



International Civil Aviation Organization

**The Fourth Meeting of the Air Traffic Flow Management Task Force
(ATFM/TF/4) and BOBCAT Workshop**

Bangkok, Thailand, 7 to 11 November 2005

Agenda Item 5: Safety Assessment

**SAFETY ASSESSMENT
FOR OPERATIONAL TRIAL OF BOBCAT**

(Presented by the Secretariat)

SUMMARY

This paper presents the draft hazard log for the operational trial of the Bay of Bengal Cooperative Air Traffic Flow Management Advisory System (BOBCAT) for review and updating by the meeting.

1 INTRODUCTION

1.1 In accordance with Annex 11 provisions in respect of safety assessment, the ATFM/TF/3 (September 2005) meeting considered the safety aspects in relation to the introduction of BOBCAT during the operational trial.

2 DISCUSSION

2.1 The ATFM/TF/3 meeting acknowledged that BOBCAT was not intended nor designed to “control” aircraft or take away any of the responsibilities of the ATS providers concerned, rather BOBCAT was an advisory system which did not have executive control of aircraft. Nevertheless, BOBCAT would provide scheduling information for aircraft departures and, if the system did not perform to design expectations, may exacerbate traffic congestion. In this context, the meeting conducted a hazard identification activity.

2.2 As a result of hazard identification activities, the ATFM/TF/3 meeting defined hazards as described in the attached Hazard Log and commenced preliminary work on accurately collating mitigation activities. Full details of each identified hazard have been recorded in the BOBCAT Hazard Log included as an **Attachment** to this paper. ATFM/TF/3 agreed that a safety statement would be finalised during ATFM/TF /4 to record the safety issues identified by the task force, but noted that no safety impediment to the conduct of the operational trial was anticipated.

3 ACTION BY THE MEETING

3.1 The Meeting is invited to review and update the attached BOBCAT Hazard Log.

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Safety Assessment Hazard Log

Operational Trial Implementation of Bay of Bengal Cooperative Traffic Flow Management System (BOBCAT)

The Bay of Bengal Cooperative Traffic Flow Management System (BOBCAT) is not intended nor designed to “control” aircraft or relieve any of the traffic separation responsibilities of the ATS providers concerned. ATS providers retain full responsibility for all ATS functions, including air traffic collision avoidance. In accordance with Phase One of the ATFM system implementation planning for the Bay of Bengal being coordinated by the Air Traffic Flow Management Task Force (ATFM/TF) of the ICAO Bay of Bengal ATS Coordination Group (BBACG) the purpose of BOBCAT is to regulate, by the calculation and distribution of gateway slot times, the flow of westbound air traffic departing airports from East Asia, South-East Asia and South Asia and which had planned to transit the Kabul FIR between the hours of 1900UTC and 2400UTC daily.

The BOBCAT is an advisory system which does not have executive control of aircraft. Nevertheless, BOBCAT would provide scheduling information for aircraft departures and, if the system did not perform to design expectations, this could lead to traffic congestion. In no case would erroneous advisory information from BOBCAT be anticipated to lead to breakdown of required ATS separation as ATS providers retain responsibility for tactical ATS and traffic management. In this context, the Air Traffic Flow Management Task Force undertook a safety assessment hazard identification activity in preparation for an operational trial of BOBCAT. The following seven hazards and associated mitigators were identified during the hazard identification activities.

	Hazard No 1
Description:	Non-standard, incorrect or corrupt data leading to erroneous advisory information.
Remarks:	The BOBCAT is a computerized system with user access via the public internet. This hazard identifies the possibility of incorrect data being presented to or utilized by BOBCAT, resulting in erroneous advisory information being promulgated by BOBCAT.

