هيئة الطيران المدني
CIVIL AVIATION AUTHORITY

CAR-171

CIVIL AVIATION REGULATION

AERONAUTICAL TELECOMMUNICATION SERVICE PROVIDER

Effective: 28 November 2024
Approved by HE Eng. Naif Ali Hamed Al-Abri
President of CAA

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Corrigendum of Amendments

Rev No	Applicability Date	Description
02	11 Oct 2018	The complete CAR has been reissued
03	05 Jan 2020	This amendment incorporated the followings: (1) Inclusion of the applicable date of the certification requirements for Aeronautical Telecommunication Service Provider and Approval of the maintenance personnel of Aeronautical Telecommunication Service Provider. (2) Inclusion of Safety Inspection and Audit, Resolution of Safety Issues, new requirement for Flight Inspection Period, and Hazard analysis and Safety Assessment requirements. (3) Inclusion of new terms or abbreviations in Glossary (4) Inclusion of types of Voice communication systems for Aeronautical Mobile Service Voice Communication system and Advanced-Surface Movement Guidance and Control System (A- SMGCS) to the classification of facilities. (5) Addition of the Certification Requirement of Flight Inspection Service Provider (6) Required editorial correction.
04	01 Jul 2020	This amendment incorporated the followings: (1) Addition of new terms or abbreviation in Glossary (2) Updating the requirement for CIDIN operational procedure. (3) Updating the requirement for Meteorological operational channel procedures and meteorological operational communication network procedures to be compatible with ATSmessage handling services (AMHS) procedures. (4) Inclusion of A-SMGCS operational requirements. (5) Updating Environmental facilities requirements. (6) Required editorial correction
05	14 Apr 2022	This amendment incorporated the followings: (1) Required editorial correction. (2) Amending entry into force for certification requirements. (3) Changes to the maintenance personnel acceptance requirements. (4) Adding the approval requirements of organizations carrying outbuilding restricted area infringement study. (5) Inclusion of new terms or abbreviations in Glossary.
06	15 May 2023	This amendment incorporated the followings: (1) Amending entry into force for certification requirements to include an applicable date of the certification requirements for Aeronautical Telecommunication Service Provider (2) Inclusion of new definitions. (3) Required editorial correction. (4) Updating the facility performance requirements (5) Updating Quality Assurance requirements

07	28 Nov 2024	This amendment incorporated the followings: (1) Changes to new CAA logo. (2) Additional requirement for a Resolution Safety issue (3) Additional requirement for third party (4) Incorporating Amendment 93 to ICAO Annex 10 Vol II (5) Incorporating Amendment 92 to ICAO Annex 10 Volume III (6) Additional requirement for Facility logbook entry (7) Additional new section Certification phase for Flight Inspection Service provider (8) Re-arrangement Flight Inspection report and Quality Assurance for FISP (9) Editorial revision of Application Requirement for Approval of Company carrying out BRA Infringement study. (10) Additional requirement for demonstrating proposed BRA software (11) Required editorial correction

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Glossary of Terms or Abbreviations

ACC	Area control center
ADS-B	Automatic Dependent Surveillance-Broadcast
AFS	Aeronautical Fixed Service
AFTN	Aeronautical Fixed Telecommunication Network
AIP	Aeronautical Information Publication
AIS	Aeronautical Information Service
ATC	Air Traffic Control
ATS	Air Traffic Services
AT/RN	Aeronautical Telecommunication/Radio Navigation
A/G	Air Ground Communication
ATSEP	Air Traffic Safety Electronic Personnel
AWO	All Weather Operation
BRA	Building Restricted Area
CAA	Civil Aviation Authority
CAT II	Category II landing procedure
CNS	Communication, Navigation and Surveillance
DGCAR	Directorate General for Civil Aviation Regulation
DME	Distance Measuring Equipment
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
FDPS	Flight |Data Processing System
FIC	Flight Information Center
FIR	Flight Information Region
ICAO	International civil aviation organization
IFR	Instrument Flight Rules
ILS	Instrument Landing System
MLAT	Multilateration
NDB	Non-Directional Radio Beacon
PAR	Precession Approach Radar
PSR	Primary Surveillance Radar
RCC	Rescue Coordination Center
RDPS	Radar Data Processing System
RMU	Remote Monitoring Unit
RAFO	Royal Air Force Oman
SSB	Single Side Band
SSR	Secondary Surveillance Radar
UHF	Ultra-High Frequency
UPS	Uninterrupted Power Supply
UTC	Coordinated Universal Time
VDL	VHF Digital Link
VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	Very High Frequency Omni Directional Radio Range
WAM	Wide Area Multilateration

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FOREWORD

(1) The Civil Aviation Regulation (CAR) for Aeronautical Telecommunication Service Provider have been issued by the Civil Aviation Authority of Oman (hereinafter referred as CAA) under the provisions of the Civil Aviation Law of the Sultanate of Oman.

(2) CAR 171 prescribes the requirements for:
   (a) The certification and operation of organizations providing aeronautical telecommunication services in the flight information region of Oman;
   (b) The operation and maintenance of aeronautical telecommunication facilities;

(3) The following standards have been basis for CAR-171:
   (a) Sultanate of Oman Civil Aviation Law.
   (b) ICAO Annex 10 (Standards and Recommended Practices for Aeronautical Telecommunications).
   (c) ICAO Annex 14, Vol I (Aerodrome Design and Operation)
   (d) ICAO Annex 19, Safety Management
   (e) other ICAO related documents

(4) The editing practices used in this document are as follows:
   (a) 'Shall' is used to indicate a mandatory requirement and may appear in CARs.
   (b) 'Should' is used to indicate a recommendation.
   (c) 'May' is used to indicate discretion by the Authority the industry or the applicant, as appropriate.
   (d) 'Will' indicates a mandatory requirement and is used to advise of action incumbent on the Authority.

Note: The use of the male gender implies the female gender and vice versa.

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SUBPART A – GENERAL

CAR 171.001 Applicability

(1) This CAR prescribes:
   (a) The requirements governing the certification and operation of organizations providing Aeronautical Telecommunication Services within the Flight Information Region (FIR) of Oman;
   (b) The requirements for the operation and maintenance of Aeronautical Telecommunication facilities;
   (c) Authority administrative rules for management of Aeronautical Telecommunication Service Provider certification.

(2) However, this CAR does not apply to:
Person or legal entity who is providing an aeronautical telecommunication service for the Military.

CAR 171.002 Entry into Force

(1) This CAR shall come into force on its date of publishing and the Aeronautical Telecommunication Service Provider shall comply with the requirements of this CAR for carrying out operation and maintenance of Aeronautical Telecommunication facilities, except for the certification requirements specified from CAR-171.050 to CAR-171.090, and CAR-171.100(5)(C) and (D), which shall be applicable on 1st February 2025.

CAR 171.005 Interpretation

In this CAR:

Aeronautical Telecommunication Service means any of the following:

(a) Aeronautical Radio Navigation Service, within the meaning given for each in Annex 10, Volume I to the Chicago Convention

(b) 1 or both of the following, within the meaning given for each in Annex 10 Volume II and III to the Chicago Convention:
   i. an Aeronautical Broadcasting Service;
   ii. an Aeronautical Fixed Service;

(c) an Aeronautical Mobile Service, within the meaning given in Volume III of Annex 10 to the Chicago Convention, that is used to support an air traffic service of a kind mentioned in Annex 11 to the Chicago Convention;

(d) any system for Surveillance and Collision Avoidance that support air traffic service, within the meaning given for each in Annex 10 Volume IV and ICAO doc. 9924 to the Chicago Convention.

(e) any automation system that processes or displays air traffic control data to support air traffic service.

Authority, means Directorate General of Civil Aviation Regulation - Civil Aviation Authority, The Sultanate of Oman

Building Restricted Area means the volume where buildings or structures have the potential to cause unacceptable interference to the signal-in-space in the service volume of CNS facilities for AWO. All CNS facilities have BRA defined requirements which are not limited to actual site boundaries of the facility, but extend to significant distances from the facility.

BRA Infringement Study means a Study which is conducted to assess the potential for causing unacceptable interference by buildings or structures within the BRA around an Aeronautical Telecommunications Facility within the Sultanate of Oman.

Certification means a certificate, given by DGCAR - CAA, to provide a telecommunication or radio navigation service.

Configuration, in relation to:

(a) an Aeronautical Telecommunication Service—means the configuration of each facilityand any interconnection between facilities that make up the service; and

(b) a facility—means the configuration of equipment, hardware, software and data, and the interconnections between equipment.

Flight inspection means a test of the accuracy, coverage, or any other aspect of the performance of a service or facility conducted by using test equipment on board an aircraft in flight.

Human Factors principles means principles which apply to design, certification, training, operations, and maintenance and which seek safe interface between the human and other system components by proper consideration to human performance.

Key personnel, in relation to a service provider, means the person or persons who manage or more of the following:

(a) operations;

(b) maintenance;

(c) safety.

Operations Manual means a manual of the kind described in Subpart 171.130, prepared by a service provider or a person applying for approval.

Risk means risk to aviation safety.

Safety means aviation safety.

service provider means a person certified to operate and maintain an aeronautical telecommunication service, and whose certificate is not suspended or revoked.

Technical specification, for an Aeronautical Telecommunication service or facility, is a detailed description, that may use technical terms and concepts, of:

(a) the way in which the service or facility operates and performs its functions; and

(b) the technical standards to which the service or facility has been designed and manufactured.

Maintenance personnel means a person(s) who is engaged by a service provider to do 1 or more of the following:

(a) operate a facility;

(b) maintain a facility;

(c) conduct measurements of the performance of, and calibration of, a facility during a flight inspection.

Technical manual means a document, other than the operations manual, that contains technical information related to facility including design, drawing, installation, operation and maintenance.

Unacceptable interference means having an adverse effect on the availability or quality of the radiated signals of an Aeronautical Telecommunications Facility.

Facility availability. The ratio of actual operating time to specified operating time.

Facility failure. Any unanticipated occurrence which gives rise to an operationally significant period during which a facility does not provide service within the specified tolerances.

Facility reliability. The probability that the ground installation operates within the specified tolerances.
Note— This definition refers to the probability that the facility will operate for a specified period of time.

Mean time between failures (MTBF). The actual operating time of a facility divided by the total number of failures of the facility during that period of time.
Note. — The operating time is in general chosen so as to include at least five, and preferably more, facility failures in order to give a reasonable measure of confidence in the figure derived.

Signal reliability. The probability that a signal-in-space of specified characteristics is available to the aircraft.
Note — This definition refers to the probability that the signal is present for a specified period of time.

Facility Performance Category I — ILS. An ILS which provides guidance information from the coverage limit of the ILS to the point at which the localizer course line intersects the ILS glide path at a height of 30 m (100 ft) or less above the horizontal plane containing the threshold.
Note. — The lower limit is set to 30 m (100 ft) below the minimum Category I decision height (DH).

Facility Performance Category II — ILS. An ILS which provides guidance information from the coverage limit of the ILS to the point at which the localizer course line intersects the ILS glide path at a height of 15 m (50 ft) or less above the horizontal plane containing the threshold.
Note. — The lower limit is set to 15 m (50 ft) below the minimum Category II decision height (DH).

Facility Performance Category III — ILS. An ILS which, with the aid of ancillary equipment where necessary, provides guidance information from the coverage limit of the facility to, and along, the surface of the runway.

CAR 171.010 Classification of Aeronautical Telecommunication Service

(1) Classification of Communication services.
Communication services are the ground-based stations of those services defined hereunder supporting an Air Traffic Service provided under CAR-172. Airborne stations are not included.
   (a) Aeronautical Broadcasting Service. A broadcasting service intended for the transmission of information relating to air navigation.
   (b) Aeronautical Fixed Service. A telecommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services.
   (c) Aeronautical Fixed Telecommunication Network Service. A worldwide system of aeronautical fixed circuits provided, as part of the aeronautical fixed service, for the exchange of messages and/or digital data between aeronautical fixed stations having the same or compatible communication characteristics.
   (d) Aeronautical Telecommunication Network Service. An inter-network that allows ground, air-ground and avionics data sub-networks to inter-operate by adopting common interface services and protocols based on the International Organization for Standardization (ISO) Open Systems Interconnect (OSI) reference model.
   (e) Aeronautical Mobile Service. A mobile service between aeronautical ground stations and aircraft stations, in which survival craft stations may participate; emergency position-indicating radio-beacon stations may also participate in this service on distress and emergency frequencies. This service does not include ground stations that are provided for other than ATS purposes.
   (f) Any communication service which processes or displays air traffic control data (including aviation meteorological data) for use by an ATS provider under CAR-172.
   (g) Electronic briefing and flight plan lodgment service for the use of pilots.

(2) Classification of Radio Navigation services.
   (a) A radio navigation service intended for the benefit, and for the safe operation of aircraft.
   (b) Radio navigation services include radio determination (radar surveillance services) supporting ATS.
   (c) Airborne stations are not included in this CAR.

CAR 171.015 Classification of Facilities

The following list classifies the kinds of facilities used for the provision of aeronautical telecommunication service:

(1) Types of Radio Navigation Aids:
   (a) Instrument Landing System (ILS)
   (b) VHF Omni-Directional Range (VOR)
   (c) Distance Measuring Equipment (DME)
   (d) VHF Marker Beacon
   (e) Non-Directional Beacon (NDB)
   (f) Precision Approach Radar System
   (g) Microwave Landing System
   (h) Global Navigation Satellite System (GNSS) and its augmentations system

(2) Types of Voice communication systems for Aeronautical Mobile Service:
   (a) VHF air/ground voice communication facilities
   (b) HF air/ground voice communication facilities

(3) Types of Communication system for aeronautical broadcast service:
  (a) Meteorological information for aircraft in flight (VOLMET)
  (b) Automatic Terminal Information Service (ATIS)

(4) Types of Communication system for aeronautical fixed service:
  (a) ATS Direct speech circuit and network;
  (b) meteorological operation circuits, networks and broadcast system
  (c) the Common ICAO data Interchange network (CIDIN);
  (d) the Aeronautical Fixed Telecommunication Network (AFTN);
  (e) the Aeronautical Message Handling System (AMHS);
  (f) the inter-center Communication (ICC)

(5) Types of Communication systems:
  (a) Voice Communication Switching System (VCCS)
  (b) Central Exchange and Telephony System

(6) Types of Surveillance and collision avoidance system:
  (a) Primary Surveillance Radar (PSR).
  (b) Secondary Surveillance Radar (SSR)
  (c) Monopulse Secondary Surveillance Radar (MSSR)
  (d) Advanced – Surface Movement Guidance and Control System (A-SMGCS)
  (e) Automatic Dependent Surveillance Broadcast (ADS-B)
  (f) Automatic Dependent Surveillance – Contract (ADS-C)
  (g) Multilateration (MLAT)
  (h) Wide Area Multilateration (WAM)
  (i) Surface Movement Radar (SMR)

(7) Types of Automation System that support an Air Traffic Service:
  (a) Flight Data Processing System (FDPS)
  (b) Surveillance Data Processing System (SDPS)
  (c) Radar Data Processing System (RDPS)
  (d) Voice and data recording facilities.

(8) Transmission System:
  (a) VSAT
  (b) Fiber optic
  (c) Radio Link

(9) Any environmental facility to support the above facilities, could have one or more of the following systems:
  (a) Main power supply system
  (b) Uninterrupted Power Supply (UPS)
  (c) Generator Set (Genset)
  (d) Air Conditioning System and Cooling system
  (e) Fire Fighting System

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SUBPART B — CERTIFICATION OF SERVICE PROVIDER

CAR 171.050 Requirement for Certificate

(1) No person shall provide an Aeronautical Telecommunication Service for the Muscat FIR; except under the Authority of, and in accordance with the provisions of, an Aeronautical Telecommunication Service Certificate issued under this CAR.
(2) A person who is to provide an Aeronautical Telecommunication Service as mentioned in CAR-171.100 (1) shall be in cooperation or by arrangement with a legal entity.

