gateway point arrival and route segment flight levels to use in planning en route and in transit through the Kabul FIR several hours ahead of actual entry time into Kabul FIR for each flight transiting Kabul FIR. After an agreed cutoff time for inputting requests, BOBCAT processes requests from airlines and notifies airline dispatchers of their assigned ETO on each gateway point and flight level used in transit between gateway points. At this time, aircrafts that have not been assigned slots of gateway ETO and flight level from their requests will be provided with suggestions of available routes the flight can transit based on availability of slots within the system. Airline dispatchers who are not satisfied with their assignment can also cancel their requests and request new slot assignment based on availability.

2.5 In the meantime, ATS Providers with gateway points within their area of responsibility could also login to the system to view results of slot allocations for aircrafts in transit to Kabul FIR, in order to plan their air traffic management.

2.6 BOBCAT would be run by an ATFMU Specialist who will coordinate with ATS Providers concerned in cases where an adjustment of flow properties of each route segment is required.

3. THEORY OF OPERATIONS

3.1 The BOBCAT operation is divided into three phases:

- *Slot Request Submission:* Airline dispatchers log into the system to submit slot requests for flights transiting into Kabul FIR within the timeframe to be agreed on, either based on previous slot requests saved in the system or based on new set of requests. At the time of request submission, each request is scored individually according to policy stated in Section 3.2.

- *Cut-off Time Slot Assignment:* After the agreed cut-off time arrives, BOBCAT automatically processes all slot requests within the timeframe and assign slots to requesting flights based on policy and algorithm stated in Section 3.9.

- *Post-Cut-off Time Real-time Slot Assignment:* After slot assignment has been made, airline dispatchers whose flights were not assigned slots or were unable to request slot prior to the cut-off time will log into the BOBCAT system to request slot assignment based on real-time availability. The assignment policy is stated in Section 3.14.

Slot Request Scoring

3.2 During the time when airline operator submits each flight's alternate route, scoring of each alternate would be calculated and displayed. The scoring is calculated as follows.

a) Past usage statistics from the same day of week last week for each flight level of route segment/gateway fix is considered. For example, if the current slot request is for the period of time of Wednesday, 22 June 2005 during time period 2000UTC – 2059UTC, usage statistics of Wednesday, 15 June 2005 during time period 2000UTC – 2059UTC will be considered. Assume we have arrival statistics for gateway point Dera Ismail Khan (DI) for flights transiting onto airway N644 as in Table 2.

Table 2: Hypothetical flight statistics through DI gateway

Flight Level	ETO	Flight Callsign
FL280	2005	AI 111
FL310	2002	BA 134
	2015	LH 120

	2039	BA 121
FL350	2031	TG 512
	2045	DA 384
FL390	2001	VN 123

3.3 Given that the minimum spacing between flights transiting route segment of airway N644 over Kabul FIR from DI gateway point is 10 minutes, we realize that the maximum of six aircraft can transit DI gateway point to Kabul FIR. But in fact, the number of aircrafts transiting each flight level of the N644 route segment on 15 June 2005 was as in Table 2. We can calculate the percentage usage of the route segment concerned. For example, FL310 is 50% used, which implies that it is 50% free. The usage and free capacity of the route segment is shown in Table 3.

Table 3: Calculation of used capacity and free capacity given data from Table 2

Flight Level	Maximum Usage	Actual Usage	Used Capacity	Free Capacity
FL280	6	1	16.67%	83.33%
FL310	6	3	50.00%	50.00%
FL350	6	2	33.33%	66.67%
FL390	6	1	16.67%	83.33%

3.4 We then use percentage of free capacity of the route segment as “score” of the particular flight level of route segment/gateway point for the allocation of Wednesday, 22 June 2005 during the time period 2000UTC – 2059UTC.

3.5 Therefore, each route segment has an associated score for each slot assignment time period. We average the score of all route segment flight level requests within a sequence of route segments being requested by an airline dispatcher. Since BOBCAT allows entering alternate flight levels for each route segment, score of all alternate route segments would also be used to compute the average score of the route request. A route segment scoring example is shown in Table 4.

Table 4: Hypothetical of an individual flight request scoring calculation

TG 512	BKK/L507	LLK/P646	DI/N644	Score Sums
Flight Level (Planned)	FL280	FL320	FL350	
Score (%Free)	83.33	50.00	66.67	200.00
Flight Level (Alternate 1)	FL 300	FL340	N/A	
Score (%Free)	50.00	33.33	N/A	83.33
Sum of Scores	133.33	83.33	66.67	283.33
Average				**56.67**

3.6 Afterwards, scores of all alternate route requests of a flight would be averaged to obtain average score of the flight's requests. This represents average free capacity of routes requested by the flight, which in turns represents the degree of flexibility of the airline dispatcher's willingness to use less used route segments.

3.7 Since we also need to satisfy airlines' need of considering the first alternate prior to second and next alternates, we scale down the score of each alternate requests so that the first alternate receives the average score of all requested segments calculated before and the next alternate receives lower score. In our case, we take the entire average score and divide the score by the alternate number of the request. Sample calculation is shown in Table 5.

Table 5: Hypothetical flight requests scoring adjustment calculation

TG 512	Average Score	Average Flight Score	Scaled Score
Request 1	33.33	52.22	*52.22*
Request 2	56.67		*26.11*
Request 3	66.67		*17.41*

3.8 At this point, all route requests are saved into the BOBCAT's request database for appropriate cutoff-time slot assignment.

Cutoff-Time Slot Assignment

3.9 Once the cut-off time arrives, BOBCAT would gather all of the slot requests and rank the slot requests by scores each of the requests was assigned when airline operators submit flight requests into the system.

3.10 Request with best scoring (the first alternate request of flight requesting least congested flight level route segments in the past) would be allocated slot followed by the request with next best scoring. BOBCAT would check for possible conflicts with any other previously processed requests before assigning slot to a flight request. The conflict detection checks possible conflicts starting

from the entry point into Kabul FIR and tracks backwards to the point of departure location or the point of entry into the managed airspace.

3.11 If a conflict occurs such that minimum spacing could not be maintained on any segment of the requested preference, the next highest flight level alternate of the conflicting route segment is considered. The conflict detection tries all possible alternates until there is no other alternate flightf level for the conflicting route segment, after which the request is discarded and request with the next best score is considered.

3.12 If an entire request has been granted assignment, all other alternate requests of the flight will be discarded. However, if a segment of a request is not granted assignment, any previous assignment for the concerning flight from the same preference level will be removed from the assignment list.

3.13 This process continues until all requests have been either discarded or processed. After the allocation is completed, the system notifies all related stakeholders such as airline dispatchers of each requesting flights, ATS Providers and system ATFMU Specialist of the results.

Real-Time On-Demand Slot Request

3.14 Once the cutoff-time for slot assignment has passed and slot assignment has been performed on requests submitted before the cutoff-time, BOBCAT allows airline dispatchers to login to the system to re-request slot assignment based on real-time slot availability. BOBCAT shows all available ETO on all flight levels of route segments connected to the gateway point entering into Kabul FIR, calculated based on the flight's operating speed, for the dispatcher to select and enter the ETO.

3.15 After selecting the last gateway point, the available next last gateway point and appropriate flight level route segment availability would be shown for the dispatcher to choose. This process continues until the dispatcher reaches the entry point into the airspace managed by BOBCAT.

3.16 Airline dispatchers of flights which were not assigned requested routes would also be shown suggested delay for each alternate route requests previously submitted for the flight.

3.17 Future revision of the BOBCAT will also list available sequences of gateway point/route segment flight level based on entry point into the system as well as allowing airline dispatchers to select available routes with the stated procedure.

4. SYSTEM FUNCTIONALITY AND REQUIREMENTS

4.1 BOBCAT should have the following functionalities:

- ❖ Airline operators can request as many alternate path set (containing series of route segment flight levels and gateway fixes) for a given flight as they would like to.

- ❖ Airline operators can request as many alternate flight levels for a route segment as they would like to.

- ❖ Automatically checking of airline dispatchers' request input for values such as time.

- ❖ Spacing of flights en route between gateways can be metered as per ATS Providers requirements.

- ❖ Mach number technique on both faster aircraft in the back and faster aircraft in the front implemented to ensure metered spacing would be valid at the end of a route segment.

- ❖ Gateway point, flight level, spacing metering for all gateways can be configured in real-time.

- ❖ Gateways can be added, removed or modified dynamically.

4.2 Meanwhile, it has the following requirements:

- ❖ Records of airline request and assignment will need to be kept for at least 30 days.

- ❖ Airline dispatchers need to be able to enter flight requests into the system from a simple user interface.

- ❖ Airline dispatchers need to be notified of results of gateway slots he is allocated.

- ❖ ATS Providers need to be able to view slot allocation results related to his operation.

5. USER INTERFACES

5.1 BOBCAT interacts with three different groups of users: airline dispatchers, ATS Providers and ATFMU Specialist. Interaction with these groups is delineated in Sections 5.2, 5.11, and 5.14 respectively.

Airline Dispatchers

5.2 Several hours prior to an agreed cutoff time, airline dispatchers can securely login to the BOBCAT web interface to submit slot requests for gateway point/route segment flight level while in transit to Kabul FIR.

5.3 As well as aircrafts transiting Kabul FIR, other aircrafts departing from Southeast Asian or East Asian airports which also use prime en-route airways through India and Pakistan being used by Kabul traffic during the time of operation of the ATFMU will also need to join slot allocation scheme.

5.4 Several key information pertinent to airline dispatcher's slot request decision such as an overview of results from last slot assignment will be shown at login time. A home screen after a dispatcher's logon is shown in Figure 1.

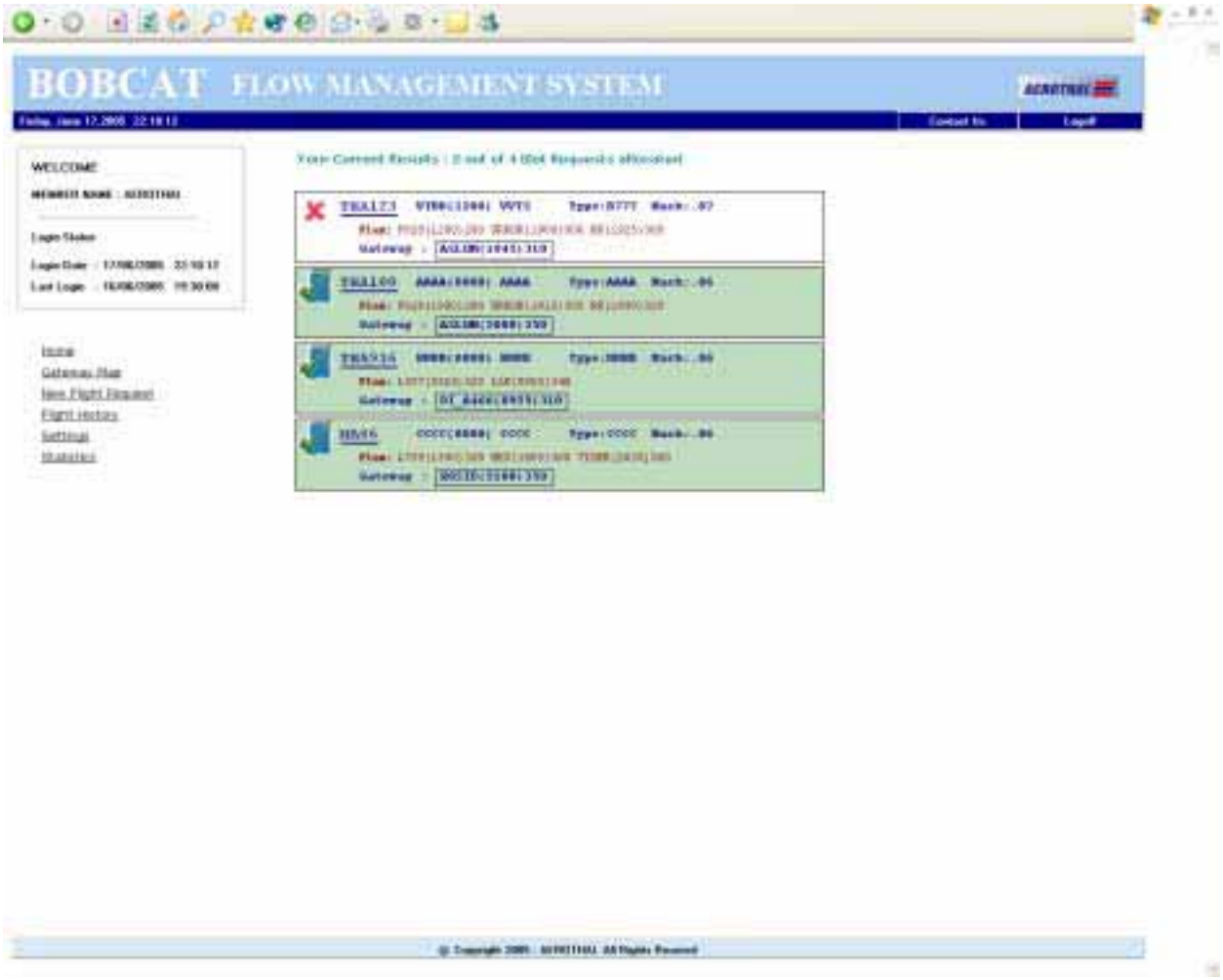


Figure 1: Airline dispatcher default screen after successful logon into BOBCAT

5.5 The user interface for requesting gateway point/route segment is shown in Figure 2.

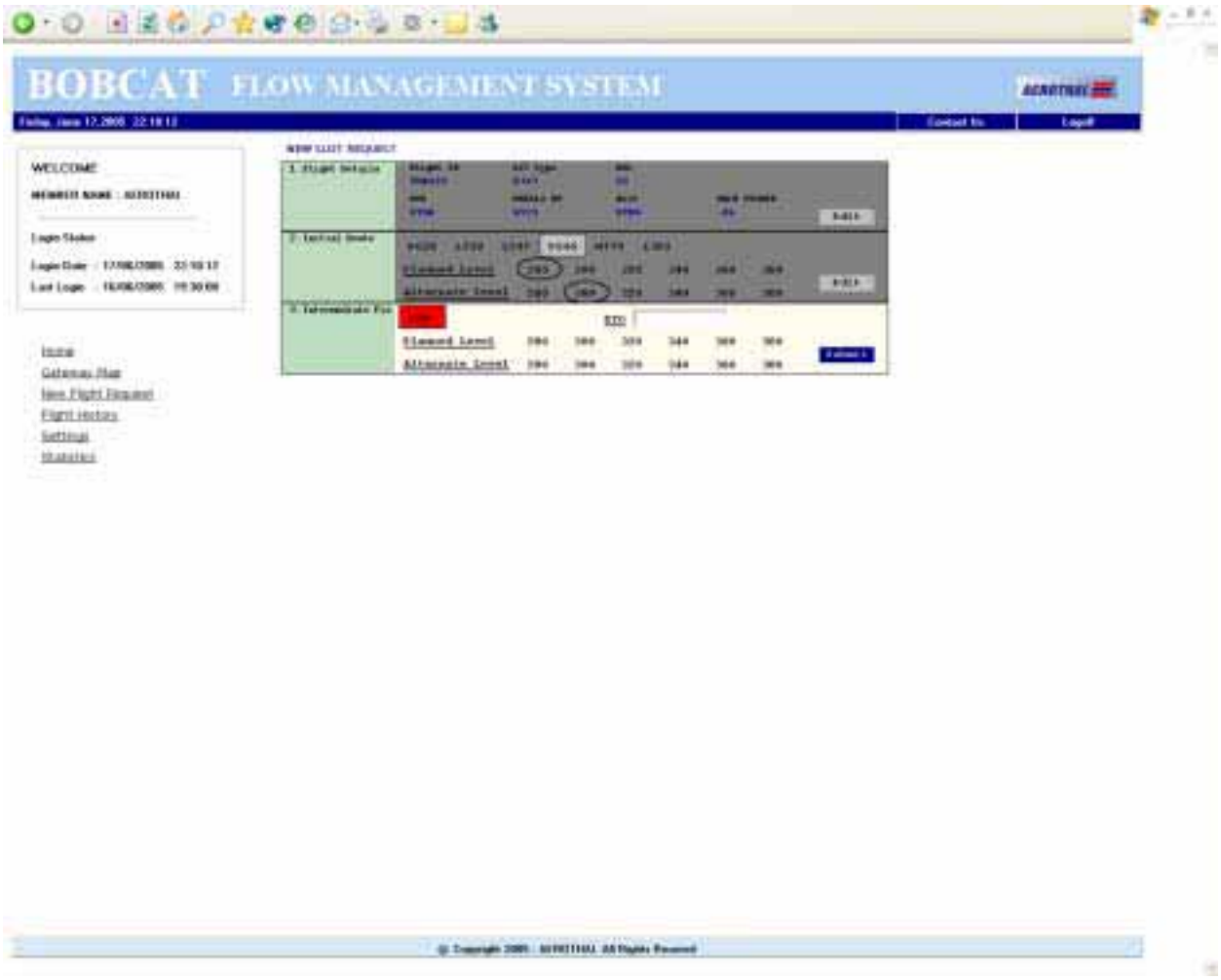


Figure 2: BOBCAT User Interface for requesting gateway point/route segment set

5.6 Since flights scheduled by airlines are most likely recurring flights, BOBCAT facilitates storing submitted requests as flight route template so that airline dispatchers can later call up a particular sequence of slot requests to edit and use as slot request for another flight in the future. Flight route template storage screen is shown in Figure 3.

