



International Civil Aviation Organization

**THE FIFTH MEETING OF THE ASIA/PACIFIC GBAS/SBAS
IMPLEMENTATION TASK FORCE (APAC GBAS/SBAS ITF/5)**

(Tokyo, Japan, 21- 23 June 2023)

Agenda Item 3: Updates from States/Administrations about GBAS/SBAS Implementation

PAK-SBAS DEVELOPMENT STATUS

(Presented by Islamic Republic of Pakistan)

SUMMARY

This paper presents the development status of Pakistan Space Based Augmentation System (Pak-SBAS) program which is being undertaken by Pakistan Space and Upper Atmosphere Research Commission (SUPARCO) in cooperation with Pakistan Civil Aviation Authority (PCAA).

1. INTRODUCTION

1.1 The Pak-SBAS program was initiated in 2019. It is owned by the Government of Pakistan and is being implemented and will be operated by SUPARCO (www.suparco.gov.pk) – the National Space Agency of Pakistan.

1.2 PCAA is cooperating with SUPARCO in the implementation of Pak-SBAS and plans to utilize its services for Performance Based Navigation (PBN) in the aviation sector in Pakistan.

2. DISCUSSION

Overview

2.1 The Pak-SBAS will provide both Public and Authorized services to users in the aviation, transportation, surveying & mapping, precision agriculture, urban planning & infrastructure development, disaster management and other sectors.

2.2 The Pak-SBAS Public service will augment GPS L1 signal and utilize GPS & BDS for L5 Dual Frequency Multi Constellation (DFMC) signal. The Pak-SBAS Authorized service will also provide Precise Point Positioning (PPP) service using BDS B2b signal.

2.3 The Pak-SBAS will comply with the SBAS requirements of International Civil Aviation Organization (ICAO) published in Annex 10 – Aeronautical Communications, Volume I, Radio Navigation Aids. The Pak-SBAS L1 Signal-in-Space 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 Signal-in-Space will comply with the SBAS L5 DFMC Interface Control Document (version 1.3) developed by the SBAS Interoperability Working Group (IWG). The Pak-SBAS B2b Signal-in-Space will comply with corresponding requirements in the BeiDou Navigation Satellite System Signal In

Space Interface Control Document Precise Point Positioning Service Signal PPP-B2b (version 1.0) published by China Satellite Navigation Office (CSNO).

2.4 The Pak SBAS will be certified by PCAA with support from certification experts.

Configuration

2.5 The current configuration of Pak-SBAS comprises Paksat-MM1 satellite at 38.2°E (GEO-1) in the Space Segment and twelve Range and Integrity Monitoring stations (RIMS), one Data Processing Centre (DPC), one Ground Uplink Station (GULS) in the Ground Segment. The Ground Segment utilizes both terrestrial and satellite communication links for interconnectivity.

2.6 The Pak-SBAS RIMS receive data from GPS & BDS satellites and transmit it to DPC. The DPC will also be linked to an International GNSS Service (IGS) Data Center (DC) to receive data online. The DPC generates Pak SBAS correction messages and transmit the same to GULS. The GULS transmits the Pak-SBAS correction messages to the Paksat-MM1 satellite which broadcasts L1/ L5/ B2b signals. The broadcast signals are received by compatible ground terminals.

