ICAO-AFPP Quality Assurance for Instrument Flight Procedure Implementation.

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COLLECTION AND VALIDATION OF DATA FOR PROCEDURE DESIGNING:

References:

1. Doc 9906, VOL 1.
2. Doc 9674, WGS84
3. Annex 15 and
4. Annex 11

OBJECTIVES:

General:

- Share practical experience on how to collect and validate the data required for procedure design.

Outline:

- Introduction,
- Categories of Data/information for procedure design(PD),
- Collection of procedure design DATA/Information,
- Validation of data for accuracy, resolution and integrity.

INTRODUCTION:

Major key essentials for procedure designing

1. The use of appropriate design criteria together with
2. data/information which meet the quality requirements.

“ Quality requirements are addressed in-terms of Accuracy, resolution and the integrity of the data”

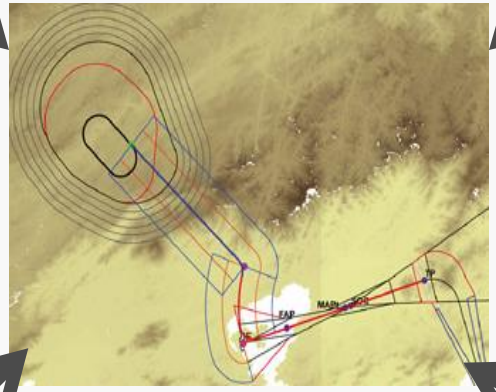
Definitions:

- **ACCURACY:** A degree of conformance between the estimated or measured value and the true value.
- **INTEGRITY:** A degree of assurance that an aeronautical data and its value has not been lost or altered since the data origination or authorized amendments.
- **VALIDATION:** Confirmation, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled.
- **VERIFICATION:** Confirmation, through the provision of objective evidence, that specified requirements have been fulfilled.

CATEGORIES OF PD DATA:

ATS STACKHOLDERS REQUIREMENTS

AERODROME DATA



TERRAIN AND OBSTACLE DATA

AERONAUTICAL AND NAV-AIDS DATA

PROCEDURE DESIGN DATA:

ATS REQUIREMENTS

- ATC
- USERS (OPERATORS)
- AIRSPACE DESIGN-CONSTRAINTS
- ENVIRONMENT CONSTRAINTS
- OTHER DEEMED NECESSARY

AERONDROME DATA

- From AIP- ARP, THR e.tc.
- MET- Weather statistics
- Magnetic variation and rate of change

PROCEDURE DESIGN DATA:

AERONAUTICAL and NAV-AIDS DATA	• Airspace structure/classification • Airways/routes, Transition altitudes/Flight level • Other Flight procedures • NAV-AIDS Coordinates, elevation frequency, coverage e.t.c.
TERRAIN AND OBSTACLE DATA	• Terrain: DTM or Paper cartographic maps • Obstacle: Man- made and natural

COLLECTION OF PD DATA:

- Should be collected from recognized sources
- Positional data must be in WGS84,
- All aeronautical data must meet the minimum quality requirements.
- It is also important to know when the data were originated.

Obstacle survey (Tanzania):

SETUP OF PANS-OPS SECTION:

- TCAA Flight Procedure Design Unit
  - It is in ANS-ATM section
  - Works in Close coordination/ collaboration with AIS/AIM (Cartography-AIM - responsible unit for obstacle survey)
  - Expected stand alone Section (Designer and Cartographers)
- TCAA Procedure design Facilities
  - GeoTITAN Software for designing,
  - Global mapper for processing/analysing DTM
  - ArcGIS for Charting,

Obstacle Survey (Tanzania):

- Under AIS/AIM section,
- Survey is Conducted by private companies,
- TOR is provided to the surveyor with detailed data quality requirements in accordance with TCAA order (TCAA/QSP/SR/O/AGA-03) derived from afore-mentioned DOCs.
- Procedure designers must participate during survey,
- Coordinates in WGS 84.
- If there is a need, Verification is done by Cartographers (Procedure designers are involved).

Aeronautical data quality requirements:

Latitude and longitude	*Accuracy data type*	*Publication resolution*	*Chart resolution*	*Integrity classification*
Flight information region boundary points	2 km (1 NM) declared	1 min	as plotted	1×10^{-3} routine
P, R, D area boundary points (outside CTA/CTZ boundaries)	2 km (1 NM) declared	1 min	as plotted	1×10^{-3} routine
P, R, D area boundary points (inside CTA/CTZ boundary)	100 m calculated	1 sec	as plotted	1×10^{-5} essential
CTA/CTZ boundary points	100 m calculated	1 sec	as plotted	1×10^{-5} essential
En-route NAVAIDS and fixes, holding, STAR/SID points	100 m surveyed/ calculated	1 sec	1 sec	1×10^{-5} essential
Obstacles en-route	100 m surveyed	1 sec	as plotted	1×10^{-3} routine
Aerodrome/heliport reference point	30 m surveyed/ calculated	1 sec	1 sec	1×10^{-3} routine
NAVAIDS located at the aerodrome/ heliport	3 m surveyed	1/10 sec	as plotted	1×10^{-5} essential
Obstacles in the circling area and at the aerodrome/heliport	3 m surveyed	1/10 sec	1/10 sec (AOC Type C)	1×10^{-5} essential
Significant obstacles in the approach and take-off area	3 m surveyed	1/10 sec	1/10 sec (AOC Type C)	1×10^{-5} essential

