

	TANZANIA CIVIL AVIATION AUTHORITY DIRECTORATE OF SAFETY REGULATIONS AIR NAVIGATION INSPECTORATE	Revision: 2 Advisory Circular
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1.0 Purpose

The purpose of this Advisory Circular is to provide guidance necessary for the flight inspection of radio navigational aids, including inspection types and facilities subject to inspections as prescribed in the applicable Civil Aviation (Radio Navigation Aids) Regulations.

Flight inspection of Radio Navigation Aids is a crucial process for ensuring that navigational aids, such as VORs (VHF Omnidirectional Radio Ranges), ILS (Instrument Landing Systems), and other radio-based navigation systems, are functioning correctly and providing accurate guidance to aircraft. This process is vital for maintaining safety in aviation and ensuring compliance with regulatory requirements.

2.0 References

- 2.1 Civil Aviation (Radio Navigation Aids) Regulations
- 2.2 ICAO DOC. 8071; Manual on Testing of Radio Navigation Aids. Vol I

3.0 Guidance and Procedures

Key Considerations During Flight Inspection:

Safety: Ensure all safety protocols are followed during flights, including clearances from air traffic control and coordination with local authorities.

Interference Avoidance: Minimize the risk of interference with other radio frequencies and ensure that flight inspection does not interfere with normal air traffic operations.

Weather Conditions: Flight inspections are typically performed in good weather conditions, as poor visibility, high winds, or other factors could affect the inspection's accuracy.

Technical Expertise: CNS Technical Personnels involved must be highly trained and knowledgeable about both the equipment being tested and the procedures involved in flight inspection.

3.1 Flight Inspection Execution

The aircraft will fly several pre-defined patterns (Profiles) around the radio navigation aid to verify its

location, operational frequency, and output. The flight inspectors will monitor several key parameters of the Radio Navigation Aids, such as:

- a) Coverage area: Ensuring the navigational signal is properly radiating across the specified area.
- b) Signal strength and consistency: Checking that the signal strength is
 - 1. consistent with the specifications, and there are no dead spots or areas of interference.
- c) Accuracy of the signal: Verifying the bearing accuracy (e.g., for VORs)
 - 1. and distance accuracy (e.g., for DME or ILS).
- d) Interference testing: Ensuring that there is no harmful interference from
 - 1. nearby signals or obstacles.
- e) Procedure Validation: Flight Inspectors will validate that the approach procedures, including approaches into airports with ILS systems, are functioning correctly. They will check for accuracy in lateral and vertical guidance, and precision in final approach angles.

3.2 Preparation and Planning

Flight inspections are typically scheduled at regular intervals as part of routine maintenance or following significant changes to the system (such as upgrades or repairs).

Ensure all necessary documentation, including the operational specifications of the navigation aid (e.g., coverage, performance parameters), is reviewed before the inspection. Also, check any regulatory requirements or standards for the specific aid being inspected.

Before departure, all instruments used to measure and analyze the performance of the radio navigation aid (such as receivers, flight inspection radar, and data logging devices) must be calibrated and tested.

Create a detailed flight plan outlining the approach patterns, airspace structure, and procedures that will be followed during the inspection. Ensure compliance with air traffic control and safety requirements.

Throughout the flight, all data from the navigation equipment on board the aircraft (including signal strength, frequency, bearing, and altitude) is logged and analyzed in real-time.

Evaluate the recorded data against the expected performance parameters, such as:

Signal consistency and precision across different altitudes and distances.

Accuracy of course and glide path deviations for systems like VORs and ILS.

Any inconsistencies or irregularities, such as signal degradation, incorrect signal direction, or coverage gaps, must be recorded for further analysis and corrective action.

3.3 Pre- Flight Inspection Preparations

- 3.3.1 Ground Technician/Engineers shall make preparations prior to a flight inspection to ensure that the flight inspection is efficiently conducted.
- 3.3.2 Ground CNS Technician/Engineers shall complete equipment adjustments and other technical preparations for the air navigation aid in question.
- 3.3.3 The following are the points to be observed during preflight inspection preparation:
 - a) Ensure that the result of all possible ground calibration and checking equipment are correct.
 - b) Competent maintenance personnel are available to make corrections and adjustments during flight inspection.
 - c) Availability of dedicated transport for equipment and personnel is ensured during the entire course of flight check.
 - d) Ensure all special tools and instruments are available at the site.
 - e) Availability of last flight inspection report.
 - f) Any requirement of special investigation during flight inspection shall be submitted in advance and followed up with Authority during flight inspection.
 - g) **In case the facility is not expected to be ready as per the regular scheduled** inspection, the Authority must be advised accordingly.
 - h) NOTAM for withdrawal of facility during Flight Inspection shall be issued without fail in coordination with local ATC.

3.4 Coordination during Flight Inspections

- 3.2.1 When equipment needs to be adjusted while flight inspection is in progress, the ground technical staff shall

notify the flight inspector and make the necessary adjustment.