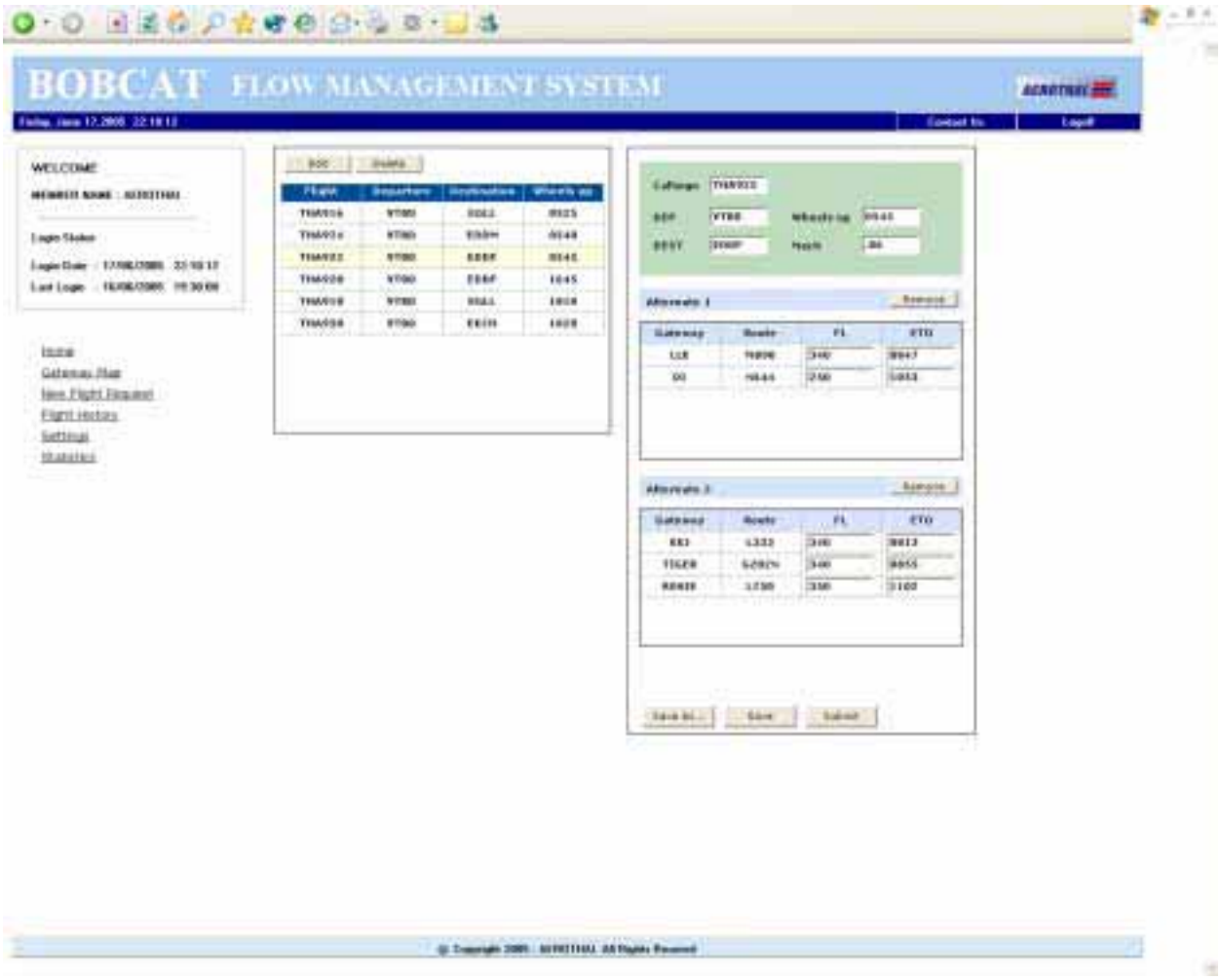


Figure 3: BOBCAT User Interface for flight route templates

5.7 Once the cutoff time for slot request submission is over, BOBCAT would stop accepting slot requests for the concerning period of time, while BOBCAT processes slot assignments for all requesting flights. Each airline dispatcher would be notified via some form of communication such as e-mail or notification message when slot assignment is completed. If a flight is not assigned a set of slots, BOBCAT would suggest possible routes which could include suggesting delays on previously requested routes. Future revision of BOBCAT would also suggest several other available routes for the airline dispatchers to choose.

5.8 Airline dispatchers whose flights were not assigned slots or were dissatisfied with the allocated slots can then request slot assignment based on real-time availability of gateway slots. A screen showing real-time on-demand slot assignment is shown in Figure 4.

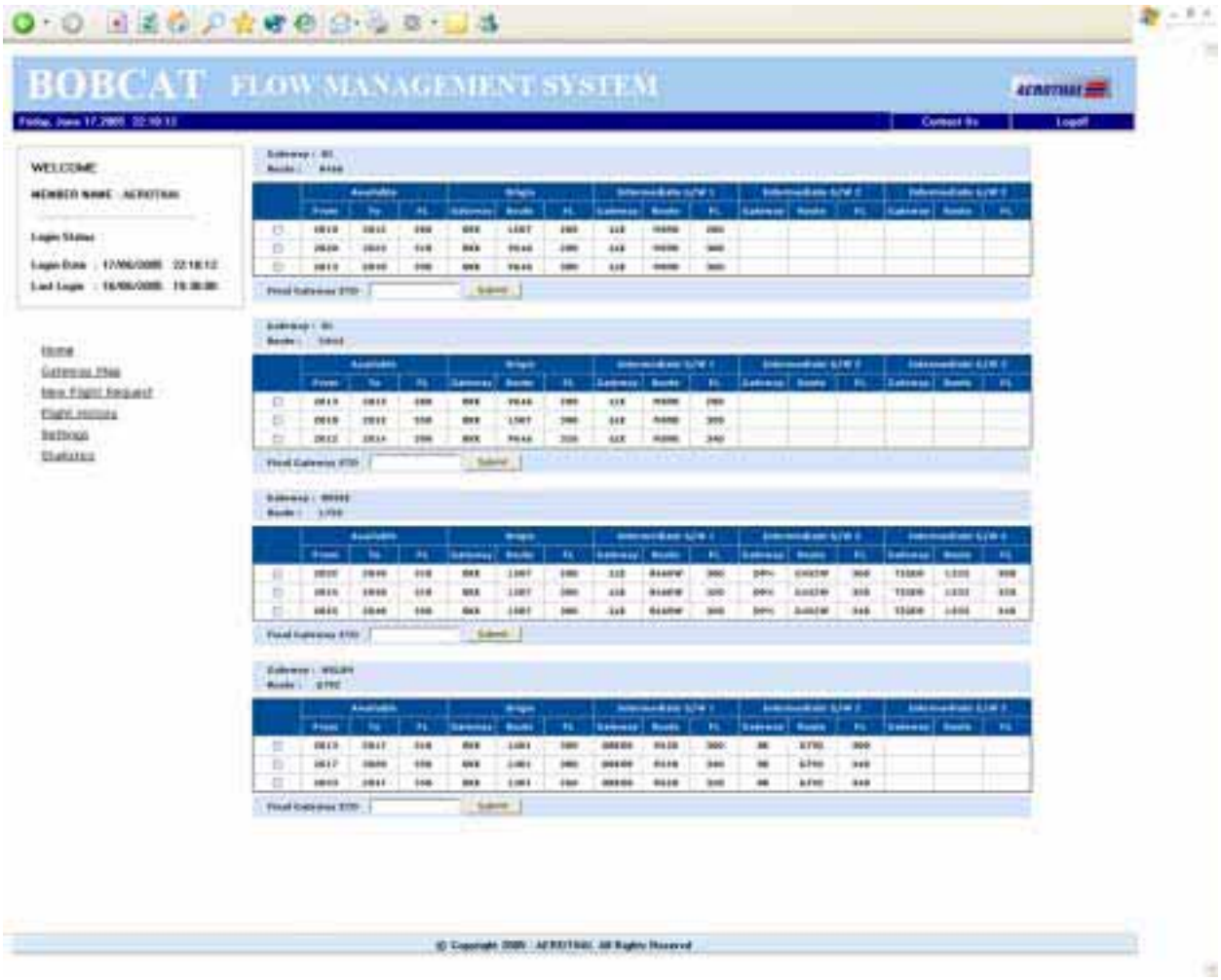


Figure 4: BOBCAT Real-time on-demand slot assignment after respective cut-off time as passed

5.9 If an airline dispatcher is still dissatisfied with the results, he could also contact ATFMU Specialist responsible for running the BOBCAT.

5.10 Once airline dispatchers receive slot allocations, they will submit flight plans based on those slot allocations and those flight plans will be transmitted to ATFMU AFTN address.

ATS Providers

5.11 ATS Providers would have capability to securely login to the system to view results of each slot allocation, in addition to viewing past slot allocation result. Once an Air Traffic Controller (ATC) login to the system, he would be shown the summary result of the most recent slot allocation. A screen of ATS Providers login is shown in Figure 5.

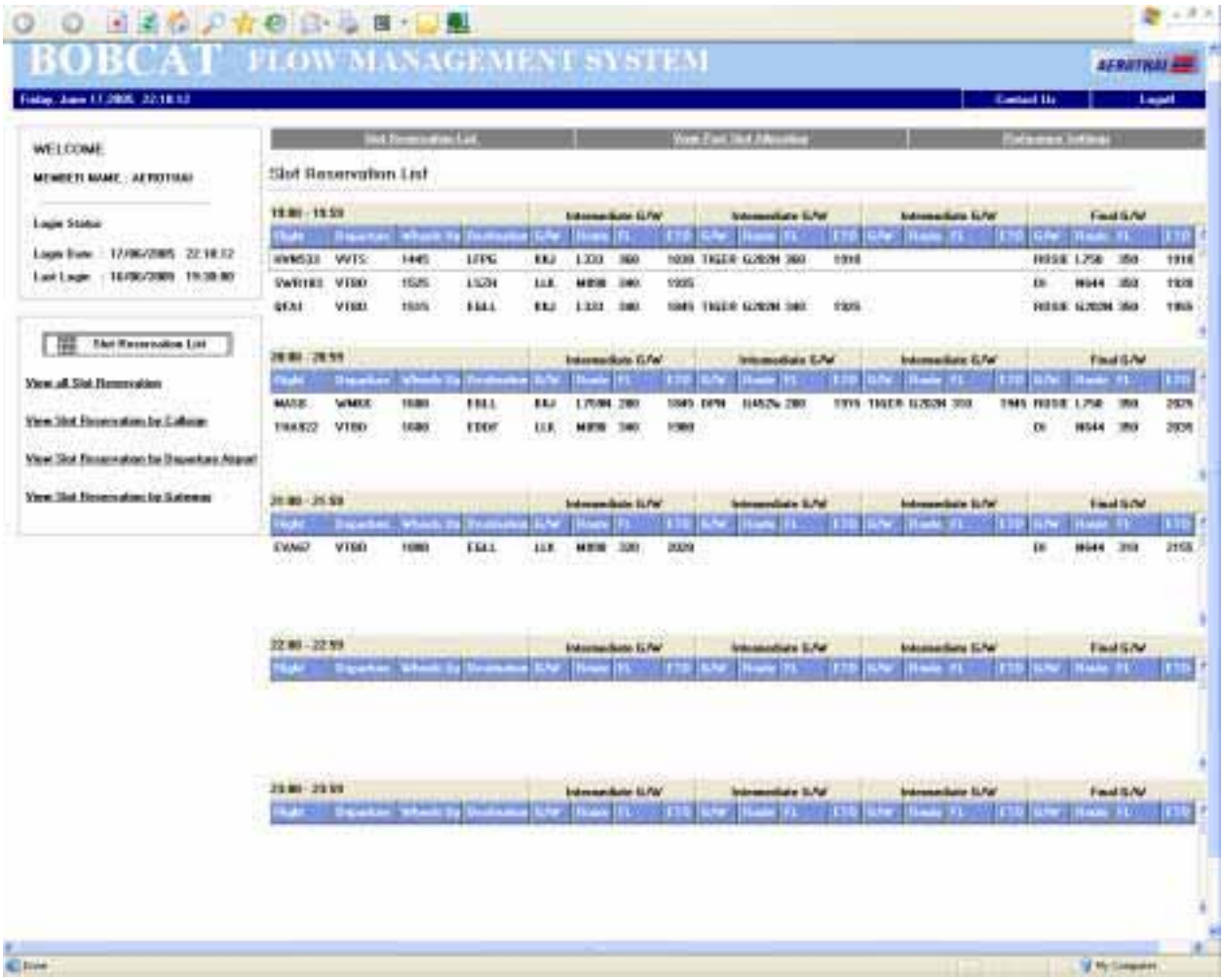


Figure 5: ATS Provider default screen after successful logon into BOBCAT

5.12 Details of the most recent slot allocation could also be viewed by simply searching for related such as searching for slot allocations of aircrafts that would be transiting some certain gateway points. A search result window for a slot allocation is shown in Figure 6.

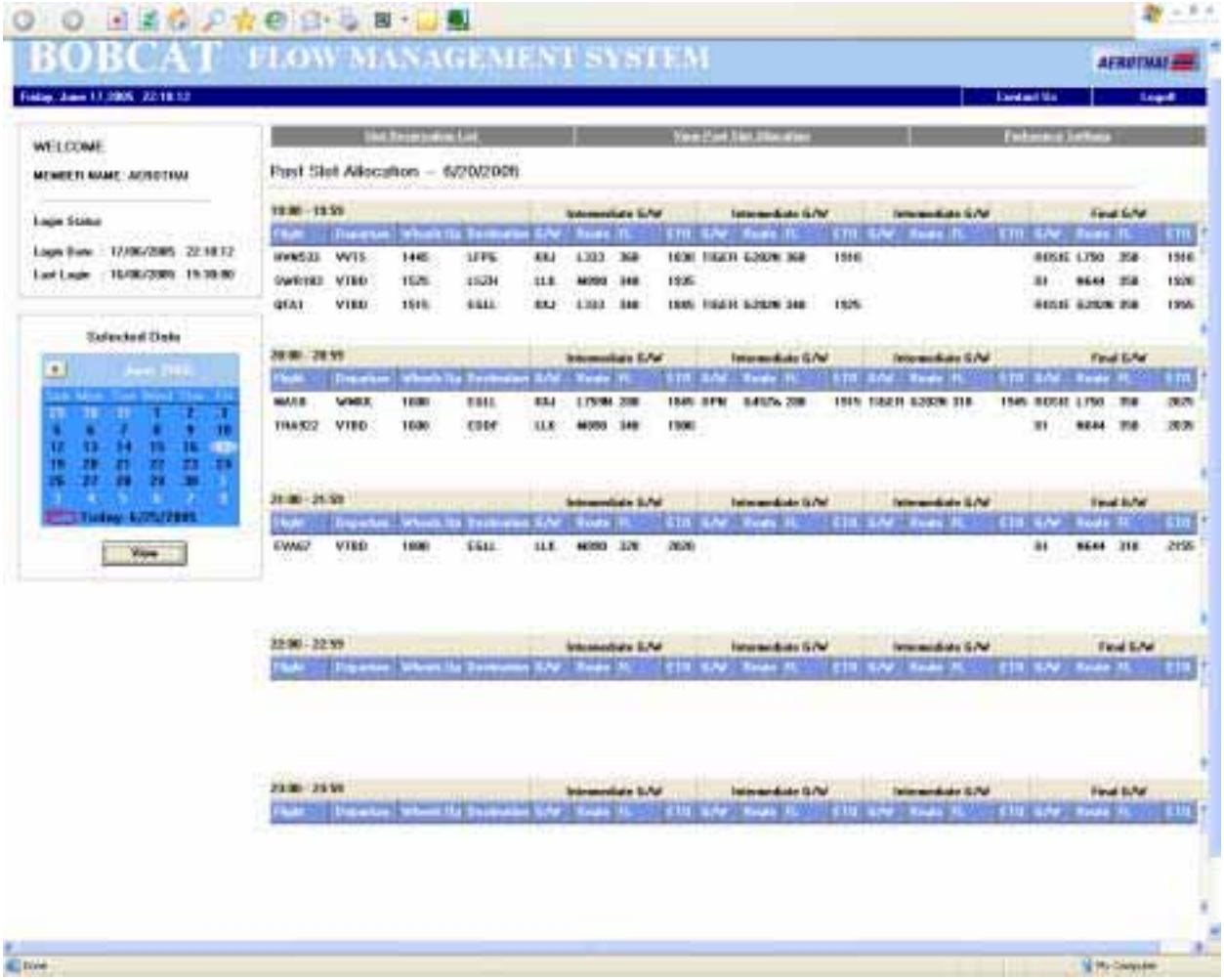


Figure 6: ATS Provider screen showing search parameters and results of search for relevant slot allocation results at a gateway point

ATFMU Specialist

5.13 The ATFMU Specialist managing BOBCAT would have similar capacity to ATS Providers in viewing results of slot assignments. Furthermore, the ATFMU Specialist would also have the capability to modify slot assignments given that the minimum spacing is not violated. The ATFMU Specialist will also be responsible for coordinating with ATS Providers in the Bay of Bengal regions to meter traffic incoming to any gateway points, .i.e. modifying minimum spacing property of each route segment within the system as well as modifying route segment flight level/gateway points within the system. Screen in Figure 7 shows ATFMU Specialist home portal page after login, which displays status of previous slot allocation as well as menu for other possible administrative options.

