

Air Traffic Flow Management – India

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Main functions of AAI

- Air Traffic Management and the provision of Air Navigation Service in India and adjoining oceanic airspace delegated to India by ICAO.
- Development, maintenance and management of airports in India.





Airports Authority of India

AAI manages -

- 17 International airports*
- 8 Custom airports
- 27 Civil Enclaves
- 78 Domestic airports

*(airports at Delhi & Mumbai have been hived out as a joint venture company where AAI has 26% stake)

> At 5 airports, AAI provides CNS/ATM facilities only.











Current CNS Infrastructure

Communication

- VHF air-ground : at all opnl airports with RCAG at 11 sites
- CPDLC (FANS-1A)- at Mumbai, Kolkata, Chennai, Delhi
- HF RT at Delhi, Mumbai, Kolkata and Chennai FIRs
- DATIS : 25 airports

Navigation

- ILS : 50 +1(LLZ) at 40 airports (3 Cat III B at Delhi)
- DVOR: 86, DME: 87 , NDB: 55 (being phased out)

Surveillance

- Radar : 16 sites [12 PSR, 12 MSSR (with PSR), 4 MSSR only]
- ASMGCS : 1 (Delhi)
- ADS-C : 4 at Delhi, Mumbai, Chennai, Kolkata



Radar Coverage

Existing ASR/MSSR

- 1. Delhi
- 2. Mumbai
- 3. Chennai
- 4. Kolkata
- 5. Ahmedabad
- 6. Hyderabad 2 Nos.
- 7. Guwahati
- 8. Trivandrum
- 9. Bangalore

Existing MSSR only

- 1. Varanasi
- 2. Nagpur
- 3. Mangalore
- 4. Behrampur



ATC Automation

- Integrated ATS Automation system at Delhi, Mumbai, Hyderabad and Bangalore Airports
- Data processing system, ATM decision support tools with safety alerts to controllers
- Limited automation (RDPS + FDPS) at other radar centres.

Traffic growth





Trends in Daily aircraft movements at the two busy airports in the country indicate sudden and unprecedented growth of traffic.

Year	Daily No.of a/c movements	
	Delhi	Mumbai
2003-04	330	380
2004-05	370	450
2005-06	↑ 480	↑ 500
2006-07	560	590
2007-08	700	750

- The other Busy airports are •Chennai •Bangalore •Kolkata
- Hyderabad

Effects of sudden traffic growth

Traffic congestion, holding and delays – delays ranging from 20 minutes to 80 minutes at peak traffic period

Extra fuel burn Financial loss to airline, airport operator, service provider.

Cancellation / diversion of flight, schedule disruption Passenger inconvenience ,

Environmental impact - Noise, Emission

Safety concerns - Traffic congestion, increased controller workload

Safety and Capacity enhancement implementations

- EMARSSH Route structure : Long haul multiple parallel ATS route structure (RNP 10 routes) implemented in Nov 2002
- RVSM implemented throughout the entire FIRs in Nov 2003
- Near Parallel runway operations at Delhi
- Cross Runway operations at Mumbai
- Performance Based Navigation System RNAV-1 SID & STAR procedures in Aug 2008

Safety and Capacity enhancement implementations

- Additional ground infrastructure
 - Parallel taxiways,
 - Rapid Exit taxiways,
 - Additional parking stands
- Multiple runway operations
 - Cross runway operations at Mumbai
 - 2 runway operations using converging runways at Delhi
- New ATC procedures for multiple runway operations
- New ATC positions in Tower and approach control
- Deployment of Additional manpower

Delhi Airport – Taxiway improvement s





Mumbai Airport – Taxiway improvements



. BEARINGS ARE MAGNETIC

Experts committee

Government appointed experts committee to examine and recommend measures to cope up with the current demand and future growth.

Committee to examine and suggest measures for modernisation of MET facilities also

Committee interacted with various industry stakeholders, International organisation, ICAO experts, other ANSPs, Boeing, Airbus etc. ICAO Global plan initiatives, ICAO Asia-Pacific Regional guidelines and National regulations were also considered

The committee drafted a "Future Indian Air Navigation System" (FIANS) Master plan for India. In accordance with the recommendations of the experts committee AAI as ANS provider has initiated actions in phased manner.

- Near term : The Near Term Plan is based on application of existing procedures, processes and capabilities. Time frame not more than 2 years.
- Mid Term : The Medium Term Plan is based on emerging procedures, processes and capabilities. Time frame up to year 2012.
- Long term : The Long Term Plan is based on concepts and involves new procedures and requirements based on Research.

Features of "Future Indian Air Navigation System" Master Plan

Communication

- Shift from Voice Communication to Data Communication.
- The digital voice to be used through communication satellite
- voice to be retained as a back-up when complete data communication is used.