CAR 171.055 Application for Certificate

Each service provider applying for the grant of an Aeronautical Telecommunication Service Provider certificate shall complete form ANS CAR-171-0 and 171-1, and submit it to the Authority with:
(1) Cover letter for the application.
(2) Service Provider's operation manual required by CAR-171.130; and
(3) a payment of the appropriate application fee prescribed by regulations.

CAR 171.060 Grant of Certificate

(1) A Service Provider is granted an Aeronautical Telecommunication Service Provider certificate if the Authorityis satisfied that:
   (a) the service provider meets the requirements of Subpart C; and
   (b) the personnel of service provider required by CAR-171.100(1)(a), (b) and (c) are fit and proper persons as per requirement;
   (c) the service provider's operation manual is approved by Authority; and
   (d) the granting of the certificate is not contrary to the interests of aviation safety.

(2) The Authority may not grant an Aeronautical Telecommunication Service Provider certificate unless the Authority is satisfied that the service provider's operation manual complies with this CAR.

CAR 171.065 Commencement of Certificate

A certificate of Aeronautical Telecommunication Service Provider comes into effect:
(1) on a day stated for that purpose in a document that is evidence of the holding of the authorization, or
(2) if no day is so stated—on the date of the document or notice.

CAR 171.070 Duration of Certificate

(1) An Aeronautical Telecommunication Service Provider certificate may be granted or renewed for aperiod of up to three (3) years.
(2) An Aeronautical Telecommunication Service Provider certificate remains in force until it expires or suspended or revoked.
(3) The holder of an Aeronautical Telecommunication Service Provider certificate that expires or revoked shall forthwith surrender the certificate to the Authority.
(4) The holder of an Aeronautical Telecommunication Service Provider certificate that is suspended, shall forthwith surrender the certificate to the Authority for appropriate endorsement.

CAR 171.075 Obligation and Privileges of Service Provider

1) Service by Provider
An Aeronautical Telecommunication Service shall be provided in accordance with:
   (a) Aeronautical Telecommunication Service Provider certificate that specifies the service that thecertificate holder is authorized to provide; and
   (b) the service provider's operations manual.

2) Changes by service provider to service
   (a) this regulation applies if a service provider intends to change its Aeronautical Telecommunication Service (including by providing an additional service);
      i. the effect of which would be that the provider's Aeronautical Telecommunication Service would no longer be in accordance with the certificate issued to the provider under CAR-171.060; or
      ii. that requires prior notification to the Authority because of a requirement to do so in the safety management system prepared in accordance with CAR-171.145.
   (b) Before making the change, the service provider shall:
      i. prepare a draft amendment of the operations manual that reflects the proposed change; and
      ii. send the draft amendment to Authority to get approval of the proposed change.
   (c) If Authority approves the draft amendment of the manual, the service provider shall:
      i. incorporate the approved amendment into the operation manual; and
      ii. put change into effect in accordance with CAR-171.065.

3) Change by Service Provider to Operation Manual.
A service provider may change its operations manual without changing its service provided, a copy of the amendment to the operations manual is sent to the Authority for subsequent approval.

CAR 171.080 Renewal of Certificate

(1) An application for the renewal of an Aeronautical Telecommunication Service Provider certificate shall be made on form ANS CAR-171-0 and 171-1.
(2) The application shall be submitted to the Authority before the application renewal date specified on the certificate or, if no such date is specified, not less than thirty (30) days before the certificate expires.

CAR 171.085 Suspension and Revocation of Certification

(1) The Authority may state, that a certificate is suspended if the Authority reasonably considers that not suspending the certificate would be likely to have an adverse effect on the safety of air navigation.
(2) Suspension of Aeronautical Telecommunication Service Provider certificate may be imposed if:
   (a) the service provider does not comply with the requirements stated in the certificate;
   (b) the service provider failed to perform the corrective action plan stated in the certificate in the exact period of time if so stated; and
   (c) The investigation, in case of an accident, proves that it was caused due to the faulty procedures and/or the malfunction or failure of AT/RN equipment or system.
(3) When a suspension is imposed, the Authority will state the reasons for such action and furnish them to the service provider.

(4) The service provider may appeal against such notice within thirty (30) days of receipt.
(5) The service provider shall furnish to the Authority any documents, records, or other pertinent information supporting the appeal.
(6) The Authority may confirm, modify, or set aside the proposed suspension based on the appeal.
(7) The Authority may permanently revoke Aeronautical Telecommunication Service Provider certificate as a subsequent procedure to suspension if:
  (a) The Service provider carries out an action in violation of the Civil Aviation Law or the regulation;
  (b) It is verified that the certificate holder will not be able to remedy non-compliant areas; or
  (c) The certificate holder stops providing the facility concerned without a convincing argument.
  (d) The Authority has decided for the interest of safety to terminate facilities provided at this aerodrome.
(8) The revoked certificate cannot be renewed; it has to be reissued not less than one year after the revocation date.
(9) The amendment as referred in paragraphs (2) and (7) shall take effect at the time the decision is made.

CAR 171.090 Revocation of Certificate Based on Request of Service Provider

(1) Authority may revoke the certificate based on a written request from the holder of the permit certificate.
(2) Revocation shall come into force since the request has been approved by the Authority.

CAR 171.092 Safety Inspections and Audits

(1) The Authority shall conduct an initial certification audit and thereafter audits or inspection at intervals not exceeding two (2) years at the service provider premises and/or facility.
(2) The Authority may require the service provider to provide such documentation and information as the Authority considers relevant to the audit or inspection.
(3) The Authority shall be granted, by the service provider, unrestricted access to the service provider's premises and facilities and shall be permitted to carry its own equipment (e.g. computers, cameras, recording devices and inspection tools) under all conditions while carrying out its oversight functions.

CAR 171.094 Resolution of Safety issues

(1) When objective evidence is found showing regulatory non-compliance by an Aeronautical Telecommunication Service Provider, the finding shall be classified as follows:
  (a) level one finding is any significant non-compliance which reduces the level of safety.
  (b) level two finding is any non-compliance that does not result in an immediate risk tosafety.
  (c) level three finding is any item where it has been identified, by objective evidence, to contain potential problems that could lead to a non-compliance. These are considered as observations only and will not impact a certificate.
(2) After service provider receives notification of a finding:
  (a) level one finding shall be rectified immediately or within the timescale specified by the Authority.
  (b) level two finding shall be addressed in a corrective action plan with a resolution period specified by the Authority and shall be appropriate to the nature of the finding, but in any circumstance shall not be more than ninety (90) days. In certain circumstances, the

Authority may extend the ninety (90) day period subject to justification that is acceptable to the Authority.

(c) Service Provider shall develop a Corrective Action Plan. A Corrective Action Plan should meet 6 (six) criteria for a good CAP, as follows:

- **i.** Relevant: CAP addresses the issues and requirements related to the finding and corresponding Compliance Checklist.
- **ii.** Comprehensive: CAP is complete and includes all elements or aspects associated with the finding.
- **iii.** Detailed and Chronological: CAP outlines implementation process using step-by-step approach.
- **iv.** Specific: CAP identifies who will do what, when and in coordination with other entities, if applicable.
- **v.** Realistic: In terms of contents and implementation timelines.
- **vi.** Consistent: In relation to other CAPs (if any)

(d) the service provider's corrective action plan shall be submitted to the Authority for acceptance.:

(3) Upon the completion and/or implementation of a corrective action, the service provider shall notify the Authority and provide evidence of its resolution.

(4) In the event of level one or level two findings, an enforcement action shall be applied to the service provider in accordance with CAR-12.105. the certificate may be subject to revocation or a partial or full suspension or restriction.

CAR 171.095 Authority's power to Direct Variation of Operation Manual

(1) If necessary, in the interests of the safety of air navigation, Authority may direct a service provider in writing to vary its operations manual, within a reasonable period specified in the direction, in a way specified in the direction;

(2) Authority may extend the period by written notice, before or after the end of the period mentioned in paragraph (1);

(3) If the service provider does not comply with the direction within the period (including any extension of it), the manual is taken to cease to be approved at the end of the period;

(4) After complying with the direction, the holder shall give Authority a copy of the manual as so varied.

SUBPART C – CERTIFICATION REQUIREMENTS

CAR 171.100 Personnel Requirements

(1) An Aeronautical Telecommunication Service Provider shall employ, contract, or otherwise engage:
   (a) a senior person identified as the Head of Organization who:
      i. has the Authority within the service provider's organization to ensure that all activities undertaken by the organization can be financed and carried out to meet applicable operational requirements; and
      ii. is responsible for ensuring that the organization complies with the requirements of this CAR; and
   (b) a senior person or persons responsible to the Head of Organization for ensuring that the service provider's organization complies with its operation manual; and
   (c) sufficient support staff and qualified technical personnel to install, inspect, supervise, and maintain the facilities listed in the service provider's operation manual

(2) An Aeronautical Telecommunication Service Provider shall ensure that ensure that each ATSEP is competent and holds appropriate qualifications to install, operate, maintain, release from, and return into operations equipment of a functional aeronautical telecommunication system.

(3) An Aeronautical Telecommunication Service Provider shall ensure that no facility listed in their operation manual is placed into operational service unless the person placing the facility into operational service is authorized and assessed as competent.

(4) An Aeronautical Telecommunication Service Provider shall provide those personnel with written evidence of the scope of their authorization according to the approved training program

(5) In particular, the service provider shall ensure that:
   (a) Each maintenance person has been appropriately trained according to the training types as part of the training programme approved by the Authority.
   (b) Each training type mentioned in the approved training programme shall fulfil the Training standards requirements listed in *the Authority – ATSEP Competency Based Training, manual no. 1.3.5.*
   (c) Assessors are accepted by Authority to conduct assessments for their ATSEP, to ensure that competency standards and safety are maintained.
   (d) Each maintenance person needs to be accepted as a competent and qualified person by the Authority.

(6) An Aeronautical Telecommunication Service Provider shall establish a procedure to maintain the Competence of those authorized personnel;

(7) An Aeronautical Telecommunication Service Provider for the grant of an Aeronautical Telecommunication Service Provider certificate shall establish procedures to ensure that their maintenance personnel are not subject to fatigue by ensuring that:
   (a) Maintenance personnel does not serve for more than eight (8) consecutive hours or does not serve for more than twelve (12) hours during a period of twenty-four (24) consecutive hours, unless a rest period of at least eight (8) hours at or before the end of the twelve (12) hours of duty have been attained;
   (b) At any time, minimum two maintenance personnel shall be present in a shift; and
   (c) in an emergency, maintenance personnel refrain from performing any duties for at least twenty-four (24) consecutive hours at least once during each 7 consecutive days.

CAR 171.105 Aeronautical Telecommunication Facility Requirements

(1) An Aeronautical Telecommunication Service Provider shall establish and put into effect a procedure, to ensure that:

(a) each aeronautical telecommunication facility listed in the operation manual:

i. is designed (including the siting), installed and commissioned in accordance with approved technical document by Authority to meet the applicable operational specification for that facility; and

ii. conforms with the applicable system characteristics and specification standards prescribed in ICAO Annex 10, Volumes I, II, III, IV, V and other related documents; and

iii. conforms with the applicable specifications and requirements of Subpart D; and

iv. has been allocated an identification code or call sign, if a code or call sign is required.

(b) information on the operational status of each radio navigation aid listed in the service provider's operation manual, that is essential for the approach, landing, and takeoff at an aerodrome, is provided to meet the operational needs of:

i. the air traffic control unit providing an aerodrome control service for that aerodrome while that service is being provided; and

ii. the air traffic control unit providing an approach control service for that aerodrome while that service is being provided; and

(c) each aeronautical facility listed in the service provider's operation manual is installed with suitable power supplies and means to ensure continuity of operation appropriate to the needs of the air traffic service or radio navigation service being supported; and

(d) each aeronautical facility listed in the service provider's operation manual is installed in accordance with the security programmed required under CAR-171.135 to minimize any risk of destruction, damage, or interference with the operation of the facility; and

(e) any critical site area of any aeronautical facility listed in the service provider's operation manual is:

i. clearly identified on the site drawings for the aeronautical facility; and

ii. physically protected by suitable signposts on the site; and

iii. protected by written agreements with the site owner, aerodrome operator, and air traffic control unit, as appropriate, to ensure that site restrictions are not infringed by buildings, fences, vehicles, machinery, or aircraft.

(2) No facility shall be put into operation except:

(a) The person placing the facility into operational service is authorized and accepted by the Authority.

(b) For initial operation, the appropriate checks i.e. Factory Acceptance Test (FAT), Site Acceptance Test (SAT) and Flight test (for Navigation Aids and Surveillance facility including its Instrument flight procedure) have been carried out to verify the performance of the facility;

(c) The appropriate checks as required in paragraph (b) will be witnessed (if deemed necessary) and the result shall be accepted by Authority.

(d) Periodic maintenance has been developed and implemented for each facility listed in the operation manual, in accordance with *the Authority - Maintenance and reporting Procedure for Aeronautical Telecommunication Facilities, manual no. 1.3.3*

(e) Ground and periodic flight inspection for radio navigation aids have been implemented as required in Annex 10 Volume I, Chapter 2.2 for ground and flight inspection.

CAR 171.110 Protection of Facilities from Radio Interference and Structural Obstacles

(1) An Aeronautical Telecommunication Service Provider shall ensure that:
   (a) All radio navigation aids are protected from radio frequency interference in accordance with ICAO Annex 10 Volume I, paragraph 3.1.4;
   (b) All aeronautical telecommunications facilities are protected from radio frequency interference in accordance to the following procedures:
      i. Where the protection heights determined are less than that operationally desirable, separation between facilities operating on the same frequency shall not be less than that necessary to ensure that an aircraft at the limit of the functional service range and the operationally desirable protection height of one facility does not come above the radio horizon with respect to adjacent facilities.
      ii. The problem of inter-State interference on frequencies allotted worldwide or on a regional basis to national services, shall be resolved by consultation between the administrations concerned.
   (c) No radio interfering devices which is transmit unnecessary or anonymous signals, message or data shall be established in the proximity of the Aeronautical Telecommunication facilities utilizing radio reception without prior approval from the Authority.

(2) An Aeronautical Telecommunication Service Provider shall ensure that all radio navigation aids systems, radio telecommunication systems and radar systems that are using transmit or receive antennas shall not be obstructed by buildings, tower and structures that would impact their performance.

(3) Identified infringement of the BRA shall be screened initially by the Authority in order to ascertain approval can be given directly if the in-depth CNS Engineering analysis is not required.

(4) In-depth CNS engineering analysis or BRA infringement study to assess the buildingswithin BRA that have potential for causing unacceptable interference with Aeronautical facilities shall be conducted by approved organization, complying with the approval requirements stipulated in Appendix C of this CAR.

CAR 171.115 Hours of Service

(1) An Aeronautical Telecommunication Service Provider shall provide twenty-four (24) hours' service of station of aeronautical telecommunication facilities to support the availability and continuity of Air Navigation Service. Whilst normal hours for administration and office will be in accordance with administrative service provider working hours.

(2) Whenever necessary and practicable, the service provider shall give notification of any change needed in the normal hours of service to the Authority.

(3) If a station of the international aeronautical telecommunication service, or an aircraft operating agency, requests a change in the hours of service of another station, such change shall be requested as soon as possible after the need for change is known. The station or aircraft operating agency requesting the change shall be informed of the result of its request as soon as possible.

(4) Any changes to the published hours of service of Aeronautical Telecommunication Facilities, shall be promulgated in a NOTAM and if permanent, published in the Oman AIP.

(5) Extensions of Service and Closing Down of Stations.
   (a) Stations of the international aeronautical telecommunication service shall extend their normal hours of service as required to provide for traffic necessary for flight operation.
   (b) Before closing down, a station shall notify its intention to all other stations with which it is in direct communication, confirm that an extension of service is not required and advise the time of re-opening if other than its normal hours of service.