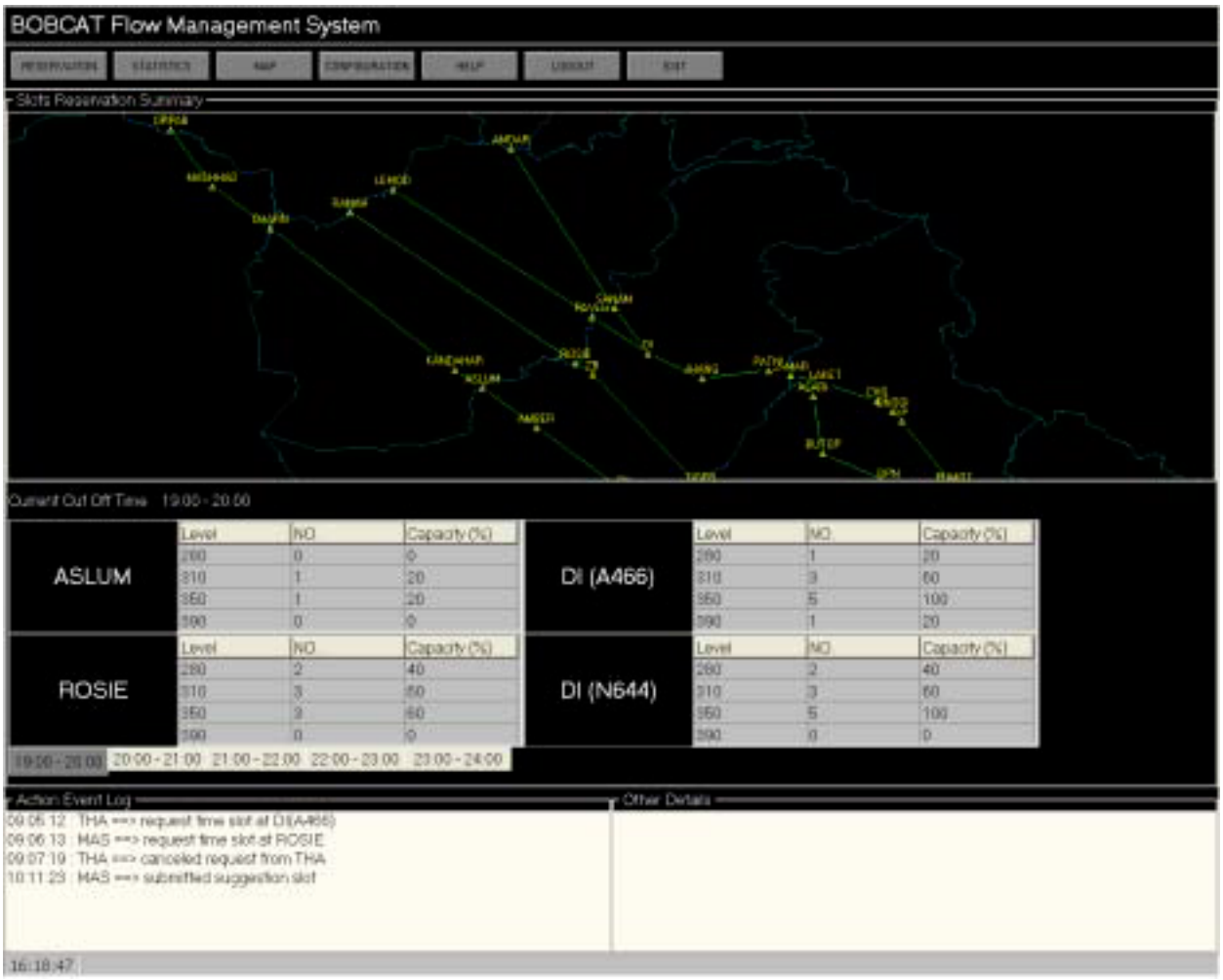


Figure 7: ATFMU Specialist default screen after successful logon into BOBCAT

5.14 The screen in Figure 8 shows possibility of the ATFMU Specialist configuring a gateway point/route segment, which allows the change in minimum spacing, adding/removing available flight levels of the route segment, in addition to adding/removing an entire gateway point/route segment.

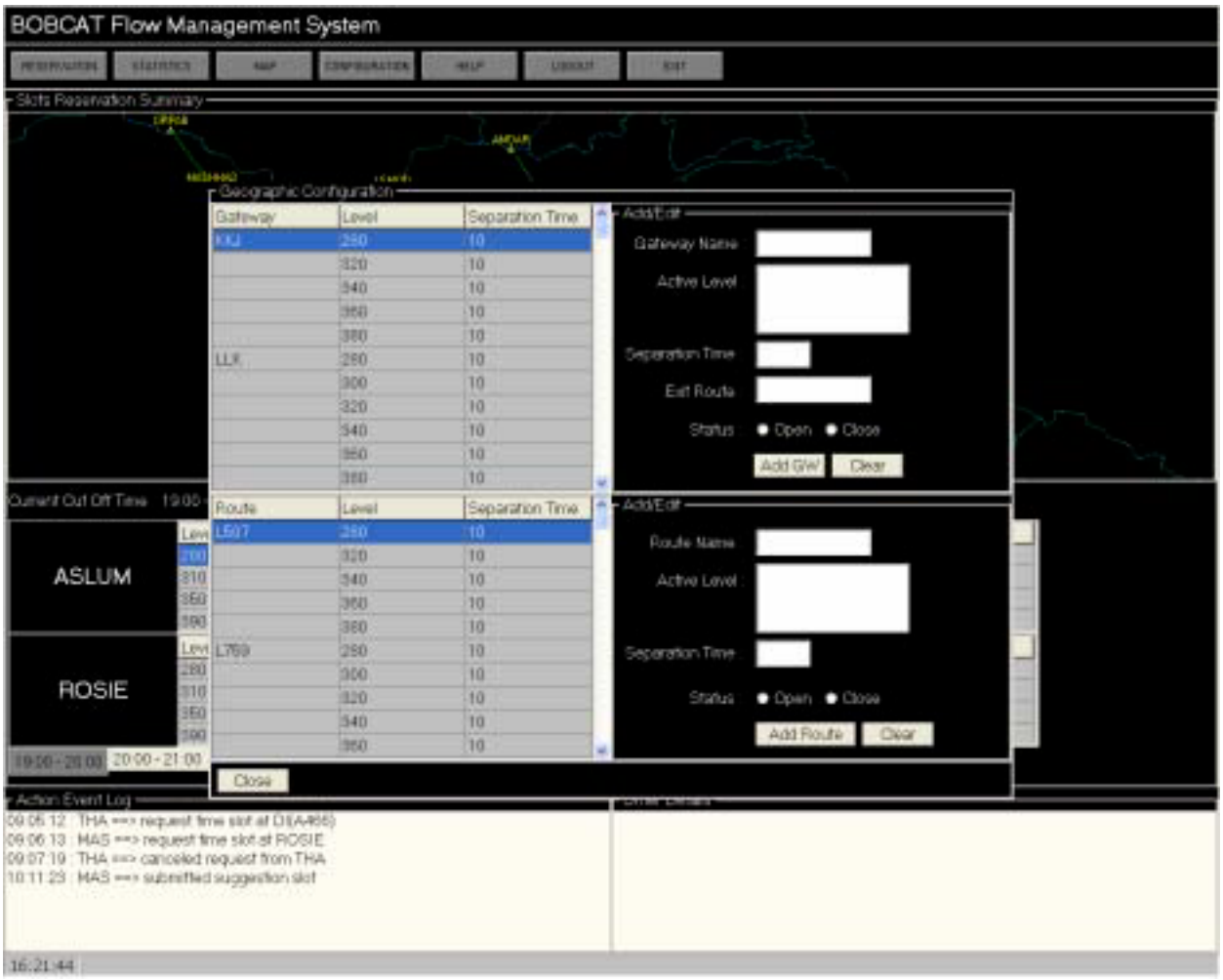


Figure 8: ATFMU Specialist screen for configuring a gateway point/route segment

5.15 In addition to results of slot assignments, the ATFMU Specialist would also be able to view hardware operational status and be alerted once a part of the operating hardware is no longer operational. In most case, the responsible engineer would already have been notified of the equipment failure.

6. ROLE OF THE AIR TRAFFIC FLOW MANAGEMENT UNIT (ATFMU)

6.1 BOBCAT will function as the Air Traffic Flow Management Unit for flights passing through Kabul FIR and flights that operate through airway segments leading to Kabul FIR such as L507, M770, and P646 in the portion between Bangkok, Kulala Lumpur, and Singapore FIR, regardless of the departure location and destination.

6.2 Dispatchers of aircrafts departing from any airports and traversing primary routes used for transit region would be required to log into BOBCAT to request slot assignment for flight level assignment on route segments/gateway points before the agreed cut-off time. Afterwards, BOBCAT would process requests for flights and notify users of the result. Dissatisfied users or dispatchers of aircrafts that

were not able to request for slot allocation would request slot assignment in real-time based on available slots after slot allocation is executed.

6.3 Dispatchers of aircrafts departing from any airports and traversing primary routes used for transit region would be required to log into BOBCAT to request slot assignment for flight level assignment on route segments/gateway points before the agreed cut-off time. Afterwards, BOBCAT would process requests for flights and notify users of the result. Dissatisfied users or dispatchers of aircrafts that were not able to request for slot allocation would request slot assignment in real-time based on available slots after slot allocation is executed.

6.4 BOBCAT will play a key role in smoothing air traffic from Thailand, Singapore and Kuala Lumpur through Kabul FIR by advising wheels-up time, ETO at key gateway points and cruising flight level through them to ensure that aircraft entering Kabul FIR does not exceed the airspace capacity there. Airline operators are responsible for following the advice given by BOBCAT. ATFM/TF/2 meeting is requested to consider consequences of airlines' failure to comply with BOBCAT's advice.

7. REQUIRED RESOURCES

Hardware Requirements

ATFMU Requirements

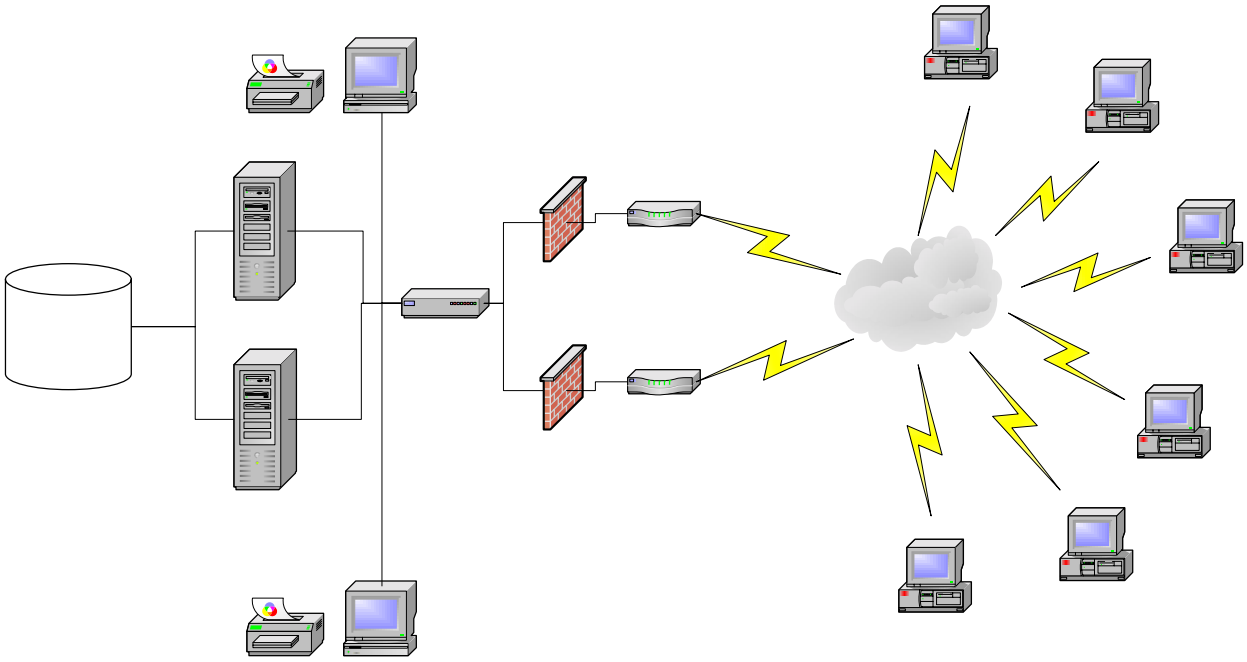


Figure 9: BOBCAT System Configuration

7.1 BOBCAT consists of two Web Servers connected to a common Data Storage, most likely Storage Area Network or Network Area Storage, which would house

databases of route segments, airline dispatchers' route request templates, slot requests, slot assignment results, and slot assignment history. Automatic backup functionality is provided by the device used.

7.2 Two manager stations are provided for ATFMU Specialist. The two Web Servers will connect to the Internet through a Load Balance device, which would distribute requests from users to the two servers evenly, and manage transfer of request from one server to another in the case of system failure on one of the servers. The load balance device connects to two redundant Internet connections via Firewall device, as shown in Figure 9.

Airline Dispatchers and ATS Providers Requirements

7.3 Airline dispatcher users and ATS Provider users connect to BOBCAT via public Internet using equipments that satisfy the following requirements:

- A Personal Computer of any operating system with the following characteristics
  - Processor: minimum CPU clock speed of 150 MHz
  - Operating System: Any that operates one of the following web browsers (i.e. Windows 2000/XP, Linux, Unix, or Mac OS)
  - RAM: 64 MB or larger (depending on operation system)
  - Harddisk Space: minimum of 500 MB or larger (depending on operating system)
  - Monitor Display Resolution: Minimum of 800 x 600 pixels
  - Web Browser: Internet Explorer 5.5 or newer, Mozilla 1.0 or newer, Mozilla Firefox 1.0 or newer, Netscape 7 or newer
- Internet Connection : 56 Kbps Modem or faster Internet connection

Manpower Requirements

7.4 Operation of BOBCAT requires at least the following personnel:

- A qualified and trained air traffic controller to operate BOBCAT as ATFMU Specialist
- A qualified and trained engineer to maintain BOBCAT in the case of any system failures or contingencies

8. HOURS OF OPERATION

8.1 BOBCAT will be operating 24 hours daily, while it will be responsible for aircrafts entering Kabul FIR between 1900UTC and 2359UTC each day.

8.2 The schedule for airline operators submitting requests for slot assignment for different segments of time in a day is shown in Table 6.

Table 6: Tentative Time Table for latest slot request submission and estimated slot assignment notification time

Time of Entry into Kabul FIR	Last Slot Request	Slot Assignment Notification

1900UTC – 1959UTC	0900UTC	1000UTC
2000UTC – 2059UTC	1000UTC	1100UTC
2100UTC – 2159UTC	1100UTC	1200UTC
2200UTC – 2259UTC	1200UTC	1300UTC
2300UTC – 2359UTC	1300UTC	1400UTC

9. COMMUNICATIONS REQUIREMENTS BETWEEN ATFMU AND USERS

9.1 The ATFMU Specialist will be provided with phone, fax, e-mail and dedicated AFTN address for communications ATS Providers and dispatchers as necessary.

10. COOPERATIVE REQUIREMENTS BETWEEN STATES CONCERNED, AIRLINES AND THE ATFMU

10.1 Cooperative requirements between states concerned, airlines and ATFMU will be considered at ATFM/TF/2 meeting.

11. COSTS

11.1 Cost breakdown of the BOBCAT is specified in Table 7.

Table 7: Tentative cost breakdown of BOBCAT

Hardware – includes web servers, storage devices for the system and peripherals used within the system as per System Configuration segment of the paper and testing and setup equipments.	US$50,000
Software Development – includes development of web interface, the entire BOBCAT System and software licenses for development and operation of the system	US$25,000
Operation Cost – includes the cost of 24x7 maintenance engineer for the system, an ATC Specialist operating the system and other miscellaneous maintenance costs.	TBA

12. REFERENCES

[1] Barnier N. and P. Brisset, 2002, *Graph Coloring for Air Traffic Flow Management*, Proceedings CP-AI-OR'02, pp.1-15.

[2] Barnier N. and Pascal Brisset, 2000, Slot Allocation in Air Traffic Flow Management, PACLP'2000.

[3] Bertsimas D.J. and A.R. Odoni, 1998, *The air traffic flow management problem with en-route capacities, Operations Research*, Vol. 46, pp.406-422.

[4] Brennan M. and Terrence R. Thompson, 2003, *Using Historical Flight Data to Evaluate Airborne Demand, Delay and Traffic Flow Control*, 5th USA/Europe Air Traffic Management Research & Development Seminar.

[5] Chen Z., Andrew T. Holle, Bernard M. E. Moret, Jared Saia, and Ali Boroujerdi, *Network Routing Models Applied to Aircraft Routing Problems*. Proc. Winter Simulation Conference, Arlington, USA, ACM, pages 1200-1206, 1995.

[6] Le L., Sanaa Kholfi, and George Donahue, 2003, *Proposal for Demand Management Using Auction-Based Arrival Slot Allocation*, 5th USA/Europe Air Traffic Management Research & Development Seminar.
[7] Nance D., Jacques Carlier, Nhat Linh Doan and Vu Duong, 2003, *A Linear Programming Approach for Route and level Flight Assignment*, 5th USA/Europe Air Traffic Management Research & Development Seminar.

