



ICAO SOUTH AMERICAN
REGIONAL OFFICE

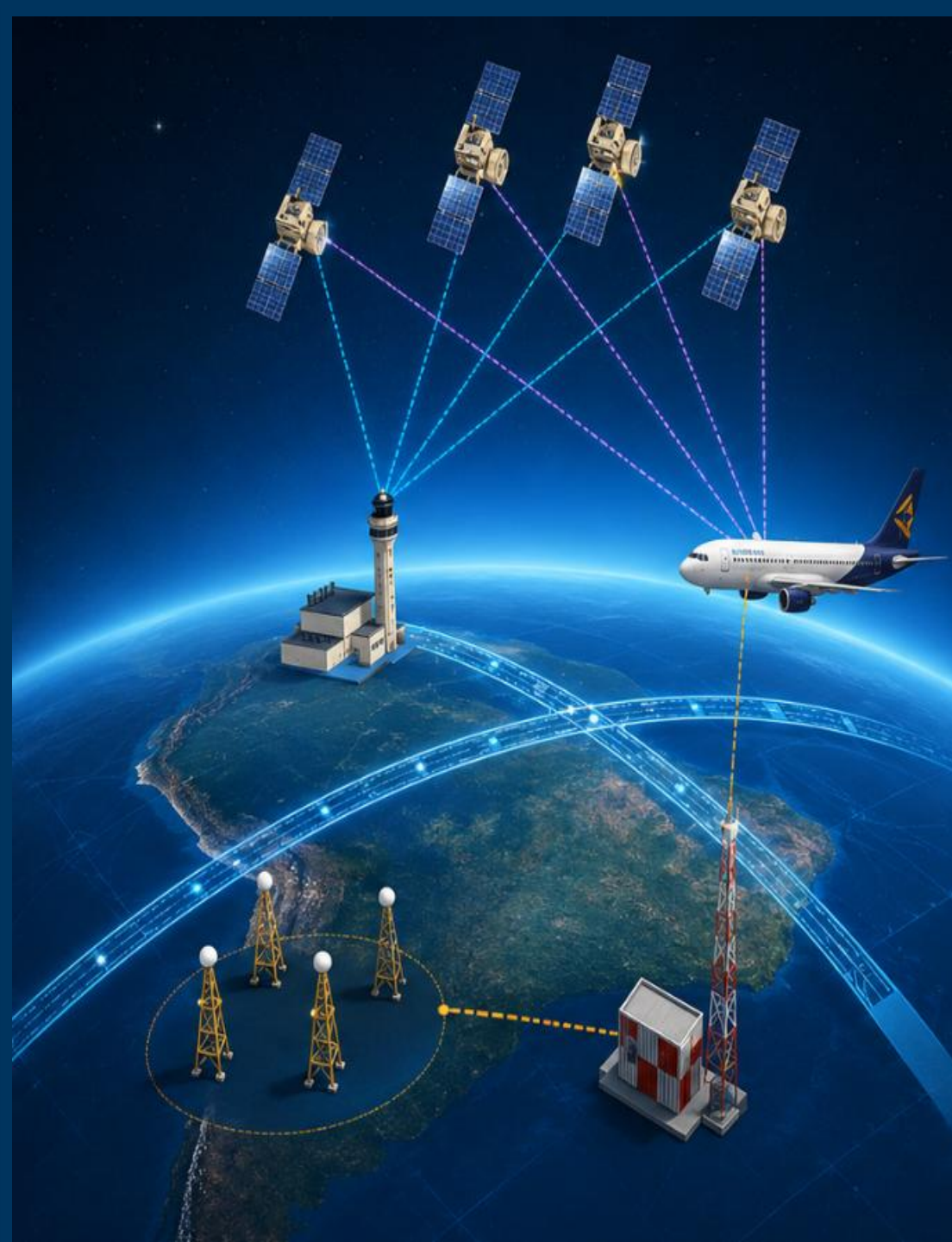
FROM GNSS VULNERABILITY TO OPERATIONAL RESILIENCE

SAM Region lessons and the path toward a
Minimum Operational Network (MON)

Radio Navigation Workshop

Lima, Peru | 2–4 September 2026

Cristian Javier Vittor | Regional Officer, CNS



Why GNSS resilience matters now

The navigation architecture is increasingly dependent on a signal that can be degraded or manipulated.