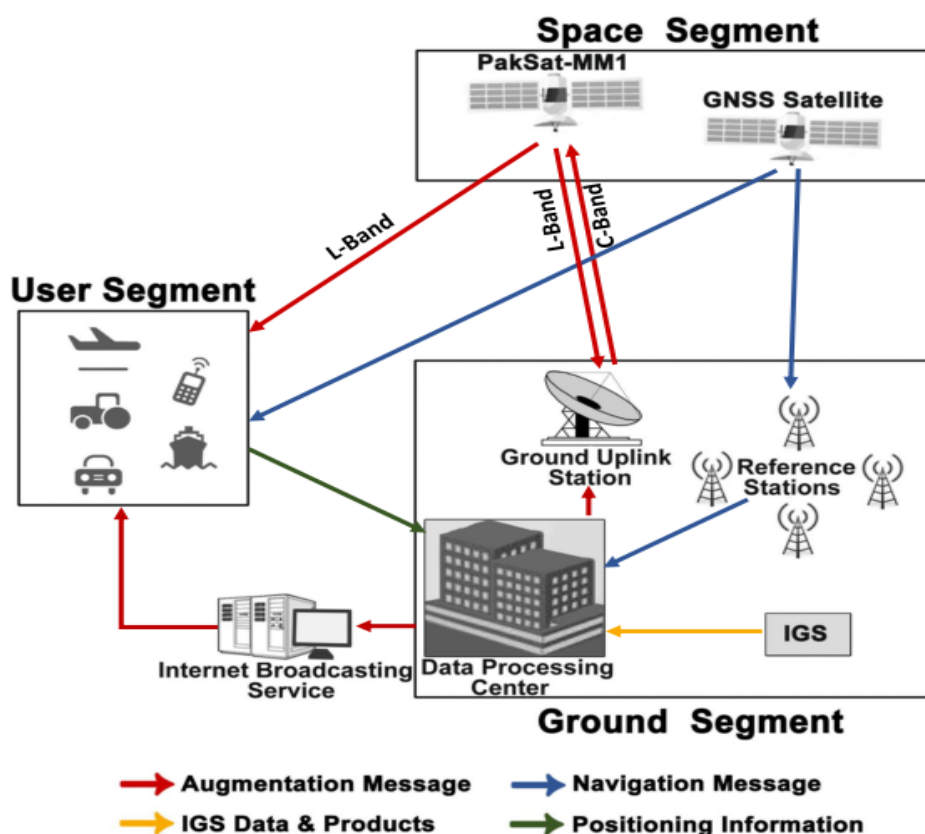


Figure 1: Pak-SBAS System Architecture

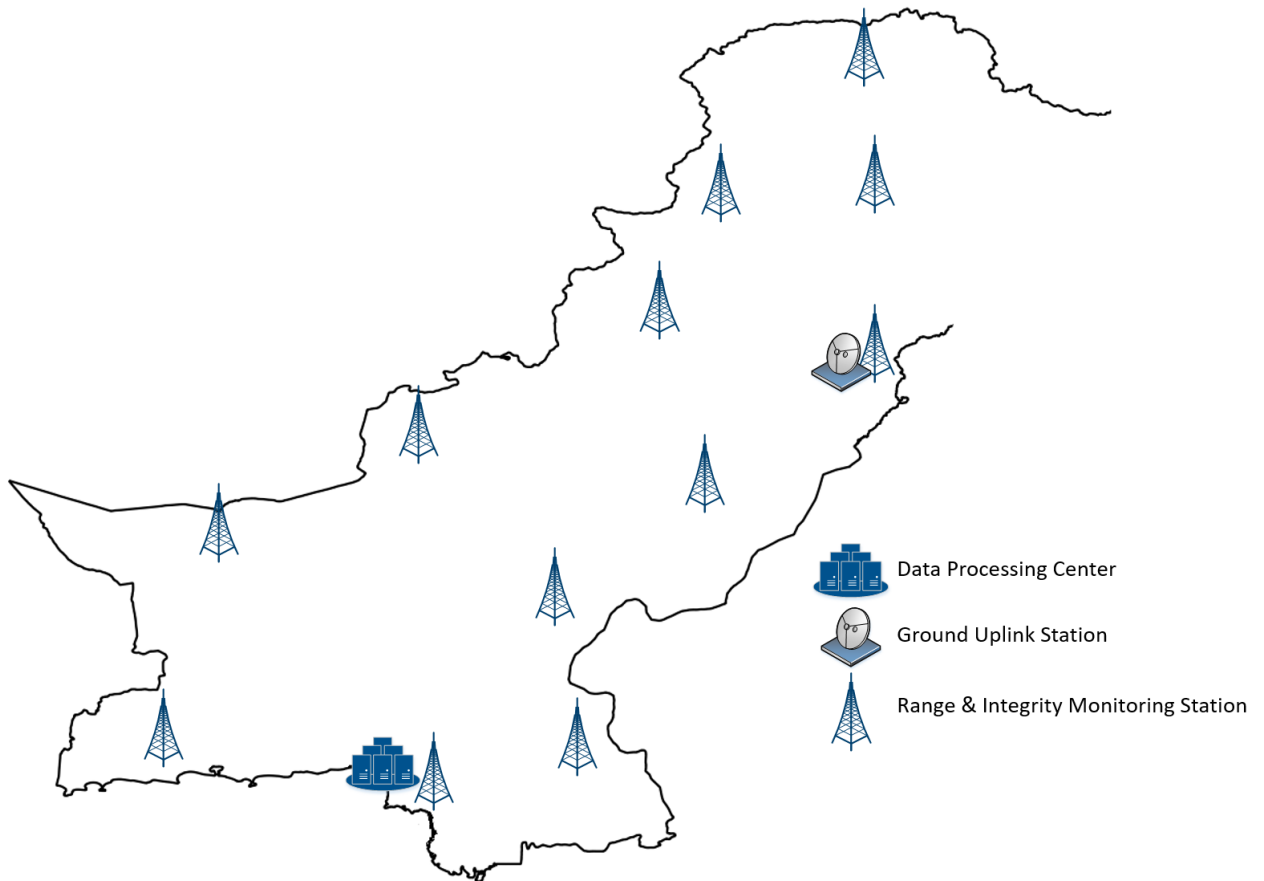


Figure 2: Pak-SBAS Infrastructure

Implementation Status

2.7 The ITU Filing of Pak-SBAS for PakSat-MM1 satellite was submitted in May 2019 by Pakistan Frequency Allocation Board (FAB). The CRC Notice was published on 12 Nov 2019 and requirement related to participation in Resolution 609 Consultation Meeting was completed during 18th RES-609 Consultation Meeting held from 9-11 Nov 2021.

2.8 The Pak-SBAS development contract was awarded in Nov 2020 and the kick-off meeting was held in Aug 2021.

2.9 The Pak-SBAS Preliminary Design Review (PDR) was completed in Dec 2021.

2.10 The Pak-SBAS Critical Design Review (CDR) was completed in Aug 2022 and system development is currently under process.

2.11 SUPARCO applied for membership of the International Committee on GNSS (ICG) on behalf of the Islamic Republic of Pakistan to meet the objectives of transparency, compatibility and interoperability of Pak-SBAS. SUPARCO presented the membership case in ICG-15 and provided update on Pak-SBAS ICG-16.

2.12 SUPARCO is also in the process of application of GPS and BDS PRN codes for Pak-SBAS with the cooperation of PCAA.

Future Plans

2.13 The Paksat-MM1 satellite is scheduled for launch by mid-year 2024. The Pak SBAS service is planned to be tested and commissioned by end-year 2024.

2.14 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.

3. ACTION REQUIRED BY THE MEETING

3.1 The meeting is invited to: amend as appropriate

- a) Note the information contained in this papers; and
- b) Discuss any relevant matters as appropriate.