13. INPUT AND DEVELOPERS OF BOBCAT

13.1 Mr. John E. Richardson,
ATM Consultant,
Aeronautical Radio of Thailand (AEROTHAI)
102 Ngamduplee, Tungmahamek, Sathon, Bangkok 10120 THAILAND
jricho282@yahoo.com

13.2 Mr. Tinnagorn Choowong,
Air Traffic Control Manager,
En-Route Air Traffic Management Department,
Aeronautical Radio of Thailand (AEROTHAI)
102 Ngamduplee, Tungmahamek, Sathon, Bangkok 10120 THAILAND
tinnagorn.ch@aerothai.co.th

13.3 Mr. Pipat Leawroongroj,
Senior System Engineer,
Air Traffic Services Engineering Research & Development Department,
Aeronautical Radio of Thailand (AEROTHAI)
102 Ngamduplee, Tungmahamek, Sathon, Bangkok 10120 THAILAND
pipat@aerothai.co.th

13.4 Ms. Sarinna Suwanrak,
Senior System Engineer,
Air Traffic Services Engineering Research & Development Department,
Aeronautical Radio of Thailand (AEROTHAI)
102 Ngamduplee, Tungmahamek, Sathon, Bangkok 10120 THAILAND
sarsir@aerothai.co.th

13.5 Mr. Popporn Kosaikanont,
System Engineer,
Air Traffic Services Engineering Research & Development Department,
Aeronautical Radio of Thailand (AEROTHAI)
102 Ngamduplee, Tungmahamek, Sathon, Bangkok 10120 THAILAND
popporn@aerothai.co.th

13.6 Mr. Piyawut Tantimekabut,
Engineer,
Air Traffic Services Engineering Research & Development Department,
Aeronautical Radio of Thailand (AEROTHAI)
102 Ngamduplee, Tungmahamek, Sathon, Bangkok 10120 THAILAND
piyawut@aerothai.co.th

Bay of Bengal Cooperative Air Traffic Flow Management Advisory System (BOBCAT)

Concept of Operation

Presented by **AEROTHAI**

Agenda

- BOBCAT development team
- BOBCAT operation
- BOBCAT prototype system

AEROTHAI Development Team

- **Executive Expert Office**
- **En-Route Air Traffic Management Department**
- **Air Traffic Services Engineering Research & Development Department**
  - CNS/ATM R&D
  - ATS Message Server
  - Flight Strip Automation
- **ICAO, IATA, Thai Airways**
- **Some States involved**

AEROTHAI Development Team

- Pipat Leawroongroj
  - Senior System Engineer, Air Traffic Services Engineering Research & Development Department
- Sarinna Suwanrak
  - Senior System Engineer, Air Traffic Services Engineering Research & Development Department
- Popporn Kosaikanont
  - System Engineer, Air Traffic Services Engineering Research & Development Department

AEROTHAI Development Team

- Tinnagorn Choowong
  - Air Traffic Control Manager, En-Route Air Traffic Management Department
- John Richardson
  - Air Traffic Management Consultant to AEROTHAI

AEROTHAI Development Team

- Piyawut Tantimekabut (Toon)
  - Engineer, Air Traffic Services Engineering Research & Development Department
  - AEROTHAI Scholar – High school and college level study in the U.S. (1997-2004)
  - B.S.E. in Computer & Telecommunications Engineering – University of Pennsylvania (2004) Mathematics Minor and Economics Minor
  - M.S.E. in Telecommunications & Networking Engineering – University of Pennsylvania (2004)

What is BOBCAT?

- **B**ay **o**f **B**engal **C**ooperative **A**ir **T**raffic Flow Management Advisory System

- Multiple metered gateways can be designated for traffic from any routes entering Kabul FIR

- Airline dispatchers submit request for gateway arrival time (ETO) and flight level specifying flight “path”

What is BOBCAT?

- BOBCAT assigns gateway slots to flights transiting gateways to Kabul FIR and notifies airline dispatchers via e-mail and other communications of results suggesting delays if slots not allocated

- Gateway slot assignment can be cancelled and requested on availability basis in case of flight schedule change

- Air Traffic Services Providers (ATS Providers) can view gateway slot assignment results for traffic planning

BOBCAT Operation

- Submit slot requests
- Cut-off time slot allocation
- Post cut-off time slot selection

Submit Slot Requests

- Flexible number of distinct “paths”
- Flexible number of flight level alternates for each route segment within a “path”
- Show “values” determining slot assignment order at request submission time
  - Based on route segment usage statistics
  - Less congested route segment gets more slot request value

Cut-off Time Slot Allocation

- Process flight slot requests in order of
  - slot request values
  - “path” choices – 1st choice considered before 2nd choice
- Mach number technique implemented
  - For faster aircraft at the back
  - For faster aircraft in front
- Gateway route segment spacing can be metered
- Flights suggested delays on requested “paths” with more preferred choices

Post-Cutoff Slot Selection

- Flights can resubmit slot requests for any reasons:
  - Slots not assigned
  - Flight rescheduling
- Flights that were not assigned slots can select delays on their requested choices as suggested by results notification or make other selections
- Slots selected based on real-time slot availability (First-Come First-Serve for remaining slot allocations)

How do we access BOBCAT?

- Real-Time Web-based system available via public Internet
- Secure password protection
- Encrypted communications via SSL/TLS
- Automatic idle-timeout for extra security

Airline Dispatcher

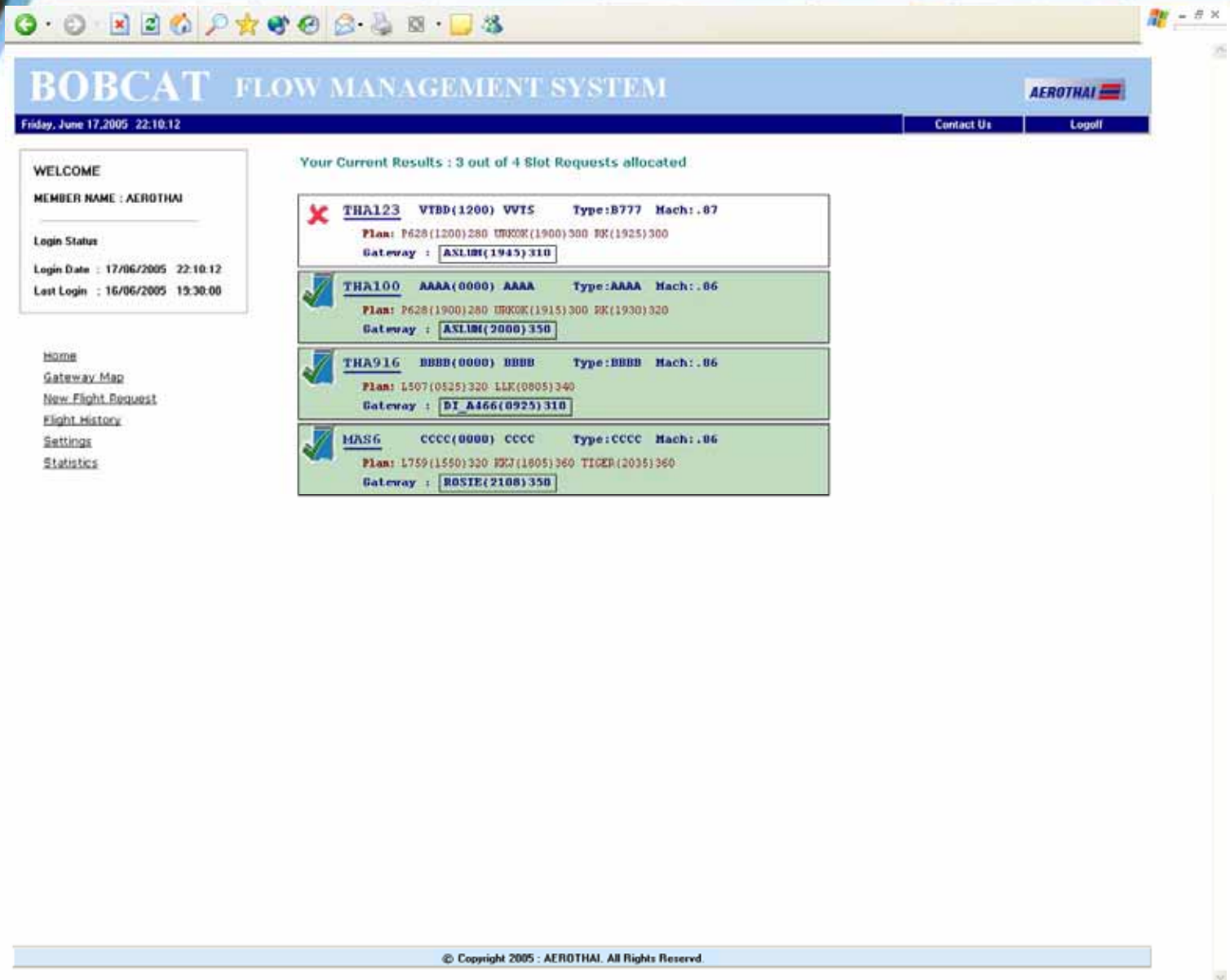
Proposed Web Interface

BOBCAT

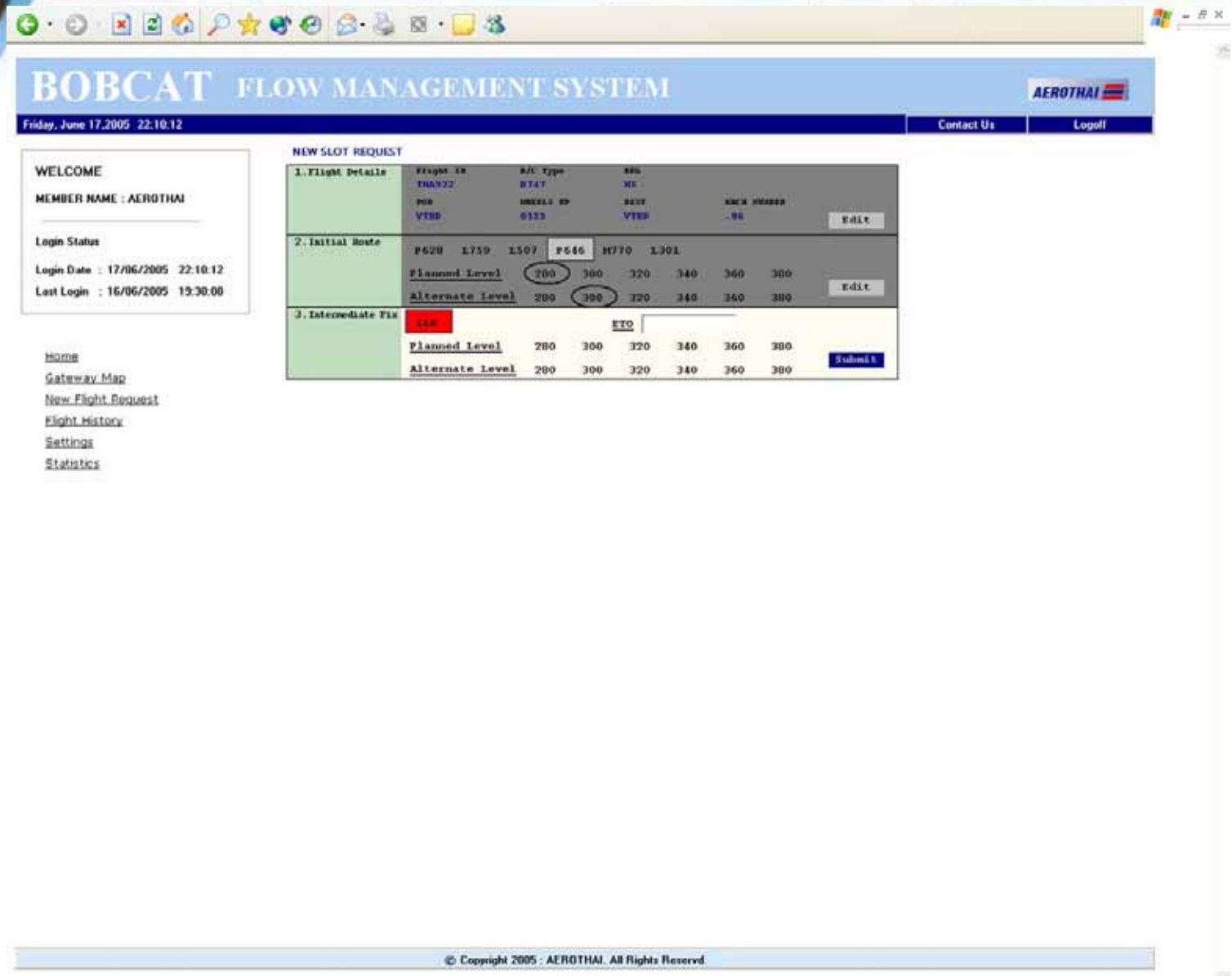
Flow Management Advisory System

Presented by **AEROTHAI**

Successful Login



Slot Request Submission



Request Templates

BOBCAT FLOW MANAGEMENT SYSTEM

AEROTHAI

Friday, June 17,2005 22:10:12 | Contact Us | Logoff

WELCOME

MEMBER NAME : AEROTHAI

Login Status

Login Date : 17/06/2005 22:10:12

Last Login : 16/06/2005 15:30:00

- Home
- Gateway Map
- New Flight Request
- Flight History
- Settings
- Statistics

Edit | Delete

Flight	Departure	Destination	Wheels up
THA916	VTBD	EGLL	0525
THA924	VTBD	EDDM	0540
THA922	VTBD	EDDF	0545
THA920	VTBD	EDDF	1645
THA910	VTBD	EGLL	1810
THA950	VTBD	EKCH	1820

Callsign: THA922

DEP: VTBD | Wheels up: 0545

DEST: EDDF | Mach: .86

Alternate 1 — Remove

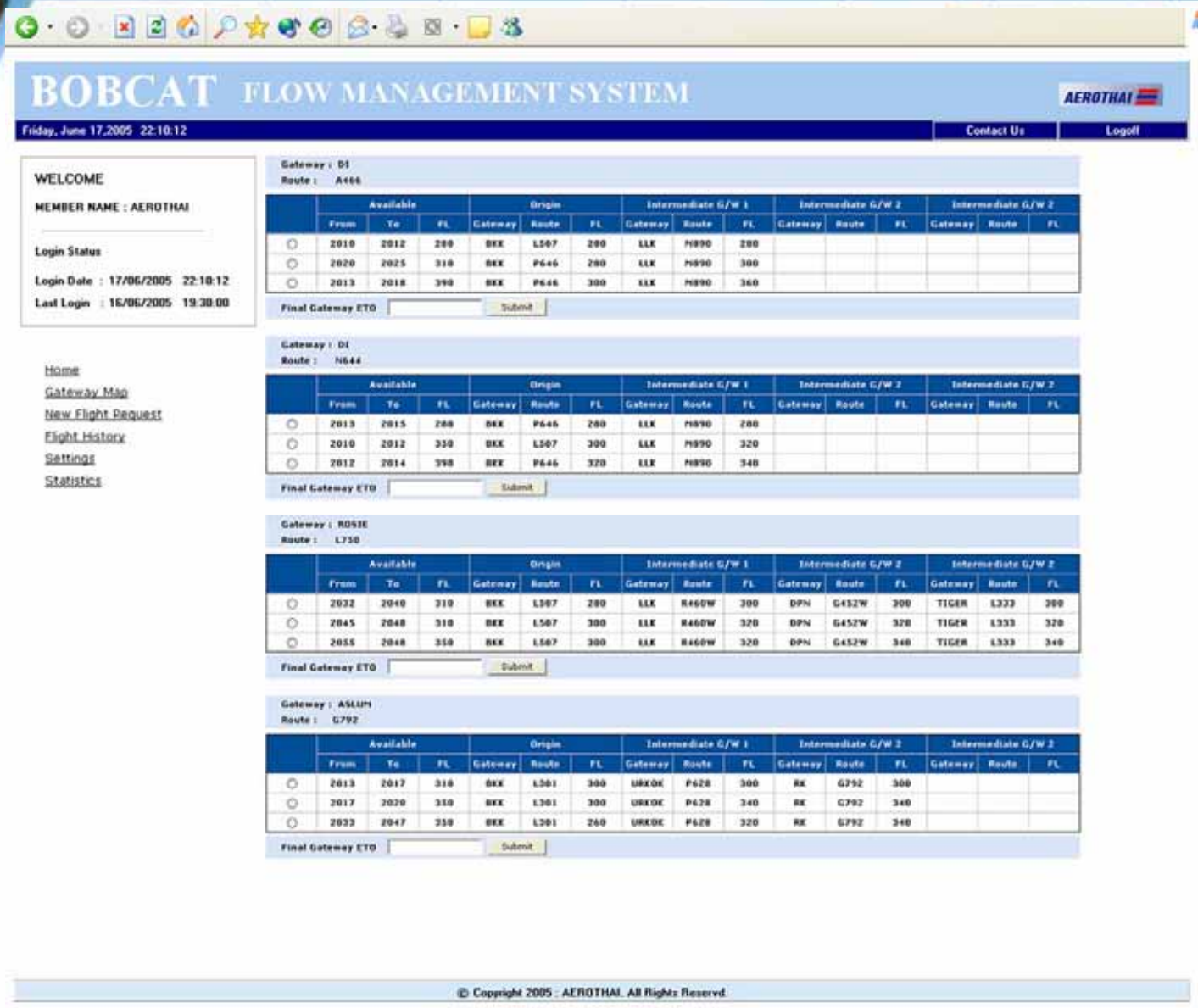
Gateway	Route	FL	ETO
LLK	M090	340	0847
DI	N644	250	1053

