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Agenda Item 4: Provisión de AGA/AOP en la Región NACC
4.3 Operaciones y Resiliencia en Aeródromos

INFORMATION AND REQUIREMENTS FROM AERODROMES FOR THE DEVELOPMENT OF A MINIMUM OPERATIONAL NETWORK (MON) FOR GNSS RESILIENCE IN THE CAR REGION

(Presented by the Secretariat)

EXECUTIVE SUMMARY

This Working Paper presents the information and coordination required from aerodrome authorities, airport operators, Air Navigation Service Providers (ANSPs), States and other stakeholders to support the development of a Minimum Operational Network (MON) for Global Navigation Satellite System (GNSS) resilience in the Caribbean (CAR) Region. The proposed CAR MON is intended to provide a regional contingency capability that would support the safe continuation and recovery of aircraft operations during GNSS interference or outages. Its development requires not only an assessment of conventional navigation aids (NAVAIDs), but also the identification of airports that should remain operational during GNSS disruptions, their available instrument approach and landing capabilities, traffic characteristics, operational capacity, alternate-airport functions, aircraft equipment, infrastructure dependencies and contingency arrangements.

This paper therefore proposes that the NACC/WG/AGA/TF support the collection and validation of aerodrome-related information necessary for the CAR MON study and coordinate this work with CNS, ATM, AIM, aircraft operators and other relevant stakeholders.

Action:	Under Section 5
Strategic Goals:	• Every Flight Is Safe and Secure • Aviation Delivers Seamless, Accessible, and Reliable Mobility for All • No Country Left Behind

1. Introduction

1.1 The CAR Region has progressively transitioned toward Performance-Based Navigation (PBN) operations, with an increasing dependency on GNSS as the primary source of positioning and navigation. While GNSS provides significant operational benefits, its signals remain vulnerable to Radio

Frequency Interference (RFI), including intentional jamming and spoofing, unintentional interference and other events capable of degrading or interrupting GNSS-based navigation.

1.2 To strengthen regional navigation resilience, ICAO NACC has proposed the development of a **Minimum Operational Network (MON)** for GNSS Resilience in the CAR Region. The objective is to develop a technical proposal that will support safe and continuous aircraft navigation during GNSS interference or outages and strengthen the resilience of the regional CNS infrastructure.

1.3 The project is expected to assess regional GNSS dependency, establish an inventory of conventional NAVAIDs, analyse GNSS interference risk scenarios, develop the conceptual design of a CAR Regional MON, identify MON infrastructure requirements and establish a regional implementation roadmap.

1.4 A MON should not be understood as a replacement for GNSS or as an infrastructure intended to reproduce the full capacity available during normal GNSS operations. Rather, it is a recovery and contingency capability independent of GNSS, designed to maintain an appropriate level of safe operations during a disruption.

1.5 Although the MON has a significant CNS component, its development cannot be undertaken solely as a navigation infrastructure exercise. The design of the MON must consider airspace, aircraft equipage, navigation infrastructure, instrument flight procedures, airports and operational requirements. This requires close coordination among AGA, CNS, ATM, AIM, aircraft operators, procedure designers and other stakeholders. Airports have an important role because the regional MON must determine where aircraft can safely continue an approach and landing, recover or divert following a GNSS disruption.

2. ANALYSIS

2.1 *Role of aerodromes in the CAR Regional MON*

2.1.1 A regional MON must provide more than en-route navigation continuity. It must ultimately allow aircraft affected by a GNSS disruption to continue safely, leave the affected area, divert when necessary and land at an appropriate aerodrome.

2.1.2 MON planning should encompass both en-route and approach operations, ensuring that conventional NAVAIDs can support the required services during GNSS outages. Consequently, one of the key outputs of the CAR MON study should be the identification of a network of aerodromes that could support safe aircraft recovery during regional or localized GNSS disruptions.

2.1.3 International experience demonstrates the importance of this airport component. For example, the United States MON concept is intended, among other objectives, to allow aircraft to recover safely to designated MON airports during GNSS outages. The French example goes further by considering not only airports forming part of an ILS MON, but also additional aerodromes that may be required to accommodate diverted traffic if parking capacity at primary MON airports becomes saturated.

2.1.4 This consideration is particularly relevant to the CAR Region because of its geography. Island States and Territories, limited airport alternatives, significant oceanic areas and differences in

airport infrastructure mean that the suitability of an airport as part of a regional MON cannot be assessed exclusively on the presence of a VOR, DME or ILS. A broader airport operational assessment is required.