(c) When it is working regularly in a network on a common circuit, a station shall notify its intention of closing down either to the control station, if any, or to all stations in the network. It shall continue watch for two minutes and may then close down if it has received no call during this period.

(d) Stations with other than continuous hours of operation, engaged in, or expected to become engaged in distress, urgency, unlawful interference, or interception traffic, shall extend their normal hours of service to provide the required support to those communications.

CAR 171.120 Time System

(1) Coordinated Universal Time (UTC) shall be used by all stations in the aeronautical telecommunication service. Midnight shall be designated as 2400 for the end of the day and 0000 for the beginning of the day.

(2) A date-time group shall consist of six figures, the first two figures representing the date of the month and the last four figures the hours and minutes in UTC.

(3) Facility is checked as necessary to ensure the correct time within 5 seconds of the UTC as determined by reference to a standard time station or GPS time standard.

(4) Wherever data link communication is utilized, the service provider shall ensure that all clocks and time -recording devices be checked as necessary to ensure correct time to within 1 second of UTC.

(5) The service provider shall ensure that the correct time, to the nearest half minute, is provided:
   (a) In respect of any aerodrome control service or aerodrome AIS, to IFR aircraft prior to taxiing for take-off; and
   (b) To any aircraft on request.

CAR 171.125 Use of Abbreviations and Codes

An Aeronautical Telecommunication Service Provider shall ensure that:

(1) Abbreviations and codes shall be used in the international aeronautical telecommunication service whenever they are appropriate, and their use will shorten or otherwise facilitate communication.

(2) Where abbreviations and codes other than those approved by ICAO are contained in the text of messages, the originator shall, if so required by the aeronautical telecommunication station accepting the message for transmission, make available to that station a decode for the abbreviations and codes used.

CAR 171.130 Content of Operation Manual

An Aeronautical Telecommunication Service Provider shall provide the Authority with an Operation Manual in accordance to *the Authority Manual no. 1.3.6 - Standard of Aeronautical Telecommunication Service Provider Manual* containing:

(1) A statement signed by Head of Organization, on behalf of the service provider'sorganization confirming that:
   (a) the operation manual defines the organization and demonstrates its means and methods for ensuring ongoing compliance with this CAR; and
   (b) the operation manual, and all associated document, operating, and maintenance instructions, shall be complied by the organization's personnel at all times;

(2) Organization and management of service provider.

An operation manual shall include an organization chart of the service provider that shows:

(a) the titles and names of the senior person or persons required under CAR- 171.100 (1)(a) and (b) and (c);

(b) job descriptions of the senior person or persons in paragraph (2)(a), including matters for which they have responsibility to deal directly with the Authority on behalf of the organization; and

(c) lines of responsibility between the personnel specified in paragraph (2)(b);

(d) the relevant qualifications, relevant experience and positions of the personnel specified in paragraph (2)(b).

(3) Compliance the standards.

An operations manual shall:

(a) contain each standard that relates to the design, installation, testing, operation or maintenance of the service provider's services and facilities;

(b) explain how any of the following standards that apply to the service or facility are fulfilled:

i. a standard set out in Annex 10 Volume I, II, III, IV and V;

ii. related ICAO Documents to Annex 10 Volume I, II, III, IV and V;

iii. standard and requirement under this CAR

iv. standard in the Acceptable Means of Compliance and Guidance Material as complementary of this CAR;

v. any other standard included in the operations manual.

(4) Functional specification and performance values of services

An operation manual shall include:

(a) the functional specification of each of the service provider's Aeronautical Telecommunication services; and

(b) the values or characteristics for each of the following that apply to the service:

i. availability;

ii. reliability;

iii. accuracy;

iv. integrity.

(c) The values mentioned in paragraph (b) shall be derived or measured from either or both of:

i. the configuration of each service; and

ii. the known performance of each service.

(d) An operation manual shall also describe the method used to calculate each of the values mentioned in paragraph (b) as described in *the Authority - Maintenance and Reporting Procedure for Aeronautical Telecommunication Facilities, manual no.1.3.3.*

(e) For a radio navigation service, the integrity values or characteristics shall be given for each kind of navigation aid facility that forms part of the service.

(5) Service Provided

(a)An operation manual shall describe, for each Aeronautical Telecommunication service provided:

i. the kind and location of each facility; and

ii. the technical specification of each kind of facility; and

iii. interconnection of each type of service with other facilities or service; and

iv. the way in which the service provider monitors each facility to ensure that it is operating in accordance with its technical specification.

(b) In the event of service provided by the third party, the details of the third party shall be mentioned in the operational manual along with the service provided by the third party.

(c) The service provider shall ensure that the third party:

i. Provide sufficient and qualified technical personnel to conduct the maintenance (preventive and corrective).

ii. Maintains the qualification of technical personnel by providing proper training and refreshing training for related equipment under their responsibility.

iii. Provides the Maintenance schedule and maintenance form referring to DGCAR Manual no.1.3.3; Maintenance and Reporting Procedure for Aeronautical Telecommunication Facility and /or the technical manual of the equipment.

(6) Hours of Service.

(a) Service provider shall provide information of normal hours of stations and office of aeronautical telecommunication service as per required under CAR-171.115.

(b) Shift Administration.

i. An operation manual shall describe information about shift administration to ensure that adequate time is provided before start of the shift and after endof each shift;

ii. A minimum of ten (10) minutes is provided for each transfer of duties at an operational facility.

(7) List of facilities:

A list of each type of aeronautical facility to be operated under the Authority of the Aeronautical Telecommunication Service Provider certificate completed with the summary of the operational details of each aeronautical facility;

(8) Facility operation and maintenance plan

An operation manual shall contain, for each kind of facility, an operation and maintenance plan that includes the following:

(a) the maintenance procedures and maintenance schedule for each facility as mentioned in *the Authority Manual - Maintenance and Reporting Procedure for Aeronautical Telecommunication Facilities, manual no. 1.3.3.;*

(b) an analysis of the workload of maintenance personnel and key personnel that takes into account the numbers of these people and their qualifications.

(9) Operating and maintenance instructions

An operation manual shall contain the operating and maintenance instructions of the manufacturer for each facility listed in their Operation manual, for the use and guidance of their personnel, operating and maintenance instructions of the manufacture for each facility listed in their operation manual. The instructions shall set out the requirements for operating and maintaining each facility.

The instructions shall include a list of:

(a) the critical performance parameters;

(b) the test equipment required for the measurement of those parameters;

(c) the check procedures for placing the facility into operational service and terminate the service (On-Off procedure);

(d) Trouble shooting procedures in accordance with manufacture's equipment manual.

(10) Periodic Performance check and testing.

An operation manual shall describe procedures to conduct periodic performance check and testing of the Aeronautical Telecommunication facilities to verify that they meet the applicable operational requirements and performance specifications, including:

(a) Periodization of ground inspection is as follows:

SR	NAME OF FACILITY	FACILITY FUNCTION	GROUND INSPECTION PERIOD
1.	ILS	LANDING	2 weeks
2.	VOR	HOMING	2 weeks
		ENROUTE	4 weeks
3.	DME	HOMING	2 weeks
		ENROUTE	4 weeks
		CO-LOCATED GP-ILS	2 weeks
	NDB	LOCATOR	2 weeks
	NDB	HOMING/CHECK POINT	4 weeks
5	RADAR	APPROACH/TERMINAL	2 weeks
		ENROUTE	4 weeks
5.	COMMUNICATION (VHF)	FIS, TOWER, APP, ACC	4 weeks
6.	PAPI WITH ILS	APPROACH	2 weeks
7.	PAPI WITHOUT ILS	APPROACH	4 weeks
8.	VASI	APPROACH	4 weeks

(b) procedure to conduct ground inspection as required in ICAO Doc 8071 and where if it is necessary according to the manufacturer technical manual;

(c) procedure to adjust ground facility to support flight inspection where if it necessary according to the manufacturer technical manual.

(11) Flight Inspection:

An operation manual shall contain an approved Flight Inspection program for Radio Navigation Aids to assure the accuracy, coverage or any other aspect of the performance of service meet the standards and requirements.

The flight inspection program shall cover:

(a) The interval or periodization between flight inspection for each radio navigation aids complying with thefollowing periodicities:

SR	NAME OF FACILITY	FACILITY FUNCTION	FLIGHT INSPECTION PERIOD
1.	ILS	LANDING	6 Months
2.	VOR	HOMING/ENROUTE	12 Months
	DVOR	HOMING/ENROUTE	3 Years
3.	DME	CO-LOCATED VOR	12 Months
		CO-LOCATED DVOR	3 Years
		CO-LOCATED ILS	6 Months
	NDB	LOCATOR	6 Months
	NDB	HOMING/CHECK POINT	12 Months
4.	RADAR	APPROACH	If Required
		ENROUTE	If Required
5.	COMMUNICATION (VHF)	FIS, TOWER, APP, ACC	If Required
6.	PAPI WITH ILS	APPROACH	6 Months
7.	PAPI WITHOUT ILS	APPROACH	12 Months
8.	VASI	APPROACH	12 Months

(b) Procedure to conduct flight inspection for each facility mentioned in paragraph (a) shall refer to Authority manual no 1.3.20; Flight Inspection Manual for Radio Navigation Aids.

(c) Flight Inspection for Radio Navigation Aids shall be conducted by Flight Inspection service

provider certified by the Authority complying with the certification requirements stipulated in Appendix A.

(d) The service provider shall notify the Authority of any radio navigation aid that is not subject to be flight inspected.

(e) The periodicities of the flight inspection specified in paragraph 11(a) shall not be extended unless other periodicities have been specifically submitted and approved by the Authority after fulfilling the requirements listed in *the Authority - Flight Inspection Manual for Radio Navigation Aids, manual no. 1.3.20.*

(12) Security Program

An operation manual shall include the information and details about the security program as required under CAR-171.135

(13) Quality Assurance Program

An Operation Manual shall describe details of internal quality assurance program as required under CAR-171.140

(14) Safety Management system

An operation manual shall describe details of safety management system as required under CAR-171.145

(15) Safe Operation

An operation manual shall describe the following detailed procedures, or an outline of the procedures including information that identifies the documentation that contains the detailed procedures:

(a) the procedure used to design, install and conduct commissioning of each facility and each item of equipment so that it provides a safe service and ensures that the design of, or changes to, a service or facility are authorized by a person who is qualified and competent to do so;

(b) the procedure used to assess the competence of the maintenance personnel as stipulated in CAR-171.100 (3) and (5)(c);

(c) the method to be used to specify any changes to a service or facility, and to design, test and implement those changes as required in CAR 171.075 (2);

(d) the procedure to be used to monitor the performance of each service and facility, and to compare the results with the appropriate technical specification;

(e) the procedure to be used to receive and forward the information of the facility status as required under CAR-171.150

(f) the procedure to be used if a service fails or a facility fault occurs during operation and maintenance of the facility, including the way in which the failure or fault is to be reported and rectified, as required under CAR-171.155;

(g) the procedure to be used to check the facility after accident or incident as required under CAR-171.160;

(h) the procedure to operate a temporary aeronautical facility and carry out site tests as required under CAR-171.165.

(i) the procedure to be used to:

i. change software to adapt to any changes to the configuration of hardware;

ii. change the design of equipment or facilities to adapt to any change to the functional or technical specification.

(16) Contingency Plan

(a) An operation manual shall contain an Authority approved contingency plan providing for the safe and orderly continuation of service in the event of a disruption, interruption, or temporary malfunction of facility equipment or related supporting service.

(b) The plan shall be made on the equipment level, system level and operational level.

(17) Coordination

An operation manual shall describe the system and procedure for coordination required under CAR-171.170

(18) Documentation

An operation manual shall describe a documentation system required under CAR-171.175.

(19) Record.

An Operation Manual shall describe a system and procedure to record as required under CAR-171.180.

CAR 171.135 Aeronautical Telecommunication Facility Security Program

(1) An Aeronautical Telecommunication Service Provider shall prepare and put into effect a security program under the National Security Plan;

(2) Each security program shall specify the physical security requirements, practices, and procedures to be followed for the purposes of minimizing the risk of destruction of, damage to, or interference with the operation of, any facility operated by the service provider where such destruction, damage, or interference is likely to endanger the safety of aircraft;

(3) Without limiting the generality of paragraph (2), the security program shall specify such physical security requirements, practices, and procedures as may be necessary:

(4) All aeronautical telecommunication stations, including end systems and intermediate systems of the aeronautical telecommunication network (ATN), shall be protected from unauthorized direct or remote access.

(5) To ensure that entrances to permanent facilities operated by the service provider are subject to positive access control at all times, so as to prevent unauthorized entry; to protect personnel on duty;

(6) To be followed in the event of a bomb threat or other threat of violence against a facility; and

(7) To monitor unattended facility buildings to ensure that any intrusion or interference is detected.

CAR 171.140 Quality Assurance

(1) An Aeronautical Telecommunication Service Provider shall establish and put into effect a quality assurance process to ensure compliance with, and the adequacy of the procedures required by this Subpart as approved by the Authority;

(2) The quality assurance process shall include:

(a) Performance check procedures that are understood, implemented, and maintained at all levels of the organization;

(b) A procedure to ensure quality control indicators, including maintenance records, defect, interference and incident reports, and personnel and customer feedback, are monitored to implement required performance standards and to identify existing problems or potential causes of problems within the system;

(c) An internal audit program to ensure conformity with the procedures in the operation manual and maintain a desired level of facility performance. The internal audit program shall:
   i. Specify the frequency of the audits taking into account the nature of the activity to be audited;
   ii. Measure the effectiveness of any preventative or corrective action taken by the personnel responsible for the activity being audited.

(d) A procedure for corrective action specifying how to:
   i. Correct an existing problem;
   ii. Follow up a corrective action to ensure the action is effective;
   iii. Measure the effectiveness of any corrective action taken;

(e) A procedure for preventive action specifying how to manage a potential problem.

CAR 171.145 Safety Management System

(1) An Aeronautical Telecommunication Service Provider of an aeronautical telecommunication shall establish, implement and maintain a system for safety management in accordance with CAR-100.

(2) A safety management system processes shall cover as a minimum:
   (a) identify safety hazards;
   (b) ensure that remedial action necessary to maintain an acceptable level of safety is implemented;
   (c) provide for continuous monitoring and regular assessment of the safety level achieved;
   (d) aim to make continuous improvement to the overall level of safety.
   (e) clearly define lines of safety accountability including a direct accountability for safety on the part of senior management for those services with direct air traffic services operational implications.

(3) A service provider of an aeronautical telecommunication shall ensure that their safety management system provides hazard analyses and safety assessments for any significant safety-related change to the ATS system *as described in the Authority Manual - development of aeronautical telecommunication system safety case.*

(4) The results of this system, related audits and corrective actions shall be made available to the Authority upon request.

CAR 171.150 Information Flow Requirements

(1) An Aeronautical Telecommunication Service Provider shall establish procedures for the receipt of information on the following activities when the activity could affect air traffic services within the area of responsibility:
   (a) Designated personnel shall be available to monitor the status of all En-route facilities or receive them either through the air traffic control supervisor or through the facility technical staff;
   (b) Designated personnel shall be available to receive all status of all radio navigation aids facility and report the status to the AIS or the air traffic control supervisor depending on the particular case; and
   (c) Designated personnel shall be available to receive all status reported at the airdromes and take necessary actions including reporting the status to the appropriate authorities.

(2) An Aeronautical Telecommunication Service Provider shall establish systems and procedures to ensure that each facility, appropriate to the intended area of responsibility, is kept informedof the operational status and the existence of temporary hazards of:

(a) All navigation aids in the system;
(b) All surveillance radar in the system;
(c) All air/ground and ground/ground communication facilities in the system;
(d) All automation facilities in the system; and
(e) All environmental facilities in the system.