GNSS is an operational dependency — not simply a navigation sensor.



JAMMING

Signal denied



SPOOFING

Signal deceived



SYSTEM EFFECT

Continuity challenged

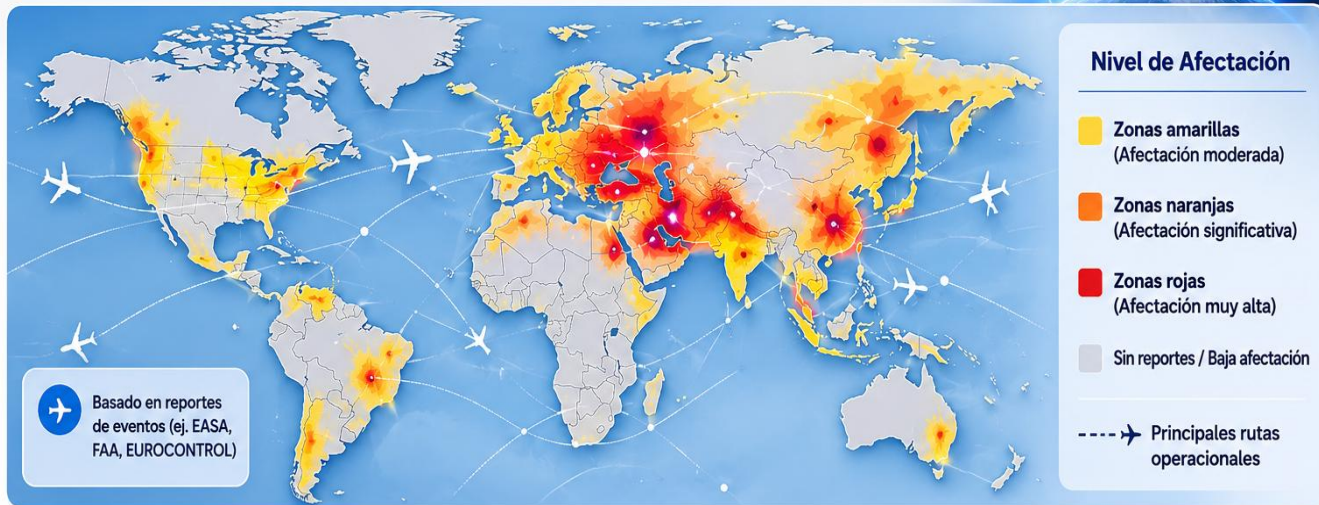
The strategic question:

How do we continue safely when GNSS is not fully available?

What the Region saw

GNSS interference is no longer an exceptional scenario.

“ Hace apenas algunos años estos eventos eran considerados excepcionales. Hoy forman parte de la **operación diaria** en diversas regiones del mundo.

