

# Pakistan Space Based Augmentation System (Pak-SBAS) Development Status



ICAO APAC GBAS/SBAS ITF-5  
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Tokyo, Japan

Pakistan Space & Upper Atmosphere Research Commission

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## Introduction

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- National Aviation Policy of Pakistan commits to upgrade its Navigation infrastructure in the light of ICAO GANP
- PBN Plan of Pakistan also envisages implementation of PBN related ASBU modules at major international airports on priority
- Pakistan Space Based Augmentation System (Pak-SBAS) program was initiated in 2019 to primarily meet the national aviation requirements
- SUPARCO (National Space Agency) will develop and operate the System
- PCAA will utilize Pak-SBAS service for PBN in the aviation sector in Pakistan

# Introduction

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- Targeted objectives:
  - To meet Safety-of-Life (SoL) positioning requirements of transportation sector (aviation, marine, land, rail) in a phased manner (initially IOC, later FOC)
  - To meet positioning requirements of other national sectors such as surveying & mapping, precision agriculture, urban planning & infrastructure development, disaster management

# Overview

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- Constellations      GPS, BeiDou
- Signals                L1, L5, B2b
- Protocols             RTCA, DFMC, PPP
- Services              Public, Authorized

## Overview

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- The Pak-SBAS will comply with the SBAS requirements of **ICAO published in Annex 10 - Aeronautical Communications, Volume I, Radio Navigation Aids**
- The Pak-SBAS L1 SIS will comply with the corresponding requirements in the **SBAS Minimum Operational Performance Standards (MOPS) (DO-229E)** published by RTCA (Radio Technical Commission for Aeronautics)
- The Pak-SBAS L5 SIS will comply with the **SBAS L5 DFMC Interface Control Document (version 1.3)** developed by the SBAS Interoperability Working Group (IWG)

## Overview

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- The Pak-SBAS B2b SIS will comply with corresponding requirements in the **BeiDou Navigation Satellite System SIS Interface Control Document Precise Point Positioning Service Signal PPP-B2b (version 1.0)** published by China Satellite Navigation Office (CSNO)
- The Pak-SBAS will be **certified by PCAA** with support from certification experts

# Configuration

## ■ Space Segment

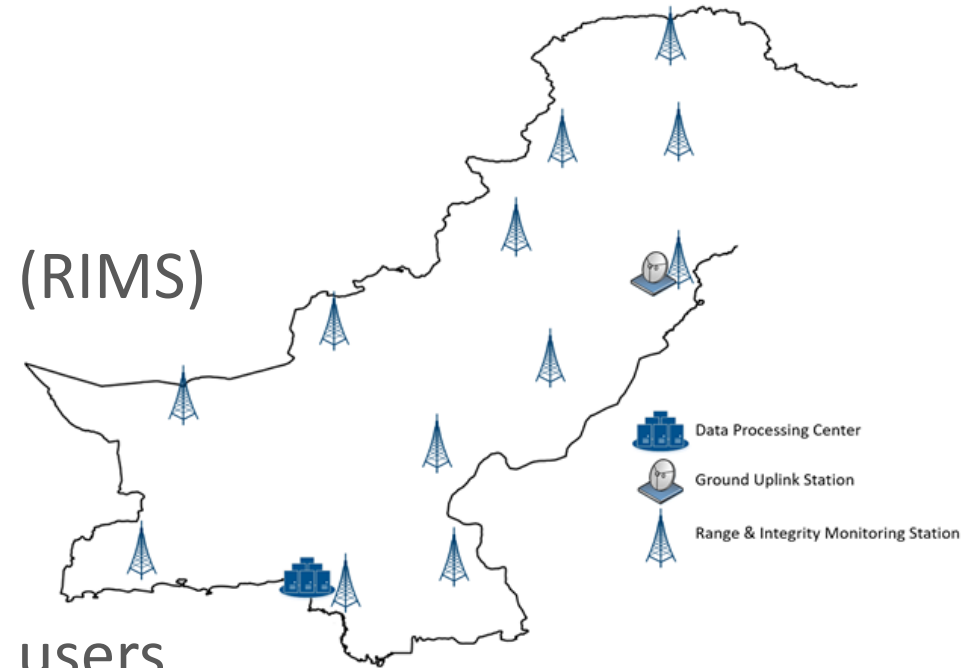
- SBAS Payload onboard PakSat MM-1 (GEO-1) at  $38.2^{\circ}$