3.2.1 CNSP service provider shall notify relevant agencies that the air navigation aid in question is undergoing a flight inspection.

3.5 Types of Flight Inspections

Flight inspections are classified and shall be carried out as follows:

- a) **Site approval:** Inspection to be carried out to confirm that the location selected for installation of a new air navigation aid is appropriate, it may include checks normally made during a commissioning inspection and any additional tests which may be required.
- b) **Commissioning:** is a comprehensive inspection to be carried out to obtain complete information regarding all aspects of performance of navigational aids. The facility shall not be declared operational before this check.
- c) **Periodic:** Inspection to be conducted on a regular basis to confirm the validity of air navigation aids.
- d) **Surveillance:** surveillance inspection shall be carried out to ensure that Navigational aids facility is being maintained within tolerance limits in spite of the inherent drift in the equipment. Surveillance inspections do not normally involve major adjustments unless the performance is observed to have drifted either close to, or beyond the applicable tolerance limits.
- e) **Special Inspections:** Special flight inspection shall be made on special request to confirm satisfactory performance. It may follow a major maintenance on the equipment especially the antenna system. Special Flight Inspection may also be carried out for investigation purpose after any incident or accident.

3.6 Flight Inspection Unit

Flight inspection of air navigation shall be conducted by organizations or **units that are approved by the Authority.**

3.7 Flight Inspection Aircraft

3.5.1 This section describes the concept for the special requirements of the aircraft, flight

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inspection crew members and ground support equipment used for flight Inspection.

3.5.2 Appropriately equipped aircraft shall be used when required to undertake flight inspection. The general characteristics of a flight inspection aircraft shall be as follows:

- a) Aircraft equipped with special instrument for flight check;
- b) Sufficient capacity for a flight inspection crew, ground maintenance and/or installation personnel, and required electronic equipment;
- c) Sufficient range and endurance for a normal mission;
- d) Aerodynamically stable throughout the speed range;
- e) Low noise and vibration level;
- f) Adequate and stable electrical system capable of operating required electronic and recording equipment and other aircraft equipment;
- g) Wide speed and altitude range to allow the conduct of flight inspections under normal conditions as encountered by the users; and
- h) Appropriate for modifications for flight inspection of new and improved navigation services.

3.8 Flight Inspection Crew Members

The members of the flight inspection crew shall be experts in their individual fields, have sound knowledge and experience in flight inspection procedures and be capable of working as a team.

3.9 Airborne and Ground Support Equipment

The selection and utilization of flight inspection equipment used to determine the validity of navigation information shall minimize the uncertainty of the measurement being performed.

Proof of Aircraft **calibrated flight inspection equipment** and **ground support equipment** shall be verified before putting in use.

3.10 Preparation of Flight Inspection Plan

3.10.1 CNS service provider shall prepare the following year's flight inspection plan for air navigation aids that

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require flight inspections and notify the Authority.

3.10.2 CNS service provider shall send one copy of the flight inspection records of the previous year to the Authority.

3.10.3 When it is necessary to change the flight inspection date, CNS service provider shall notify the Authority, of the changed flight inspection date.

3.11 Priority of Flight Inspections

3.11.1 CNS service provider shall conduct flight inspections according to the following priorities:

- a) Inspection requested from a concerned agency in relation to an aircraft accident.
- b) Inspection to correct a malfunction of an air navigation aid, inspection of a reported malfunction, or malfunction inspection after repairs according to a plan.
- c) Periodic, Commissioning, inspection of instrument flight procedures, and site approval.

3.12 Inspection after upgrading or modification of facility

Inspection shall be carried out when the conditions below prevail:

- a) Upgrade/modification of feeders, antennas, and other major components;
- b) Change in location of antenna or upgrade/modification of VOR counter poise;
- c) Modification or replacement of main components of the transmitter;
- d) Change in operation frequency and/or ID code;
- e) Change in transmission output following increase or decrease of an air navigation aid's service area;
- f) Where there is concern for signal interruption from construction of a buildings, a power line, or other obstacles in the vicinity of an operating air navigation aid;
- g) Partial upgrade/modification or extension of any operating light system (approach light, approach angle indicator light, runway indicator light); and

h) Other special flight inspections deemed necessary.

3.13 Basic Schedule for Periodic Flight Inspection

3.13.1 This section prescribes the minimum frequency of periodic flight inspections. More frequent inspections may be made when deemed necessary. Facilities subject to flight inspections and frequency of their inspections are as follows

NAVAIDS Facility	Maintenance Standards	Maximum Periodicity, GI	Maximum Periodicity, FI
DVOR	8071 Vol. 1 Annex 10 Vol. 1	360 days	1 years
CVOR	8071 Vol. 1 Annex 10 Vol. 1	360 days	1 year
DME/N	8071 Vol. 1 Annex 10 Vol. 1	360 days	1 year
ILS	8071 Vol. 1 Annex 10 Vol. 1	90 days	6 Months
DME/L	8071 Vol. 1 Annex 10 Vol. 1	90 days	6 Months
NDB	8071 Vol. 1 Annex 10 Vol. 1	180 days	1 year where operationally required
LIGHTING SYSTEMS			1 year

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3.13.2 ATC Facility (VHF, UHF) and aeronautical information broadcasting facilities shall be inspected when the Surveillance facilities (radar, ADS-B, MLAT etc) are commissioned.