CAR 171.155 Facility Malfunctions

(1) An Aeronautical Telecommunication Service Provider shall establish a procedure to record, investigate, and rectify any detected or reported malfunction of any facility listed in operation manual;
(2) The procedure shall ensure that a report is forwarded to the Authority whenever a facility malfunction investigation reveals that:
   (a) The facility has been operating outside the allowable tolerances; or
   (b) The facility had the potential to operate outside the allowable tolerance; or
   (c) There appears to be a recurring cause for the facility malfunction reports.
(3) The report required in paragraph (2) shall be forwarded within seven (7) days of malfunction being detected or reported and shall include full details of the malfunction, the findings of the investigation and the corrective action taken to prevent a re-occurrence.

CAR 171.160 Facility Check after Accident or Incident

(1) An Aeronautical Telecommunication Service Provider shall establish a procedure to check and record the operating condition of any facility listed in their operation manual that may have been used by an aircraft or an air traffic service involved in an accident or incident.
(2) The procedure shall ensure that:
   (a) The checks are carried out as soon as practicable after notification to the service provider of such an accident or incident; and
   (b) The record of the facility's operating condition as checked and the past recorded history are kept in a secure place for possible use by any subsequent investigation.

CAR 171.165 Conducting Temporary Tests of Facility

(1) An Aeronautical Telecommunication Service Provider shall establish and put into effect a procedure to conduct temporary tests of facility.
(2) The temporary test of facility shall not cause any interference with any other operating aeronautical facility;
(3) The procedure for the operation of the facility for conducting temporary test shall include:
   (a) Advise the Authority of a plan to conduct the temporary test;
   (b) the plan shall indicate the purpose of the test, the time frame for conducting the test and shall include the type and class of the facility that the test will be conducted.
(4) In order to avoid harmful interference, service provider shall prescribe the taking of all possible precautions, such as the choice of frequency and of time, and the reduction or, if possible, the suppression of radiation. Any harmful interference resulting from tests and experiments shall be eliminated as soon as possible.
(5) appropriate information regarding the temporary test of facility is forwarded to the provider of the AIS for the issue of a NOTAM, and if appropriate the publication of a Supplement to the AIP; and
(6) An Aeronautical Telecommunication Service Provider shall not conduct the temporary tests unless the Authority approval is obtained and an appropriate NOTAM has been published if so required.

CAR 171.170 Coordination

(1) An Aeronautical Telecommunication Service Provider shall establish procedure and letter of agreement, where applicable to co-ordinate with the following agencies in providing the service:
   (a) Flight Information Service Provider;
   (b) Air traffic service provider;
   (c) Aeronautical Information Service provider;
   (d) PANS-Ops Service Provider;
   (e) Meteorology Service Provider
   (f) The Royal Oman Air Force;
   (g) Aerodrome operator;
   (h) Telecommunication service provider to coordinate:
      i. National telecommunication facilities;
      ii. International telecommunication facilities
   (i) the entities providing service for each facility (internal or external)

(2) In case of occasional infringements of the Procedures contained in Annex 10 Volume II, when not serious, can be dealt with by direct communication between the parties immediately interested either by correspondence or by personal contact. Any serious or repeated infringement shall be reported to the Authority.

(3) An Aeronautical Telecommunication Service Provider shall establish a procedure to coordinate with the Authority related to frequency assignment for aeronautical telecommunication facilities.

CAR 171.175 Documentation

(1) The following documents shall be maintained by Aeronautical Telecommunication Service Provider:
   (a) ICAO International standards and recommended practices related to Aeronautical Telecommunication (latest amendment of Annex 10 Vol. I, II, III, IV and V) and its related document;
   (b) Latest amendment of Oman Civil Aviation Regulation (CAR) related to Aeronautical Telecommunication including its Acceptable Means of Compliance and Guidance Material;
   (c) any technical manual and other necessary documents for the provision and maintenance of the facilities listed in the operation manual;
   (d) the updated operations manual.

(2) An Aeronautical Telecommunication Service Provider shall ensure that the operation manual is maintained for:
   (a) the currency of document includes all amendments;
   (b) the date of the creation of the document;
   (c) for a revised document — the most recent revision of the document;
   (d) the availability to the personnel who shall refer to the document; and
   (e) identifies the person who authorized the creation and any revision of the document.

(3) An Aeronautical Telecommunication Service Provider shall establish a system and procedure to control all the documentation. The procedure shall ensure that:
   (a) a master copy of each document mentioned in this regulation is kept safely
   (b) all incoming documentation is reviewed by appropriate personnel, and directed as required, by authorized personnel;

(c) Current of the relevant documentation are available to personnel at all locations where they need access to such documentation for the provision and operation of facilities;
(d) All obsolete documentation is promptly removed from all points of issue or use;
(e) Any obsolete documents retained as archives are suitably identified as obsolete;
(f) Changes to documentation are reviewed and approved by appropriate personnel who shall have access to pertinent background information upon which to base their review and approval.

CAR 171.180 Record

(1) An Aeronautical Telecommunication Service Provider shall establish systems and procedures to record the following document to facilitate the safe provision and operation of the facilities listed in their operation manual and assistance with any accident or incident investigation:
   (a) A record for each facility includes:
      i. history of installation;
      ii. record of operational performance of service;
      iii. record of changes to configuration of a facility;
      iv. record of its maintenance, periodic ground inspections and test.
      v. record of software and hardware upgrades;
      vi. Record of Flight commissioning (for Radio Navigation Aids and Surveillance) includes approved procedures and result and periodic Flight Inspection for Radio Navigation Aids
      vii. Record of Factory Acceptance Test (FAT) and Site Acceptance Test (SAT).
   (b) A record for each item of test equipment required for the measurement of critical performance parameters. The record shall provide a traceable history of the location, maintenance, and the calibration checks for such test equipment;
   (c) A record of each facility malfunction recorded and investigated under the procedures required by CAR-171.155. The record shall detail the nature of the malfunction, the findings of the investigation, the follow up corrective actions, or where applicableinclude a copy of the report forwarded the Authority;
   (d) A record for the current spare parts available on-site;
   (e) A record of each internal quality assurance review of the service provider's organization carried out under the procedures required by CAR-171.140 (1);
   (f) A record for each technical personnel shall include details of their experience, qualifications, training, competence assessments and current assignment/authorization;
(2) The record shall be traceable to the person or persons responsible for each of the recorded activities;
(3) A record procedure shall cover activity to identify, collect, index, file, store, control, secure, maintain, access, and dispose of the document;
(4) The record can be either a paper or computer system or any combination of both and shall be controlled and secured in a safe way with regards to fire, food and theft;
(5) Paper system shall use robust material which can withstand normal handling and filling. The record shall legible throughout the required retention period;
(6) Computer systems used for maintenance records shall have at least one backup systemwhich shall be updated;
(7) Each terminal is required to contain program safeguards against the ability of authorized personnel to alter the data base;
(8) All facility records are retained for a period of at least three (3) years unless a longer period is required to establish a performance history for a facility; and
(9) The maintenance record shall be inspected and stored as required by the Authority

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SUBPART D – OPERATING REQUIREMENTS

CAR 171.200 Radio Navigation Aids

An Aeronautical Telecommunication Service Provider shall ensure the availability, continuity, accuracy and integrity of the services they are providing and shall demonstrate that:

(1) Instrument Landing System requirements and system characteristics shall comply with:
   (a) ICAO International Standards and Recommended Practices of Annex 10 volume I Chapter 2, 2.1 for general provision, Chapter 3, 3.1 for the specification of Instrument Landing System (ILS) and Attachment C, 2 for Guidance on Material concerning ILS;
   (b) The identification signal shall employ the International Morse Code and consist of two letters, preceded by the International Morse Code signal of the letter "I", followed by a short pause where it is necessary to distinguish the ILS facility from other navigational facilities in the immediate area.
   (c) ICAO International Standards and Recommended Practices of Annex 10 volume V chapter 4, 4.2 for utilization in the frequency band 108-117.975 MHz

(2) Precision Approach Radar System requirements and system characteristics shall comply with ICAO International Standards and Recommended Practices of Annex 10 volume I Chapter 2, 2.1 for general provision, Chapter 3, 3.2 for specification of PAR, and Attachment C, 4 for PAR system.

(3) VHF Omnidirectional Range (VOR) for En-route and terminal radio navigation service requirements and system characteristics shall comply with:
   (a) the ICAO International Standards and Recommended Practices of Annex 10 volume I chapters 2, 2.1 for general provision, chapter 3, 3.3 for the specification of VHF Omnidirectional Range (VOR), Attachment C,3 for Guidance on Material concerning VOR/DVOR and Attachment H, 3.3 for VOR related Consideration for supporting Performance Based Navigation;
   (b) ICAO International Standards and Recommended Practices of Annex 10 volume V chapter 4, 4.2 for utilization in the frequency band 108-117.975 MHz
   (c) VOR sitting selection requirements for check-points:
      i. the signal strength of the nearby VOR has to be sufficient to ensure satisfactory operation of a typical aircraft VOR installation. In particular, full flag action (no flag showing) shall be ensured. The check-points shall, within the limits of operating convenience, be located away from buildings or other reflecting objects (fixed or moving) which are likely to degrade the accuracy or stability of the VOR signals;
      ii. the observed VOR bearing at any selected point shall ideally be within plus or minus 1.5 degrees of the bearing accurately determined by survey or chart plotting;
         Note: *The figure of plus or minus 1.5 degrees has no direct operational significance in that the observed bearing becomes the published bearing; however, where a larger difference is observed, there is some possibility of poor stability.*
      iii. the VOR information at a selected point shall be used operationally only if found to be consistently within plus (+) or minus (-) 2 degrees of the published bearing. The stability of the VOR information at a selected point shall be checked periodically with a calibrated receiver to ensure that the plus or minus 2-degree tolerance is satisfied, irrespective of the orientation of the VOR receiving antenna;
         Note: *The tolerance of plus or minus 2 degrees relates to the consistency of the information at the selected point and includes a small tolerance*

for the accuracy of the calibrated VOR receiver used in checking the point. The 2-degree figure does not relate to any figure for acceptance or rejection of an aircraft VOR installation, this being a matter for determination by the Authority and users in the light of theoperation to be performed.

iv. checkpoints, which can satisfy the foregoing requirements, shall be selected in consultation with the operators concerned. Provision of checkpoints in holding bays, at runway ends and in maintenance and loading areas, is usually desirable.

v. each VOR checkpoint shall be distinctively marked. This marking shall include the VOR bearing which a pilot would observe on his aircraft instrument if his VOR installation were operating correctly.

(4) Non-Directional Beacon requirements and system characteristics shall comply with:

a) ICAO International Standards and Recommended Practices of Annex 10 volume I Chapter 2, 2.1 for general provision, Chapter 3, 3.4 for the standard and specification of Non-Directional Beacon (NDB) and Attachment C, 6 for Guidance on Material concerning NDB;

b) ICAO International Standards and Recommended Practices of Annex 10 volume V Chapter 3, 3.2 for NDB Frequency Management.

(5) Distance Measuring Equipment (DME) requirements and system characteristics shall comply with:

(a) ICAO International Standards and Recommended Practices of Annex 10 volume I Chapter 2, 2.1 for general provision, Chapter 3, 3.5 for the standard and specification of DME, Attachment C, 7 for Guidance on Material concerning DME and Attachment H, 3.4 for DME related Consideration for supporting Performance Based Navigation;

(b) ICAO International Standards and Recommended Practices of Annex 10 volume V Chapter 4, 4.3 for Utilization in the frequency band 960 – 1 215 MHz for DME.

(6) En-route VHF Marker Beacon requirements and system characteristics shall comply with ICAO International Standards and Recommended Practices of Annex 10 volume I, Chapters 2, 2.1 for general provision, Chapter 3, 3.6 for the standard and specification of En-route VHF Marker Beacon and Attachment C, 5 for Specification for 75 MHz Marker Beacon (En-route);

(7) Global Navigation Satellite System (GNSS) requirements and system characteristics shall comply with:

(a) ICAO International Standards and Recommended Practices of Annex 10 volume I Chapter 2, 2.1.4 for General provision, Chapter 3, 3.7 for the standard and specification of GNSS, Appendix B for Technical Specification for GNSS and Attachment D for Information and material for guidance in the application of the GNSS Standards and Recommended Practices;

(b) ICAO International Standards and Recommended Practices of Annex 10 volume V Chapter 4, 4.2 for utilization in the frequency band 108-117.975 MHz.

(8) Microwave Landing System requirements and system characteristics shall comply with:

(a) ICAO International Standards and Recommended Practices of Annex 10 volume I Chapter 2, 2.1 for general provision, Chapter 3, 3.11 for the standard and specification of MLS, Appendix A for MLS characteristics and Attachment G, for information on operational objectives associated with MLS facility performance;

(b) ICAO International Standards and Recommended Practices of Annex 10 volume V Chapter 4, 4.4 for Utilization in the frequency band 5 030.4 – 5 150.0 MHz.

(9) Alternative means to radio navigation are identified in case of service interruption of the main radio navigation aids services:

(a) In case of ILS failures, normally an alternative means needed to take effect such as downgrading the service category provided by equipment unless failure is related to equipment. In this case a redundant system and efficient logistic support need to be maintained; and

(b) In case of VOR failures, normally an alternative means may involve the use of overlapping VOR coverage or use of other operational means unless failure is related to the equipment. In this case a redundant system and efficient logistics support need to be maintained

(10) A list of no redundant (main equipment only) radio navigation aid facilities needs to be prepared and reported to the head of the technical and operational supervisor to take appropriate operational measures in case of their failure;

(11) In localities and along routes where conditions of traffic density and low visibility necessitate a ground based short–distance radio aid to navigation for the efficient exercises of air traffic control, or where such short–distance aid is required for the safe and efficient conduct of aircraft operations, the minimum navigation aid shall be the VHF Omni directional radio range (VOR) of the continuous wave phase.

(12) It is permissible to replace non-visual aid with an alternative non-visual aid as long as it is approved by Authority.

(13) When a radio navigation aid is provided to support precision approach and landing, it should be supplemented, as necessary, by a source or sources of guidance information which, when used in conjunction with appropriate procedures, will provide effective guidance to, and efficient coupling (manual or automatic) with, the desired reference path.

CAR 171.205 Communication Facilities

An Aeronautical Telecommunication Service Provider shall ensure the availability, continuity, accuracy and integrity of the services they are providing and shall demonstrate that:

(1) Aeronautical Telecommunication Network, requirements and system characteristics shall comply with:

(a) ATN is specifically and exclusively intended to provide digital data communication services to air traffic service provider and aircraft operation agencies in support of:

i. air traffic services communications (ATSC) with aircraft;
ii. air traffic services communications between ATS units
iii. aeronautical operational control communications (AOC)
iv. aeronautical administrative communications (AAC)

(b) ATN communication services shall support ATN applications.

(c) Requirements for implementation of the ATN shall be made on the basis of regional air navigation agreements. The agreements shall specify the area in which the communication standards for the ATN/OSI or the ATN/IPS are applicable.

(d) ICAO Annex 10 Volume III Part I Chapter 3, 3.4 for General Requirement, Chapter 3, 3.5 for ATN Application Requirements, Chapter 3, 3.6 for ATN Communication Service Requirements, Chapter 3, 3.7 for ATN Naming and Addressing requirements and Chapter 3, 3.8 for ATN Security Requirement.

(2) Aeronautical Mobile Satellite Route system (AMS(R)S), requirements and system characteristics shall comply with:

(a) ICAO Annex 10 Volume III, Part 1 Chapter 4.

(b) operation only in frequency bands which are appropriately allocated to AMS(R)S and protected by the ITU Radio Regulations.