Navigation

- Satellite based navigation system complimented with Flight Management Systems.
- The ground based navigation equipments retained as a back-up for some time before being phased out.
- GAGAN (GPS aided Geo augmented Navigation) to play an extremely important part in the future navigation systems

Surveillance

- Radars would continue to be primary surveillance equipment in high density traffic and terminal approach areas.
- The upcoming technologies in surveillance are ADS-B and wide area multilateration and both to be used in combination to provide extended surveillance

Augmentation of CNS/ATM Infrastructure

• Communication

- VHF air-ground RCAG at 12 more sites
- DATIS : 21
- AMHS (transition to ATN)
- Datalink -AIDC, Clearance Delivery
- DSCN
- Navigation
 - ILS : 15
 - DVOR/DME: 9, GAGAN, GBAS (Mumbai, Delhi)
- Surveillance
 - Radar : 11 (4 MSSR/PSR, 7 MSSR only),
 - Radar networking
 - ASMGCS : 5 (Mumbai, Chennai, Kolkata, Bangalore, Hyderabad)
 - ADS-B





- DSCN (Dedicated Satellite Communication Network) systems connecting 80 airports.
- ATS Message Handling System (AMHS) at Mumbai to handle ground sub-network of Aeronautical Telecommunication Network (ATN)
- Networking of all DATIS to enable download of Terminal
- Information of any airport from any where through data communication.
- Data link for clearance delivery

Current status of implementation Satellite based Navigation



- Jointly developed by AAI and ISRO(Indian Space Research organisation)
- Technical Demonstration system (TDS) and Final system acceptance test(FSAT) completed in August 2007
- GAGAN signal in space is available for flight validation
- Flight Inspection carried out and results are satisfactory
- GAGAN Final Operational phase (FOP) is expected to be completed and system commissioned by 2010-11

Current status of Master plan implementation: CNS/ATM-Navigation

GBAS – Ground Based Augmentation System

Under implementation at Delhi and Mumbai Airport

Performance based Navigation

- Performance based Navigation procedures (RNAV-1 SID/STAR) implemented at Mumbai, Delhi and Ahmedabad terminal approach areas w. e.f 28th August 2008.
- Phased implementation at other terminal approach areas and in enroute areas.
- Reduced separation both in enroute and approach areas in a progressive manner to enhance capacity
- · Environmental Benefits Noise abatement, Reduced emission

Current status of Master plan implementation : CNS/ATM-Surveillance

□ 70% of the continental airspace is covered under radar surveillance

Additional radars - under implementation to achieve 100% overlapping radar cover over the continental airspace

ADS - C - covers the entire oceanic airspace (Bay of Bengal, Arabian Sea & Indian Ocean)

ASMGCS - (SMR + multilateration) at one airport (Delhi). 5 more system are under implementation at Mumbai, Chennai, Kolkata, Bangalore and Hyderabad.

□ ADS-B - Being considered to supplement radars and gap filling



The CNS/ATM - transition

·Integrated Networked Automated system

- Separation Management
- System Wide Information Management

Air Traffic Management

back-up communicatior CPDLC, AIDC, DATIS be to Voice Data

COM

Satellite based Navigation Q back GAGAN, GBAS, PBN to be VOR/DME

NAV

/Mutilateration situationa capability Satellite based 'Airborne Radar/ ADS

awareness

SUR

New ATM system concept : Network Centric Real-time Data Exchange for Collaborative Decision Making by Integrating



ATM Automation....

- Integrated Automation system in place at Mumbai, Delhi, Bangalore & Hyderabad.
 - Data processing system, Controller tools, Safety alerts.
- Implementation plans in progress for other centres.
 - dynamic exchange of flight related data and
 - airspace situation data for strategic and dynamic airspace management .
 - dynamic routings / user preferred tracks
- Automation system for remote towers under implementation.
 - System interface with main system at central ACC.
- Networking of radars and ATM facilities
- Amalgamation of 11 enroute centres into 4 centres initially and 2 centres - in plan.
- Central Air Traffic Flow Management system in plan

Airspace restructure and networking



Networking of Radars

Entire Controlled airspace under radar surveillance

 Seamless Controller-Pilot communication

Seamless radar separation

 Amalgamation of 11 enroute centres into 4 centres with multiple sectors

 Dynamic consolidation and de-consolidation of enroute setors

•Amalgamation of 4 enroute centres into 2 centres.

Airspace restructuring and sectorisation

- Airspace consolidation and sectorisation as part of restructuring.
- Implementation of more efficient ATC procedures.
- Air Traffic Flow Management system.
- Terminal Flow control to minimise delays and bunching of traffic.
- Flexible use of airspace.
- ATC automation tools to reduce controller workload and enhance efficiency.
- Upper Area Harmonisation.

UPGRADATION OF METEOROGLOGICAL FACILITIES

- The AAI in coordination with Indian Meteorological Department is preparing a road map for the upgradation of meteorological facilities at the airports.
- This would include provision of
 - new integrated automated weather information system,
 - web based meteorological information,
 - interfacing of Met Computers with ATS Automation System at major airports for enhancing the efficiency of Pilots and Controllers.
 - Integrated MET data display of current and forecast Wx data directly from the MET computer in all ATC units in major airports/ centres
 - Real-time Satellite Wx picture with Wx warnings. Wake vortex warning.
 - OPMET data exchange through ATN
 - ATN Wx database.
 - Uplink / downlink of MET data
 - Integrated ATS/MET/AIS pre-flight briefing to operators and ATS personnel



Air traffic Flow management - objectives

to enhance airspace usage, airport capacity, sector productivity

 balancing demand vs capacity and thereby reduced fuel burnt, engine emission, environmental impact and delays

Optimise system preferred and user preferred flight trajectories.

 Optimise flight profiles and routes during adverse weather conditions

Optimise recovery solutions during and after disruptive events.



Airports Authority of India



THANK YOU