



GAGAN Status and Plan

RAMASUBRAMANIAN R
Programme Director
Indian Space Research Organization
India

GAGAN (GPS Aided Geo Augmented Navigation)

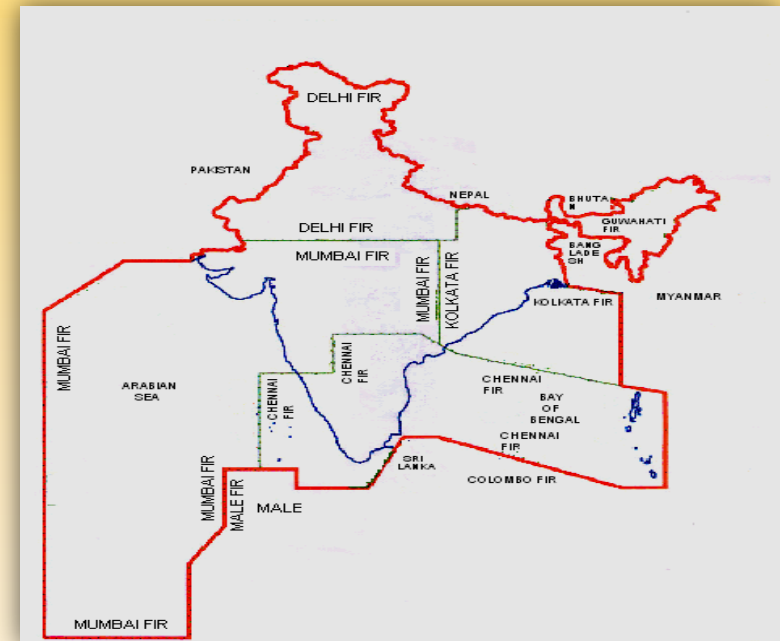
Joint development by ISRO and AAI

Objective:

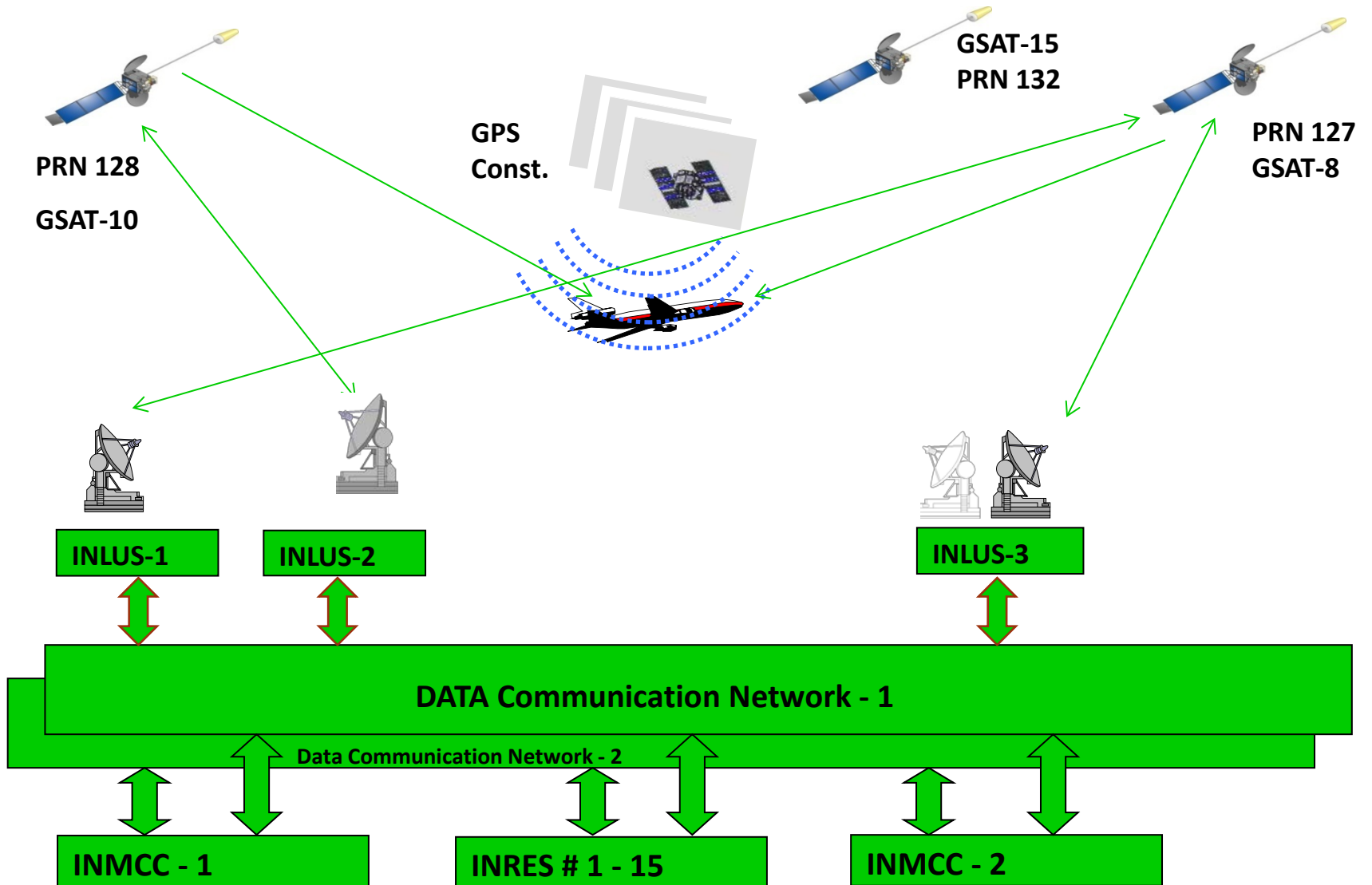
- To deploy and certify an operational SBAS for India to achieve an RNP0.1 capability over Indian FIR and APV-1/1.5 service over Indian land mass on nominal days

