



International Civil Aviation Organization

**The First Meeting of the APANPIRG ATM Sub-Group
(ATM /SG/1)**

Bangkok, Thailand, 20 – 24 May 2013

Agenda Item 4: ATM Systems (Modernization, Seamless ATM, CNS, ATFM)

UPPER AIRSPACE HARMONIZATION AND ROUTE DEVELOPMENTS

(Presented by Airports Authority of India)

SUMMARY

The paper presents India's effort in restructuring the airspace and ATS routes to make them more efficient to save fuel, time, reduction in emission of aviation gases, enhance the efficiency and regularity of flight operations through improved ATS Automation system and implementation of PBN based International RNP10 and RNAV 5 city pair ATS routes.

This paper relates to –

Strategic Objectives:

- A: *Safety – Enhance global civil aviation safety*
- C: *Environmental Protection and Sustainable Development of Air Transport – Foster harmonized and economically viable development of international civil aviation that does not unduly harm the environment*

Global Plan Initiatives:

- GPI-3 Harmonization of level systems
- GPI-4 Alignment of upper airspace classifications
- GPI-7 Dynamic and flexible ATS route management
- GPI-8 Collaborative airspace design and management
- GPI-9 Situational awareness
- GPI-10 Terminal area design and management

1. INTRODUCTION

1.1 India has witnessed a tremendous growth in air traffic in the last decade, poised to grow at a rate of 12% much higher than the world average in the next five years. This unprecedented growth in air traffic in the last decade and the forecast growth call for enhancement in safety, efficiency and capacity of airspace and airports in India. ICAO Global Plan Initiative and Ajay Prasad Committee Recommendations have emphasized the need for establishment of a single continuum of upper airspace for uniform application of rules and procedures. India is constantly working to restructure the airspace and PBN based ATS routes to make them more efficient to save fuel, time, reduction in emission of aviation of gases, enhance the efficiency and regularity of flight operations.

2. DISCUSSION

Upper Airspace Harmonization of Kolkata and Delhi FIRs

2.1 India has taken the initiative to review the existing Indian airspace structure and develop a new Airspace Management Strategy to cope with the predicted impressive future growth of air traffic through the state of the art ATM Automation.

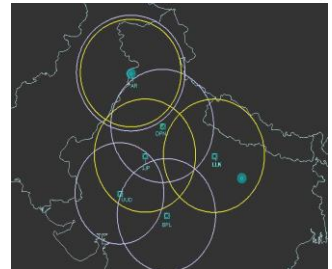
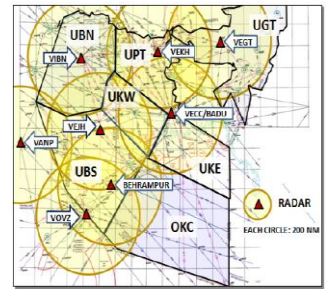
2.2 As per the Master plan for restructuring of entire Indian airspace, each FIR will have only one Upper ACC centre with multiple sectors to be operated from four major cities thereby amalgamating 11 ACCs into 4 ACCs initially and subsequently into 2 ACCs. The surveillance data from Radar/ADS-B will be networked and electronically processed with relevant flight data from the Flight data processor to provide an integrated track data output correlated with flight plan combined with matching seamless air-ground communication would enable application of uniform radar separation throughout the FIRs.

2.3 Considering the complexity and magnitude of the task, AAI has thought it prudent to proceed in a phased manner and embarked on the project to restructure Chennai FIR in the first phase. Accordingly, the upper Airspace of Chennai FIR above 26000 was restructured as a single continuum of airspace with the introduction of advanced ATS automation system along with integration of 10 Radars & ADS-B data from Port Blair. The new technique of cross coupling of VHF facilitated creation of multiple sectors to be operated from single centre at Chennai and enabled consolidation/deconsolidation of sectors dynamically. Introduction of ATS Inter Facility Data Communication (AIDC) permits automatic exchange of aeronautical data among ATC units thereby reducing ATS coordination significantly.

2.4 Having successfully implemented the establishment of upper Airspace harmonization in Chennai FIR, AAI has prepared a time bound action plan to implement the upper Airspace harmonization in Kolkata and Delhi FIRs at a much faster rate. The number of upper airspace sectors that are planned for Delhi is five namely UDP 1,UDP 2,UDP 3,UDP 4 and UDP 5 and for Kolkata the number of upper airspace sectors will be seven namely UGT,UPT,UBS,UBN ,UKW,UKE and OKC (shown in Fig:1 and Fig:2) which would be operated from Delhi and Kolkata and would permit consolidation/deconsolidation of sectors by these ATC Centres.