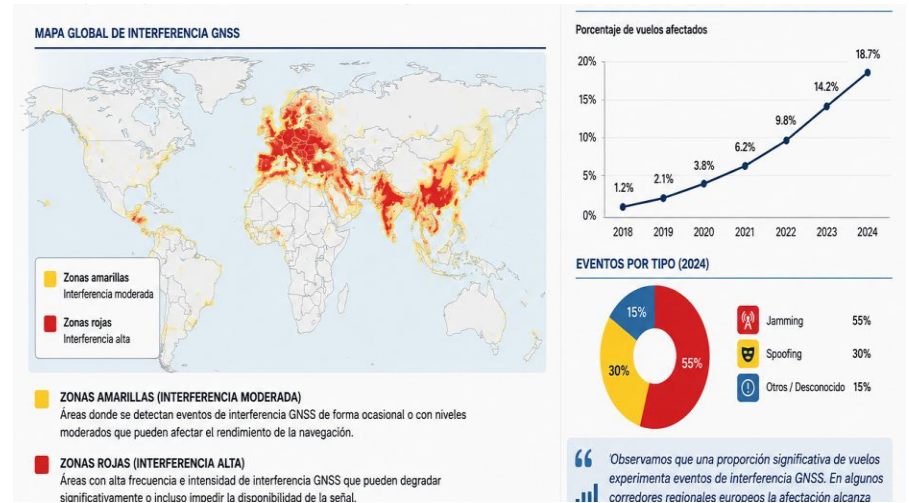


Tipos de Interferencia



Conclusiones Clave

- “Observamos que una proporción significativa de vuelos experimenta eventos de interferencia GNSS. En algunos corredores regionales europeos la afectación alcanza valores muy elevados.”
- “Este fenómeno dejó de ser un problema local para convertirse en un **desafío internacional**.”



The discussion shifted from
“Where is the interference?”
to “What capability remains?”

A regional meeting changed the frame

Five steps: awareness — solution — infrastructure — resilience — roadmap



The outcome was not a list of radio aids.
It was the beginning of a regional resilience strategy.



MON: the operational meaning

A Minimum Operational Network is the capability to preserve **safe navigation** and **ATM continuity** during GNSS degradation.

EVAIR REPORTS

No significant impact on human life.



WHAT ARE EVAIR REPORTS?

EVAIR is the ICAO standard platform to report PNT degradations (including regional outages and alternative navigational solutions) across Europe.



1. PNT INFORMATION AVAILABLE IN EVAIR REPORTS



PNT degradation reports are collected and published on the platform.

2. ANSPs APPLY RISK MANAGEMENT MEASURES



Operational measures are implemented to maintain safety, continuity and efficiency.

3. AIRLINES ADJUST OPERATIONS ACCORDING TO EACH OPERATIONAL SCENARIO



Flight plans, routes and procedures are adapted based on the risk level.

4. THIS ENSURES OPERATIONAL RESILIENCE AND CONTINUITY OF OPERATIONS



The ability to operate safely, even in degraded conditions, is preserved.

5. THIS SUPPORTS CONFIDENCE IN THE GLOBAL AIR NAVIGATION SYSTEM



A resilient network protects today's safety and the future of aviation.



