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INFORMATION PAPER

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Agenda Item 6: **AIM & SWIM implementation Roadmap. Tracking Website of the NAM/CAR Regions**

VERIFICATION AND VALIDATION OF OBSTACLE AND TERRAIN DATA: A GEOMATICS-BASED APPROACH

(Presented by Trinidad and Tobago)

EXECUTIVE SUMMARY

This information paper outlines the geospatial tools and methodologies employed by the Geomatics Unit of the Trinidad and Tobago Civil Aviation Authority (TTCAA) to verify and validate obstacle and terrain data in alignment with Terrain and Obstacle Data requirements. It highlights the integration of satellite imagery, ground survey techniques, and inter-agency collaboration. The paper underscores the critical role of the Geomatics Unit in ensuring data accuracy, quality assurance, and adherence to international aviation standards.

Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency
References:	• ICAO Annex 14 Vol I— Aerodromes • ICAO Annex 15 — Aeronautical Information Services • ICAO Doc 9881 — Guidelines for Electronic Terrain, Obstacle and Aerodrome Mapping Information • ICAO Doc 9674 — World Geodetic System — 1984

1. Introduction

1.1 The Geomatics Unit, established in 2015 under the Aeronautical Information Management (AIM) Department of TTCAA's Air Navigation Services Division, is tasked with managing terrain and obstacle data in accordance with Trinidad and Tobago Civil Aviation Regulations (TTCARs) and International Civil Aviation Organisation (ICAO) Standards and Recommended Practices (SARPs).

1.2. Staffed by two (2) qualified Geomatics Engineers, the Unit applies geospatial science to ensure compliance with ICAO Annexes and standards for the acquisition and verification of terrain and obstacle data.

1.3. This paper presents the Unit's methods for verifying and validating terrain and obstacle data, including the use of satellite imagery, survey techniques, and collaboration with national agencies.

2. ICAO Guidance and Geomatics-Based Verification Framework

2.1 ICAO Document (Doc) 9881 outlines data quality requirements, data product specifications, data traceability, positional accuracy, and validation protocols.

2.2 It is essential that all such data undergo systematic verification to maintain high standards of accuracy, reliability, and safety in aviation operations.

2.3 The Geomatics Unit's verification framework follows these principles through:

a. Validation from multiple sources.
b. Global Navigation Satellite System (GNSS) based surveys aligned with ICAO Document 9674 (World Geodetic System 1984).
c. Historical data comparisons and control checks.
d. Inclusion of metadata.

3. Methods of Verification and Validation

3.1 Satellite Imagery Verification

a. Google Earth Pro is used for spatial cross-checking and time-stamped imagery reviews.
b. It supports horizontal verification and obstacle growth monitoring.

3.2 Survey-Based Validation

a. Total Station and GNSS Surveys are conducted for vertical and horizontal accuracy validation.
b. Surveys are benchmarked against national geodetic control.

3.3 The Geomatics Unit collaborates with State Agencies responsible for surveys and mapping to carry out extended surveys and obtain supplementary survey data, including control point information and Light Detection and Ranging (LiDAR) datasets.

3.4 Cross-Dataset Analysis

a. Existing LiDAR, drone imagery, and aeronautical chart datasets are referenced.
b. The Unit performs statistical checks for data consistency.

4 Collaboration with State Agencies

4.1 Data validation is strengthened through formal communication and data-sharing with key national agencies, including those responsible for:

a. Building and development approvals.
b. Geodetic control, topographic data acquisition, and technical survey support.
c. Telecommunications infrastructure regulation.

d. Public telecommunication service operations.

4.2 These partnerships ensure early detection of potential obstacles and foster the development of an accurate obstacle and terrain database.

5. Challenges and Recommendations

5.1 Challenges:

a. Delay in access to high-resolution or current imagery and LiDAR data.
b. Limited GNSS infrastructure.
c. Asynchronous data from external agencies.

5.2 Recommendations:

a. Investment in GNSS equipment and Unmanned Aerial Vehicles (UAVs) for local data acquisition.
b. Establishment of formal data exchange agreements.
c. Acquire certified Geomatics specialist/s to verify and validate acquired and exchanged geospatial data, ensuring its accuracy, reliability, and compliance with applicable standards.

6. Conclusion

6.1 The TTCAA Geomatics Unit has developed and continues to integrate improvements for a structured and scalable framework for verifying and validating obstacle and terrain data, aligned with ICAO standards. This framework integrates the use of freely available satellite imagery, professional surveying techniques, and collaboration with national agencies to ensure a cost-effective, compliant, and high-quality Terrain and Obstacle Database.

6.2 This integrated approach strengthens the accuracy, reliability, and sustainability of aeronautical data management, contributing to improved aviation safety and operational efficiency.

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