Executed in two phases

- ❖ **GAGAN – TDS**
Minimum set of ground and space elements implemented to demonstrate the proof of concept
- ❖ **GAGAN – FOP**
Certifiable SBAS built over the TDS elements with additional ground and space elements

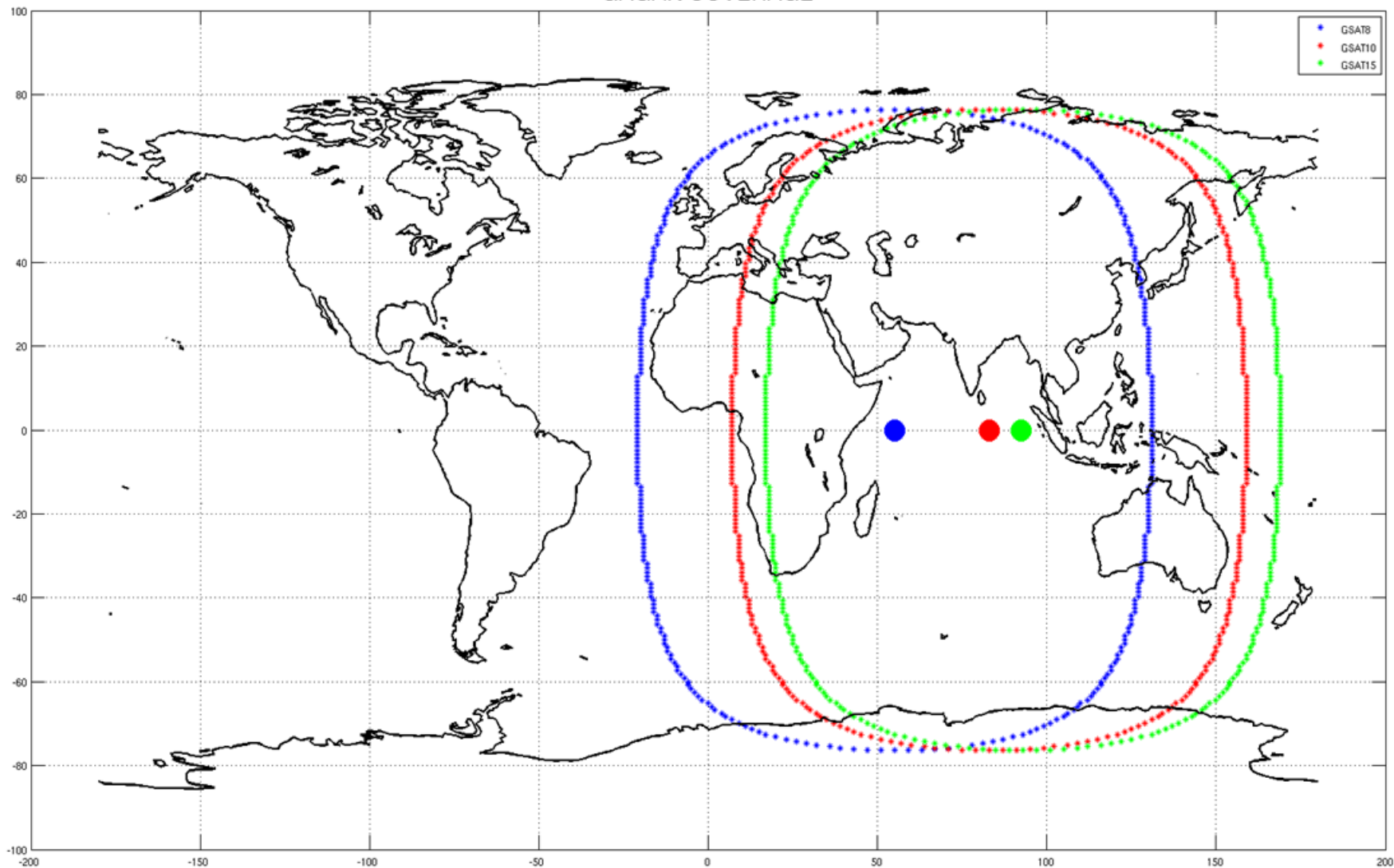


GAGAN -FOP Architecture



GAGAN – Satellite coverage

GAGAN COVERAGE



GAGAN Current Status

RNP 0.1 Service : Certification:30-Dec-2013

APV 1.0 Service : Certification:21-Apr-2015

IGM-MLDF (ISRO GIVE Model - Multi Layer Data Fusion)

- First SBAS system to serve the equatorial anomaly region.
- Algorithm for computing the ionosphere corrections at pre-defined grid points. Fuses the delays and confidences at two different layers .

GAGAN has become the third country in the world to have such precision approach capabilities.

GAGAN Implementation Plans – in India

Alternative to ILS, when ILS is unserviceable or under maintenance.

At runways not equipped with ILS or at terrain constrained airports where ILS installation is not practicable, GAGAN approaches will provide the requisite vertical guidance.

At small airports where only few aircraft movement exist.

At new airports where traffic density is expected to be less than 10 movements.

- APV procedures for 6 Airports and in the process of development of additional nine airports.
- Testing & validation of these procedure is expected to be completed 2016