## ■ Ground Segment

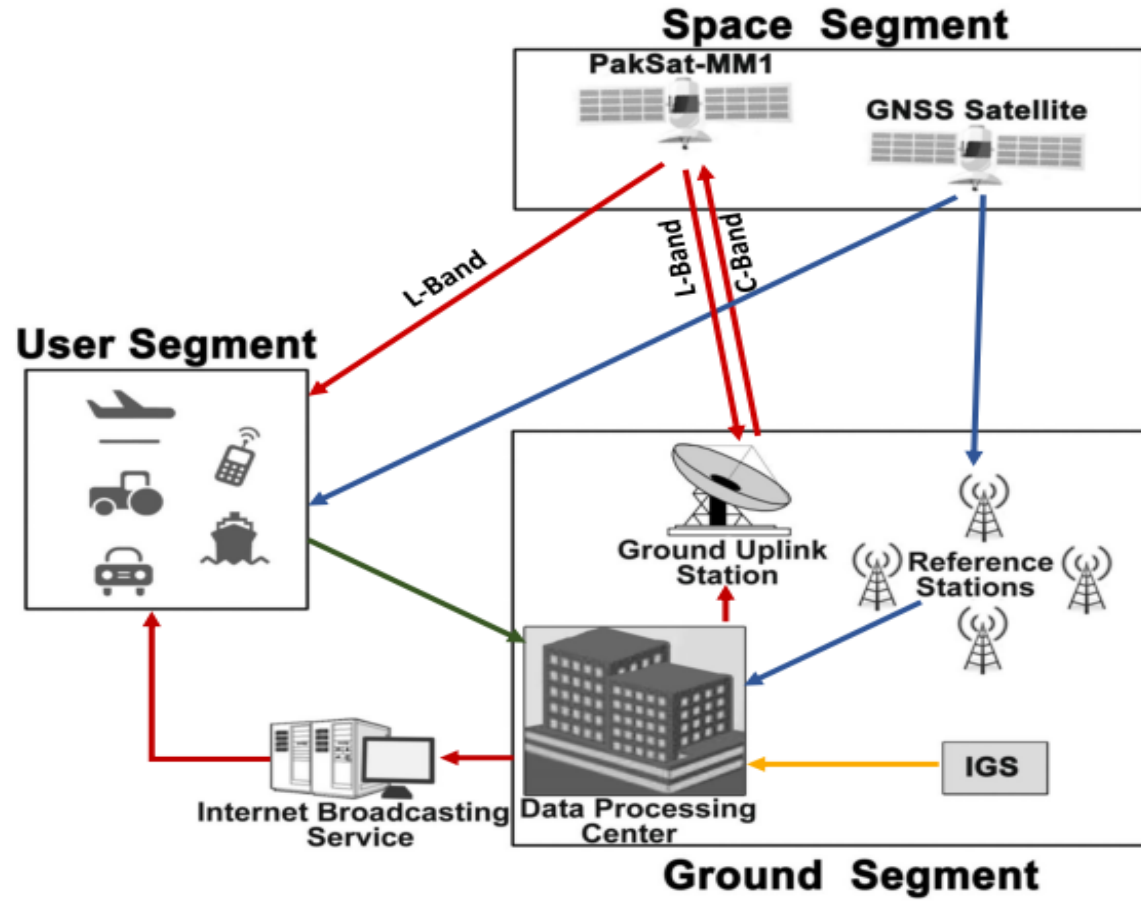
- 01 x Data Processing Center (DPC)
- 12 x Range and Integrity Monitoring Stations (RIMS)
- 01 x Ground Uplink Station
- Data Communication Network

## ■ User Segment

- Pak-SBAS receivers for aviation, marine, land users



# Configuration



- Augmentation Message
- Navigation Message
- IGS Data & Products
- Positioning Information

# Implementation Status

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- Contract Nov 2020
- Kick-off Aug 2021
- PDR Dec 2021
- CDR Aug 2022
- IOC (GEO-1) Mid 2024

# Implementation Status

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- **Frequency coordination:**
  - C-Notice submitted to ITU in 2019
  - Resolution 609 Data submitted to ITU in 2021
  - Pak SBAS included in the List of RNSS Networks at ITU in 2021
- **PRN codes:**
  - ICAO Information Paper submitted (APAC GBAS/SBAS ITF-5)
  - Application for SBAS Service ID submitted to ICAO NSP
  - GPS PRN Codes assignment application to be submitted shortly
  - BeiDou B2b PPP PRN code assignment is in progress

# Implementation Status

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- SUPARCO applied for membership of the International Committee on GNSS (ICG) on behalf of the Government of Pakistan in Jan 2021
- SUPARCO presented its application credentials at ICG-15 and Pak SBAS Status update at ICG-16
- SUPARCO will present Pak SBAS update at ICG-17 and 63<sup>rd</sup> CGSIC later this year
- Pakistan is committed to the objectives of transparency, compatibility and interoperability of ICG for GNSS, RNSS and Augmentation Systems

## Future Plans

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- The Pak-SBAS service is planned to be tested and commissioned by end-year 2024
- The launch of the second satellite (GEO-2) in the Pak-SBAS Space Segment and augmentation of the Ground Segment is being considered in the year 2026

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# Thank You