OPERATIONS

Safe continuity / PBN where feasible



PROCEDURES

ATC, flight crew, contingency playbooks



ALTERNATIVE PNT

DME/DME • INS/IRS
ILS • conventional



INFRASTRUCTURE

Selected NAVAIDs + surveillance + monitoring



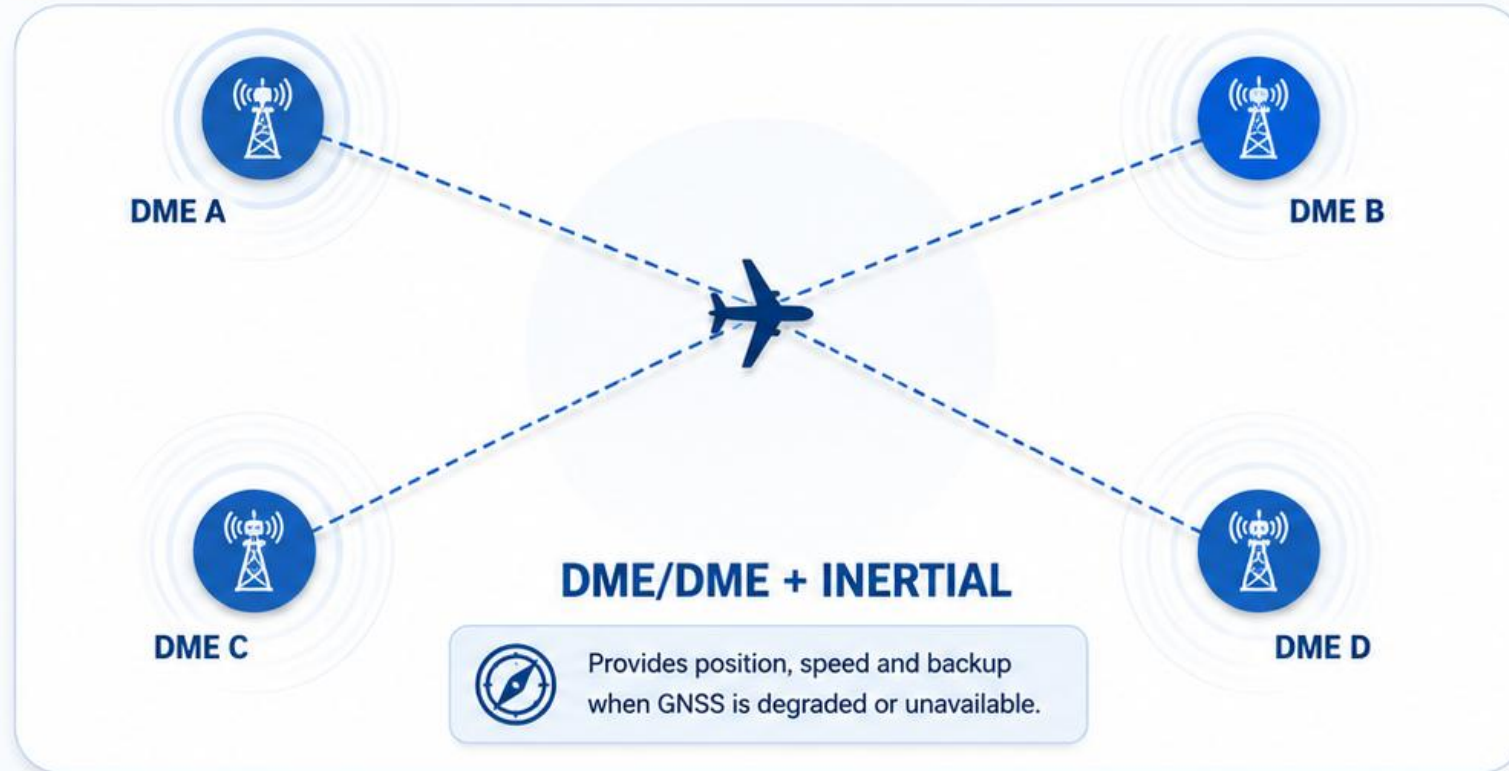
MON ≠ “keep every legacy NAVAID”

It means strategically retaining what delivers resilience.



DME becomes strategic infrastructure

The value of DME is determined by **geometry**, **coverage** and **operational use** — **not by quantity**.



DESIGN FOR

traffic flows & priority TMA's



VERIFY WITH

coverage analysis & flight inspection



PROTECT THROUGH

maintenance, spectrum & contingency planning



OBJECTIVE: Preserve usable RNAV capability where the operational benefit is highest.

Brazil: a concrete MON implementation case

A resilience plan linking infrastructure, procedures, training and spectrum coordination.



01


PRIORITIZE

High-traffic and strategic areas

02


ENGINEER

DME/DME/Inertial for RNAV operations

03


VALIDATE

Coverage studies and flight inspection

04


COORDINATE

DECEA + spectrum authority + training


REGIONAL LESSON:

MON must be risk-based and tailored to each State's operational environment.

SAM already has the building blocks

National experience can now be converted into a regional method.



