

A photograph of an air traffic control tower at night. The tower is illuminated from within, showing the control room and observation deck. The top of the tower features a large radar antenna and several red navigation lights. The background is a dark blue sky with some clouds.

ICAO NACC REGIONAL OFFICE

NAM/CAR Regional Developments

Navigation infrastructure evolution across Mexico, Central America and the Caribbean — CONOPS for Navigation Aids, Minimum Operational Network and SBAS.

GNSS-primary · PBN-enabled · Resilient by design

Regional Agenda

01 Regional Project

Two components: CONOPS for Navigation Aids and the Minimum Operational Network.

02 CAR CONOPS

Coordinated framework for the evolution of regional navigation infrastructure.

03 MON

A GNSS-independent contingency capability for safe continuity of operations.

04 SBAS Analysis

Evidence-based assessment of SBAS potential through GREPECAS Project A2.

05 WAAS Experience

Operational maturity and demonstrated benefits of SBAS at scale.

06 Regional Gaps

Annex 10 training needs and NAVAID validation and certification.

KEY MESSAGE

The NAM/CAR Region is advancing a structured, evidence-based path toward a resilient GNSS-primary navigation environment.

A Regional Project with Two Components

The NAM/CAR Region is delivering a single navigation programme built on two mutually reinforcing components. Together they define both the target environment and the safety net that protects it.

01 CONOPS for Navigation Aids

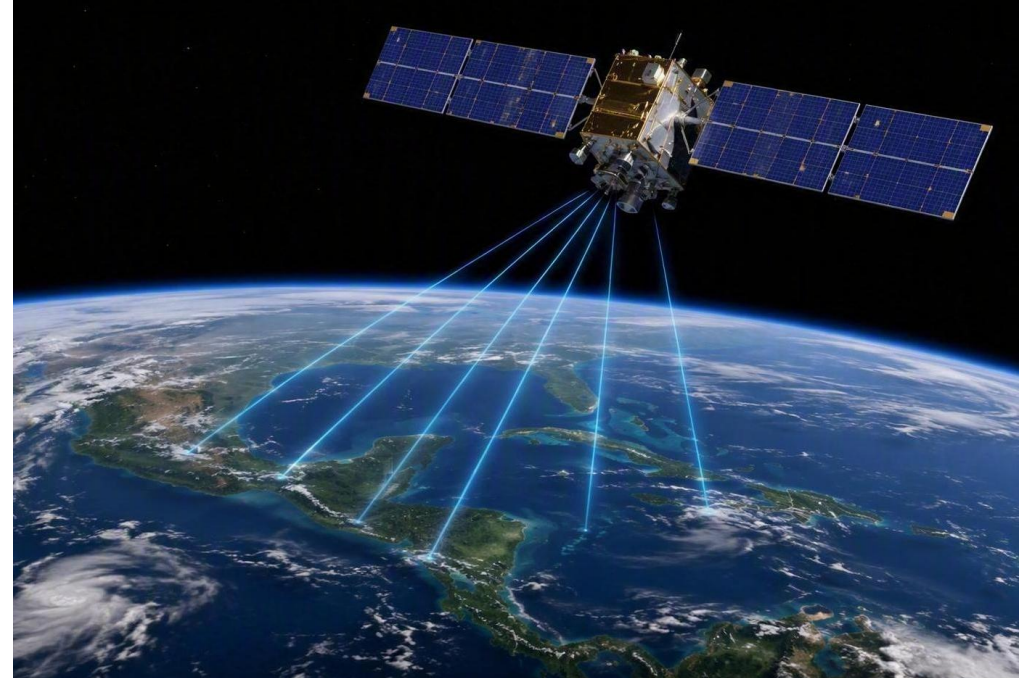
Regional framework for navigation infrastructure evolution.
Almost complete

02 Minimum Operational Network (MON)

Terrestrial safety net sustaining IFR operations during GNSS outages.
In development

KEY MESSAGE

The first component — the CAR Regional CONOPS for Navigation Aids — is almost complete.



CAR Regional CONOPS for Navigation Aids

The CONOPS establishes a coordinated framework for the evolution of navigation infrastructure across Mexico, Central America and the Caribbean. It supports the transition toward a GNSS-primary, PBN-enabled environment while maintaining a Minimum Operational Network of terrestrial navigation aids to ensure resilience and continuity of IFR operations during GNSS disruption, interference or outages.

GNSS / PBN as Primary RNAV and RNP operations across en-route, terminal and approach phases.	Regional MON Safety Net Selected DME/DME, VOR/DME and ILS/LOC infrastructure for GNSS contingencies.	NAVAID Rationalization Progressive decommissioning of obsolete or low-benefit infrastructure, particularly NDBs.
DME/DME Coverage Principal terrestrial PBN reversion supporting RNAV 1, RNAV 2 and RNAV 5.	Selective VOR/DME Retained for non-PBN aircraft, cross-border connectivity and contingency operations.	ILS at Key Airports Precision approaches and GNSS-independent recovery where operationally required.
KEY MESSAGE A roadmap toward a GNSS-primary, PBN-enabled regional environment, underpinned by an optimized MON for safe continuity during GNSS disruption.		