(3) Aeronautical Mobile Airport Communication System (AeroMACS) requirements and system characteristics shall:

(a) comply with ICAO Annex 10 Volume III, Part I Chapter 7.
(b) transmit when on the surface of an aerodrome.
(c) support aeronautical mobile (route) service (AM(R) S) communications.
(d) process messages according to their associated priority.
(e) support multiple levels of message priority.
(f) support point to point communication.
(g) support multicast and broadcast communication services.
(h) support internet protocol (IP) packet data services.
(i) provide mechanisms to transport ATN/IPS and ATN/OSI (over IP) based messaging.
(j) support multiple service flows simultaneously.
(k) support adaptive modulation and coding.
(l) support handover between different AeroMACS Base Stations during aircraft movement or on degradation of connection with current Base Station.
(m) keep total accumulated interference levels with limits defined by the International Telecommunication Union — Radio communication Sector (ITU-R) as required by national/international rules on frequency assignment planning and implementation.
(n) support a flexible implementation architecture to permit link and network layer functions to be located in different or same physical entities.

(4) SSR Mode S Air -Ground Data Link between aircraft and ground station requirements shall comply with Annex 10 Volume III, Part I Chapter 5, 5.2 for Mode S Characteristic; Chapter 5, 5.3 for functional requirement for DCE and XDCE and Chapter 5, 5.4 for Mode S package format.

(5) VHF Air-ground Digital Link (VDL) requirements and system characteristics shall comply with:
(a) ICAO Annex 10, Volume III, Part I Chapter 6 for VDL Modes 2, 3 and 4.
(b) ICAO Annex 10 Volume V, chapter 4, 4.1.2 Frequency separation and limits of assignable frequency and Chapter 4, 4.1.3 for frequency used for particular function.

Note: *Additional information on VDL is contained in the Manuals on VHF VDL Mode 2, VDL Mode 3 and VDL Mode 4 Technical Specifications (Docs 9776, 9805 and 9816).*

(6) Aeronautical Fixed Service (AFS) requirements and system characteristics shall comply with:
(a) ICAO Annex 10, Volume III, Part I Chapter 8. for Technical provisions associated with AFTN;
(b) Implementation aspects of AFTN/AMHS to support the exchange of messages and/or digital data between aeronautical fixed stations.
(c) Annex 10 Volume III, Chapter 8, 8.6.5 for general provision and requirement for CIDIN and Annex 10 Volume II, Chapter 4, 4.5 for CIDIN operating procedures.
(d) Implementation aspects relating to interoperable data exchange between AFTN and CIDIN stations and networks with the ATN.
(e) ICAO Annex 10 Volume II Chapter 3, 3.3 for General requirement for acceptance, transmission and delivery of message in Aeronautical telecommunication service and Chapter 4, 4.1.2 for Material permitted in AFS messages.
(f) Cancellation process of the messages by a telecommunication station only when cancellation is authorized by the message originator.
(g) ICAO Annex 10 Volume II, Chapter 4, 4.4 for AFTN operating procedures, chapter 4,4.6 for AMHS procedure and chapter 4, 4.7 for ICC procedure.
(h) Meteorological operational channel procedures and meteorological operational communication network procedures shall be compatible with aeronautical fixed telecommunication network (AFTN) or ATS message handling services (AMHS)

Procedures

(i) ICAO Annex 10 Volume II, Chapter 3,3.9 for implementation of Globally Unique Flight Identifier (GUFI).

(7) Universal Access Transceiver (UAT) Technical specification and system characteristics shall comply with:

(a) ICAO ANNEX 10 Volume III, Part I Chapter 12.1 for Overall system characteristic; Chapter 12.2 for Characteristic of the ground station; and Chapter 12.4 for Physical layer requirement.

(b) implementation aspects of a wideband broadcast data link operating on 978 MHz with a channel modulation rate of just over 1 Mbps. By design, UAT supports multiple broadcast services, including flight information services (FIS-B) and traffic information services (TIS-B), in addition to automatic dependent surveillance — broadcast (ADS-B).

Note: *Guidance material for the implementation of UAT is ICAO Doc 9861, Manual on the Universal Access Transceiver.*

(8) Air-Ground VHF Communication system requirements and system characteristics shall comply with:

(a) ICAO International Standard and Recommended Practice Annex 10 Volume III, Part II Chapter 2, 2.1 for Air-Ground VHF Communication system characteristic and Chapter 2, 2.2 for system characteristic of the ground installation (25 kHz Channel spacing system).

(b) ICAO International Standards and Recommended Practices of Annex 10 volume V chapter 4, 4.1 for utilization in the frequency band 117.975-137.000 MHz

(c) Requirement for Emergency channel (121.500 MHz) shall be conformed to Annex 10 Volume V, Chapter 4.1.3.1.

(d) Requirement for Search and Rescue Channel (123.100 MHz) shall be conformed to Annex 10 Volume V, Chapter 4.1.3.4.

(e) When two or more ATS frequencies are being used by a controller, consideration shall be given to provide facilities to allow ATS and aircraft transmissions on any of the frequencies to be simultaneously retransmitted on the other frequenciesin use thus permitting aircraft stations within range to hear all transmissions to and from the controller.

(f) In case a full failure of voice switching system occur, service provider shall assure the availability of a bypass to the equipment providing the service

(g) Alternative means to ground communications are identified in case of service interruption of the main means of ground communications. Alternative means of ground telecommunications could include direct connections from the telephone company, satellite communications, microwave links and or other systems

(h) Communication procedure that applicable to the aeronautical mobile service as defined in Annex 10 Volume II, chapter 5, 5.1.

(i) ICAO Annex 10 Volume II, Chapter 5, 5.2 for Procedures related to Radiotelephony.

(j) Distress and urgency Radiotelephony communication procedures shall be in accordance with Annex 10 Volume II, Chapter 5,5.3.

(k) The station addressed by an aircraft being subjected to an act of unlawful interference, or first station acknowledging a call from such aircraft, shall render all possible assistance, including notification of appropriate ATS units as well as any other station, agency or person in a position to facilitate the flight, as stipulated in Annex 10 Volume II, chapter 5, 5.4.

(l) Annex 10 Volume II, Chapter 3, 3.5 for record of communications for aeronautical telecommunication service.

(m) CAR-172, Air Traffic Service Organization – Certification, regarding the clocks and time recording system of the ATC Communication

(9) Single Side Band (SSB) HF Communication System requirements and system characteristics shall comply with:

(a) ICAO International Standard and Recommended Practice Annex 10 Volume III, Part 2, Chapter 2, 2.4 for Characteristics and requirements of SSB HF Communication system.

(b) ICAO International Standards and Recommended Practices of Annex 10 volume V Chapter 3,3.1 for method of operation of High Frequency below 30 MHz

(10) Satellite Voice Communication System requirements and system characteristics to support communication for ATM operation in airspace shall comply with:

(a) ICAO International Standard and Recommended Practice Annex 10 Volume III, Part 2, Chapter 2, 2.5 for Characteristics and requirements of SATVOICE.

Note: *Guidance material for the implementation of the aeronautical mobile satellite service is contained in the Manual on the Aeronautical Mobile Satellite (Route) Service (Doc 9925). Additional guidance for SATVOICE systems is contained in the Satellite Voice Operations Manual (Doc 10038), and the Performance-based Communication and Surveillance (PBCS) Manual (Doc 9869).*

(11) Selective Calling (SELCAL) System requirements and characteristics shall comply with:

(a) ICAO Annex 10 Volume III, Part 2 Chapter 3 for system characteristic of SELCAL.

(b) ICAO Annex 10 Volume II, Chapter 5, 5.2.4 for communication procedure.

(c) Implementation aspects relating to the usage of Selective Calling systems as an alternative means of communication to aircraft or as main means of communication to aircraft for areas that may not be covered by VHF communications.

Note: *Guidance material on the use of SELCAL system is contained in the Attachment to the PART 2 of Annex 10 Volume III.*

(12) Aeronautical Speech Circuit requirements and system characteristics shall comply with:

(a) Technical provisions relating to international aeronautical speech circuit switching and signaling for ground-ground applications contained in ICAO Annex 10, Volume III, Part II, Chapter 4;

(b) Provision relating to Direct Speech communication contained in ICAO Annex 11 Chapter 6;

(c) The implementation aspects relating to the usage of circuit switching and signaling to provide speech circuits to interconnect ATS units not interconnected by dedicated circuits and which shall be by agreement between the Administrations concerned.

(d) The implementation aspects relating to the application of aeronautical speech circuit switching and signaling which shall be made based on regional air navigation agreements.

(13) Communication procedure for aeronautical broadcasting service (voice broadcasting) shall be in accordance with Annex 10 Volume II, chapter 7.

(14) Communication procedure for aeronautical mobile service using data link shall be in accordance with Annex 10 Volume II, chapter 8.

(15) Establishment of Radio Communication requires:

(a) All stations shall answer calls directed to them by other stations in the aeronautical telecommunication service and shall exchange communications on request.

(b) All stations shall radiate the minimum power necessary to ensure a satisfactory service.

(16) All radio equipment shall be fully redundant to ensure service reliability that are required by the system specifications;
(17) All remote radio sites shall be easily accessible to the maintenance personnel to allow on time arrival for them in case of emergencies;
(18) Automatic recording facilities shall be provided on pilot-controller two-way radiotelephony or data link air-ground communication channels, direct speech or data link ground-ground communications, and Surveillance data from primary and secondary radar equipment or other systems (e.g. ADS-B, ADS-C) as described in Appendix B.
(19) All voice switches and position control panels shall be maintained to guarantee continuity of service according to the specifications;
(20) Communication means shall be established to communicate between ATS units and between the en-route (area) control centers and remote air/ground communication stations or en-route radar stations or military control centers as described in Appendix B, and maintained to guarantee continuity of service according to the system specifications;

CAR 171.210 Surveillance Facilities

An Aeronautical Telecommunication Service Provider shall ensure the availability, continuity, accuracy and integrity of the services they are providing and shall demonstrate that:

(1) Secondary Surveillance Radar requirements and system characteristics shall comply with:
  (a) ICAO Annex 10 Volume IV, Chapter 2, 2.1.2 and Chapter 3, 3.1.1 for characteristic of Secondary Surveillance Radar (SSR) systems (having only Mode A & C capabilities);
  (b) Ground SSR equipment shall have appropriate ground decoding system to ensure immediate recognition of Mode A Codes 7500, 7600 and 7700.
  (c) Mode A code 2000 shall be reserved in the ground decoding system to provide recognition of an aircraft which has not received any instruction from Air Traffic Controller to operate the transponder.
  (d) SSR system having Mode-S capabilities shall conform to the standards incorporated in Annex 10 Volume IV, Chapter 3, 3.1.2.
  (e) The Monopulse secondary surveillance radar (MSSR) shall be modified to the application of Mode-S.
  (f) Application of Mode S Extended Squitter system supporting TIS-B out shall conform to Annex 10 Volume IV, Chapter 5, 5.1 and Chapter 5, 5.2 for Mode S Extended Squitter system supporting ADS-B IN.
  (g) Mode S Extended squitter messages for TIS-B shall conform to requirements specified in the Technical Provisions for Mode S Services and Extended Squitter (Doc 9871).
  (h) ground station supporting TIS-B use an extended squitter transmission capability, the characteristics of such ground stations, in terms of transmitter power, antenna gain, transmission rates, etc., are to be tailored to the desired TIS-B service volume of the specific ground station assuming airborne users are equipped with (at least) Class A1 receiving systems.
(2) Multi-lateration (MLAT) System requirements and system characteristics shall comply with:
  (a) ICAO Annex 10 Volume IV, Chapter 6 for general requirement of Multi-lateration system as amended.
  (b) An MLAT system used for air traffic surveillance shall be capable of determining aircraft position and identity.
  (c) Where an MLAT system is equipped to decode additional position information contained in transmissions, it shall report such information separately from the aircraft position calculated based on TDOA.

(d) Radio frequency characteristics, structure and data contents of signals used in 1090 MHz MLAT systems shall conform to the provisions of ICAO Annex 10 Volume IV, Chapter 3.

(3) Alternative operational means to radar surveillance services are identified in case of service interruption of the main radar surveillance services facilities according to the CAR-172 and associated procedures;

(4) All surveillance systems are provided with monitoring facilities to ensure service continuity.

(5) Non-aircraft transponders that are installed on aerodrome surface vehicles, obstacles or fixed Mode S target detection devices for surveillance and/or radar monitoring purposes shall be assigned 24-bit aircraft addresses confirming to standards incorporated in Annex 10 volume III, Chapter 9, 9.1.1.

(6) All radar services are provided in accordance with procedures published in Document 4444 or Document 7030 (as applicable to the Middle East/Asia Region.

(7) Full information is made available to air traffic control administration on:
   (a) The nature and extent of the radar services provided; and
   (b) Any significant limitations regarding such radar service.

(8) Based on the needs of an aerodrome and ICAO Regional Air Navigation Plan, ICAO Doc 9830, A-SMGCS manual should be referenced for guidance on the application of the Operational and Performance Requirements of A-SMGCSS implementation.

(9) In accordance with ADS-B requirements and system characteristics, both ICAO Doc 9924 Aeronautical Surveillance Manual and ICAO MID Doc 013 surveillance plan should be referenced for guidance on the application of the operational and planning requirements of ADS-B ground system implementation.

CAR 171.215 ATS Automation System

(1) An Aeronautical Telecommunication Service Provider shall ensure the availability, continuity, accuracy and integrity of the services they are providing and shall demonstrate that the automation systems that serve the en-route, the approach and the towerfacilities are maintained according to the approved operation manual and the maintenance manual of the manufacturer of each system;

(2) ATS Automation system is required to enhance the safety of the flights by providing the controllers with information of air movements from radars, flight plans, direction finders.

(3) All ATS Automation equipment shall be fully redundant to ensure service reliability that are required by the system specifications;

(4) The main system components of ATS Automation system shall comprise of:
   (a) Redundant Radar Data Processing system;
   (b) Redundant Flight Data Processing system;
   (c) Redundant MET and AIS data processing system
   (d) Data Recording and analysis;
   (e) Situation Data display;
   (f) A computer-controlled Data communication system;
   (g) A computer-controlled Voice communication system
   (h) Simulation;
   (i) Common time system

(5) ATS Automation system shall fulfill the following characteristics:
   (a) Based on a legacy of successfully delivered systems around the world;
   (b) pen system architecture by complying with open system standards (UNIX, etc.);
   (c) Use of COTS technology from industry leaders;
   (d) Scalable design that allows future growth;
   (e) All mission critical servers are redundant with proven switchover strategy;

(f) Designed to allow evolutionary upgrades and future enhancements;

(6) Service provider of an aeronautical telecommunication service should refer to ICAO Doc 9426, ATS Planning Manual, Section 2, Chapter 3 for general provision and requirement of ATS Automation system.

CAR 171.220 Identification Codes and Calls Signs

(1) An Aeronautical Telecommunication Service Provider shall make sure that all required identification code for a radio navigation facility or call sign for a communications facility appropriately registered locally and internationally; and

(2) Such action is needed prior to operational of the equipment.

CAR 171.225 Notification of Facility Information

(1) An Aeronautical Telecommunication Service Provider shall provide the users of the facilities with the operational information for each facility.

(2) The operational information on any facility that supports an air traffic service or the Omani air navigation system is forwarded to an aeronautical information service (AIS) for publication in the country's aeronautical information publication (AIP);

(3) The users of a facility are notified without delay of any updates in the facility information that if updated, may affect the safety of air navigation. For those facilities published in the Omani AIP the information concerning any change to their information shall be forwarded to the aeronautical information service for the issue of a NOTAM if so required.

CAR 171.230 Notification of Facility Operational Status

(1) An Aeronautical Telecommunication Service Provider shall provide the users information of the operational status of each facility or service listed in the operation manual.

(2) The users of an aeronautical telecommunication facility are notified without delay of any change in operational status of the facility or service that may affect the safety of air navigation, and, except where the change is temporary in nature, information concerning any change in operational status of the facility is forwarded to the air traffic service provider and service provider of the aeronautical information service for the NOTAM service.

