1.0 PURPOSE

1.1 The purpose of this Advisory Circular is to guide CNS Service Provider on preparations of technical specification with respect to Tanzania Civil Aviation Regulations.

2.0 REFERENCES.

2.1 Civil Aviation (Radio Navigation Aids) Regulations.

2.2 Civil Aviation (Communication Procedures) Regulations.

2.3 Civil Aviation (Communication Systems) Regulations.

2.4 Civil Aviation (Surveillance and Collision Avoidance systems) Regulations.

2.5 Civil Aviation (Aeronautical Radio Frequency spectrum Utilization) Regulations

3.0 GUIDANCE AND PROCEDURES

3.1 General

The preparation and installation of Communication, Navigation, and Surveillance (CNS) equipment are crucial for the functioning of air traffic management systems. The technical specifications for CNS equipment generally cover a broad range of parameters and requirements. These specifications ensure that the equipment is installed, configured, and operates according to regulatory requirements.

3.2 Technical specifications related to the preparation and installation of CNS equipment

3.2.1 Communication Equipment (C)

Types of Communication Systems:

a) VHF (Very High Frequency) radios for air-to-ground communication.

b) HF (High Frequency) radios for long-range communication.

c) Satellite Communication (SATCOM) systems for global communication.

d) Voice Switching Systems for managing communication channels.

Technical Specifications:

a) Frequency ranges (e.g., VHF 118–137 MHz).

b) Power output (typically measured in watts).

c) Modulation techniques (AM, FM).

d) Transmission range and quality (clear and uninterrupted communication).

e) Redundancy and failover systems to ensure uninterrupted service.

f) Security features for encrypted communication.

g) Compliance

3.2.2 3.2.2 Navigation Equipment (N)

Types of Navigation Systems:

a) Radar systems (Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR)).

b) Global Navigation Satellite Systems (GNSS) like GPS and Galileo.

c) Instrument Landing Systems (ILS).

d) Distance Measuring Equipment (DME).

e) VOR (VHF Omnidirectional Range).

Technical Specifications:

a) Frequency ranges for radio navigation aids (e.g., ILS, VOR, DME).

b) Signal accuracy, stability, and coverage.

c) Installation of antennas and transmitters to meet coverage requirements.

d) Calibration and alignment of navigation systems.

e) Compliance with TCARs and documentation for system performance.

f) Fail-safe and redundancy for critical navigation systems.

g) Integration with radar and satellite-based navigation systems.

3.2.3 Surveillance Equipment (S)

Types of Surveillance Systems:

a) Radar Systems: Primary and Secondary Surveillance Radars (PSR/SSR) for monitoring aircraft in the airspace.

b) ADS-B (Automatic Dependent Surveillance–Broadcast): A satellite-based system providing real-time tracking of aircraft.

Technical Specifications:

a) Antenna specifications (height, placement, and type for coverage).

b) Power levels and transmission rates.

c) Range and resolution of radar systems.

d) Data format for surveillance systems (e.g., Mode A/C/S for SSR).

e) Security and encryption for data transmission.

f) Integration capabilities with air traffic management (ATM) systems and databases.

3.2.4 Installation Considerations

a) Site Survey: Before installation, a detailed survey of the site must be conducted to assess factors such as:

b) Geographical location (for optimal coverage).

c) Electromagnetic interference from surrounding sources.

d) Structural integrity of buildings or towers for antenna installations.

e) Power supply requirements and backup systems.

f) Cooling and environmental control systems for equipment.

Cabling and Wiring: Proper wiring should be installed to ensure minimal electromagnetic interference and meet safety standards. This includes:

a) Shielded cables to reduce signal noise.

b) Routing to avoid physical damage or interference from external sources.

Mounting and Positioning:

a) Equipment should be mounted securely to avoid vibration and impact from weather or operational conditions.

b) Antennas and radars must be positioned for optimal coverage, free from obstructions.

Redundancy:

Key CNS equipment should be installed with redundancy to ensure system reliability in case of failure. This includes:

a) Backup power sources (e.g., UPS, generators).

b) Redundant communication links and radar systems.

Testing and Calibration: After installation, the following steps are performed:

a) Functional testing to ensure the equipment works as expected.

b) Calibration of sensors, antennas, and navigation systems.

c) Signal testing to verify communication and surveillance capabilities.

d) Performance validation against international standards.

3.2.5 Compliance and Safety Standards

ICAO Standards: The International Civil Aviation Organization sets forth standards and recommended

practices (SARPs) for CNS equipment, ensuring compatibility and interoperability across global air traffic systems.

ITU Regulations: The International Telecommunication Union regulates frequency allocation and communication protocols for global communication.

Electromagnetic Compatibility (EMC): CNS equipment should be designed and installed to minimize interference with other communication and electronic systems.

Safety Protocols: Compliance with safety standards for electrical and environmental safety during the installation and operation of CNS equipment.

3.2.6 Maintenance and Monitoring

a) **Regular Maintenance**: Scheduled preventive maintenance to ensure optimal performance of equipment.

b) **Software Updates and Patches**: Regular updates to firmware and software components to enhance functionality and security.

c) **Real-time Monitoring**: Continuous monitoring of communication, navigation, and surveillance systems to detect any failures or issues promptly

Tanzania Civil Aviation Authority