2.2 Information required from airports and States

2.2.1 To support development of the CAR Regional MON, the Secretariat considers that States, airport operators and ANSPs should provide a standardized dataset for each international airport and for other aerodromes that could potentially perform a contingency or alternate function. Under Appendix A, provide the information needed from the Airports.

2.3 Instrument approach and landing capability

2.3.1 Particular attention should be given to airports where all or most instrument approaches depend on GNSS. Airports where approaches are based on GNSS may experience serious operational impacts during a GNSS outage. It also recognizes the continuing resilience role of ILS, particularly for low-visibility operations.

2.3.2 States should therefore identify, for each relevant airport:

- which runways have GNSS-dependent approaches;
- which runways have GNSS-independent approaches;
- whether ILS remains operational and its category;
- whether VOR/DME or other conventional procedures remain available;
- which procedures would become unavailable immediately following a GNSS outage;
- whether missed-approach procedures have GNSS dependencies; and
- what minimum approach capability should be retained to support contingency operations.

2.3.3 This analysis is essential because the presence of an ILS alone does not necessarily establish complete GNSS-independent recovery capability. The entire procedure, including the missed approach and supporting navigation infrastructure, must be considered.

2.4 Identification of potential CAR MON airports

2.4.1 Based on the information collected, the CAR MON study should classify airports according to their potential role during GNSS contingency operations. A possible classification for further analysis could include:

- Category A – Primary MON Airports
Aerodromes considered essential for continued regional operations and capable of providing GNSS-independent approach and landing capability.
- Category B – MON Recovery/Alternate Airports:
Aerodromes capable of receiving diverted aircraft and providing appropriate recovery capability during GNSS disruptions.
- Category C – GNSS-Dependent Airports:
Aerodromes where instrument operations are substantially dependent on GNSS and where alternative contingency arrangements would therefore be required.
- Category D – Supporting Aerodromes:
Aerodromes that may provide additional regional contingency capability based on geographical location, available infrastructure or operational requirements.

2.5 Traffic and aircraft equipage

2.5.1 MON planning should consider the type and volume of traffic and the navigation capabilities of aircraft operating at each airport. This information is necessary to determine whether DME/DME, VOR/DME or other conventional navigation capabilities can effectively support contingency operations during GNSS outages.

2.6 Airport capacity during a GNSS disruption

2.6.1 Potential MON airports should be assessed not only for navigation capability but also for their capacity to receive diverted traffic. Runway capacity, aprons and parking availability, fuel, ground handling and other operational limitations should be considered, particularly during large-scale GNSS disruptions.

2.7 Cross-border and regional considerations

2.7.1 The CAR MON should be developed as a regional network. States should consider the use of NAVAIDs and airports in neighboring States where this improves contingency coverage, operational continuity and cost efficiency, supported where necessary by bilateral or regional agreements.

2.8 Protection of critical NAVAIDs and airport infrastructure

2.8.1 States should identify NAVAIDs and airport infrastructure that are essential to maintaining operations during GNSS outages. Any planned replacement, modernization or decommissioning should consider MON requirements and the possible impact on routes, procedures and airport accessibility.

3. Conclusions

3.1 The CAR Regional MON requires coordinated participation from AGA, CNS, ATM, AIM, airport operators, ANSPs, procedure designers and aircraft operators. Airport information is essential to determine which aerodromes can support safe recovery, diversion and continued operations during GNSS outages and to identify regional infrastructure gaps.

4. Recommendation

4.1 The AGA/TF should support a standardized regional data-collection process covering airport infrastructure, instrument approaches, GNSS dependency, conventional NAVAIDs, traffic, aircraft equipage, contingency capability and future infrastructure plans. States should also identify airports that could serve as primary or alternate MON airports.