Mitigation:	1) BOBCAT provides advisory information only; ATS providers retain responsibility for tactical ATS and traffic management. 2) Hardware – The BOBCAT Concept of Operations includes details of system hardware architecture which incorporates contemporary firewall protection to ensure no unauthorized access is obtained, in particular to application and database servers. 3) Software – incorporates checking algorithms to ensure aircraft can not be scheduled at the same gateway fix at the same time and at the same flight level. 4) Paper Trial – Paper trials/simulations of full functionality of BOBCAT prior to operational trial comprises validation exercises in order to identify data errors and other issues. 5) ATFMU – Structured training programme for ATFMU staff to ensure recognition of non-normal data configurations, and a “reasonableness” check of gateway allocation lists is conducted by ATFMU staff prior to the list being published to users. 6) ATS Unit – The ATS Units adjacent to or controlling gateway fixes would identify situations where traffic was inappropriately sequenced and provide tactical ATS intervention. 7) Shadow/Ghost Operations – Implementation of operational trial will utilize staged implementation of BOBCAT. Stage one (7 day period) would require full functionality and user input, but slots generated would not be issued to aircraft. Facilitates testing of databases and procedures under operational conditions. Stage 2 commences live operations only provided Stage 1 operations are acceptable.
	Hazard No 2
Description:	Errors or bugs in software updates leading to erroneous advisory information.

Remarks:	This hazard identifies concerns in respect of major software changes or other major equipment changes which could result in introduction of catastrophic software threats.
Mitigation:	1) BOBCAT provides advisory information only; ATS providers retain responsibility for tactical ATS and traffic management. 2) Hardware – The BOBCAT Concept of Operations includes details of system hardware architecture which includes duplicated systems throughout enabling redundancy , allows one system to be non operational whilst duplicated system carries the load. 3) Bay of Bengal and South Asia ATFM Handbook includes requirements and procedures for major software updates. Significant system and software changes to be reviewed by suitable oversight authority e.g. Air Traffic Flow Management Task Force, Bay of Bengal ATS Coordination Group, AEROTHAI Senior Engineering Staff prior to implementation 4) Paper trial and shadow/ghost operations provide intensive testing of software.
Hazard No 3	
Description:	Hardware or networking failures or incompatibilities leading to absence of advisory information or promulgation of erroneous advisory information.
Remarks:	Hardware and/or hardware networking problems/public internet failures may create a situation where BOBCAT goes off line without warning, leading to an absence of data or erroneous data presentation to users due lack of update capability. <i>Question for AEROTHAI – How will users know when the list was last updated? Does the list remain visible once the internet connection is lost? Is there some way of indicating to users that the list has not been recently updated and therefore is not accurate?</i>

Mitigation:	1) BOBCAT provides advisory information only; ATS providers retain responsibility for tactical ATS and traffic management. 2) Hardware – The BOBCAT Concept of Operations includes details of system hardware architecture which includes duplicated systems throughout enabling redundancy of hardware without compromising entire BOBCAT system. 3) Bay of Bengal and South Asia ATFM Handbook includes requirements and procedures for internet outage, including manual procedures for contact with ATFMU via telephone, AFTN and fax to allow gateway allocation list to be updated and gateway allocations issued. 4) ATFMU staffing includes provision for technician qualified and trained on all BOBCAT facilities to be on duty during hours of operation of ATFMU. 5) Paper trial and shadow/ghost operations provide intensive testing of system. Shadow/ghost operations allow testing of hardware and networked system under operational conditions.
	Hazard No 4
Description:	Inadequate or inappropriate information entered into the system by users leading to erroneous advisory information.
Remarks:	BOBCAT would have a large number of users, particularly dispatchers from many airlines, interacting with the system. Potential for the “wrong” information to be entered, leading to consequential erroneous data being promulgated by BOBCAT.

Mitigation:	1) BOBCAT provides advisory information only; ATS providers retain responsibility for tactical ATS and traffic management. 2) Two day BOBCAT Workshop (9 & 10 November 2005) for airline dispatchers and affected ATS officers will be conducted during ATFM/TF/4 meeting (7 – 11 November 2005). 3) Bay of Bengal and South Asia ATFM Handbook includes comprehensive requirements and procedures for users of the system. 4) Structured training programme for ATFMU staff to ensure recognition of non-normal data configurations, and a “reasonableness” check of slot allocation lists is conducted by ATFMU staff prior to the list being published to users. 5) BOBCAT software makes extensive use of simplified menus for user selection of data input, limited choices in each menu for routes, levels etc, no ability for users to vary menus or input data other than what is contained in the menus. 6) BOBCAT Concept of Operations includes provisions for security of user access to BOBCAT. Access only via password to authorized users with written approval from ATFMU manager.
	Hazard No 5
Description:	Unforeseen changes in airspace operational status leads to sudden reduction in airspace capacity.
Remarks:	If the airspace operational status changes without due notification e.g. sudden non-availability of an ATS route, it will take some time before BOBCAT can reschedule slots if the sudden change in status occurs prior to the publication of the nightly slot allocation list. If the change in airspace operational status occurs after the slot allocation list has been published, BOBCAT is unable to assist.

