International Civil Aviation Organization
North American, Central American and Caribbean Office

INFORMATION PAPER

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First North American, Central American and Caribbean Working Group (NACC/WG) Aerodromes and Ground Aids (AGA) Implementation Task Force Meeting (NACC/WG/AGA/TF/1)

Mexico City, Mexico, 3 to 7 July 2023

Agenda Item 9: Other Business

WORLD GEODETIC SYSTEM – 1984 (WGS84) UPDATE

(Presented by the Secretariat)

EXECUTIVE SUMMARY	
This paper presents significant information on the need, by different States, of the update of the WGS84 geodetic system and its significance for performance-based navigation (PBN), Instrument Flight Procedures (IFPs), and other important Aerodrome requirements.	
Strategic Objectives:	• Strategic Objective 1 – Safety • Strategic Objective 2 – Air Navigation Capacity and Efficiency
References:	• Annex 4 • Annex 15 • Annex 11 • Annex 14 • PANS-OPS Doc 8168 Vol I to III • Aeronautical Information Services Manual – Doc 8126 new Ed • World Geodetic System - 1984 (WGS84) Manual – Doc 9674 • Electronic Terrain and Obstacle Data - Doc 9881 • Performance-based Navigation (PBN) Manual – Doc 9613 • Global Air Navigation Plan (GANP), now available in web-based Doc 9750

1. Introduction

1.1 Geodetic reference problems in air navigation were identified for the first time in Europe in the 70s during the development of multi-radar tracking systems when processing tracking data from radars located in different European countries, which prevented a combined display of tracks for air traffic controllers.

1.2 Likewise, while testing paths with the French system (automatic navigation aid flight testing system), note was taken of the existence of position hops when switching between Distance Measuring Equipment (DME) units located in different States. These errors resulted from the incompatibility of ground aid coordinates. The same error occurs for Aerodrome location.

1.3 Consequently, the ICAO Council, at its 126th session held in March 1989, approved Recommendation 3.2 of the fourth meeting of the Special Committee on Future Air Navigation Systems (FANS/4) concerning the adoption of the World Geodetic System – 1984 (WGS84) as the geodetic reference system standard for International Civil Aviation Navigation, World-wide.

1.4 This recommendation specifies that this standard should be incorporated in Annexes 4 and 15 to ensure prompt and full implementation of the WGS84 geodetic reference system, supported by Doc 9674, World Geodetic System - 1984 (WGS84) Manual. Subsequently, in 1995, it was incorporated in Annexes 11 and 14.

2. Discussion

2.1 In regard to some previous editions of Doc 9750 (now GANP is available on a Web basis), in Table 1-1 of Chapter 1 appeared 23 Global Plan Initiatives (GPI), two of them directly related to aeronautical information (GPI-18 — Aeronautical Information, and GPI-20 — WGS84) and many having an indirect impact on the way in which aeronautical information will be exchanged (Aeronautical Information Exchange Model - AIXM) in the future.

2.2 Failure to express horizontal geodetic reference in accordance with the WGS84 system has a significant impact on AIS-to-AIM transition (Phase-I) and on safety since the existing aircraft autonomous navigation systems increasingly need the WGS84 in their reference system to have more accuracy. Although States have made great efforts to implement this system, they are not yet updated on it.

2.3 Bearing in mind the critical importance of using the WGS84 as the geodetic reference system and considering the implementation steps foreseen in the Aeronautical Information System (AIS)-to-Aeronautical Information Management (AIM) transition roadmap for the provision of new AIM products towards Airport Mapping Database (AMDB), Electronic Charts (eCHARTS), Performance Based Navigation (PBN), and System wide information management (SWIM), it is necessary to establish the status of implementation and update.

2.4 In addition, remember that with respect to the World Geodetic System — 1984 (WGS84) defined ellipsoid, the difference between the WGS84 ellipsoidal height and orthometric height represents WGS84 geoid undulation, for elevation purposes, applied on thresholds and ARPs of the Runways for all Aerodromes.

3. Conclusion

3.1 The CAR Region has established the implementation of WGS84 (Doc, 9674), for some years. Now it is intended to evaluate and improve the quality of the geographic coordinates data and the vertical Datum (geoid undulation) to comply with the ICAO specifications in Annexes 4, 11, 14, and 15, as well as Doc 9674, although they have already been performed the existing survey points, to comply with the ICAO specification on the WGS84 standard and requirements. In this regard, the CAR WGS84 implementation prescribed all detailed activities, including the executing official agency. The CAR Region

has obtained success in several steps according to the initial plan, however, in this new stage, it will be necessary to establish a programme with a periodic review of the **Primary and Secondary Aerodrome Control Points** (PACs and SACs) of the WGS84 coordinate network, to maintain the data accuracy in support to PBN Requirements.

