



*International Civil Aviation Organization*

**FIFTEENTH MEETING OF THE  
ASIA/PACIFIC AIR NAVIGATION PLANNING AND  
IMPLEMENTATION REGIONAL GROUP (APANPIRG/15)  
Bangkok, Thailand, 23 to 27 August 2004**

**Agenda Item 3: CNS/ATM Implementation and Related Activities**

**GAGAN IMPLEMENTATION IN INDIA**

(Presented by India)

**SUMMARY**

This paper gives a brief outline of the progress made by India in the implementation of its Space Based Augmentation System 'GAGAN'.

**1. INTRODUCTION**

1.1 'GNSS' as navigation standard of the future has been adopted internationally and also promulgated throughout the global community. ICAO also has published its Global Air Navigation Plan for CNS/ATM system. Pursuant to this, India decided to go for its own Satellite Based Augmentation System 'GAGAN'. This is being implemented jointly by Airports Authority of India (AAI) and the Indian Space Research Organisation (ISRO). The project will be implemented in three phases viz. :

- i) Technology Demonstration System (TDS)
- ii) Initial Experimental Phase
- iii) Final Operational Phase

The TDS phase is targeted for completion by mid-2006 and the Final Operational Phase by 2008.

**2. TECHNOLOGY DEMONSTRATION SYSTEM (TDS)**

2.1 The TDS phase will have 8 Reference Stations (INRES) , a Master Control Centre (INMCC) and an Uplink Station (INLUS) as the ground network. One of the GSAT series satellites, GSAT-4 will carry a navigation payload. The L-band Transponder will have L-1 frequency and will also have the capability to broadcast on L-5 frequency as and when this is used. After successful completion of the TDS phase, the system will be upgraded with additional INRES as may be necessary and redundancy will be added to achieve final operational capability in the subsequent phases. A contract has been signed for implementation of the ground elements of 'GAGAN'.

**3. Ionospheric Study and Model**

3.1 Because of the geographical location of India close to the equator, Indian airspace is subjected to higher level of ionospheric activities and scintillation. To minimize the impact of ionospheric effect on the accuracy of augmented signals, it has been decided to develop Ionospheric Model for Indian airspace. Accordingly, 20 TEC Stations have been established and data collections has commenced. The Ionospheric Model when developed will be integrated to the INMCC during the TDS phase.

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