Mitigation:	1) BOBCAT provides advisory information only; ATS providers retain responsibility for tactical ATS and traffic management. 2) Sudden changes in operational status that occur prior to the cut off time for the calculation and promulgation of the gateway allocation list can be managed by BOBCAT, e.g. a route that is suddenly not available is removed from the route selections available to users. Users that have already selected the route that is no longer available would be allocated one of their other preferences that did not include this route. 3) In circumstances where the change in operational occurs after the gateway allocation list has already been promulgated would require ATS providers to tactically manage the situation in accordance with ATS contingency plans/procedures.
	Hazard No 6
Description:	Industry does not comply with agreed wheels up and/or gateway fix times leading to congestion and un-flowed traffic sequence.
Remarks:	Inadvertent or willful non compliance by Industry with published wheels up and/or gateway fix times would lead to schedule conflicts at gateway fixes.
Mitigation:	1) BOBCAT provides advisory information only; ATS providers retain responsibility for tactical ATS and traffic management. 2) ICAO PANS ATM (Doc 4444) includes provisions at paragraph 7.8.1 which place responsibility on pilot and operator to ensure that aircraft is ready to taxi in time to meet ATFM requirements. 3) Implementation of flow management provided by BOBCAT is as a result of collaborative arrangements between Bay of Bengal ATS providers and IATA, including IATA member airlines. Industry consultation/liaison with/by IATA and ICAO Regional Office provides increased communications and agreement between users and ATS providers.

	4) AIP Supplement agreed by users and issued by involved States requires compliance by users with gateway slots allocated by BOBCAT. AIP Supplement will highlight importance of meeting allocated slot times. 5) BOBCAT software includes tracking/ reporting capability will be used to identify users that habitually do not comply. ATFMU will contact these users to advise of non compliance and ascertain remediation proposed by users. 6) Bay of Bengal and South Asia ATFM Handbook includes comprehensive requirements and procedures for users of the system, including provision for non participating aircraft and coordination activities required in the event of a missed slot. 7) Two day BOBCAT Workshop (9 & 10 November 2005) for airline dispatchers and affected ATS officers will be conducted during ATFM/TF/4 meeting (7 – 11 November 2005).
	Hazard No 7
Description:	ATS Units do not comply with agreed wheels up and/or gateway fix times leading to congestion and un-flowed traffic sequence.
Remarks:	Inadvertent or willful non compliance by ATS Units with published wheels up and/or gateway fix times would lead to schedule conflicts at gateway fixes.

Mitigation:	1) BOBCAT provides advisory information only; ATS providers retain responsibility for tactical ATS and traffic management. 2) ICAO PANS ATM (Doc 4444) includes provisions at paragraph 7.8.1 which enable adjustments to be made to sequence of departing aircraft in respect of aircraft subject to ATFM requirements. 3) Implementation of flow management provided by BOBCAT is as a result of collaborative arrangements between Bay of Bengal ATS providers and IATA, including IATA member airlines. Industry consultation/liaison with/by IATA and ICAO Regional Office provides increased communications and agreement between users and ATS providers. 4) Downstream ATS Units will be required to tactically manage non compliances from upstream ATS Units. 5) AIP Supplement agreed by users and issued by involved States requires compliance by users with gateway slots allocated by BOBCAT. AIP Supplement will highlight importance of meeting allocated slot times. 6) BOBCAT software includes tracking/ reporting capability will be used to identify ATS Units that habitually do not comply. ATFMU will contact these ATS Units to advise of non compliance and ascertain remediation proposed by ATS Units. 7) Bay of Bengal and South Asia ATFM Handbook includes comprehensive requirements and procedures for users of the system, including provision for non participating aircraft and coordination activities required in the event of a missed slot. 8) Two day BOBCAT Workshop (9 & 10 November 2005) for airline dispatchers and affected ATS officers will be conducted during ATFM/TF/4 meeting (7 – 11 November 2005).
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