2.5 The Key Enablers are as follows.

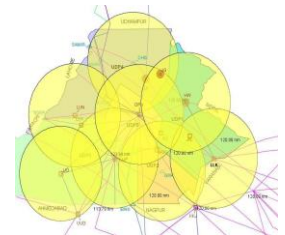
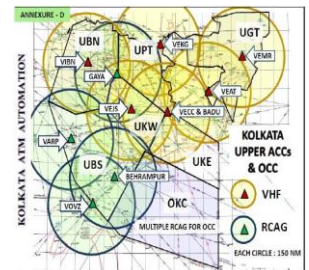
- These Centres will be equipped with multiple numbers of controller workstations of similar configuration and HMI to achieve operational efficiency.
- The surveillance data from RADAR sensors Delhi, Bhopal,Udaipur,Amritsar and ADS-B sensors located at Jaipur,Amritsar,Lucknow would be integrated into the New Automation System leading to complete RADAR coverage of continental airspace in Delhi FIR and also will have overlapping coverage with adjoining FIRs of Kolkata and Mumbai
- The surveillance data from radar at Kolkata, BADU, Guwahati, Katiahar, Varanasi, Jharsaguda, Nagpur, Vizag, Berhampur and ADS-B sensors located at Agartala, Guwahati,Varanasi,Nagpur and from the proposed ADS-B stations Bhubaneswar, Pakyong, Patna and Pathein (data sharing with Myanmar) would be integrated into the New Automation System of leading to complete RADAR coverage of continental and critical portion of Oceanic airspace in Kolkata FIR and also will have overlapping coverage with adjoining FIRs of Delhi, Chennai and Mumbai.



- Cross coupling, grouping and remote operation of VHF frequencies from various locations for Delhi and Kolkata as shown in figures on either side would be accomplished for ensuring reliable and seamless, two way VHF communication with aircraft which will be as far as 600NM from Delhi and Kolkata .
- The advanced Automation tools employed in the system will provide for safety nets like Short Term Conflict Alert, Airspace proximity warning, Ground proximity warning, etc. for the controllers.
- Introduction of ATS Inter Facility Data Communication (AIDC) would permit automatic exchange of aeronautical data among ATC units.

2.6 The benefits are as follows.

- Reduction in separation between aircraft, resulting in increased airspace capacity utilization and enabling aircraft to get User Preferred Flight Profile.
- Even Distribution of workload, reducing controllers' stress and fatigue.
- Effective utilization of Manpower by consolidating and deconsolidating Sectors dynamically depending on Traffic density.
- Would pave way for creation of closely spaced city pair routes.
- Substantial reduction in voice coordination between units.
- Enhanced Safety through seamless surveillance, communication and Safety Tools.



Restructuring of ATS routes in India

Implementation of RNAV 5 City pair ATS route

2.7 Airports Authority of India has submitted a PBN implementation plan to ICAO APAC office, Bangkok which has accepted it as a robust plan. As per the plan India has proposed to implement 8 RNAV5 routes between Metro cities. These direct routes will not only help in saving fuel but also time and in reducing emission of aviation gases.

2.8 Air traffic between Metro cities has grown at tremendous pace. As a result airspace congestion is experienced at economic flight levels (30,000 to 36,000 ft). The peak demand between metro cities is during morning and evening hours, and, therefore, sometimes, flights are cleared at non-economic level due to traffic congestion on these routes.

2.9 At present most of the ATS routes are based on conventional Nav-aids i.e. VOR/DME or NDB which are longer and are not direct between Metro Cities. Therefore, direct connectivity between Metro cities was explored and found to be feasible to introduce RNAV5 routes. In accordance with AAI PBN implementation plan, India implemented the first RNAV 5 city pair route DELHI – MUMBAI – DELHI on 15th May 2012 considering Delhi – Mumbai segment as one of the busiest (seventh) routes in the world and Chennai –Mumbai in 02 May 2013. India has a plan to implement the following RNAV5 city pair routes (Fig:3) within a definite time frame developed by AAI for other Metro cities as shown in the table:

RNAV 5 CITY PAIR	SAVING FUEL(KG) PER MONTH	NO OF FLIGHTS PER MONTH	LONGITUDINAL SEPARATION	FUEL COST SAVINGS PER MONTH(IN million US Dollars) @ RS 56/KG	TIMELINE STATUS
VABB-VIDP	36982800.0 KG, converts into the saving of 53% mainly due to allocation of preferred FLIGHT LEVELS	3600	Reduced to 50NM From 80NM.	41.6	IMPLEMENTED Q1-Q7
VOMM-VABB	4392600.0 KG converts into the saving of 36% mainly due to allocation of preferred FLIGHT LEVELS	1360	Reduced to 50NM From 80NM	4.91	IMPLEMENTED Q8-Q9
VOMM-VECC	3417200.0 KG, converts into the saving of 54% mainly due to allocation of preferred FLT LEVELS	400	Reduced to 30NM from 80NM.	3.83	TO BE IMPLEMENTED BY JULY 2013
VOBL-VIDP	7589600.0 KG, converts into the saving of 36% mainly due to allocation of preferred FLIGHT LEVELS	1500		8.5	PROPOSED (AWAITING AHQ CONCURRENCE)
VOHS-VIDP	4134500.0 KG, converts into the saving of 36% mainly due to allocation of preferred FLIGHT LEVELS	1100		4.6	PROPOSED (AWAITING AHQ CONCURRENCE)
VECC-VIDP	6203200.0 KG, converts into the saving of 28% mainly due to allocation of preferred FLIGHT LEVELS	1200		6.94	PROPOSED (AWAITING AHQ CONCURRENCE)
VABB-VECC	22994000.0 KG, converts into the saving of 28% mainly due to allocation of preferred FLIGHT LEVELS	4200 (INCLUDES OVERFLYING)		25.74	TO BE IMPLEMENTED BY JULY 2013
VABB-VOTV	2247000KG, converts into the saving of 9% mainly due to allocation of preferred FLIGHT LEVELS	2700	Reduced to 50NM from 80NM.	2.5	TO BE IMPLEMENTED BY JULY 2013
TOTAL	943283700 KG	15060		104.58	

2.10 Proposed RNAV5 routes will have following features:-

- a) The proposed RNAV5 route will be available from FL290 to FL460
- b) RNAV5 is implemented in areas where there is no seamless surveillance. RNAV5 routes are designed with spacing of 30NM.
- c) RNAV5 operations are based on the use of RNAV equipment which automatically determined the aircraft position in the horizontal plane using input from one or a combination of the following types of position sensors:
 - VOR/DME;
 - DME/DME;
 - INS or IRS; and
 - GNSS
- d) Direct pilot to ATC (voice) communication
- e) Radar monitoring by the ATS be used to mitigate the risk of gross navigation errors
- f) Longitudinal Separation on RNAV5 route is proposed as 50NM/30NM.
- g) Safety assessment has been completed for the proposed routes.

2.11 India is enthusiastic to cooperate and support its neighbouring States to jointly develop PBN RNAV 5 routes and arrival/departure procedures to form a seamless network of PBN routes and arrival/departure procedures in the sub-continent.

Implementation of RNP10 ATS routes

2.12 In the table shown we have few RNP10 ATS routes that are already implemented and some more routes are likely to be implemented in the near term (Fig: 3) within Indian FIRs to provide shorter connectivity to different international destinations. These ATS routes are in the planning stage by AAI.

S.No	ATS ROUTE	DETAILS	BENEFIT	TIMELINE/STATUS
1.	L518	SADAP-HIA	<ul style="list-style-type: none"> ➤ RESULTED IN SAVING OF 109NM FOR VOHS-VTBD FLIGHTS AND 84NM FOR WSSS/WMKK FLIGHTS ➤ PROVIDE INTERNATIONAL ROUTE CONNECTIVITY BETWEEN VOHS AND SE ASIA 	IMPLEMENTED
2.	V30-V31	ADKIT-TTR(V30) ATETA-TTR(V31)	<ul style="list-style-type: none"> ➤ V30 PROVIDE CONNECTIVITY TO TTR FROM ATS ROUTE N563 AND SAVINGS OF 45NM ➤ V31 PROVIDE CONNECTIVITY TO TTR FROM ATS ROUTE M300 AND SAVINGS OF 10NM 	IMPLEMENTED
3.	MUMBAI-N. AMERICA	AAE-POINT"A" (265750N0720420E) -VIKIT	➤ SHORTER CONNECTIVITY BETWEEN MUMBAI AND NORTH AMERICA	PROPOSED (AWAITING AHQ CONCURRENCE)
4.	VUTAS-MMV	VUTAS-GOLEM-MML-BIA-MMV	➤ PROVIDE SHORTER CONNECTIVITY TO E.AFRICAN COUNTRIES	AIP SUPP ISSUED JUNE 2013.
5.	EXTENSION OF L518 UPTO BBB	SADAP-HIA-BBB	➤ PROVIDE INTERNATIONAL ROUTE CONNECTIVITY BETWEEN VOHS AND MIDDLE EAST/EUROPE	TO BE IMPLEMENTED BY JULY 2013.
6.*	BBS-BPL	N2014.6 E08548.8 N2317.0 E07720.2	SHORTER CONNECTIVITY KOLKATTA/MUMBAI	WOULD BE IMPLEMENTED IN JULY 2013

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a. note India's effort in restructuring the airspace enabled through ATS Automation and radar/ADS-B networking in India;
- b. collaborate with India in bringing out an effective ATS route network and to establish single continuum of airspace in the sub-region that will benefit the stake holders across the borders;
- c. take advantage of India's offer in developing PBN procedures of other states in the region to achieve their PBN Implementation objectives; and
- d. Collaborate with India in implementing seamless RNAV-5ATS routes across the border in the region.

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