Alternate 2 — Remove

Gateway	Route	FL	ETO
KKJ	L333	340	0813
TIGER	G202N	340	0855
ROSIE	L750	350	1102

Save As... | Save | Submit

Post-Cutoff Slot Selection



ATS Providers

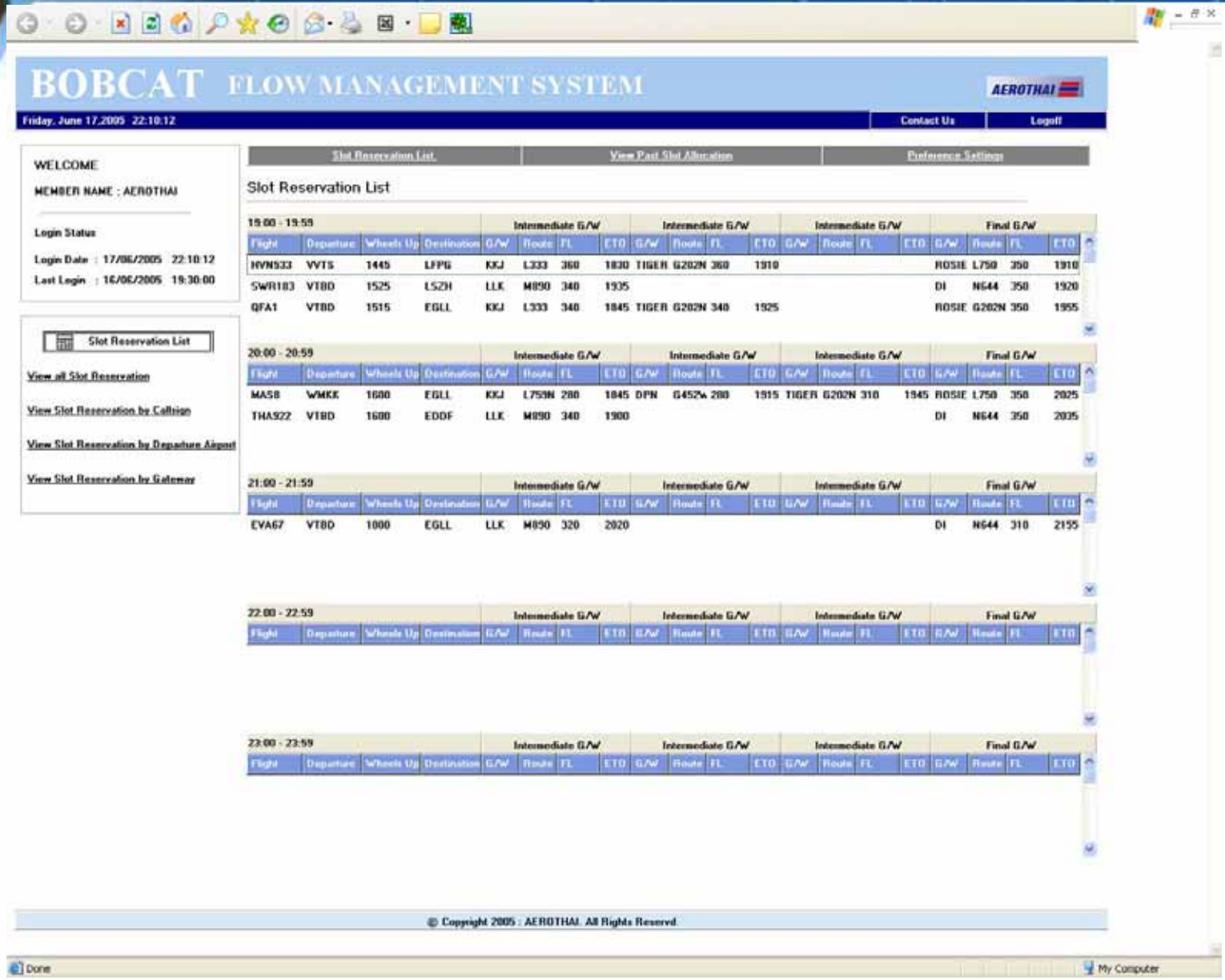
Proposed Web Interface

BOBCAT

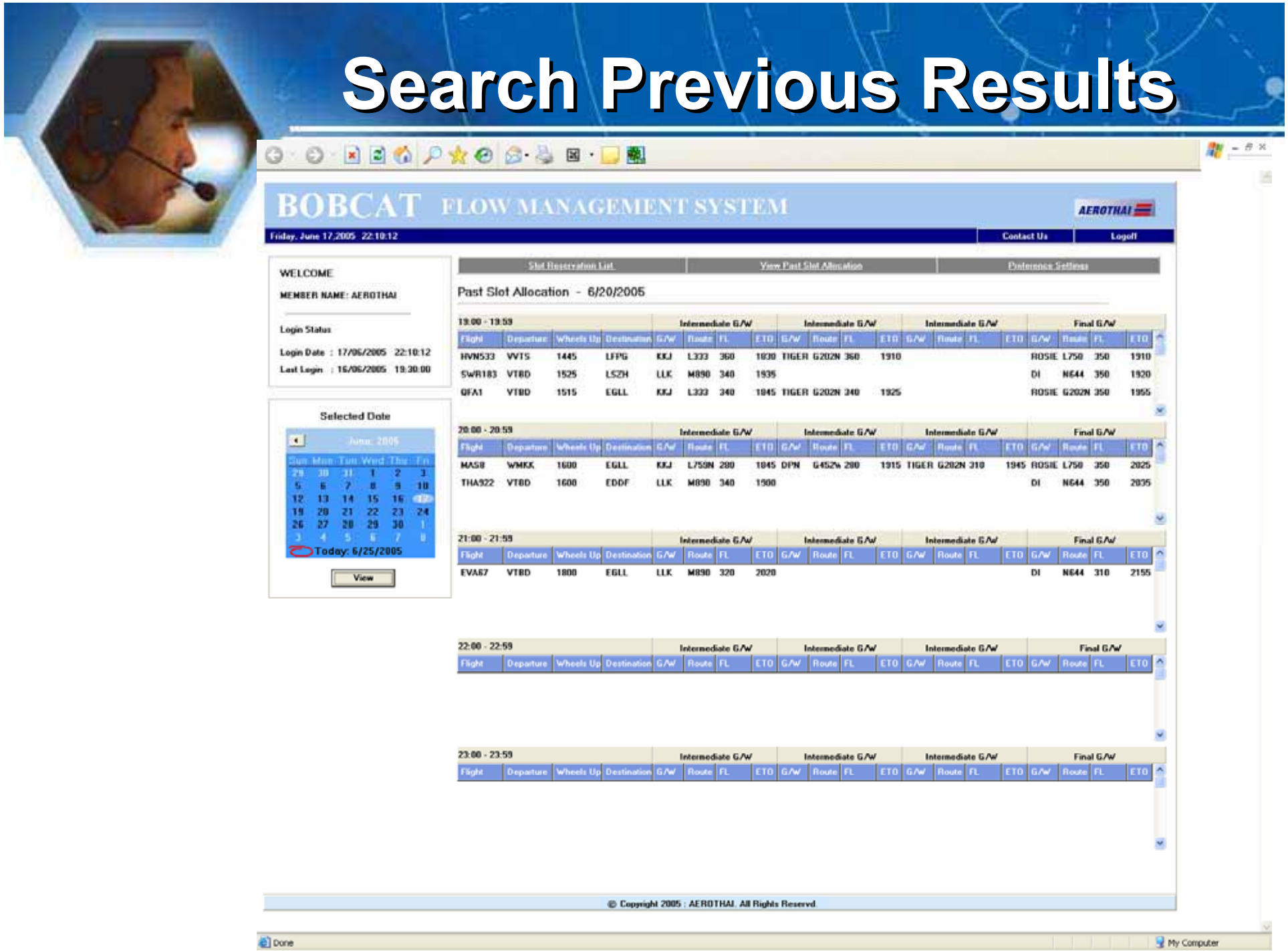
Flow Management Advisory System

Presented by **AEROTHAI**

Successful Login



Search Previous Results



What about administration?

- Who will monitor the ATFMU?
- Who will coordinate with airline dispatchers in case of contingencies?
- Who will coordinate with ATS Providers in case of gateway metering change is requested?

ATFMU Specialist

Proposed User Interface

BOBCAT

Flow Management Advisory System

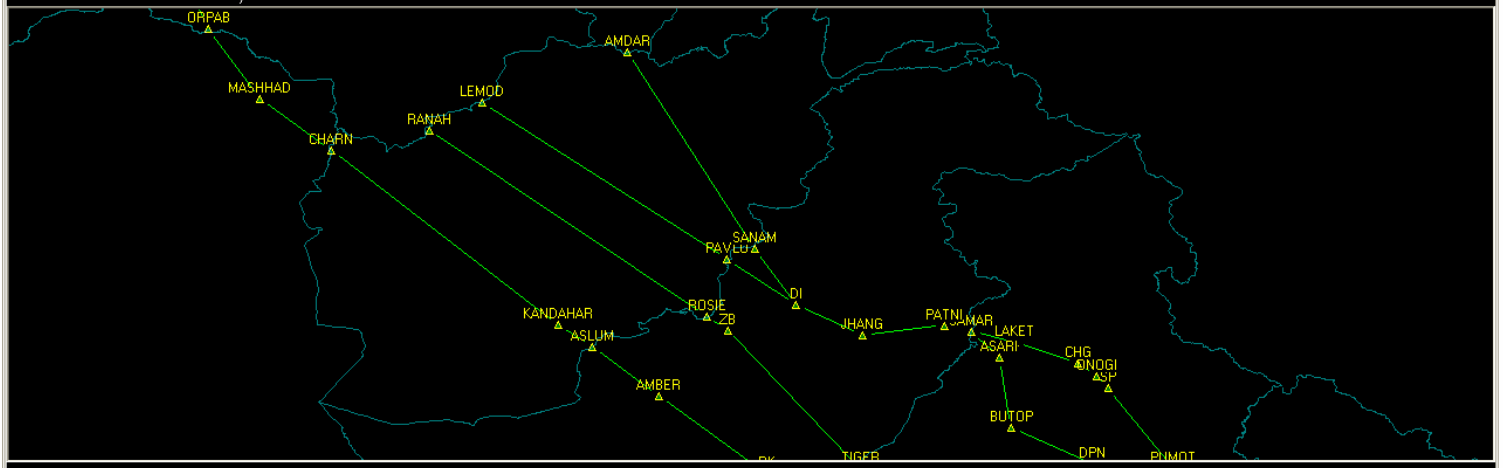
Presented by **AEROTHAI**

ATFMU Specialist Screen

BOBCAT Flow Management System

RESERVATION | STATISTICS | MAP | CONFIGURATION | HELP | LOGOUT | EXIT

Slots Reservation Summary



Current Cut Off Time 19:00 - 20:00

ASLUM	Level	NO.	Capacity (%)
	280	0	0
	310	1	20
	350	1	20
	390	0	0

DI (A466)	Level	NO.	Capacity (%)
	280	1	20
	310	3	60
	350	5	100
	390	1	20

ROSIE	Level	NO.	Capacity (%)
	280	2	40
	310	3	60
	350	3	60
	390	0	0

DI (N644)	Level	NO.	Capacity (%)
	280	2	40
	310	3	60
	350	5	100
	390	0	0

19:00 - 20:00 | 20:00 - 21:00 | 21:00 - 22:00 | 22:00 - 23:00 | 23:00 - 24:00

Action Event Log

09:05:12 : THA ==> request time slot at DI(A466)
09:06:13 : MAS ==> request time slot at ROSIE
09:07:19 : THA ==> canceled request from THA
10:11:23 : MAS ==> submitted suggestion slot

Other Details

16:18:47

Gateway Configuration

BOBCAT Flow Management System

RESERVATION | STATISTICS | MAP | CONFIGURATION | HELP | LOGOUT | EXIT

Slots Reservation Summary

ORPAB MASHHAD AMDAR

Geographic Configuration

Gateway	Level	Separation Time
KKJ	280	10
	320	10
	340	10
	360	10
	380	10
LLK	280	10
	300	10
	320	10
	340	10
	360	10
	380	10

Add/Edit

Gateway Name :

Active Level :

Separation Time :

Exit Route :

Status : Open Close

Add GW Clear

Current Cut Off Time 19:00

ASLUM

Leve
280
310
350
390

ROSIE

Leve
280
310
350
390

19:00 - 20:00 20:00 - 21:00

Route	Level	Separation Time
L507	280	10
	320	10
	340	10
	360	10
	380	10
L759	280	10
	300	10
	320	10
	340	10
	360	10

Add/Edit

Route Name :

Active Level :

Separation Time :

Status : Open Close

Add Route Clear

Close

Action Event Log

09:05:12 : THA ==> request time slot at DI(A466)
09:06:13 : MAS ==> request time slot at ROSIE
09:07:19 : THA ==> canceled request from THA
10:11:23 : MAS ==> submitted suggestion slot

Other Details

16:21:44

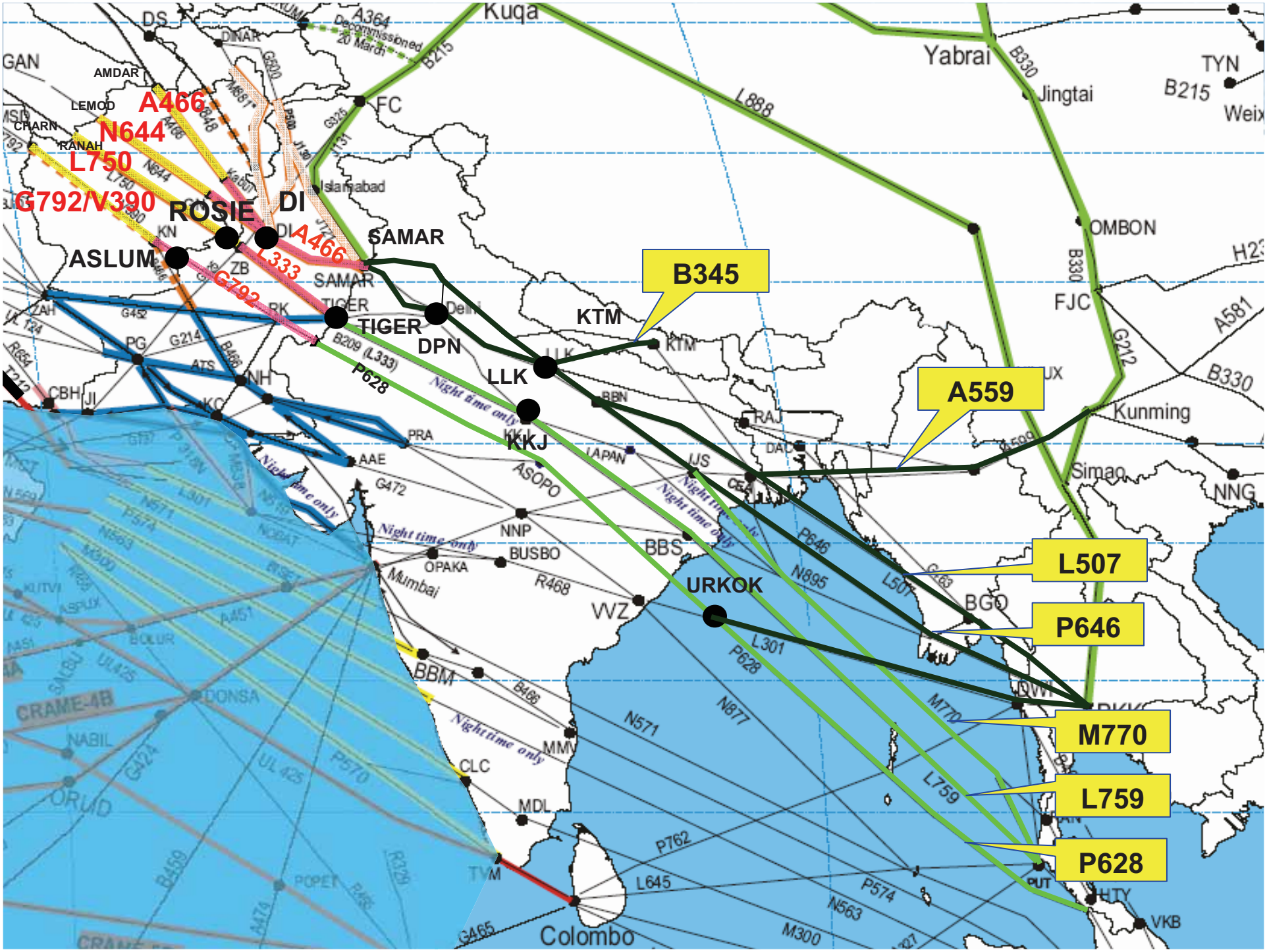
Prototype System

BOBCAT
Flow Management Advisory System

Presented by **AEROTHAI**

BOBCAT Prototype

- Airline Dispatcher Request Interface
- Slot Assignment System
- Airline Dispatcher Slot Assignment Result Display