(3) Notification for the navigation aid systems shall take place through at least remote monitoring unit (RMU) Systems at the towers or the en-route (area) centers;

(4) Aerodrome control towers and units providing approach control service shall be provided without delay with information on the operational status of radio navigation aids essential for approach, landing and takeoff at the aerodrome.

(5) Arrangements shall be made for the local aeronautical information service unit to receive without delay essential information about changes in the operational status of non-visual aids as required for pre-flight briefing and dissemination in accordance with the provisions of Annex 15.

CAR 171.235 Facility Maintenance and Report

(1) An Aeronautical Telecommunication Service Provider shall apply proper maintenance to each Aeronautical Telecommunication Facilities and report its condition to Authority in accordance with *the Authority - Maintenance and Reporting procedure for Aeronautical Telecommunication Facilities, manual no. 1.3.3.*

(2) All service interruptions to the Aeronautical Telecommunication services shall be promptly reported and acted upon according to the standard corrective maintenance procedures.

CAR 171.240 Facility Logbook

(1) An Aeronautical Telecommunication Service Provider shall provide each aeronautical telecommunication facility with a logbook and kept at each facility site or location.
(2) The facility logbook shall contain sufficient information in the first pages of the logbook to identify:
    (a) Facility information;
    (b) Precautions of operation or its reference number that included in the operation manual;
    (c) The services are being provided from the facility.
(3) The logbook shall be maintained by the senior person, or the person on duty at a nominated operating position;
(4) The logbook is maintained throughout the operating hours of the facility;
(5) All entries shall include the name of technical personnel and details maintenance activities, date, time of entry and signature;
(6) Every page of the logbook shall be signed by the facility manager or senior person;
(7) Logbook entries are:
    (a) In chronological sequence and in ink;
    (b) Without erasure, defacement, or obliteration; and
    (c) Corrected by drawing a single line through the erroneous information and initialing the correction.
(8) Actual times of opening and closing facility are recorded in the logbook, together with the reason for every variation from published hours of service; and
(9) Logbooks are retained for a period of 3 years from the date of final entry.

CAR 171.245 Reporting Service Disruptions

(1) An Aeronautical Telecommunication Service Provider shall:
    (a) advise the Authority of any planned disruption of equipment that will result in disruption of air traffic services that could have an impact on safety;
    (b) report to the Authority within forty-eight (48) hours of the unplanned disruption of equipment resulting disruption of air traffic services when the disruption affected, or could have affected, the safety of air traffic including development of a list of such disruptions of equipment that are reportable. All other disruptions that are not affecting the continuation of air traffic services are reportable internally only; and
    (c) Investigate any unplanned disruption to the provision of air traffic services and send a report of the investigation to the Authority.
(2) Planned disruption reportable under CAR 171.245 (1)(a) shall include, but are not limited to:
    (a) Routine maintenance of equipment that will have an impact on the service when service is brought off-air; and
    (b) New installations or changes on established services that require the service to be off-air.
    (c) Any service that may affect the safe continuation of air traffic services without having a contingency plan for the operation.
(3) Unplanned disruption reportable under CAR 171.245 (1)(b) shall include, but are not limited to:
    (a) Any interference on the air/ground telecommunications channel that may affect the service for more than ten (10) minutes;
    (b) Failure of any radar coverage to areas that are declared as covered in the Muscat FIR in the Oman AIP for more than ten (10) minutes;

(c) Failure of any radio navigation aids providing service in the Muscat FIR and published in the Oman AIP for more than ten (10) minutes; and
(d) Any other unplanned disruption to the safe continuation of an air traffic service for more than ten (10) minutes;

CAR 171.250 Reporting Unsafe Conditions

(1) An Aeronautical Telecommunication Service Provider shall establish a policy encouraging the reporting of unsafe conditions or practices observed by facility personnel;
(2) An Aeronautical Telecommunication Service Provider shall establish a checklist to report at the beginning of each shift the conditions of equipment in the facility where unsafe condition exists. Unsafe conditions reportable under paragraph (a) may include, but are not limited to:
    (a) Radar signal of fixed targets are not present on the screen;
    (b) Unstable performance of navigation aid;
    (c) Simultaneous failure of radar and voice signals;
    (d) Failure of air conditioning of the facility to operate;
    (e) Failure of the UPS to function when the main power supply is interrupted;
    (f) Persistent power failures without adequate alarms or failure of UPS systems to function in case of power failure;
    (g) Persistent failures of main or standby equipment in the facility;
    (h) Problems with shift administration;
    (i) Failure to comply with aeronautical telecommunication/radio navigationFacility instructions;
    (j) Significant equipment reading deviations; and
    (k) Procedural errors or inconsistencies that may affect the safety of air navigation services.

CAR 171.255 Human Factors Considerations

(1) An Aeronautical Telecommunication Service Provider shall observe Human factors principle in the design and certification of Aeronautical telecommunication facility.
(2) Guidance material on Human Factors principles can be found in the Human Factors Training Manual (Doc 9683) and Circular 249 (Human Factors Digest No. 11 — Human Factors in CNS/ATM Systems).

CAR 171.260 Environmental Facilities

An Aeronautical Telecommunication Service Provider shall establish procedures to ensure that:
(1) All Aeronautical Telecommunication facilities shall be provided with suitable power supplies that comprise the main feed power and uninterruptible power supply system as well as back-up power supply such as diesel-powered electrical generator to provide additional power means and ensure continuity of the service consistent with the use of the service(s) involved.
(2) The power supply switch-over times for Aeronautical Telecommunication facilities shall comply with the following table:

Type of runway	Aids requiring power	Maximum Switch – over times (seconds)
Instrument approach	DME	15
	VOR / NDB	15
	D/F facility	15
Precision approach, Category I	ILS Localizer	10
	ILS glide path	10
	ILS middle marker	10
	ILS outer marker	10
	PAR	10
Precision approach, Category II	ILS localizer	0
	ILS glide path	0
	ILS inner marker	1
	ILS middle marker	1
	ILS outer marker	10
Precision approach, Category III	(same as Category II)	(same as Category II)

(3) The power supply voltage stability shall comply with the manufacturer of the specific equipment specifications;
(4) All Aeronautical Telecommunication facilities equipment rooms are provided with firefighting means and environmental condition including room temperature and humidity, within the recommended values by the specific equipment manufacturer;
(5) All Aeronautical Telecommunication facilities equipment rooms are shielded and insulated against leakage of air and dust. All exit doors and windows shall be closed to ensure the environmental conditions meet the requirements of this CAR;
(6) The service provider shall ensure that all water supply is adequate to provide the water required for firefighting equipment and other purposes by ensuring proper operation of water pumps;
(7) All ventilation systems in the Aeronautical Telecommunication facilities are maintained according to the general standards.
(8) the antennas and masts of the Aeronautical Telecommunication facilities shall be properly protected against corrosion and lightening;
(9) All services interruptions to the environmental facilities are promptly reported and acted upon according to the standard corrective maintenance procedures;
(10) The standard preventive and periodic maintenance procedure are applied to the environmental facilities to minimize the probability of service interruption;
(11) Alternative means to environmental facilities is identified in case of service interruption of the main means of environmental facilities.

CAR 171.265 Inspection Measuring and Test Equipment

(1) An Aeronautical Telecommunication Service Provider shall ensure that appropriate inspection, measuring and test equipment is available for their personnel to maintain thesafe operation of each facility listed in their operation manual.
(2) An Aeronautical Telecommunication Service Provider shall control, calibrate and maintainall of the inspection, measuring and test equipment to ensure that each item of equipment has the precision and accuracy that is necessary for the measurements and tests to be performed.
(3) An Aeronautical Telecommunication Service Provider shall ensure that each item of test equipment required for the measurement of critical performance parameters is:
  (a) Calibrated before use or at prescribed intervals against certified equipment having a known valid relationship to nationally recognized standards. Where no

such standards exist, the basis used for the calibration shall be documented. records of such calibrations and the standards used shall be maintained in accordance with the procedures required by CAR-171.200;

(b) Identified with a suitable indicator to show its calibration status;

(c) Controlled to:

i. Safeguard against adjustments that would invalidate the calibration setting;

ii. Ensure that the handling, preservation and storage are such that the accuracy and fitness for use is maintained.

(4) Where hardware and software systems are used as an alternative form of facility performance testing, the functions of the systems shall be checked before being releasedfor use in order to establish that they are capable of verifying the performance of the facility. These functions shall be checked at prescribed intervals. Records of these checks shall be maintained as evidence and verification of adequate performance of the test system.

CAR 171.270 Deviations

(1) Subject to compliance with CAR-171.140 and CAR-171.145, the Aeronautical Telecommunication Service Provider may deviate from any requirement of this CAR to meet an emergency situation if there is a need to take immediate action for the protection of life or property involving carriage by air.

(2) The Aeronautical Telecommunication Service Provider who deviates from a requirement of this CAR under CAR 171.270(1) shall provide a written report to the Authority as soon as practicable, but in any event not later than seven (7) days after the emergency. The report shall cover the nature, the extent and the duration of the deviation.

CAR 171.275 Limitations on Service

(1) An Aeronautical Telecommunication Service Provider shall not operate a facility if there is any cause to suspect the integrity of the information being provided by the facility. A cause to suspect the integrity of the information being provided by a facility includes the infringement of any critical site area of the facility until performance checks on the facility verify that the infringement does not and will not affect the performance of the facility.

(2) An Aeronautical Telecommunication Service Provider shall not operate a radio transmitting facility on an aeronautical radio frequency except pursuant to a written radio apparatus license granted by the Telecommunication Regulatory Authority and subject to the provisions of ICAO Annex 10, Volume V.

(3) Except where a deviation under CAR-171.270 is required, the Aeronautical Telecommunication Service Provider shall not operate a facility unless:

(a) The facility is listed in the operation manual;

(b) The performance of the facility meets the applicable facility published information;

(c) The performance of the facility meets the applicable facility requirements in CAR-171.105(2);

(d) Any integrity monitoring system for the facility is fully functional;

(e) All the periodic tests for the facility are completed in accordance with the programs established under CAR-171.105 (2) (d) and CAR-171.260 (10);

(f) The facility is included in the holder's airways security program, if the destruction, damage, or interference of the facility is likely to endanger the safety of an aircraft in flight;

(g) The provisions of the holder's airways security program for the facility are being complied with.

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APPENDIX A CERTIFICATION REQUIREMENTS OF FLIGHT INSPECTION SERVICE PROVIDER

PART I - CERTIFICATION OF SERVICE PROVIDERS

1. **Applicability**
   This Appendix prescribes the requirements governing:

   (1) The certification and operation of organization providing flight inspection services in the flight information region of Oman; and
   (2) The operation and technical standards for providing flight inspection services by those organizations.

2. **Requirement for Certificate**
   No person shall provide flight inspection service within Muscat FIR except under the Authority of, and in accordance with the provisions of flight inspection service certificate issued under this CAR.

3. **Grant of Certificate**
   An applicant is entitled to a Flight Inspection service provider certificate if the Authority is satisfied that:
   (1) the applicant meets the Certification requirements of Part II; and
   (2) the applicant's operation manual including Flight Inspection Procedure is approved by Authority; and
   (3) the granting of the certificate is not contrary to the interests of aviation safety.
   (4) CAA may terminate the formal application phase for the lack of contact or inactivity of greater than 90 calendar days.

4. **Privileges of Certificate**

The Flight Inspection Service provider certificate holder shall only carry out tasks in accordance with the operation manual and authorized specifications.4.2 The applicant shall submit any proposed changes to the flight inspection system, operation or organization to Authority within thirty (30) days for approval before furtherflight inspection are conducted.

5. **Duration of Certificate**

A certificate for Flight Inspection Service Provider shall be valid for a period of two (2) years from the date of issue.

6. **Renewal of Certificate**
   (1) An application for renewal of a Flight Inspection Service certificate shall be made on a cover letter, submitted to the Authority, not less than thirty (30) days before the certificate expires.
   (2) The cover letter for renewal shall be submitted along with:
      (a) old (original)certificate; and
      (b) Revision of Operation Manual, including updated Flight Inspection Procedure (if any).

7. **Certification Fees**

Each applicant for the grant of Flight Inspection Service Provider shall bear the appropriate application process fees prescribed by this regulation.

8. **Power to Inspect**
   (1) The Authority shall conduct an initial certification audit and thereafter audits or inspection at intervals not exceeding two (2) years at the certificate holder's office and/or unit or facility.
   (2) The Authority may require the certificate holder to provide such documentation and information, as the Authority considers relevant to the audit or inspection.
   (3) The Authority shall be granted, by the applicant or certificate holder, unrestricted access to the applicant's or certificate holder's facilities and shall be permitted to carry its own equipment (e.g. computers, cameras and recording devices) under all conditions while carrying out its oversight

functions.

9. **Suspension and Revocation of Certification**

(1) The Authority may state, that a certificate is suspended if the Authority reasonably considers that not suspending the certificate would be likely to have an adverse effect on the safety of air navigation.

(2) Suspension of Flight inspection service provider certificate may be imposed if:
   (a) service provider does not comply with the requirements stated in the certificate;
   (b) service provider failed to perform the corrective action plan stated in the certificate in the exact period of time if so stated; and
   (c) The investigation, in case of an accident, proves that it was caused due to the faulty procedures.

(3) When suspension is imposed, Authority will state the reasons for such action and furnish them to the service provider.

(4) The service provider may appeal against such notice within thirty (30) days of receipt.

(5) The service provider shall furnish to Authority any documents, records, or other pertinent information supporting the appeal.

(6) Authority may confirm, modify, or set aside the proposed suspension based on the appeal.

(7) Authority may permanently revoke Flight inspection service provider certificate as a subsequent procedure to suspension if:
   (a) service provider carries out an action in violation of the Aviation Act or the regulation;
   (b) It is verified that the certificate holder will not be able to remedy non-compliant areas; or
   (c) The certificate holder stops providing the facility concerned without a convincing argument.

(8) The revoked certificate cannot be renewed; it should be reissued not less than one year after the revocation date.

(9) The amendment as referred in paragraphs (2) and (7) shall take effect at the time the decisionis made.

10. **Revocation of Certificate Based on Request of Service Provider**

(1) Authority may revoke the service certificate based on a written request from the holder of the permit certificate.

(2) Revocation shall come into force since the request has been approved by the Authority.

PART II - CERTIFICATION REQUIREMNTS

1. Organization

An applicant for Flight Inspection service provider certificate shall nominate:

(1) a senior person identified as the accountable manager who has the Authority within the applicant's organization to ensure:
   (a) all activities undertaken by the organization can be financed and carried out to meet applicable operational requirements;
   (b) the organization fulfill the relevant laws and regulations for Flight Inspection of Radio Navigation Aids; and
   (c) the organization is highly prioritizing safety when assessing commercial, operational, environmental or social pressures.

(2) senior person or persons who are responsible for ensuring that the applicant's organization complies with the requirements of this regulation. Such nominated person or persons shall be ultimately responsible to the Accountable Manager; and

(3) competent and qualified Flight Inspection Crew in carrying out Flight Inspection activities of Radio Navigation Aids.

2. **Flight Inspection Crew**

(1) An applicant for flight inspection service provider certificate shall ensure that the compositionof flight inspection crew:
   (a) at least consist of two pilots and one or two Flight Inspection System Operator;
   (b) Composed of experts in their individual fields and certified as Flight InspectionPersonnel by State Authority where the organization established.
   (c) Listed in the flight inspection operation manual is accepted by the Authority to carryout flight inspection activates in the sultanate of Oman.

(2) The flight inspection service provider shall establish procedures to:

   (a) Assess the competence of the Flight Inspection Crew;
   (b) Maintain the competency of the Flight Inspection Crew.