- In the next 5 years, APV procedures for almost all operational airports in India

GAGAN Service to Neighbouring Nations

- Service to all neighboring countries such as Afghanistan, Bangladesh, Bhutan, Maldives, Nepal, Myanmar, Sri Lanka etc. is possible
- Countries of South East Asia, such as Thailand, Indonesia, Malaysia, Singapore and others over Australia and Africa falling within GEO foot print subject to installing Indian Reference Stations (INRES).
- Aviation in the region will be greatly enhanced with the use of GAGAN as it is an enabler for transition to seamless satellite navigation based on the ICAO framework for Aviation System Block Upgrades (ASBU).

Assistance by India to other countries

- Support in RFP Preparation & Evaluation
- Assistance for Site Selection for Reference Stations, Up link Stations & Master Control Stations
- Engineering Support for Site infrastructure development
- Engineering Support in establishing data communication Network
- Evaluation of Vendor Supplied Technical Documents
- Support for Equipment FAT / Installation / SAT / System Integration & Testing

Assistance by India to other countries

- System Performance Evaluation / System Anomaly analysis & Resolution.
- Operational Test & Evaluation using S/W Tools
- Support for Certification Activities
- Training for Operation & Maintenance personnel
- Support for SBAS procedures design and development

Thank you
For
Your patience