ARGENTINA



- ✓ GNSS event evolution
- ✓ DME analysis
- ✓ DEMETER



BRAZIL



- ✓ MON criteria
- ✓ DME rationalization



COLOMBIA



- ✓ Operational analysis
- ✓ Event classification



PERU



- ✓ Contingency management
- ✓ Institutional coordination



GUYANA



- ✓ DME network planning



COMMON METHODS



SHARED DATA



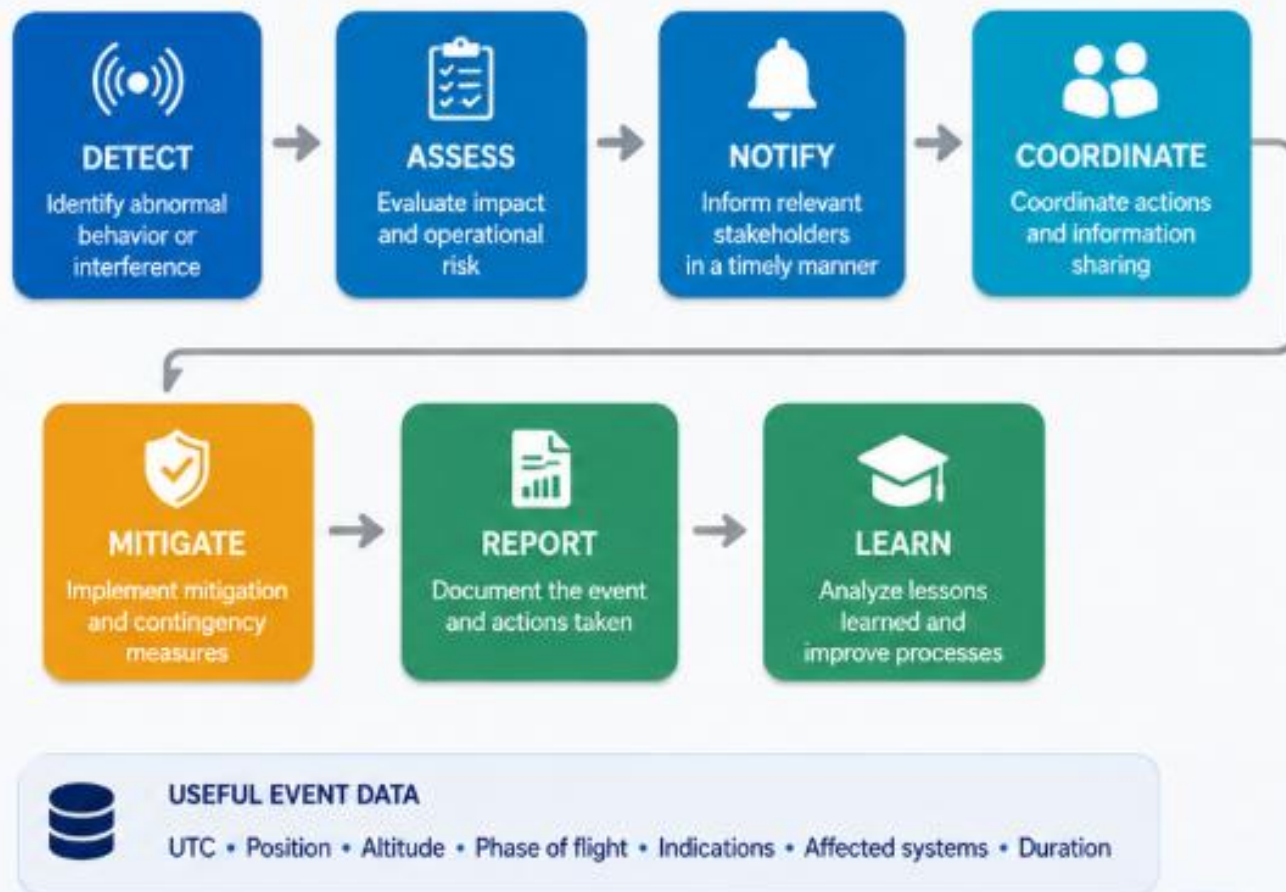
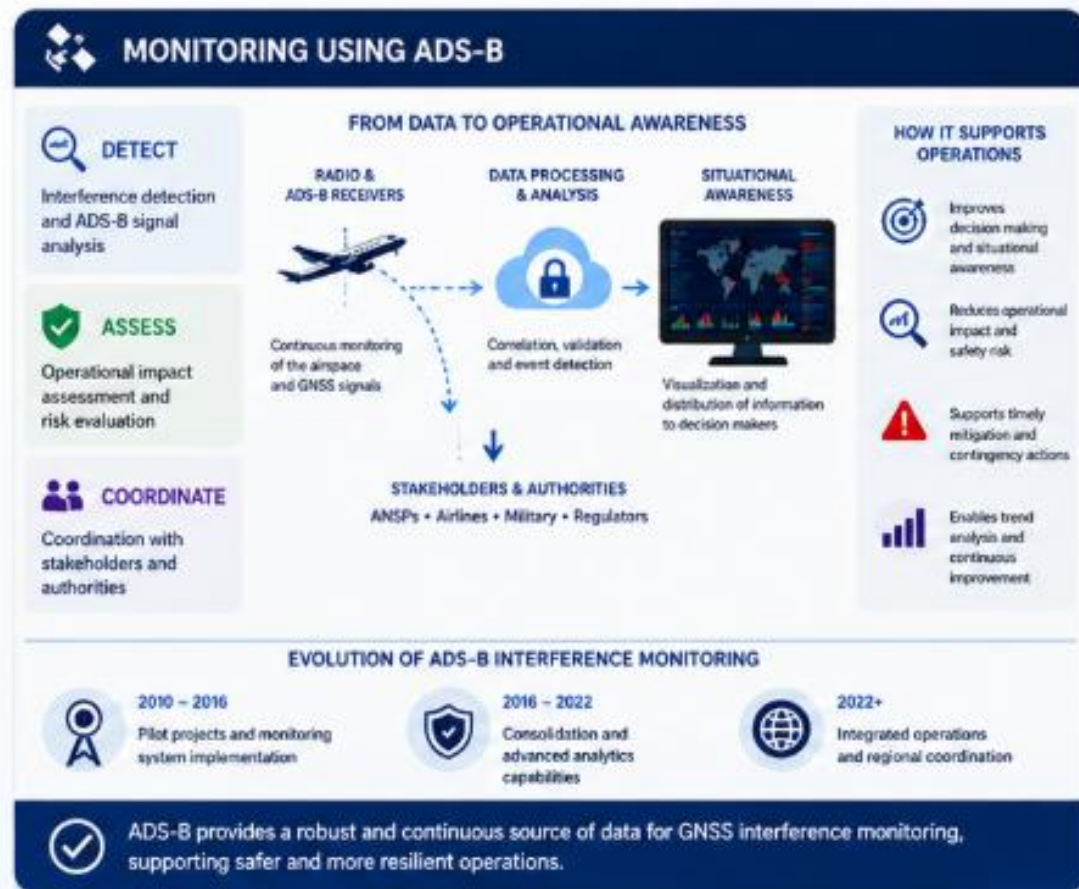
HARMONIZED
PROCEDURES