3. **Flight Inspection operation manual**

An applicant for flight inspection service provider certificate shall provide the Authority with an operation manual or system of manuals containing:

(1) Policy statement and purposes of the organization;
(2) the organizational chart showing lines of responsibility between the persons specified in paragraph 1;
(3) personnel requirements specified in paragraph 2;
(4) the duties and responsibilities of the senior person or persons specified in paragraph 2;
(5) Flight inspection system technical description including:
   (a) Flight inspection system block diagram; and
   (b) List of all flight inspection system receivers and its function, type model and date of installation.
(6) flight inspection aircraft requirements and characteristics as specified in paragraph 4;
(7) Flight Inspection system capabilities as specified in paragraph 6;
(8) flight inspection operating instructions for the flight inspection crew including:
   (a) The flight profile to be used for individual measurements;
   (b) Pre-flight calibration of measuring system;
   (c) Sitting of any necessary ground tracking or position fixing system;
   (d) Operation of measuring system;
   (e) Production of the flight inspection report;
   (f) The production of records and graphs
   (g) Production of a certificate attesting the result of a flight inspection and calibration;
(9) Flight inspection procedures as specified in paragraph 13;
(10) Maintenance procedures of the flight inspection system as specified in paragraph 16; and
(11) List of test equipment and Calibration procedure of Flight Inspection System and TestEquipment as specified in paragraph 11.

4. **Flight Inspection Aircraft**

(1) An applicant for flight inspection service provider certificate shall have its own Flight Inspection Aircraft with:
   (a) Valid Aircraft Operator Certificate (AOC)/ Aircraft Operator Permit (AOP)/ otherequivalent Document issued by ICAO's member state will be accepted by Authority.
   (b) Valid Certificate of Airworthiness (CoA).
   (c) Valid Radio License Certificate or equivalent of it.
   (d) Valid Aircraft Insurance.
   (e) Valid Medical and License for Crew Member.

(2) Flight Inspection Aircraft should fulfill the following desirable characteristics:
   (a) Reliable, efficient type equipped and certified for IFR operations;
   (b) Sufficient carrying capacity for the flight crew, as well as all necessary electronic and recording equipment and spares.
   (c) Sufficient range and endurance to complete a normal mission without refueling;
   (d) Aerodynamically stable throughout its speed range, but particularly at speedsencountered during flight inspection;
   (e) Low noise and vibration levels;
   (f) Low electrical noise characteristics to minimize interference with received signals; e.g. propeller modulation of the received signal must be as low as possible;
   (g) Stable electrical system of adequate capacity to operate the required electronicequipment in addition to the aircraft equipment;
   (h) Reasonably wide-speed and altitude range to enable flight inspection to be conducted,where possible, under the conditions encountered by users;
   (i) Suitable for future modifications or expansion of equipment to allow for inspection of additional aids or to increase accuracy or processing speed on existing facilities.

5. **Aircraft Instrumentation**

An applicant for flight inspection service provider certificate shall ensure that the flight inspection aircraft contains the following instruments:

(1) full range of navigation equipment as required for instrument flying;
(2) Additional equipment shall be provided for the monitoring and recording of the received navigation signals;
(3) The navigation receivers used by the flight inspection equipment shall be independent from the navigation equipment used by the aircraft.

6. **Flight Inspection System**

(1) An applicant for flight inspection service provider certificate shall ensure that the flight inspection system comprises of:
   (a) fully automated system with advance feature to support inspection for new upgraded technology of Radio Navigation Aids, proven integrity and extended flexibility for future expansion.
   (b) flight inspection receivers with associated antenna, positioning fixing system, equipment for data display and processing and equipment for data recording.
   (c) A VHF radio in order to allow independent communication between the flight inspectorand the ground crew, without affecting the pilot.
(2) Flight Inspection system shall be fully certified or approved by State Authority where the organization established.

7. **Flight Inspection Receiver and Sensors**

An applicant for flight inspection service provider certificate shall ensure that flight inspection receiver fulfills the following characteristics:

(1) provide both navigation information as in standard aircraft equipment and flightinspection information.
(2) include an AGC measurement to allow the determination of the filed strength when thereceiver and antenna characteristic is considered
(3) calibrate pulsed navigation facilities such as DME and radars, and provide the video signalof these facilities.
(4) Flight inspection equipment shall have its own dedicated antennas on the aircraft thatare independent from the antennas used by aircraft's own navigation equipment;
(5) highest quality in order to obtain the accuracy and integrity required for flight inspectionpurposes and shall provide additional measurement outputs specific to flight inspection.

(6) The antenna of flight inspection receiver must be accurately placed in order to avoid interference problem.

8. **Position Fixing System**

An applicant for flight inspection service provider certificate shall ensure that position-fixing system fulfills the following characteristics:

(1) provide reference position (navigation) information in order to determine the navigationaccuracy of the facility.
(2) generate position reference information using the same coordinate system as thenavigation system under testing.
(3) independent from the facility under testing/inspection.

9. **Position Reference System**

An applicant for flight inspection service provider certificate shall ensure that the flight inspection aircraft is equipped with position reference system which:

(1) provide the information for all phases of flight inspection.
(2) combines of different sensors for testing, including INSs, Radar altimeter, and GNSS augmentation as necessary.

10. **Data Processing, Display and Recording**

An applicant for flight inspection service provider certificate shall ensure that the flight inspection system capabilities comprise:

(1) a computer, which is used to read the data from the position-fixing sensors or system andfrom the flight inspection receivers and to compare the facility navigation information and the position reference information.
(2) Data generated from the flight inspection receivers and the position-fixing system are to be displayed and processed. The processing maybe performed either on-line or after completion of an inspection.
(3) The computer has the capability of determining the parameters required for the navigation aid being inspected,
(4) All relevant information like facility navigation information, reference information, facility error and additional receiver information, such as field strength, shall be displayedon board the flight inspection aircraft for the operator. Data may be displayed on analogue or digital instruments as well as on computer screens.
(5) Chart recorders or printers should be used for the documentation of flight inspection results. All data must be annotated properly either by the operator or automatically by the data-processing system.
(6) All raw data and computed data should be recorded in electronic format of tapes or disksfor investigation purpose.

11. **Calibration of Flight Inspection System and Test Equipment**

An applicant for flight inspection service provider shall establish procedures to ensure that:

(1) Regular calibration of the flight inspection receivers and position-fixing system shall beperformed in order to ensure a back tracing of data to international or national standards.
(2) The calibration can be performed either on board the flight inspection aircraft or in alaboratory.
(3) Each item of test equipment and signal generators shall be calibrated on a periodic basisin order to ensure the calibration status of the equipment is tracked.

12. **General Technical Requirements**

An applicant for flight inspection service provider shall establish procedures to ensure that:

(1) Integration of the systems in the aircraft shall not affect the Airworthiness Certificate of the aircraft. Every modification has to be recorded in the technical documentation of theaircraft, along with the approvals of the manufacturer and of the certification state Authority concern.

(2) Particular operating instructions should be registered in flight and exploitation manuals.If this integration entails any performance limitation or operational restrictions for the aircraft, they should appear clearly in the corresponding documents.

13. **Flight Inspection Procedure**

(1) An applicant for Flight Inspection service provider certificate shall establish the following flight inspection procedures:
   (a) flight profile / maneuver used in conducting of flight inspection for each facility;
   (b) procedure for measurement of equipment during pre- flight inspection.
   (c) Procedure for placement of position fixing equipment.
   (d) Procedure for placement of ground tracking equipment.
   (e) Procedure for operation of Flight Inspection Receiver for each Radio Navigation Facility.

(2) All procedures shall be controlled so that the correct version of any procedure can be easily identified and used.

14. **Documentation and Data Recording**

An applicant for flight inspection service provider certificate shall establish procedure to ensure that:

(1) flight inspection data recordings shall be archived and maintained on file with the flight inspection reports.
(2) flight inspection Data Recordings serve as a record of the raw signal information used toassess ground facility performance.
(3) flight inspection data recordings shall be made available to engineering and maintenance personnel for solving site problems and for assessing trends in facility or equipment performance
(4) records of the calibration results of flight inspection system and test equipment used shallbe retained to ensure the calibration is traceable back to national measurement standards.
(5) Accurate information regarding ground survey data, facility and equipment types, frequencies, etc. shall be prepared at the time of commissioning and revised as necessaryto maintain the current data which can be loaded into flight inspection system.
(6) sufficient historical flight inspection data are retained to legally establish the trends in facility performance over a reasonable interval of time.
(7) As a minimum, all commissioning flight inspection reports and data recordings shall be retained in the facility file along with reports and data recording from the last five years.
(8) All special flight inspections carried out during this time period shall be retained on file.

15. **FLIGHT INSPECTION REPORT REQUIREMENTS**

(1) All flight inspection results shall be documented to a report format agreed with Authority.
(2) Any unforeseen events occur during flight inspection; this shall be highlighted in the remarks section of the report.
(3) Current and any new restrictions applied shall be properly referenced in the remarks section ofthe report.
(4) Confirmation of status of the inspection shall be referenced in the preliminary report issued before leaving the site.
(5) A confirmation of the status of the inspection shall be provided immediately after theinspection.
(6) A final report shall be issued as soon as possible after the completion of the flight inspection.
(7) The minimum information to be provided on the final flight inspection report shall be:
   (a) Station name and facility designation;
   (b) Category of operation;
   (c) Date of inspection;
   (d) Unique serial number of reports;
   (e) Type of inspection e.g. commissioning, routine or annual, special;

(f) Aircraft registration;
(g) Manufacturer, type and frequency of system being inspected;
(h) Names and functions of all personnel involved in the inspection;
(i) Results of all measurements made;
(j) Method of making each measurement;
(k) Details of associated attachments (recordings, etc.);
(l) Details of extra flights made necessary by system adjustments;
(m) an assessment by the flight crew of the navigational aid performance;
(n) Comments by the flight Inspector/equipment operator;
(o) Details of any immediately notifiable deficiencies;
(p) Results and tolerances;
(q) Statement of conformance/nonconformance; and
(r) Signature of the individual who is legally responsible.

16. **FLIGHT INSPECTION MAINTENANCE PROCEDURES**

An applicant for flight inspection service provider certificate shall provide the Authority with details of:

(1) Procedures for managing spares in relation to the flight inspection system;
(2) Procedures for recording system malfunction and taking subsequent action; and
(3) Procedures for preventive maintenance of the flight inspection system conforming with manufacture's maintenance instructions

17. **QUALITY ASSURANCE**

(1) Each applicant for flight inspection service provider certificate shall establish a quality assurance process to ensure compliance with, and the adequacy of, the procedures required by this Appendix as approved by the Authority;
(2) The quality assurance process shall include:
   (a) Performance check procedures that are understood, implemented, and maintained at all levels of the organization;
   (b) A procedure to ensure quality control indicators, including maintenance records, defect, interference and incident reports, and personnel and customer feedback, are monitoredto implement required performance standards and to identify existing problems or potential causes of problems within the system;
   (c) An internal audit program to ensure conformity with the procedures in the operation manual and maintain a desired level of facility performance. The internal audit program shall:
      (i) Specify the frequency of the audits considering the nature of the activityto be audited;
      (ii) Measure the effectiveness of any preventative or corrective action taken by the personnel responsible for the activity being audited.
   (d) A procedure for corrective action specifying how to:
      (i) Correct an existing problem;
      (iii) Follow up a corrective action to ensure the action is effective; and
      (ii) Measure the effectiveness of any corrective action taken.
   (e) A procedure for preventive action specifying how to manage a potential problem;

18. **CHANGES TO CERTIFICATE HOLDER'S OPERATION MANUAL**

(1) Each holder of flight inspection service provider certificate shall ensure that their operation manual is amended to remain a current description of the holder's organization and flight inspection system. The certificate holder shall ensure that any amendments made to the holder’s operation manual meet the applicable requirements of this CAR;
(2) The certificate holder shall provide Authority with a copy of each amendment to the holder’s operation manual as soon as practicable before its incorporation into the manual.

PART III. CERTIFICATION PHASE

1. Certification Procedure.

The company who intends to apply for Flight Inspection Service Provider shall undergo the procedure for the application and granting of certificate with the following sequence:

(1) pre-application phase;
(2) formal application phase;
(3) document evaluation phase;
(4) demonstration and inspection phase; and
(5) certification phase.

Service provider shall coordinate with the Authority for details procedures on Certification Process.

2. Application Forms

Each Applicant for the grant of Flight Inspection Service provider shall complete the Application Form 171-2 and 171-3 along with the cover letter. The application forms can be downloaded from CAA Website under related service.

APPENDIX B; AERONAUTICAL MOBILE SERVICE (AIR-GROUND COMMUNICATIONS)

1. General

Radiotelephony and/or data link shall be used in air-ground communications for air traffic services purposes.

ATS units shall be provided with and maintain guard on the emergency channel 121.5 MHz as specified in Annex 10 Volumes II and V.

When direct pilot-controller two-way radiotelephony or data link communications are used for the provision of air traffic control service, recording facilities shall be provided on all such air- ground communication channels and shall be retained for a period of at least thirty days.

2. Flight information service

Information air-ground communication facilities shall enable two-way communications to take place between a unit providing flight information service and appropriately equipped aircraft flying anywhere within the flight information region and whenever practicable direct rapid continuous and static free two-way communications should be permitted.

3. Area control service

Air-ground communication facilities shall enable two-way communications to take place between a unit providing area control service and appropriately equipped aircraft flying anywhere within the control areas and whenever practicable direct rapid continuous and static free two-way communications should be permitted.

4. Approach control service

Air-ground communication facilities shall enable direct, rapid. continuous and static-free two- way communications to take place between the unit providing approach control service and appropriately equipped aircraft under its control. Where the unit providing approach control service functions as a separate unit, air-ground communications shall be conducted over communication channels provided for its exclusive use.

5. Aerodrome control service

Air-ground communication facilities shall enable direct, rapid, continuous and static-free two-way communications to take place between an aerodrome control tower and appropriately equipped aircraft operating at any distance within 45 km (25 NM) of the aerodrome concerned. Where conditions warrant, separate communication channels should be provided for the control of traffic operating on the maneuvering area.

6. Ground to ground communications

Direct-speech and/or data link communications shall be used in ground-ground communications for air traffic services purposes. Requirements for retention of all automatic recordings of communications in ATC as specified in Annex 10. Volume II. 3.5.1.5.

7. Flight Information Centre

A Flight Information Centre shall have facilities for communication with the following units providing a service within its area of responsibility:

(1) The area control centre unless collocated.
(2) Approach control units.
(3) Aerodrome control towers.

8. Area Control Centre

In addition to being connected to the Flight Information Centre, an Area Control Centre shall have facilities for communications with the following units providing a service within its area of responsibility:

(1) approach control units.
(2) aerodrome control towers;
(3) air traffic services reporting offices, when separately established,

9. Approach Control Unit

In addition to being connected to the Flight Information Centre and the Area Control Centre, an Approach Control Unit shall have facilities for communications with the associated aerodrome control tower{s) and, when separately established, the associated air traffic services reporting office(s).

10. Aerodrome Control Tower

In addition to being connected to the Flight Information Centre, the Area Control Centre and the Approach Control Unit, an Aerodrome Control Tower shall have facilities for communications with the associated air traffic services reporting office, when separately established.

11. Communications between air traffic services units and other units.

A Flight Information Centre and an Area Control Centre shall have facilities for communications with the following units providing a service within their respective area of responsibility:

(1) appropriate military units;
(2) the meteorological office serving the center;
(3) the aeronautical telecommunications station serving the center;
(4) the unit providing apron management services, when separately established;
(5) the rescue coordination center, or in the absence of such center, any other appropriate emergency service; and
(6) the international NOTAM office serving the center.

The communication facilities required shall include provisions for rapid and reliable communications between the air traffic services unit concerned and the military unit(s) responsible for control of interception operations within the area of responsibility of the air traffic services unit.