Note: NDBs are not subjected to flight inspection except where operationally required.

3.14 Flight Inspection Notification Status

3.14.1 CNS Service Provider shall determine operation levels of air navigation aids as follows based on the results of flight inspections and notify relevant agencies for publication in AIP.

3.14.2 **Usable** is a status assigned to air navigation aids that are deemed to be operational in a flight inspection and shall be assigned one of the following operational status:

- a) *Unrestricted*: Assigned in cases where signals-in-space can be generated within the air navigation aid's coverage area to maintain safety and continuity of the air navigation aid and precise signals can be sent.
- b) *Limited or Restricted*: Assigned in cases where there are spaces that cannot send normal signals in all or some sections within the coverage area of the air navigation aid. In such cases, limited/restricted use of air navigation aid can be assigned in sections where there are no impediments in use of the air navigation aid in question by an aircraft. However, limited/restricted status shall not be assigned when judged that it is difficult to secure safety and continuity of the air navigation aid.

3.14.3 **Unusable**: Assigned in cases where it is judged that the air navigation aid cannot be used due to difficulty in securing safety and continuity of the air navigation aid within its operational range or in cases where there are airspaces wherein flight inspections cannot be conducted because of signal failure, designation as a no fly zone, or airspace use is restricted for other reasons.

3.15 Notification of Status Levels of Air Navigation Facilities

3.15.1 When it is deemed necessary to newly assign or change the status level of an air navigation aid following results of a flight inspection, ground CNS engineer /technician shall notify the relevant agencies for status to be published in the AIP. When it is deemed that an immediate action is needed, the following shall be observed;

- a) For an air navigation aid assigned unrestricted, restricted or usable, a request shall be made to the relevant

agency so that notification of the assignment or change in operational status can be made immediately in the NOTAM.

- b) For an air navigation aid assigned unusable status, action shall be taken to immediately suspend operation of the air navigation aid.

3.16 In-Flight Inspection

During the inspection, flight inspector shall advise CNS Engineer of observed conditions which require adjustment of ground equipment. Request for adjustment shall be specific and readily understandable. Normally the flight inspector is not expected to diagnose the fault but shall furnish sufficient information to enable the maintenance team to make the corrective adjustment when the aircraft is airborne and record the adjustments done for post analysis. Relevant measurements on ground for establishing a meaningful correlation with the flight check results after each run shall be taken.

3.17 Post-Flight Inspection Measures

After the flight, the collected data is thoroughly analyzed to identify any discrepancies or performance issues.

A detailed inspection report is created, documenting the findings, including any deviations from acceptable performance standards. The report should include:

- a) Flight inspection results.
- b) Identified issues and their potential impact on aviation safety.
- c) Recommendations for corrective actions or further testing if needed.

Corrective Actions: If issues are found, corrective actions such as recalibration, repair, or replacement of components may be necessary. Additional inspections or follow-up flights may be scheduled to verify the resolution.

- 3.17.1 The flight inspector shall determine the operational status of the air navigation aids in question after completing the flight inspection and notify the ground technical staff whether the air navigation aid passed or failed the flight inspection.
- 3.17.2 CNS provider shall prepare a report of flight inspection results **within 14 days after completion of the flight inspection** and notify the ground technical staff. An immediate report shall be made to the Authority of any air navigation aid that fails flight inspection.

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3.17.3 CNS provider shall keep commissioning data records of the air navigation aid in question until its permanent disuse and shall keep records of scheduled inspections and other flight inspections for at **least 5 years**.

3.18 Post-Flight Inspection

Ground CNS engineer shall complete the following actions:

- a) Take action as per the advice of Flight Inspector;
- b) Take relevant measurements on ground for establishing a meaningful correlation with the flight check results;
- c) Implement the suggestions in the final report; and
- d) Advice the Authority and all concerned regarding any major change in the facility performance through NOTAM.
- e) Approval
- f) Operational Integrity: Once the Radio Navigation Aids has been inspected and verified as meeting all operational standards, the system may be recertified for continued use. This might involve providing the report to the authority for final approval.
- g) Regulatory Compliance Check: Confirm that the inspection and the navigational aid comply with regulatory standards.
- h) Report Submission:
- i) Flight check report shall be submitted to the Director Safety Regulations for Evaluation and Assessment and thereafter communicated back to the Director Air Navigation Services.
- j) Publication in AIP;
- k) NAVAIDS results shall be published by the CNS Provider in the AIP on time after completion of Assessment and Evaluation by the Regulator



Tanzania Civil Aviation Authority