REGIONAL
RESILIENCE

An interference event is a process — not a notification

Operational value comes from the full detect—assess—mitigate—learn cycle.



Resilience is multidisciplinary

The July regional discussions confirmed that CNS cannot solve GNSS resilience alone.



CNS

Technology, infrastructure
and operational continuity.



ATM

Procedures, capacity
and decision-making.



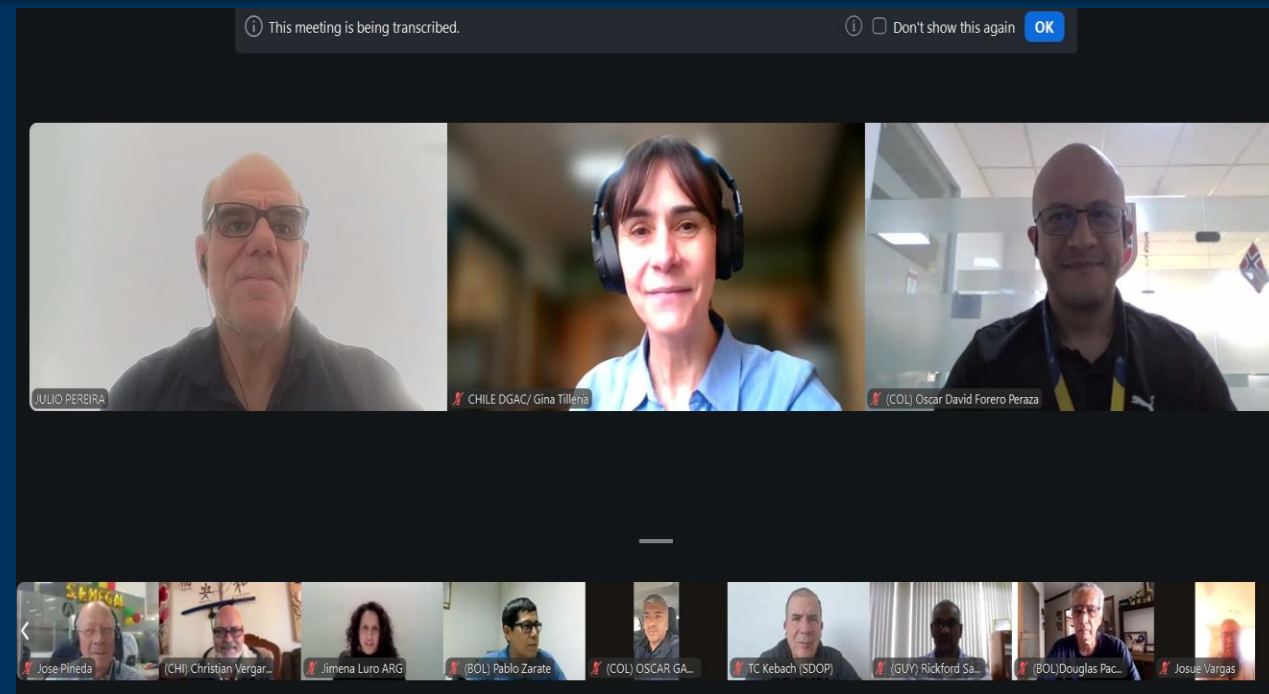
SPECTRUM

Protection, monitoring
and coordination.



MILITARY / SECURITY

Threat awareness, national
security and mitigation.



Regional MON / GNSS resilience meeting — SAM, July 2026



Governance is part of the technical solution.

Regional gaps → regional deliverables

The objective is **harmonized resilience**, not identical infrastructure.



INFRASTRUCTURE



Regional DME / alternative-PNT inventory



PROCEDURES



Common contingency principles



REPORTING



Harmonized taxonomy & regional database



GOVERNANCE



National focal points & coordination model



CAPACITY



Training, simulation & exercises



A **common regional framework** allows different national solutions to produce a coherent operational outcome.



Proposed SAM roadmap

A phased path from assessment to integrated PNT resilience.



Regional Guidance • PNT Resilience CONOPS • GNSS Event Database • DME Analysis Method • Capacity Building

Two actions can anchor the next phase

Focused, practical and suitable for follow-up through the regional mechanisms.

01



REGIONAL GUIDANCE

ICAO SAM guidance on GNSS resilience and MON



Concepts



MON criteria



Event classification



Reporting



Contingency principles



Case studies

02



REGIONAL EXPERT NETWORK

A standing technical network supporting implementation



CAA • ANSP



CNS • ATM



Operators



Spectrum authorities



Industry



Stronger guidance + active collaboration =

A more resilient and safer air navigation system in SAM



ICAO

SOUTH AMERICAN
REGIONAL OFFICE

FINAL MESSAGE

RESILIENCE IS NOT A BACKUP SYSTEM.



It is the coordinated ability to continue safe operations when the primary navigation capability is degraded.



GNSS



MON



PROCEDURES



MONITORING



COORDINATION



REGIONAL
COOPERATION



From vulnerability to operational resilience —
TOGETHER.



Thank You