A466
N644
L750
G792/V390
ROSIE
DI
ASLUM
SAMAR
TIGER
DPN
KTM
LLK
KKJ
ASOPO
NNP
BUSBO
OPAKA
BBS
URKOK
VVZ
BBM
MMV
CLC
MDL
TVM
Colombo
Kuqa
Yabrai
Jingtai
Islamabad
Delhi
OMBON
FJC
Kunming
Simao
NNG
BGO
B345
A559
L507
P646
M770
L759
P628
Night time only

Airline Dispatcher Prototype

- Prototype designed to accommodate
  - 3 Alternate “paths”
  - 2 Flight Level alternates for each route segment
- Assume for simplifications that aircrafts in the prototype departs from
  - Bangkok
  - Kuala Lumpur
  - Singapore

Airline Dispatcher Prototype

- Use flight plans as requests into the system
  - Bangkok departures: 3 flights
  - Singapore departures: 6 flights
  - Kuala Lumpur departures: 3 flights
- Use flight departures such that the range of entry time into Kabul FIR is within approximately one-hour time period

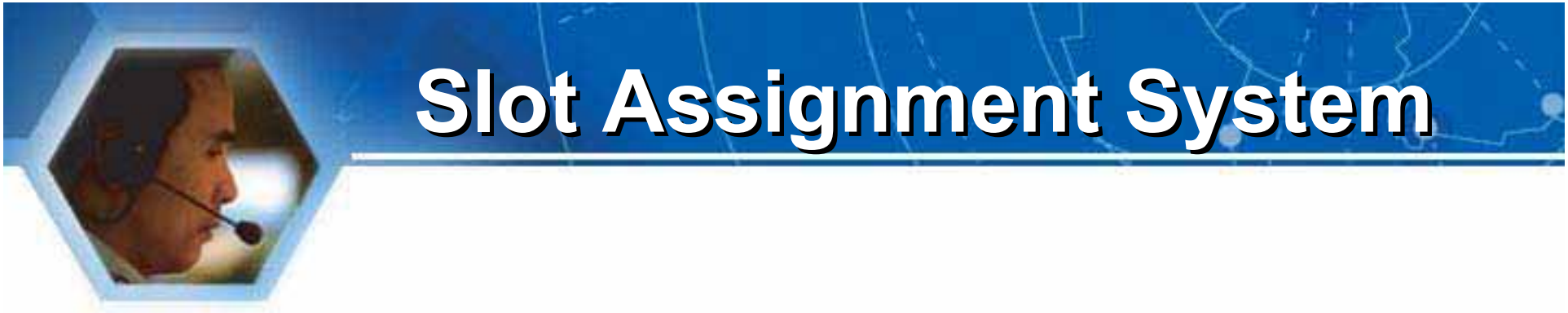
Airline Dispatcher Request Submission Demonstration

Prototype System

BOBCAT

Flow Management Advisory System

Presented by **AEROTHAI**



Slot Assignment System

- MATLAB simulation
  - Flight request “value” calculation
  - Slot assignment
- Mach number technique for faster aircrafts at the back implemented
- Spacing configuration
  - Kabul FIR: 10 minutes
  - Elsewhere: 5 minutes

Slot Assignment Demonstration

Prototype System

BOBCAT

Flow Management Advisory System

Presented by **AEROTHAI**

Airline Dispatcher Slot Assignment Result Demonstration

Prototype System

BOBCAT

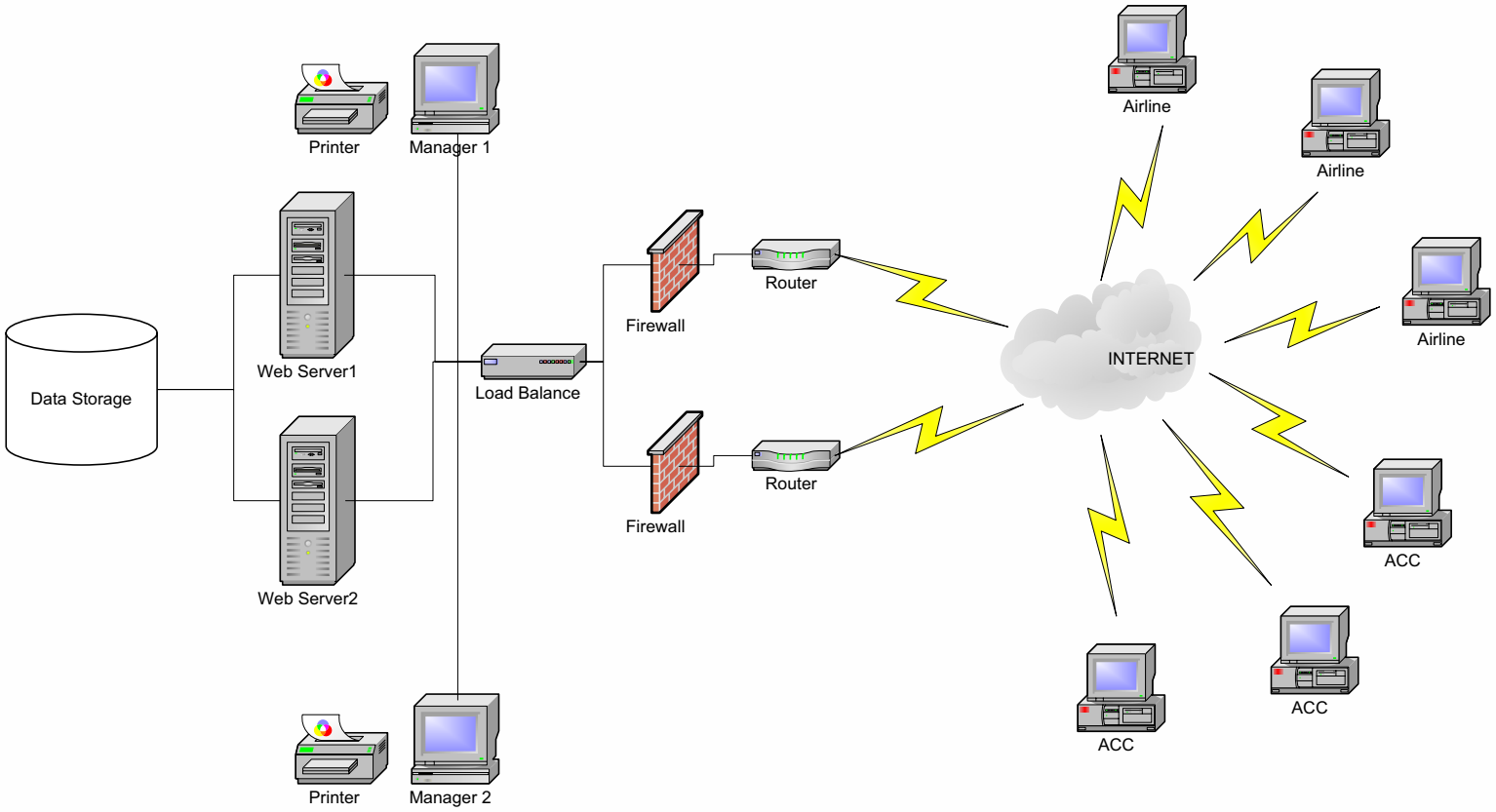
Flow Management Advisory System

Presented by **AEROTHAI**

System Configuration

- Current configuration includes
  - BOBCAT web servers
  - BOBCAT manager stations
  - Storage device (SAN or NAS)
  - Load balance device

System Configuration



User Equipment Requirements

- Same requirement for Airline Dispatchers and ATS Providers
- Personal Computer
  - Minimum clock speed: 150 MHz
  - Operating system: Windows 2000/XP, Linux, Unix, Mac OS or any that supports web browsers
  - Memory: 128 MB of RAM or larger (OS dependent)
  - Display Resolution: 1024 x 768 pixels or higher
  - Web Browsers:
    - Internet Explorer 5.5 or newer
    - Mozilla 1.0 or newer
    - Mozilla Firefox 1.0 or newer
    - Netscape 7 or newer
- Internet connection: 56kbps modem access or faster

Manpower Requirements

- Qualified and trained air traffic controller to operate as ATFMU Specialist

- Qualified and trained engineer to maintain BOBCAT in case of any contingencies

Communications Requirements

- Phone communication (1 phone line)
- Fax communication (1 phone line)
- E-mail communication
- Dedicated AFTN addressing

Hours of Operation

- Proposed cutoff time for submitting slot requests

Kabul FIR Entry	Last Slot Request	Slot Assignment Notification
1900UTC – 1959UTC	0900UTC	1000UTC
2000UTC – 2059UTC	1000UTC	1100UTC
2100UTC – 2159UTC	1100UTC	1200UTC
2200UTC – 2259UTC	1200UTC	1300UTC
2300UTC – 2359UTC	1300UTC	1400UTC

Costs

Hardware – includes web servers, storage devices for the system and peripherals used within the system as per System Configuration segment of the paper and testing and setup equipments.	US$50,000
Software Development – includes development of web interface, the entire BOBCAT System and software licenses for development and operation of the system	US$25,000
Operation Cost – includes the cost of 24x7 maintenance engineer for the system, an ATC Specialist operating the system and other miscellaneous maintenance costs.	<TBA>

References

- Barnier N. and P. Brisset, 2002, *Graph Coloring for Air Traffic Flow Management*, Proceedings CP-AI-OR'02, pp.1-15.
- Barnier N. and Pascal Brisset, 2000, Slot Allocation in Air Traffic Flow Management, PACLP'2000.
- Bertsimas D.J. and A.R. Odoni, 1998, *The air traffic flow management problem with en-route capacities, Operations Research*, Vol. 46, pp.406-422.
- Brennan M. and Terrence R. Thompson, 2003, *Using Historical Flight Data to Evaluate Airborne Demand, Delay and Traffic Flow Control*, 5th USA/Europe Air Traffic Management Research & Development Seminar.

References

- Chen Z., Andrew T. Holle, Bernard M. E. Moret, Jared Saia, and Ali Boroujerdi, *Network Routing Models Applied to Aircraft Routing Problems*. Proc. Winter Simulation Conference, Arlington, USA, ACM, pages 1200-1206, 1995.

- Le L., Sanaa Kholfi, and George Donahue, 2003, *Proposal for Demand Management Using Auction-Based Arrival Slot Allocation*, 5th USA/Europe Air Traffic Management Research & Development Seminar.

- Nance D., Jacques Carlier, Nhat Linh Doan and Vu Duong, 2003, *A Linear Programming Approach for Route and level Flight Assignment*, 5th USA/Europe Air Traffic Management Research & Development Seminar.

Q & A

Presented by AEROTHAI

Thank You!

BOBCAT
Flow Management Advisory System

Development Team

Presented by **AEROTHAI**

ATFM/TF/2
Appendix E to the Report

OVERFLIGHTS IN DELHI FIR (WITH ENTRY/EXIT TIME) ON 12/05/2005

S.No.	ACID	TYPE	DIR	DEP	DEST	ROUTE (ENTRY/EXIT TIME)	OPS-DATE
1	SIA318	B744	W	WSSS	EGLL	IBANI0556 NIKOT0608 BIDAN0610 LATOS0625 VIKIT0639	5/12/2005
2	SIA320	B747	W	WSSS	EGLL	IBANI0916 NIKOT0927 BIDAN0930 LATOS0945 VIKIT1002	5/12/2005
3	SIA326	B747	W	WSSS	EDDF	IBANI1059 NIKOT1111 BIDAN1113 LATOS1128 VIKIT1142	5/12/2005
4	DLH777	B744	W	WSSS	EDDF	IBANI1842 NIKOT1852 BIDAN1854 LATOS1906 VIKIT1919	5/12/2005
5	KLM838	B744	W	WSSS	EHAM	IBANI1915 NIKOT1930 BIDAN1933 LATOS1948 VIKIT2001	5/12/2005
6	KLM810	B744	W	WMKK	EHAM	IBANI1928 NIKOT1942 BIDAN1945 LATOS2000 VIKIT2014	5/12/2005
7	DLH777	B747	W	WSSS	EDDF	IBANI1940 NIKOT1957 BIDAN1959 LATOS2014 VIKIT2027	5/12/2005
8	MAS14	B747	W	WMKK	LIRF	IBANI2010 NIKOT2022 BIDAN2024 LATOS2040 VIKIT2054	5/12/2005
9	SIA026	B744	W	WSSS	EDDF	IBANI2043 NIKOT2055 BIDAN2058 LATOS2113 VIKIT2130	5/12/2005
10	SIA334	B744	W	WSSS	LFPG	IBANI2059 NIKOT2111 BIDAN2114 LATOS2129 VIKIT2143	5/12/2005
11	QFA31	B744	W	WSSS	EGLL	IBUDA0138 KKJ0158 NOBOM0211 AGG0221 GURTI0226 DPN0234 BUTOP0248 ASARI0259 SAMAR0304	5/12/2005
12	AEW172	B763	W	VTBD	UKBB	IBUDA0152 KKJ0213 AGG0242 GURTI0247 DPN0256 BUTOP0310 ASARI0322 SAMAR0329	5/12/2005
13	AEW171	B763	W	VTBD	UKBB	IBUDA0152 KKJ0213 NOBOM0225 AGG0234 GURTI0239 DPN0247 BUTOP0259 ASARI0310 SAMAR0316	5/12/2005
14	MAS90	B744	W	WMKK	ESSA	IBUDA0531 KKJ0551 NOBOM0609 AGG0619 GURTI0623 DPN0631 CHI0635 LKA0651 TIGER0703	5/12/2005
15	MAS12	B744	W	WMKK	EGCC	IBUDA0612 KKJ0631 NOBOM0648 AGG0658 GURTI0702 DPN0710 CHI0714 LKA0730 TIGER0746	5/12/2005
16	MAS4	B747	W	WMKK	EGLL	IBUDA0753 KKJ0812 NOBOM0828 AGG0838 GURTI0842 DPN0850 CHI0854 LKA0910 TIGER0922	5/12/2005
17	QFA9	B744	W	WSSS	EGLL	IBUDA1849 KKJ1909 ASIDI1912 MEMID1925 BAVOX1934 INTIL1940 JJP1946 KABEL2002 TIGER2014	5/12/2005
18	MAS20	B744	W	WMKK	LFPG	IBUDA1908 KKJ1928 ASIDI1932 MEMID1947 BAVOX1957 INTIL2002 JJP2008 KABEL2025 TIGER2036	5/12/2005
19	QFA5	B744	W	WSSS	EDDF	IBUDA1910 KKJ1930 ASIDI1934 MEMID1948 BAVOX1957 INTIL2003 JJP2009 KABEL2025 TIGER2037	5/12/2005
20	AFR257	B773	W	WSSS	LFPG	IBUDA1925 KKJ1945 ASIDI1948 MEMID2000 BAVOX2010 INTIL2015 JJP2021 KABEL2038 TIGER2049	5/12/2005
21	SIA324	B772	W	WSSS	EHAM	IBUDA2015 KKJ2035 ASIDI2038 MEMID2051 BAVOX2101 INTIL2107 JJP2113 KABEL2130 TIGER2141	5/12/2005
22	SIA340	B772	W	WSSS	LIRF	IBUDA2105 KKJ2125 ASIDI2129 MEMID2143 BAVOX2152 INTIL2158 JJP2204 KABEL2221 TIGER2232	5/12/2005
23	QTR355	A320	W	VNKT	OTBD	LLK0319 JAL0331 SSB0347 DPN0352 CHI0356 LKA0416 TIGER0429	5/12/2005
24	BAW144	B772	W	VGZR	EGLL	LLK0440 JAL0453 PUMOT0502 SP0518 ONOGI0521 CHG0525 LAKET0535 SAMAR0543	5/12/2005
25	THA970D	B744	W	VTBD	LSZH	LLK0451 JAL0503 PUMOT0512 SP0528 ONOGI0532 CHG0535 LAKET0546 SAMAR0553	5/12/2005
26	LTU751	A332	W	VTBD	EDDL	LLK0813 JAL0827 PUMOT0836 SP0852 ONOGI0856 CHG0900 LAKET0910 SAMAR0918	5/12/2005
27	THA924	B744	W	VTBD	EHAM	LLK0902 JAL0914 PUMOT0923 SP0939 ONOGI0943 CHG0946 LAKET0957 SAMAR1003	5/12/2005
28	AFL552	IL96	W	VTBD	UUEE	LLK0906 JAL0919 PUMOT0929 SP0946 ONOGI0950 CHG0954 LAKET1005 SAMAR1012	5/12/2005
29	EVA67	B744	W	VTBD	EGLL	LLK0931 JAL0943 PUMOT0951 SP1007 ONOGI1011 CHG1014 LAKET1024 SAMAR1031	5/12/2005
30	GFA407	B763	W	VNKT	OMAA	LLK1349 JAL1401 SSB1417 DPN1422 CHI1425 LKA1446 TIGER1459	5/12/2005
31	BBC043	DC10	W	VGZR	OKBK	LLK1600 JAL1611 SSB1625 DPN1630 CHI1633 LKA1651 TIGER1703	5/12/2005
32	THA505	A306	W	VTBD	OPLA	LLK1625 JAL1637 SSB1653 DPN1658 BUTOP1712 ASARI1725 SAMAR1730	5/12/2005
33	PIA002	A310	W	WSSS	OPRN	LLK1701 JAL1714 SSB1731 DPN1736 ASARI1804 SAMAR1810	5/12/2005
34	RNA229	B752	W	VNKT	OMDB	LLK1728 JAL1739 SSB1753 DPN1757 CHI1800 LKA1817 TIGER1830	5/12/2005
35	RBA33	B763	W	VTBD	EDDF	LLK1902 JAL1914 PUMOT1923 SP1940 ONOGI1943 CHG1947 LAKET1957 SAMAR2003	5/12/2005
36	KLM878	B744	W	VTBD	EHAM	LLK1905 JAL1917 PUMOT1926 SP1941 ONOGI1944 CHG1947 LAKET1957 SAMAR2003	5/12/2005
37	BAW10	B744	W	VTBD	EGLL	LLK1914 JAL1924 PUMOT1933 SP1949 ONOGI1952 CHG1955 LAKET2005 SAMAR2012	5/12/2005
38	DLH783	A343	W	VTBD	EDDM	LLK1927 JAL1941 SSB1955 DPN2000 CHI2003 LKA2021 TIGER2033	5/12/2005
39	SWR183	A343	W	VTBD	LSZH	LLK1948 JAL2000 PUMOT2009 SP2025 ONOGI2028 CHG2032 LAKET2042 SAMAR2048	5/12/2005
40	AUA32	A343	W	VNKT	LOWW	LLK2003 JAL2014 PUMOT2023 SP2039 ONOGI2042 CHG2046 LAKET2056 SAMAR2102	5/12/2005
41	DLH779	B744	W	VTBD	EDDF	LLK2005 JAL2015 PUMOT2023 SP2038 ONOGI2041 CHG2045 LAKET2054 SAMAR2100	5/12/2005
42	CAL063	A343	W	RCTP	LOWW	LLK2005 JAL2017 SSB2034 DPN2039 CHI2043 LKA2101 TIGER2113	5/12/2005