Aeronautical data quality requirements:

Latitude and longitudes Conts:

Final approach fixes/points and other essential fixes/points comprising instrument approach procedures	3 m surveyed/ calculated	1/10 sec	1 sec	1×10^{-5} essential
Runway threshold	1 m surveyed	1/100 sec	1 sec	1×10^{-8} critical
Runway end (flight path alignment point)	1 m surveyed	1/100 sec	—	1×10^{-8} critical
Runway centre line points	1 m surveyed	1/100 sec	1/100 sec	1×10^{-8} critical
Taxiway centre line points	0.5 m surveyed	1/100 sec	1/100 sec	1×10^{-5} essential
Ground taxiway centre line points, air taxiways and transit routes points	0.5 m surveyed/ calculated	1/100 sec	1/100 sec	1×10^{-5} essential
Aircraft/helicopter standpoints/INS checkpoints	0.5 m surveyed	1/100 sec	1/100 sec	1×10^{-3} routine
Geometric centre of TLOF or FATO thresholds, heliports	1 m surveyed	1/100 sec	1 sec	1×10^{-8} critical

Aeronautical data quality requirements:

Elevation/altitude/height	*Accuracy data type*	*Publication resolution*	*Chart resolution*	*Integrity classification*
Aerodrome/heliport elevation	0.5 m or 1 ft surveyed	1 m or 1 ft	1 m or 1 ft	1×10^{-5} essential
WGS-84 geoid undulation at aerodrome/heliport elevation position	0.5 m or 1 ft surveyed	1 m or 1 ft	1 m or 1 ft	1×10^{-5} essential
Runway or FATO threshold, non-precision approaches	0.5 m or 1 ft surveyed	1 m or 1 ft	1 m or 1 ft	1×10^{-5} essential
WGS-84 geoid undulation at runway or FATO threshold, TLOF geometric centre, non-precision approaches	0.5 m or 1 ft surveyed	1 m or 1 ft	1 m or 1 ft	1×10^{-5} essential
Runway or FATO threshold, precision approaches	0.25 m or 1 ft surveyed	0.5 m or 1 ft	0.5 m or 1 ft	1×10^{-8} critical
WGS-84 geoid undulation at runway or FATO threshold, TLOF geometric centre, precision approaches	0.25 m or 1 ft surveyed	0.5 m or 1 ft	0.5 m or 1 ft	1×10^{-8} critical
Obstacle Clearance Altitude/Height (OCA/H)	as specified in PANS-OPS (Doc 8168)	—	as specified in PANS-OPS (Doc 8168)	1×10^{-5} essential
Threshold crossing height, precision approaches	0.5 m or 1 ft calculated	0.5 m or 1 ft	0.5 m or 1 ft	1×10^{-8} critical

Aeronautical data quality requirements:

Elevation/altitude/heights conts:

Obstacles in the approach and take-off areas	1 m or 1 ft surveyed	1 m or 1 ft	1 m or 1 ft	1×10^{-5} essential
Obstacles in the circling areas and at the aerodrome/heliport	1 m or 1 ft surveyed	1 m or 1 ft	1 m or 1 ft	1×10^{-5} essential
Obstacles en-route, elevations	3 m (10 ft) surveyed	3 m (10 ft)	3 m (10 ft)	1×10^{-3} routine
Distance Measuring Equipment/ Precision (DME/P)	3 m (10 ft) surveyed	3 m (10 ft)	—	1×10^{-5} essential
Distance Measuring Equipment (DME) elevation	30 m (100 ft) surveyed	30 m (100 ft)	30 m (100 ft)	1×10^{-5} essential
Instrument approach procedures altitude	as specified in PANS-OPS Doc 8168)	—	as specified in PANS-OPS (Doc 8168)	1×10^{-5} essential
Minimum altitudes	50 m or 100 ft calculated	50 m or 100 ft	50 m or 100 ft	1×10^{-3} routine

Data verification:

- No need for an additional Data verification if they meet quality requirements,
- Verification is required when the Data quality requirements is unknown or below the stated requirements based on the procedure to be designed.
- Data validated when they fulfill the requirements for the intended use.

Data verification:

Methods:

- Analyze the data against other trusted data,
- After procedure designing we use a certain tool to overlay a procedure over the google earth (Tanzania).
- Flight validation/check.

Mitigation:

- Additional of appropriate buffers,
- Determination of negligible effects on the procedure.

Importance of quality characteristics of the DATA in procedure design:

- Helps to ensure proper horizontal and vertical safety margins required by procedure design criteria.
- E.g. The declared vertical accuracy of data must be included in the MOC.

THANKS FOR YOUR ATTENTION