5. Suggested Action

5.1 The Meeting is invited to support the CAR MON initiative, and it proposes the following conclusion:

DRAFT CONCLUSION ACRONYM/XX		DRAFT CONCLUSION NACC/WG/AGA/TF/4/XX — PROVISION OF AERODROME INFORMATION FOR DEVELOPMENT OF THE CAR REGIONAL MINIMUM OPERATIONAL NETWORK (MON)
What: That, in order to support the development of a harmonized CAR Regional Minimum Operational Network (MON) for GNSS resilience, CAR States and Territories, in coordination with airport operators and ANSPs: a) provide ICAO NACC with the required information on airport infrastructure, instrument approach and landing capabilities, GNSS dependency, conventional NAVAIDs, traffic, operational capacity, alternate-airport capability, contingency arrangements and future infrastructure plans; b) identify airports where approach and landing operations should be maintained during GNSS outages and identify the GNSS-independent infrastructure and procedures supporting those operations; c) identify airports whose instrument operations are substantially dependent on GNSS and the corresponding contingency gaps; d) validate the information in coordination with AGA, CNS, ATM, AIM, PBN procedure-design and aircraft-operator stakeholders; and e) support ICAO NACC in consolidating this information for the technical assessment, conceptual design and implementation roadmap of the CAR Regional MON.		Expected impact: ☐ Political / Global ☒ Inter-regional ☐ Economic ☐ Environmental ☒ Operational/Technical
Why: To provide the operational and aerodrome information necessary to determine which airports and navigation infrastructure should form part of the CAR Regional MON and ensure safe recovery, diversion and continuation of aircraft operations during GNSS interference or outages.		
When: October 30, 2026	Status: ☐ Valid / ☐ Superseded / ☐ Completed	
Who: ☒ States ☒ ICAO ☐ Other:	All CAR States and Territories	

PROVISION OF AERODROME INFORMATION FOR DEVELOPMENT OF THE CAR REGIONAL MINIMUM OPERATIONAL NETWORK (MON)

This Appendix provides the proposed framework for collecting and validating the aerodrome information required to support the development of the CAR Regional Minimum Operational Network (MON) for GNSS resilience. It is intended to guide CAR States and Territories, in coordination with airport operators, ANSPs and relevant CNS, ATM and AIM stakeholders, in identifying airports capable of supporting continued approach, landing, recovery and diversion operations during GNSS disruptions.

The information collected should cover airport infrastructure, instrument procedures, conventional navigation capabilities, traffic characteristics, aircraft equipage, operational capacity, contingency arrangements and identified infrastructure or operational gaps. Once validated, this information will be submitted to ICAO NACC for incorporation into the regional technical analysis and the development of the proposed CAR MON.

Area	Information required
1. Airport identification	State/Territory; airport name; ICAO location indicator; coordinates/elevation; airport operator; ANSP; hours of operation
2. Runway infrastructure	Runway designations; runway dimensions; declared distances; operational restrictions; runway availability; relevant limitations for aircraft expected during contingency operations
3. Instrument approach capability	Available ILS CAT I/II/III, LOC, VOR/DME, VOR, RNP APCH, RNP AR, GBAS/GLS and other instrument approach procedures
4. GNSS dependency	Identification of approaches, arrivals, departures and other airport operations that depend primarily or exclusively on GNSS
5. GNSS-independent approaches	Identification of runways having an instrument approach/landing capability that can remain available following loss of GNSS
6. Conventional NAVAIDs	VOR, DME, VOR/DME, ILS/DME, NDB or other relevant facilities supporting the airport; location; ownership; coverage; operational status
7. NAVAID reliability	Availability, serviceability, redundancy, maintenance arrangements, flight inspection status and known limitations
8. Traffic information	Annual movements; peak-hour traffic; IFR movements; principal aircraft categories/types; scheduled commercial operations; cargo and GA activity
9. Aircraft equipage	To the extent available, information regarding typical aircraft capabilities such as DME/DME, VOR/DME, INS/IRS and relevant PBN capabilities
10. Airport capacity	Capacity to receive diverted aircraft; apron/parking limitations; terminal constraints; fuel availability; ground-handling considerations
11. Alternate airport role	Current designated alternate functions and potential capability to serve as a MON recovery/diversion airport
12. Contingency procedures	Existing airport/ANSP procedures for GNSS degradation or loss, including approach, landing, diversion and recovery arrangements

Area	Information required
13. GNSS interference history	Known GNSS RFI, jamming or spoofing events affecting airport operations and any operational consequences
14. Future infrastructure plans	Planned installation, replacement, modernization or decommissioning of ILS, VOR, DME, NDB, GBAS or other navigation infrastructure
15. Dependencies	Identification of airport procedures dependent upon specific NAVAIDs, including facilities located outside the airport or in another State
16. Criticality	State/airport assessment of whether the airport should maintain operations during a localized or regional GNSS outage and the minimum operational level required