3.2 In this new review and update phase, ICAO will propose to survey the WGS84 coordinates again, to verify the accuracy and quality of the currently declared in the AIPs of the Region by each State to collect the status of the coordinates and to ensure that all existing coordinates are updated in accordance with the WGS84 reference system and data quality control was applied. While establishing national regulations to promulgate the required WGS84 standards and other necessary requirements as outlined in ICAO Manual 9674 and Annex 4 and Annex 14 for aerodrome standards.

3.3 In addition, several workshops were held a few years ago to explain the inspection procedure and guidance for aerodrome inspectors (Runways, Taxiways, Platforms, and many other installations), airspace coordinate information (fixes, FIR limits, en-route waypoints, etc.), Aids to Navigation, Data Originators and Related Areas to ensure understanding of all WGS84 procedures and processes and the data quality requirement.

3.4 The related stakeholders must have reviewed their own procedures, re-inspected, and confirmed the Aerodrome, airspace points inspected, declared, and surveyed by applying the methodology and new technologies in accordance with the applicable regulations and the recommendations of the WGS84 Manual. As a result of this, all the coordinate points in the AIPs, in the Region, **require to be updated and reviewed by the related data originators**, while AIS/AIM applied quality control measures as prescribed in the applicable documentation and regulations.

4. Recommendations

4.1 It is important that CAR States consider and take some actions if necessary to:

a) review the information provided in this information paper and in **Appendix**;

b) update data and information of the WGS-84 coordinates (Aerodromes) in the CAR Region; and

c) incorporate all needed and proper activities to apply the QMS to WGS84 coordinates database.

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APENDIX / APÉNDICE
WGS84UPDATE / WGS84 ACTUALIZACIÓN

Información General / General Information
Does your administration currently have a national database including information on WGS-84 coordinates? / ¿Actualmente su administración dispone de una base de datos nacional que incluya información de coordenadas WGS-84?
Was the topographic method used to estimate WGS-84 coordinates to ensure accurateness and integrity required, made with at least three control stations to determine referential parameters in the local referential framework and the WGS-84? / ¿El método de levantamiento topográfico utilizado para calcular las coordenadas geográficas WGS-84 que garantice la precisión e integridad requerida se realizó con por lo menos tres estaciones de control para determinar los parámetros de referencia entre el marco de referencia local y el WGS-84?
• ATS/RNAV En-route fixes / Puntos en-ruta ATS/RNAV
• En-route reference fixes / Puntos de referencia en-ruta
• Holding pattern Fixes; and puntos STAR/SID / STAR/SID fixes / Punto de espera; y puntos STAR/SID / STAR/SID
• En-route navigation aids / Radioayuda para la navegación en-ruta
• Restricted/Prohibited/Dangerous areas / Zonas restringidas/prohibidas/peligrosas
• En-route obstacles / Obstáculos en ruta
• FIR boundaries / Límites de la FIR
• CTA boundaries, CTZ / Límites de CTA, CTZ
• Other significant points having relationship with en-route areas / Otros puntos significativos que tengan relación con en-ruta
• Aerodrome-heliport reference point / Puntos de referencia de aeródromo/ helipuerto
• Runway thresholds / Umbrales de pista
• Runway end (flight trajectory alignment point) / Extremo de pista (punto de alineación de la trayectoria de vuelo)
• Approach and departure final area (FATO) / Área de aproximación final y de despegue (FATO)
• FATO thresholds / Umbrales de la FATO
• Nav-aids in terminal area / Radioayudas para la navegación en el área terminal
• Nav-aids located in the aerodrome/heliport / Radioayudas situadas en el aeródromo/helipuerto
• FAF, FAP Fixes; and other Essential IAP / Puntos FAF; FAP; otros IAP esenciales;
• Runway centreline points / Puntos en el eje de pista
• Taxiway centreline points / Puntos de eje de calle de rodaje
• Air taxiing / Puntos de rodaje aéreo
• Air traffic points / Puntos de tránsito aéreo
• Aircraft parking position / Puestos de estacionamiento de aeronaves
• INS checking point / Punto de verificación INS
• Obstacles in the circuit area and in the aerodrome-heliport / Obstáculos en el área de circuito y en el aeródromo/helipuerto
• Reference points and other Essentials fixes for final approach including instrument precision approach procedure / Puntos de referencia y otros puntos esenciales para la aproximación final comprendido el procedimiento de aproximación por instrumentos de precisión

— END / FIN —