OVERFLIGHTS IN DELHI FIR (WITH ENTRY/EXIT TIME) ON 12/05/2005

S.No.	ACID	TYPE	DIR	DEP	DEST	ROUTE (ENTRY/EXIT TIME)	OPS-DATE
43	DLH789	A346	W	ZGGG	EDDF	LLK2010 JAL2022 PUMOT2030 SP2046 ONOGI2050 CHG2053 LAKET2104 SAMAR2110	5/12/2005
44	AFR169	A343	W	VTBD	LFPG	LLK2015 JAL2026 PUMOT2034 SP2050 ONOGI2054 CHG2057 LAKET2107 SAMAR2114	5/12/2005
45	THA920	B744	W	VTBD	EDDF	LLK2020 JAL2032 PUMOT2040 SP2056 ONOGI2100 CHG2103 LAKET2114 SAMAR2120	5/12/2005
46	FIN092	MD11	W	VTBD	EFHK	LLK2029 JAL2042 PUMOT2051 SP2106 ONOGI2110 CHG2113 LAKET2123 SAMAR2130	5/12/2005
47	THA930	B744	W	VTBD	LFPG	LLK2033 JAL2044 PUMOT2053 SP2109 ONOGI2112 CHG2116 LAKET2126 SAMAR2133	5/12/2005
48	THA970	MD11	W	VTBD	LSZH	LLK2049 JAL2101 PUMOT2110 SP2126 ONOGI2129 CHG2133 LAKET2142 SAMAR2149	5/12/2005
49	THA944	B743	W	VTBD	LIRF	LLK2052 JAL2103 PUMOT2112 SP2127 ONOGI2130 CHG2133 LAKET2143 SAMAR2149	5/12/2005
50	SAS972	A343	W	VTBD	EKCH	LLK2053 JAL2106 PUMOT2115 SP2131 ONOGI2135 CHG2138 LAKET2149 SAMAR2156	5/12/2005
51	THY71	A343	W	VTBD	LTBA	LLK2058 JAL2126 SSB2142 DPN2147 CHI2151 LKA2210 TIGER2223	5/12/2005
52	CPA293	B744	W	VHHH	LIRF	LLK2102 JAL2112 SSB2126 DPN2131 CHI2134 LKA2153 TIGER2205	5/12/2005
53	THA940	MD11	W	VTBD	LIMC	LLK2103 JAL2113 PUMOT2122 SP2137 ONOGI2141 CHG2144 LAKET2154 SAMAR2200	5/12/2005
54	QFA1	B744	W	VTBD	EGLL	LLK2104 JAL2116 PUMOT2125 SP2141 ONOGI2144 CHG2148 LAKET2159 SAMAR2206	5/12/2005
55	THA910	B744	W	VTBD	EGLL	LLK2129 JAL2139 PUMOT2148 SP2204 ONOGI2207 CHG2211 LAKET2221 SAMAR2227	5/12/2005
56	THA960	B744	W	VTBD	EKCH	LLK2148 JAL2156 PUMOT2205 SP2220 ONOGI2224 CHG2227 LAKET2237 SAMAR2244	5/12/2005
57	CLX797	B744	W	VTBD	UBBB	LLK2319 JAL2332 PUMOT2341 SP2356 ONOGI2359 CHG0003 LAKET0013 SAMAR0019	5/12/2005
58	CAL067	B744	W	VTBD	LIRF	LLK2325 JAL2336 SSB2351 DPN2355 CHI2359 LKA0018 TIGER0030	5/12/2005
59	MAS10	B772	W	WMKK	LSZH	VILOP1933 KKJ1948 ASIDI1951 MEMID2004 BAVOX2014 INTIL2019 JJP2026 KABEL2043 TIGER2054	5/12/2005
60	SIA322	B744	W	WSSS	EGLL	VILOP1943 KKJ1957 ASIDI2000 MEMID2012 BAVOX2021 INTIL2027 JJP2033 KABEL2049 TIGER2100	5/12/2005
61	HVN535	B772	W	VVNB	LFPG	VILOP1945 KKJ2001 ASIDI2004 MEMID2014 BAVOX2024 INTIL2029 JJP2036 KABEL2053 TIGER2104	5/12/2005
62	MAS2	B744	W	WMKK	EGLL	VILOP1947 KKJ2002 ASIDI2006 MEMID2022 BAVOX2032 INTIL2037 JJP2043 KABEL2059 TIGER2111	5/12/2005
63	MAS6	B772	W	WMKK	EDDF	VILOP2002 KKJ2017 ASIDI2020 MEMID2033 BAVOX2043 INTIL2049 JJP2056 KABEL2113 TIGER2125	5/12/2005
64	MAS16	B744	W	WMKK	EHAM	VILOP2018 KKJ2033 ASIDI2037 MEMID2051 BAVOX2100 INTIL2106 JJP2113 KABEL2128 TIGER2140	5/12/2005
65	CAL065	B744	W	VTBD	EHAM	VILOP2217 KKJ2230 ASIDI2233 MEMID2246 BAVOX2255 INTIL2300 JJP2306 KABEL2322 TIGER2333	5/12/2005
66		B772	W	WMKK	LOWW	VILOP2222 KKJ2237 ASIDI2240 MEMID2252 BAVOX2302 INTIL2307 JJP2314 KABEL2330 TIGER2342	5/12/2005

OVERFLIGHTS IN DELHI FIR (WITH ENTRY/EXIT TIME) ON 13/05/2005

S.No.	ACID	TYPE	DIR	DEP	DEST	ROUTE (ENTRY/EXIT TIME)	OPS_DATE
1	MAS12	B744	W	WMKK	EGCC	BHITI0618 KKJ0634 AGG0701 GURTI0705 DPN0713 CHI0717 LKA0734 TIGER0746	5/13/2005
2	MAS4	B747	W	WMKK	EGLL	BHITI0737 KKJ0753 AGG0822 GURTI0827 DPN0834 CHI0838 LKA0855 TIGER0909	5/13/2005
3	SIA318	B744	W	WSSS	EGLL	IBANI0725 NIKOT0738 BIDAN0741 LATOS0756 VIKIT0813	5/13/2005
4	DLH777	B744	W	WSSS	EDDF	IBANI1043 NIKOT1055 BIDAN1057 LATOS1113 VIKIT1129	5/13/2005
5	SIA326	B744	W	WSSS	EDDF	IBANI1052 NIKOT1105 BIDAN1107 LATOS1123 VIKIT1140	5/13/2005
6	SIA320	B744	W	WSSS	EGLL	IBANI1253 NIKOT1306 BIDAN1308 LATOS1324 VIKIT1341	5/13/2005
7	DLH777	B744	W	WSSS	EDDF	IBANI1939 NIKOT1951 BIDAN1953 LATOS2008 VIKIT2022	5/13/2005
8	AFR257	B773	W	WSSS	LFPG	IBANI2005 NIKOT2017 BIDAN2020 LATOS2034 VIKIT2049	5/13/2005
9	DLH773	A343	W	VTBD	EDDM	IBANI2005 NIKOT2018 BIDAN2021 LATOS2037 VIKIT2052	5/13/2005
10	SIA026	B744	W	WSSS	EDDF	IBANI2021 NIKOT2042 BIDAN2044 LATOS2100 VIKIT2113	5/13/2005
11	SIA322	B744	W	WSSS	EGLL	IBANI2033 NIKOT2053 BIDAN2055 LATOS2110 VIKIT2124	5/13/2005
12	SIA334	B744	W	WSSS	LFPG	IBANI2049 NIKOT2101 BIDAN2104 LATOS2119 VIKIT2136	5/13/2005
13	QFA31	B744	W	WSSS	EGLL	IBUDA0139 KKJ0159 NOBOM0215 AGG0225 GURTI0230 DPN0239 BUTOP0252 ASARI0304 SAMAR0309	5/13/2005
14	MAS4	B744	W	WMKK	EGLL	IBUDA1649 KKJ1708 NOBOM1720 AGG1729 GURTI1733 DPN1740 CHI1744 LKA1800 TIGER1812	5/13/2005
15	QFA5	B744	W	WSSS	EDDF	IBUDA1859 KKJ1919 ASIDI1923 MEMID1937 BAVOX1947 INTIL1953 JJP1959 KABEL2016 TIGER2028	5/13/2005
16	QFA9	B744	W	WSSS	EGLL	IBUDA1911 KKJ1931 ASIDI1935 MEMID1950 BAVOX1959 INTIL2005 JJP2011 KABEL2029 TIGER2040	5/13/2005
17	KLM836	B744	W	WSSS	EHAM	IBUDA1930 KKJ1949 NOBOM2000 AGG2009 GURTI2013 DPN2021 BUTOP2033 ASARI2044 SAMAR2049	5/13/2005
18	MAS2	B744	W	WMKK	EGLL	IBUDA1939 KKJ1959 ASIDI2003 MEMID2016 BAVOX2026 INTIL2031 JJP2038 KABEL2055 TIGER2106	5/13/2005
19	MAS6	B772	W	WMKK	EDDF	IBUDA1949 KKJ2010 ASIDI2014 MEMID2030 BAVOX2040 INTIL2046 JJP2053 KABEL2111 TIGER2126	5/13/2005
20	MAS16	B744	W	WMKK	EHAM	IBUDA2000 KKJ2020 ASIDI2024 MEMID2038 BAVOX2048 INTIL2054 JJP2100 KABEL2117 TIGER2128	5/13/2005
21	CLX799	B744	W	VTBD	UBBB	LLK0031 JAL0043 PUMOT0052 SP0107 ONOGI0111 CHG0114 LAKET0124 SAMAR0131	5/13/2005
22	IRM5044	A310	W	VTBD	OIII	LLK0311 JAL0326 SSB0343 DPN0347 CHI0351 LKA0411 TIGER0424	5/13/2005
23	QTR351	A320	W	VNKT	OTBD	LLK0325 JAL0338 SSB0355 DPN0400 CHI0404 LKA0426 TIGER0438	5/13/2005
24	UZB532	A310	W	VTBD	UTTT	LLK0506 JAL0517 SSB0532 DPN0537 BUTOP0551 ASARI0603 SAMAR0609	5/13/2005
25	THA916	B744	W	VTBD	EGLL	LLK0828 JAL0840 PUMOT0849 SP0905 ONOGI0909 CHG0912 LAKET0923 SAMAR0930	5/13/2005
26	THA924	B744	W	VTBD	EDDM	LLK0855 JAL0907 PUMOT0916 SP0933 ONOGI0936 CHG0940 LAKET0950 SAMAR0956	5/13/2005
27	THA922	B744	W	VTBD	EDDF	LLK0910 JAL0921 PUMOT0930 SP0946 ONOGI0950 CHG0953 LAKET1003 SAMAR1010	5/13/2005
28	AFL542	IL96	W	VVNB	UUEE	LLK0910 JAL0923 PUMOT0933 SP0951 ONOGI0954 CHG0958 LAKET1009 SAMAR1016	5/13/2005
29	GFA407	B763	W	VNKT	OMAA	LLK1401 JAL1415 SSB1432 DPN1438 CHI1442 LKA1503 TIGER1519	5/13/2005
30	QTR353	A306	W	VNKT	OTBD	LLK1541 JAL1553 SSB1609 DPN1613 CHI1617 LKA1637 TIGER1653	5/13/2005
31	THA505	A306	W	VTBD	OPLA	LLK1627 JAL1642 SSB1659 DPN1704 BUTOP1719 ASARI1731 SAMAR1736	5/13/2005
32	CLX791	B744	W	VTBD	UBBB	LLK1807 JAL1820 PUMOT1829 SP1845 ONOGI1849 CHG1853 LAKET1903 SAMAR1910	5/13/2005
33	AFR171	A343	W	VTBD	LFPG	LLK1831 JAL1842 PUMOT1850 SP1905 ONOGI1909 CHG1912 LAKET1921 SAMAR1927	5/13/2005
34	RNA229	B752	W	VNKT	OMDB	LLK1837 JAL1848 SSB1905 DPN1910 CHI1914 LKA1934 TIGER1950	5/13/2005
35	RBA35	B763	W	VTBD	EDDF	LLK1914 JAL1927 PUMOT1936 SP1953 ONOGI1957 CHG2000 LAKET2011 SAMAR2018	5/13/2005
36	AFR171	A343	W	VTBD	LFPG	LLK1917 JAL1931 SSB1947 DPN1952 BUTOP2005 ASARI2016 SAMAR2022	5/13/2005
37	BAW10	B744	W	VTBD	EGLL	LLK1919 JAL1934 PUMOT1943 SP1958 ONOGI2002 CHG2005 LAKET2016 SAMAR2022	5/13/2005
38	KLM878	B744	W	VTBD	EHAM	LLK1921 JAL1934 SSB1948 DPN1952 BUTOP2005 ASARI2017 SAMAR2022	5/13/2005
39	EVA61	A332	W	VTBD	LOWW	LLK1941 JAL1955 PUMOT2004 SP2021 ONOGI2024 CHG2028 LAKET2039 SAMAR2047	5/13/2005
40	SWR183	A343	W	VTBD	LSZH	LLK1946 JAL2000 PUMOT2009 SP2026 ONOGI2029 CHG2033 LAKET2044 SAMAR2051	5/13/2005
41	THA920	B744	W	VTBD	EDDF	LLK1958 JAL2010 PUMOT2018 SP2034 ONOGI2038 CHG2041 LAKET2051 SAMAR2058	5/13/2005
42	THA946	MD11	W	VTBD	LGAV	LLK2002 JAL2013 PUMOT2021 SP2035 ONOGI2038 CHG2042 LAKET2051 SAMAR2057	5/13/2005