Integration, Harmonization and Augmentation



Analysis of SBAS and GBAS Integration

Introduced where operational benefits, coverage, aircraft equipage and cost-benefit considerations support implementation.

MON Airports and Contingency Routes

Identified so aircraft can navigate safely and reach suitable airports during GNSS outages.

Regional Harmonization

Cross-border coordination recognizing interconnected FIRs, island environments, international traffic flows and shared NAVAID coverage.

Integrated Capability

Navigation infrastructure aligned with AIM, surveillance, ATFM/CDM, maintenance and GNSS interference reporting.

KEY MESSAGE

Navigation is planned as one integrated regional contingency capability, not as isolated infrastructure.

Minimum Operational Network (MON)

A MON provides a resilient, GNSS-independent contingency capability to maintain safe operations during GNSS disruptions — including radio frequency interference, jamming, spoofing or ionospheric disturbance. It is not intended to replace GNSS or reproduce its full capability, but to provide a minimum level of navigation service allowing aircraft to safely continue, reroute or recover during an outage.

GNSS Resilience

An appropriate minimum network of conventional NAVAIDs as backup during outages.

PBN Continuity

DME/DME supports RNAV 5, 2 and 1; residual VOR/VOR-DME adds recovery capability.

Operationally Driven Design

Reflecting traffic, equipage, terrain, airspace structure and expected failure scenarios.

Regional Coordination

Shared NAVAID coverage and bilateral arrangements for cross-border routes.

Integrated Planning

Coordinated with PBN implementation, airspace and procedure design, and NAVAID lifecycle.

Cost-Effective Infrastructure

Retain what safety requires while reducing duplication and lifecycle costs.

Stakeholder Coordination

ANSPs, regulators, operators, military authorities and procedure designers.

KEY MESSAGE

MON is a fundamental component of GNSS resilience — minimum, cost-effective and operationally sustainable terrestrial navigation that sustains safe operations during disruption.

NAM/CAR Activities toward SBAS Implementation

The ICAO NACC Regional Office, with the SAM Region and through GREPECAS Project A2, is assessing the potential implementation and operational benefits of SBAS in the CAR/SAM Regions — consistent with the GANP and ASBU framework, and building on prior WAAS and EGNOS/SACCSA experience.

Regional Coordination

GREPECAS Project A2, including an SBAS Task Force and designated Rapporteurs.

Ionospheric Analysis

Data collection and modeling of regional conditions and implications for SBAS performance.

Regional CONOPS

Development of a preliminary CAR/SAM Regional SBAS Concept of Operations.

State Surveys

PBN requirements, operational needs, aircraft equipage and potential demand.

Benefits Assessment

LPV approaches, airport accessibility, reduced ground infrastructure dependence, resilience.

Feasibility and CBA

Regional cost-benefit analysis including sustainable financing mechanisms.

Testbed Activities

Evaluating technical performance and added value under actual regional conditions.

Reporting

Results to NACC/DCA, NACC/WG, SAM/IG and GREPECAS to guide State decisions.

KEY MESSAGE

The approach is not simply to implement SBAS, but to build the technical, operational and economic evidence to determine where and how it delivers value — subject to sovereign State decisions.

WAAS — United States SBAS Implementation

Developed by the FAA, WAAS improves the accuracy, integrity and availability of GPS for civil aviation across all phases of flight — en-route, departure, arrival and instrument approach.

4,219

LPV procedures

2,035

airports served

1,273

airports without ILS

As reported by the FAA, November 2025

Wide-Area Augmentation

Surveyed reference stations monitor GPS; corrections and integrity data are broadcast via geostationary satellites.

Accuracy and Integrity

Positioning accurate to a few meters, with alerts to users within six seconds of hazardous misleading information.

LPV and Coverage

ILS-like capability with minima as low as 200 ft, extending useful coverage into Canada and Mexico.



KEY MESSAGE

WAAS demonstrates SBAS maturity at scale — transforming GNSS into a safety-critical capability that enables thousands of vertically guided approaches.

Regional Gaps and Priorities

Annex 10 Training

A training need in Annex 10 has been identified across the entire Region, affecting the technical capacity required to sustain navigation infrastructure and standards.

NAVAID Validation and Certification

A lack of complete NAV-AID validation and certification remains outstanding, directly affecting confidence in the terrestrial network underpinning MON and contingency operations.

Addressing both gaps is a prerequisite for the Region to realize the full benefit of the CONOPS, the MON and any future SBAS deployment.

KEY MESSAGE

Training under Annex 10 and complete NAVAID validation and certification are the foundations on which regional navigation resilience is built.



THE WAY FORWARD

A GNSS-primary Region, resilient by design

Advancing PBN and satellite-based navigation across the NAM/CAR Region, sustained by an optimized Minimum Operational Network and evidence-based decisions on SBAS.

ICAO NACC Regional Office · GREPECAS Project A2