OVERFLIGHTS IN DELHI FIR (WITH ENTRY/EXIT TIME) ON 13/05/2005

S.No.	ACID	TYPE	DIR	DEP	DEST	ROUTE (ENTRY/EXIT TIME)	OPS_DATE
43	DLH779	B744	W	VTBD	EDDF	LLK2013 JAL2028 PUMOT2036 SP2052 ONOGI2055 CHG2059 LAKET2109 SAMAR2116	5/13/2005
44	THA930	B744	W	VTBD	LFPG	LLK2024 JAL2036 PUMOT2044 SP2100 ONOGI2104 CHG2108 LAKET2118 SAMAR2124	5/13/2005
45	CPA293	B744	W	VHHH	LIRF	LLK2033 JAL2045 SSB2100 DPN2105 CHI2108 LKA2126 TIGER2138	5/13/2005
46	FIN098	MD11	W	VTBD	EFHK	LLK2034 JAL2048 PUMOT2057 SP2113 ONOGI2117 CHG2120 LAKET2131 SAMAR2138	5/13/2005
47	SAS972	A343	W	VTBD	EKCH	LLK2037 JAL2052 PUMOT2102 SP2119 ONOGI2122 CHG2126 LAKET2137 SAMAR2144	5/13/2005
48	THA942	B744	W	VTBD	LIRF	LLK2047 JAL2100 PUMOT2109 SP2125 ONOGI2129 CHG2132 LAKET2143 SAMAR2150	5/13/2005
49	CLX741	B744	W	VHHH	UBBB	LLK2047 JAL2101 PUMOT2110 SP2126 ONOGI2129 CHG2133 LAKET2143 SAMAR2150	5/13/2005
50	THA970	MD11	W	VTBD	LSZH	LLK2053 JAL2110 PUMOT2120 SP2136 ONOGI2140 CHG2144 LAKET2154 SAMAR2201	5/13/2005
51	THY61	A343	W	VTBD	LTBA	LLK2115 JAL2128 SSB2145 DPN2149 CHI2153 LKA2213 TIGER2229	5/13/2005
52	THA910	B744	W	VTBD	EGLL	LLK2118 JAL2130 PUMOT2139 SP2155 ONOGI2159 CHG2202 LAKET2212 SAMAR2219	5/13/2005
53	PIA893	A310	W	VTBD	OPRN	LLK2120 JAL2132 SSB2149 DPN2154 BUTOP2210 ASARI2222 SAMAR2229	5/13/2005
54	THA950	B744	W	VTBD	EKCH	LLK2137 JAL2152 PUMOT2201 SP2217 ONOGI2220 CHG2224 LAKET2234 SAMAR2241	5/13/2005
55	EVA75	B744	W	VTBD	EHAM	LLK2300 JAL2310 PUMOT2319 SP2335 ONOGI2338 CHG2341 LAKET2352 SAMAR2358	5/13/2005
56	HVN525	B772	W	VVNB	UUDD	LLK2324 JAL2336 SSB2352 DPN2357 BUTOP0011 ASARI0023 SAMAR0029	5/13/2005
57	MAS20	B744	W	WMKK	LFPG	VILOP1917 KKJ1932 ASIDI1937 MEMID1954 BAVOX2004 INTIL2010 JJP2016 KABEL2033 TIGER2044	5/13/2005
58	MAS22	B772	W	WMKK	LOWW	VILOP1928 KKJ1943 ASIDI1947 MEMID2003 BAVOX2013 INTIL2019 JJP2026 KABEL2044 TIGER2055	5/13/2005
59	KLM836	B744	W	WSSS	EHAM	VILOP1942 KKJ1956 NOBOM2014 AGG2024 GURTI2029 DPN2037 BUTOP2051 ASARI2103 SAMAR2108	5/13/2005
60	HVN533	B772	W	VVTS	LFPG	VILOP1950 KKJ2004 ASIDI2008 MEMID2022 BAVOX2031 INTIL2037 JJP2044 KABEL2101 TIGER2113	5/13/2005
61	QFA1	B744	W	VTBD	EGLL	VILOP2032 KKJ2046 ASIDI2050 MEMID2104 BAVOX2113 INTIL2119 JJP2125 KABEL2142 TIGER2154	5/13/2005
62	QFA15	B744	W	WSSS	EGLL	VILOP2037 KKJ2052 ASIDI2055 MEMID2106 BAVOX2116 INTIL2122 JJP2128 KABEL2145 TIGER2156	5/13/2005
63	SIA352	B772	W	WSSS	EKCH	VILOP2130 KKJ2145 ASIDI2149 MEMID2203 BAVOX2213 INTIL2218 JJP2225 KABEL2242 TIGER2254	5/13/2005
64	CAL065	B744	W	VTBD	EHAM	VILOP2226 KKJ2239 ASIDI2243 MEMID2257 BAVOX2306 INTIL2312 JJP2318 KABEL2334 TIGER2346	5/13/2005

DATA FOR ATFM PRESENTATION ON 28-06-2005

Date: 09-05-2005

PERIOD	OVERFLYING				DEPARTURE FROM DELHI			GRAND TOTAL
	TIGER	SAMAR	VIKIT	Total	TIGER	SAMAR	Total	
0000-0100	01	-	-	01	-	01	01	02
0101-0200	-	-	-	-	01	-	01	01
0201-0300	-	-	-	-	02	01	03	03
0301-0400	-	01	-	01	01	-	01	02
0401-0500	-	01	-	01	02	-	02	03
0501-0600	-	-	-	-	01	-	01	01
0601-0700	01	-	01	02	-	-	-	02
0701-0800					-	-	-	-
0801-0900	01	-	-	01	03	01	04	05
0901-1000	01	02	-	03	02	-	02	05
1001-1100	-	01	-	01	-	-	-	01
1101-1200	01	-	02	03	-	-	-	03
1201-1300	-	-	-	-	-	01	01	01
1301-1400	-	-	-	-	-	01	01	01
1401-1500	-	-	-	-	-	-	-	-
1501-1600	01	-	-	01	01	-	01	02
1601-1700	02	-	-	02	01	-	01	03
1701-1800	-	01	-	01	-	-	-	01
1801-1900	-	01	-	01	-	01	01	02
1901-2000	-	01	01	02	-	02	02	04
2001-2100	06	05	07	18	-	-	-	18
2101-2200	05	09	02	16	02	03	05	21
2201-2300	05	04	-	09	-	01	01	10
2301-2400	-	03	-	03	02	01	03	06
TOTAL	**24**	**29**	**13**	**66**	**18**	**13**	**31**	**97**

DATA FOR ATFM PRESENTATION ON 28-06-2005

Date: 10-05-2005

PERIOD	OVERFLYING				DEPARTURE FROM DELHI			GRAND TOTAL
	TIGER	SAMAR	VIKIT	Total	TIGER	SAMAR	Total	
0000-0100	01	-	-	01	-	01	01	02
0101-0200	-	-	-	-	01	-	01	01
0201-0300	-	01	-	01	03	-	03	04
0301-0400	-	01	-	01	-	-	-	01
0401-0500	-	01	-	01	01	-	01	02
0501-0600	-	-	-	-	01	-	01	01
0601-0700	01	01	-	02	02	01	03	05
0701-0800	01	01	-	02	-	02	02	04
0801-0900	-	-	-	-	01	01	02	02
0901-1000	01	03	-	04	01	-	01	05
1001-1100	-	-	-	-	-	-	-	-
1101-1200	01	-	-	01	-	-	-	01
1201-1300	-	-	-	-	-	-	-	-
1301-1400	02	-	-	02	-	-	-	02
1401-1500	-	-	-	-	01	-	01	01
1501-1600	-	-	-	-	01	-	01	01
1601-1700	02	-	-	02	-	-	-	02
1701-1800	01	01	-	02	-	-	-	02
1801-1900	-	-	-	-	-	01	01	01
1901-2000	-	02	01	03	01	02	03	06
2001-2100	05	04	04	13	-	-	-	13
2101-2200	08	09	02	19	02	01	03	22
2201-2300	01	04	-	05	01	-	01	06
2301-2400	-	01	-	01	01	-	01	02
TOTAL	**24**	**29**	**07**	**60**	**17**	**09**	**26**	**96**

DATA FOR ATFM PRESENTATION ON 28-06-2005

Date: 11-05-2005

PERIOD	OVERFLYING				DEPARTURE FROM DELHI			GRAND TOTAL
	TIGER	SAMAR	VIKIT	Total	TIGER	SAMAR	Total	
0000-0100	-	-	-	-	01	-	01	01
0101-0200	-	01	-	01	01	-	01	02
0201-0300	-	01	-	01	02	-	02	03
0301-0400	-	-	-	-	02	01	03	03
0401-0500	-	-	-	-	01	-	01	01
0501-0600	01	-	-	01	01	-	01	02
0601-0700	01	-	01	02	-	-	-	02
0701-0800	-	-	-	-	01	-	01	01
0801-0900	-	01	-	01	-	-	01	02
0901-1000	01	02	-	03	01	-	01	04
1001-1100	-	01	01	02	-	-	-	02
1101-1200	-	-	01	01	01	01	02	03
1201-1300	-	-	-	-	02	01	03	03
1301-1400	-	-	-	-	-	-	-	-
1401-1500	-	-	-	-	-	-	-	-
1501-1600	-	-	-	-	01	-	01	01
1601-1700	01	-	-	01	01	-	01	02
1701-1800	-	01	-	01	-	-	-	01
1801-1900	01	-	-	01	-	-	-	01
1901-2000	-	01	-	01	-	02	02	03
2001-2100	04	10	02	16	-	03	03	19
2101-2200	05	10	03	18	-	02	02	20
2201-2300	02	03	-	05	01	-	01	06
2301-2400	01	-	-	01	-	01	01	02
TOTAL	**17**	**31**	**08**	**56**	**16**	**12**	**28**	**94**

DATA FOR ATFM PRESENTATION ON 28-06-2005

Date: 12-05-2005

PERIOD	OVERFLYING				DEPARTURE FROM DELHI			GRAND TOTAL
	TIGER	SAMAR	VIKIT	Total	TIGER	SAMAR	Total	
0000-0100	01	01	-	02	01	01	02	04
0101-0200	-	-	-	-	01	-	01	02
0201-0300	-	-	-	-	02	01	03	05
0301-0400	-	03	-	03	-	02	02	05
0401-0500	01	-	-	01	02	-	02	03
0501-0600	-	02	-	02	-	-	-	02
0601-0700	-	-	01	01	01	-	01	02
0701-0800	02	-	-	02	-	-	-	02
0801-0900	-	-	-	-	01	-	01	01
0901-1000	01	01	-	02	02	-	02	04
1001-1100	-	03	01	04	-	-	-	04
1101-1200	-	-	01	01	01	-	01	02
1201-1300	-	-	-	-	-	01	01	01
1301-1400	-	-	-	-	-	-	-	-
1401-1500	01	-	-	01	01	02	03	04
1501-1600	-	-	-	-	02	-	02	02
1601-1700	-	-	-	-	01	-	01	01
1701-1800	01	01	-	02	-	-	-	02
1801-1900	01	01	-	02	-	01	01	03
1901-2000	-	-	01	01	-	01	01	02
2001-2100	07	05	04	16	-	02	02	18
2101-2200	07	10	02	19	01	02	03	22
2201-2300	03	02	-	05	01	-	01	06
2301-2400	02	-	-	02	02	-	02	04
TOTAL	**27**	**29**	**10**	**66**	**19**	**13**	**32**	**98**

DATA FOR ATFM PRESENTATION ON 28-06-2005

Date: 13-05-2005

PERIOD	OVERFLYING				DEPARTURE FROM DELHI			GRAND TOTAL
	TIGER	SAMAR	VIKIT	Total	TIGER	SAMAR	Total	
0000-0100	-	01	-	01	-	02	02	03
0101-0200	-	01	-	01	02	-	02	03
0201-0300	-	01	-	01	-	01	01	02
0301-0400	-	01	-	01	03	-	03	04
0401-0500	02	-	-	02	01	-	01	03
0501-0600	-	-	-	-	-	-	-	-
0601-0700	-	01	-	01	01	-	01	02
0701-0800	01	-	-	01	01	02	03	04
0801-0900	-	-	01	01	01	01	02	03
0901-1000	01	02	-	03	02	-	02	05
1001-1100	-	02	-	02	-	-	-	02
1101-1200	-	-	02	02	01	-	01	03
1201-1300	-	-	-	-	01	-	01	01
1301-1400	-	-	01	01	-	01	01	02
1401-1500	-	-	-	-	-	-	-	-
1501-1600	01	-	-	01	02	-	02	03
1601-1700	01	-	-	01	02	-	02	03
1701-1800	-	01	-	01	-	-	-	01
1801-1900	01	-	-	01	01	01	02	03
1901-2000	01	02	-	03	-	-	-	03
2001-2100	04	09	03	16	-	02	02	18
2101-2200	07	07	03	17	-	02	02	19
2201-2300	02	-	03	05	01	-	01	06
2301-2400	01	01	-	02	01	02	03	05
TOTAL	**22**	**32**	**10**	**64**	**20**	**14**	**34**	**98**

DATA FOR ATFM PRESENTATION ON 28-06-2005

Date: 14-05-2005

PERIOD	OVERFLYING				DEPARTURE FROM DELHI			GRAND TOTAL
	TIGER	SAMAR	VIKIT	Total	TIGER	SAMAR	Total	
0000-0100	01	-	-	01	-	01	01	02
0101-0200	-	01	-	01	01	01	02	03
0201-0300	-	-	-	-	02	02	04	04
0301-0400	-	01	-	01	-	01	01	02
0401-0500	-	01	-	01	02	-	02	03
0501-0600	-	-	-	-	-	01	01	01
0601-0700	01	-	01	02	02	-	02	04
0701-0800	01	-	-	01	01	01	02	03
0801-0900	-	01	-	01	-	-	-	01
0901-1000	01	01	-	02	01	03	04	06
1001-1100	01	02	-	03	01	-	01	04
1101-1200	-	01	-	01	-	-	-	01
1201-1300	01	-	-	01	-	01	01	02
1301-1400	01	01	-	02	-	-	-	02
1401-1500	-	-	-	-	-	-	-	-
1501-1600	-	-	-	-	02	-	02	02
1601-1700	02	-	-	02	01	-	01	03
1701-1800	-	-	-	-	-	-	-	-
1801-1900	-	-	-	-	-	-	-	-
1901-2000	-	-	-	-	01	03	04	04
2001-2100	04	06	06	16	-	-	-	16
2101-2200	07	04	05	16	-	03	03	19
2201-2300	02	06	-	08	-	03	03	11
2301-2400	-	01	-	01	01	-	01	02
TOTAL	**22**	**26**	**12**	**60**	**15**	**20**	**35**	**95**

DATA FOR ATFM PRESENTATION ON 28-06-2005

Date: 15-05-2005

PERIOD	OVERFLYING				DEPARTURE FROM DELHI			GRAND TOTAL
	TIGER	SAMAR	VIKIT	Total	TIGER	SAMAR	Total	
0000-0100	01	02	-	03	01	-	01	02
0101-0200	-	-	-	-	02	-	02	04
0201-0300	-	-	-	-	01	01	02	02
0301-0400	-	01	-	-	02	-	02	02
0401-0500	-	-	-	-	-	01	01	02
0501-0600	01	-	-	-	01	-	01	01
0601-0700	01	-	01	02	01	-	01	03
0701-0800	-	-	-	-	-	-	-	-
0801-0900	01	-	-	01	01	01	02	03
0901-1000	01	01	01	03	02	01	03	06
1001-1100	01	05	-	06	01	-	01	07
1101-1200	-	-	-	-	01	-	01	01
1201-1300	-	-	-	-	-	-	-	-
1301-1400	01	-	01	02	-	-	-	02
1401-1500	-	-	-	-	-	-	-	-
1501-1600	01	-	-	-	02	-	02	02
1601-1700					01	-	01	01
1701-1800	02	02	-	04	-	-	-	04
1801-1900	01	-	-	01	-	-	-	01
1901-2000	-	03	-	03	-	02	02	05
2001-2100	05	04	06	15	-	01	01	16
2101-2200	05	07	02	14	01	04	05	19
2201-2300	01	06	-	07	-	-	-	07
2301-2400	-	-	-	-	03	01	04	04
TOTAL	**22**	**31**	**11**	**64**	**21**	**11**	**32**	**96**

TASK LIST FOR THE IMPLEMENTATION OF AN ATFM ADVISORY SYSTEM TRIAL IN THE BAY OF BENGAL (VERSION 2.0)

ID	Task Name	Start Date	Finish Date	Completion Date	Action By	Resource Names/Remarks
1.0	**Operational Issues**					
1.1	Identify Operational Needs		9 Sep 2005			
1.2	Co-ordinate and update Operational Concept		9 Sep 2005			
1.3	Define ATFM airspace/States involved		9 Sep 2005			
1.4	Define data collection plan	01 May 2005				Regional data captured Apr 05; India provided additional data 9 – 15 May 2005
1.5	Examine the operational factors and workload associated with implementation	22 Apr 2005				
1.6	Determine required ATFM tools		1 July 2005			AEROTHAI BOBCAT system to commence ATFM system trial by 31 December 2005
1.7	Develop, coordinate and submit necessary international and regional documentation					Refer to ATM/AIS/SAR/SG for guidance/advice on multi-lateral agreements required.
2.0	**Develop ATFM Operations Manual and Procedures**	1 Jul 2005	9 Sep 2005			
2.1	Develop ATFMU procedures					
2.2	Develop ATS Unit(s) procedures					
2.3	Develop Airline procedures					
2.4	Develop contingency procedures					(e.g ATFM system/comm. outage)
3.0	**Establishment of an ATFMU**					
3.1	Determine operating hours, manning and equipment requirements		9 Sep 2005			
3.2	Coordination and communications requirements with ATS Unit(s) and Airlines	1 July 2005				
3.3	Assess workload and procedures for ATFMU and Airlines					
4.0	**Financial considerations**					

ID	Task Name	Start Date	Finish Date	Completion Date	Action By	Resource Names/Remarks
4.1	Determine funding arrangements for operation of ATFM service					Not required for trial – will be discussed prior to acceptance of ATFM system
5.0	**Determination of Communication and Interface links**					
5.1	Establishment of communication/interface links between ATFMU and ATS Unit(s)	1 Jul 2005	15 Dec 2005			Further discussions at ATFM/TF/3
5.2	Establishment of communication/interface links between ATFMU and Airlines	1 Jul 2005	15 Dec 2005			Further discussions at ATFM/TF/3
6.0	**Complete coordination with adjoining States and Industry organisations**					
6.1	Publish AIC on the ATFM trial	1 Jul 2005	4 Aug			
6.2	Publish necessary AIP Supplement					
6.3	Publish Trigger NOTAM		24 Dec 2005			7 days prior to implementation
7.0	**SMS requirements as per Annex 11**					Satisfy requirements of ATFM against Annex 11 SMS
8.0	**Training**					
8.1	Conduct training for Air Traffic Controllers and Airline Dispatchers					
8.2	Information dissemination to Airlines					
9.0	**Perform system verification**					
9.1	Conduct verification of ATFM system tool					
9.2	Conduct and review paper exercise					
10.0	**Decision for the commencement of operational trial**					
10.1	Review all factors affecting implementation decision					
10.2	Declare full operational trial capability					
11.0	**Decision to proceed to full implementation of ATFM Phase One for Bay of Bengal using BOBCAT system**					

ID	Task Name	Start Date	Finish Date	Completion Date	Action By	Resource Names/Remarks
12.0	**Post implementation review of operational trial**					
12.1	Carry out post implementation review					
13.0	**Monitor System Performance**					
13.1	Perform follow-on monitoring					