12. Communications between an Approach Control Unit and an Aerodrome Control Tower and other service units

An Approach Control Unit and an Aerodrome Control Tower shall have facilities for communications with the following units providing a service within their respective area of responsibility:

(1) appropriate military units;
(2) rescue and emergency services (including ambulance, fire. etc.);
(3) the meteorological office serving the unit concerned;
(4) the aeronautical telecommunications station serving the unit concerned; and
(5) the unit providing apron management service when separately established.

The communication facilities required shall include provisions for rapid and reliable communications between the air traffic services unit concerned and the military unit(s) responsible for control of interception operations within the area of responsibility of the air traffic services unit.

13. Description of communication facilities

The communication facilities required above shall include provisions for communications by direct speech alone. or in combination with data link communications. whereby for the purpose of transfer of control using radar or ADS·B, the communications can be established instantaneously andfor other purposes the communications can normally be established within fifteen seconds; and printed communications when a written record is required; the message transit time for such

communications being no longer than five minutes when such type of communication in service.

In all cases not covered above, the communication facilities should include provisions for: communications by direct speech along, or in connection with data link communications whereby the communications can normally be established within fifteen seconds.

In all cases where automatic transfer of data to and/or from air traffic services computers is required, suitable facilities for automatic recording shall be provided.

The communication facilities required under paragraph 12 (a), (b) and (c) shall include provisions for communication by direct speech arranged for continues communications.

All facilities for direct-speech or data link communications between air traffic units and otherunits shall be provided with automatic recording.

Recordings of data and communications as required above shall be retained for a period of at least thirty (30) days.

14. Communications between Flight Information Regions

The Flight Information Centers and Area Control Centers shall have facilities for communications with all adjacent flight information centers and area control centers.

These communication facilities shall in all cases include provisions for messages in a form suitable for retention as a permanent record and delivery in accordance with transit times

specified by regional air navigation agreements.

Unless otherwise prescribed on the basis of regional air navigation agreements, facilities for communications between area control centers serving contiguous control areas shall in addition include provisions for direct speech and, where applicable, data link communications with automatic recording whereby for the purpose of transfer of control using radar, ADS-B or ADS·C data communications can be established instantaneously and for other purposes the communications can normally be established within fifteen (15) seconds.

When so required by agreement between the States concerned in order to eliminate or reduce the need for interceptions in the event of deviations from assigned track, facilities for communications between adjacent flight information centers or area control centers shall include provisions for direct speech along, or in combination with data link communications.

The communication facilities shall be provided with automatic recording.

In all cases where automatic exchange of data between air traffic services computers is required suitable facilities for automatic recording shall be provided. Recordings of data and communications as required above shall be retained for a period of at least thirty days.

Appropriate procedures for direct-speech communications should be developed to permit communication to be made for urgent calls concerning t safety.

15. Surface movement control service

Two-Way radiotelephony communication facilities shall be provided for aerodrome control service for the control of vehicles on the maneuvering area, except where communication by a system of visual signals is deemed to be adequate.

Where conditions warrant, separate communication channels shall be provided for the control of vehicles on the maneuvering area. Automatic recording facilities shall be provided on any such channels.

Recordings of communications as required above shall be retained for a period of at least thirty (30) days.

16. Automatic recording of Surveillance data

Surveillance data from primary and secondary radar equipment or other systems (e.g. ADS-B. ADS·C) used as an aid to air traffic services shall be automatically recorded for use in accident and incident investigations, search and rescue, air traffic control and surveillance systems evaluation and training.

Automatic recordings shall be retained for a period of at least thirty days. When the recordings are pertinent to accident and incident investigations, they shall be retained for longer periods until it is evident that they will no longer be required.

APPENDIX C APPROVAL OF ORGANIZATION CARRYING OUT BUILDING RESTRICTED AREA INFRINGEMENT STUDY

PART I - APPROVAL OF ORGANIZATIONS

1. **Applicability**

This Appendix prescribes the requirements governing:

The certification of an organization providing consultancy service in terms of carrying out complex and deep BRA Infringement Study within the Sultanate of Oman for Aeronautical Telecommunication facilities included in CAR-171.

2. **Facility Scope of BRA Infringement Study**

The BRA Infringement Study might be performed for the following ICAO recognized facilities which are defined in CAR-171:

(1) DME N
(2) VOR
(3) GBAS (VDB & Receiver stations)
(4) ILS (Localizer, Glide-path)
(5) SBAS (ground monitoring station) MLS (Azimuth & Elevation)
(6) Air/Ground TLC/VHF Communication
(7) Primary Radar
(8) SSR
(9) MLAT
(10) WAM

3. **Requirement for Approval**

(1) Organization shall obtain an Approval from the Authority and comply the requirements mentioned herein and other terms and conditions that may be prescribed by Authority from timeto time.
(2) Authority will not accept a BRA Infringement Study conducted by an organization that has not been approved by the Authority to conduct BRA Infringement studies.

4. **Application for Approval**

(1) Each applicant for the grant of an approval for carrying out BRA infringementstudy shall apply to the Authority in the following manner:
   (a) Cover letter submitted to Director General of Civil Aviation regulation – Civil Aviation Authority, The sultanate of Oman
   (b) Filled Application form 171-4 and 171-5. The application forms can be downloaded from CAA website under the related service
   (c) Required document according to checklist 171-4
   (d) Schedule for software demonstration
(2) Credentials of companies intending to carry out BRA Infringement Study shall be verified by Authority, particularly in case of a company intending to take up the assignment for the first time.
(3) CAA may terminate the formal application phase for the lack of contact or inactivity of greater than 90 calendar days

5. **Grant of Approval**

(1) Each applicant shall demonstrate competence in the following aviation fields to obtain an approvalfor carrying out a BRA Infringement Study:
   (a) Effects on communication, navigation and surveillance facilities. Two assessments shall carryout with regard to CNS facilities:

i. Analysis of CNS facilities standard and tolerance based on ICAO Annex 10, Aeronautical Telecommunication.

ii. Radio electric simulations for those CNS facilities whose BRA are infringed (and, when deemed necessary, also for facilities whose BRA are not infringed).

(b) Conduct BRA Infringement Study using electromagnetic 3D modelling or simulation tools as per requirement in para. 9;

(c) Conduct BRA Infringement Study with the standard parameters and limits that are typically inspected during commissioning or periodical flight checks as per *the Authority - Flight Inspection Manual for Radio Navigation Aids, manual no. 1.3.20.*

(d) Conduct BRA Infringement Study to support;

i. Feasibility analysis of new or upgrade airports/equipment's

ii. CAA Planning permission

iii. Radar and Navaids system siting

iv. Interference solving problem of PSR/SSR coverage and radar maps.

(e) Conduct Hazard identification and safety risk assessment related to CNS Performance, if required;

(f) In some cases, a separate study with respect to aviation environment may be essential for decision making. Therefore, the ability to carry out this kind of assessment will be beneficial and shall be stated by proponent.

(2) The applicant shall demonstrate the proposed software capabilities in conducting the service.

(3) The Authority reserves the right to conduct an audit of the organization in the process of approval / certification or as part of a periodic surveillance, as deemed necessary.

(4) The applicant shall bear all costs required to conduct audit as part of approval/certification

6. **Validity of Approval**

(1) An approval of organization carrying out building restricted area infringement study will bevalid for a period of 2 years from the date of issue.

(2) Such approval will remain valid during that period unless the approval is revoked, suspended orcancelled by the Authority in the event the Applicant and/or its agents:

(a) fail to demonstrate compliance with the requirements specified by the Authority; or

(b) Fail to provide sufficient level of expertise or service requested.

7. **Certification Fees**

Each applicant for the grant of an approval for carrying out building restricted area infringement study shall pay the appropriate application process fees prescribed by this regulation.

PART II - APPROVAL REQUIREMENTS

1. Simulation Tools Requirements

The approved organization for carrying out building restricted area infringement study shall use simulation software with the capability to perform:

(1) The general BRA Infringement Study including:
- (a) CAD modelling of the environment around CNS equipment antennas, taking into consideration the electric properties of the materials constituting each element;
- (b) Geographical utilities (GIS) for locating elements on a geographic continuum using most common types of datum and projections including WGS84.;
- (c) The modelling functionality (including terrain models, obstacles, interfering system, ground and airborne NAV-AIDs equipment characteristic etc.) to model the real propagation phenomena in a complex electromagnetic airport scenario where signals (VOR, DME, ILS, TLS, ATC Radar) interfere with artificial or natural obstruction.
- (d) General antenna pattern definition and modelling
- (e) Terrain Clutter Analysis and EM Visibility analysis (for ATC Radar)
- (f) Performance Simulation of CNS Equipment in the real site considering multipath effect from elements such as terrain, obstacles and other site elements (such as fences, wires and towers).
- (g) Interference analysis between two system
- (h) The post-processing of the EM analysis results.
- (i) Digital terrain Model Inspection.
- (j) Optical Visibility Analysis for minimum Radio Altitude to see the antenna (line of sight) forall CNS equipment
- (k) Radio Coverage Analysis (field Strength) as per ICAO Limit for all CNS equipment, including PSR/SSR coverage analysis at constant altitude or height and along a route segment for allCNS equipment.
- (l) Basic Coverage.
  - i. The calculation shall be based on the antenna pattern transmission characteristics (operating frequency and transmitted power)
  - ii. Terrain and environment obstruction shall be considered.
  - iii. Using the Multi-coverage add on, it must be evaluated redundancy areas in configuration of Nav-Aids and simulate possible faults of the sensors involved.
- (m) Having capability of coping with EMC (electromagnetic Compatibility) and EMI (Electromagnetic Interference) issues in complex airport and air navigation scenarios.

(2) Specific Equipment BRA Infringement simulation software:
- (a) ILS
  - i. ILS Simulation software must have the capability of Localizing and gliding path antenna modeling, CAD modeling for the environment around the Localizer and Glide path antennas to display environmental models around the installed equipment to implement the Flight Inspection simulations of ILS equipment.
  - ii. ILS simulation software must be able to evaluate ILS (LLZ, GP) performance including the scope of the beam and the level of accuracy (Signal strength, DDM and SDM Analysis precision analysis) based on:
    - a. Frequency / Channel
    - b. Antenna Geometry / feeding and parameters
    - c. Airport Layout
    - d. Terrain model digital operational area of ILS equipment
    - e. Barrier geometry and parameters defined in ICAO Standard

iii. The software must have capability for:
   a. "what if analysis" before starting work,
   b. "benefit analysis" if there is a change in location,
   c. evaluation of new building clearance,

iv. Critical and Sensitive calculation and analysis of ILS areas and consider the amount of static disturbance, location, sizes and orientation of the aircraft operated in the airport and other vehicles, runway and taxiway layout and the antenna location of LLZ and GP.
   In particular, the maximum heights of vertical aircraft tail surfaces likely to be encountered must be established, together with all possible orientations at a given location, which may include non-parallel or non-perpendicular orientations with respect to the runway.

v. Selection of types and number of antennas for replacement or procurement of new ILS equipment and "Bend analysis" to determine the ILS signal interference source.

(b) VOR

i. Simulation tools must have the ability to simulate all the available types of signal performance VOR systems on the market (Conventional VOR or Doppler VOR) in the actual location. It can also be used to evaluate the elements of cartography, terrain morphology, distribution of artificial obstacles including buildings and the effect of season (weather) on the parameters of the existing equipment at the affected location.

ii. Simulation for VOR must have the option to select equipment antenna model, network, surrounding environment (3D site/obstacles) and VOR receiver system on the aircraft.

iii. VOR simulation software must have the capability to run “what if” analysis before execution any site work.

iv. VOR modules must have the ability to calculate the Error Bearings related to the multipath effect of the environment around the VOR antenna.

v. Simulation tools shall have the capability to perform numerical analysis for the evaluation of the dynamic impact on Wind Turbine on VOR equipment in term of:
   a. VOR System definition
   b. Wind Farm characteristics definition
   c. Operational scenario definition
   d. Static bearing Error analysis
   e. Dynamic Bearing Error Analysis

(c) MULTILATERATION

The MLAT simulation software must be capable to compute the following set of parameters:

i. Number of sensors in view from each point belonging to the analysis domain.

ii. Area of radio coverage of each sensor

iii. Dilution of Precision (Horizontal and Vertical)

iv. Aircraft position error components by means of Multilateration algorithm taking into account such as masking and multipath effects, thermal noise and RX synchronization noise, and TX and RX antenna pattern

v. SSR pulse reply reconstruction in a specific point belonging to the analysis domain, taking into account such as masking and multipath effects, thermal noise and RX synchronization noise, and TX and RX antenna pattern

vi. The effect of surrounding environment shall be analyzed using raytracing numerical technique which are able to compute to a high degree of precision both the signal in space (taking into account the reflection and diffraction effect from airport structure) and the signal spreading due to multipath construction.

(d) WAM

WAM simulation software must have capability to perform the evaluation of a WAM configuration in terms of:

i. number of usable (or in coverage) sensors;
ii. geometrical benefit (DOPs);
iii. statistical positioning accuracy estimation;
iv. Performance verification with additional receiving stations, defined by the user during data analysis.

(e) DME N

i. DME simulation software must be able to compute:
   a. the DME indication error due to multipath i.e. the difference between the exact transponder-to interrogator distance and the one measured by means of DME.
   b. the Path Following Error (PFE) and Control Motion Noise (CMN) error components of the DME/P error;
   c. the multipath power delay profile, i.e. the computation, in a select observation point, of the amplitude of the DME signal components (propagating along reflection and diffraction paths) versus the transmission delay respect to the direct signal;
   d. the signal strength along the aircraft path under analysis.
ii. DME simulation software must have the capability to model the antenna and related feeding Network, surrounding environment (3D site/obstacles), aircraft receiving system and conduct performance simulation of DME (DME/N and DME/P) equipment in real site. Considering the elements such as: cartography, morphological properties of the terrain, artificial obstacles scattering, including material properties and season effects on radio electrical parameters of site elements.
iii. DME simulation software must consider the following data input during conducting the performance:
   a. Frequency
   b. Transmitted power
   c. Antenna geometry/feeding and related parameters
   d. Airport layout,
   e. Digital terrain model of the area within the DME operative area
   f. Obstacles geometry and parameters
iv. DME simulation software must allow the user to model all the types of DME system available on the market i.e. DME/N and DME P.

(f) Air/Ground Radio Communication

i. G/A communication simulation software must be able to inspect the Ground –Air Communication system performance in terms of the signal strength at the area of interest for the ground-air TLC operations, ray tracing, near field, hazard simulations and antenna pattern modification due to the surrounding environment by modelling environment to simulate the inspection executed during flight Inspection.
ii. G/A simulation software must consider the following data input in conducting the performance:
   a. Frequency
   b. Transmitted power
   c. Antenna geometry/feeding and related parameters

d. Airport layout,

e. Digital terrain model of the area within the G-A Communication system operative area

f. Obstacles geometry and parameters

(g) RADAR

RADAR simulation software must have the capability to:

i. inspect the RADAR (primary, secondary and SMR) performance in terms of:
   a. Radar LOS and signal coverage
   b. the signal strength in the area of interest for the RADAR operations;
   c. the antenna gains modifications due to the multipath contributions from environment obstacles;
   d. antenna pattern degradation, shadow regions, probability of detection and OBA (Off Bore-sight Angle)
   e. false targets detection caused by reflection/diffraction from obstacles placed around the radar antenna;
   f. False replies analysis for PSR-SSR equipment
ii. modeling environment, which enables the user to simulate the inspection executed during the Nav-aid flight checks.
iii. evaluate the joint coverage and visibility of the RADARs configuration. The configuration may be also a hybrid one, which means a configuration of both PSR and SSR.
iv. Radar simulation software must be able to execute the following set of analyses:
   a. What if analysis before the execution of any site work
   b. Cost/benefit analysis of the site modification
   c. New building clearance;
   d. Antenna selection for new installations and/or equipment replacement;
   e. Analysis for the search of most powerful sources of interference
v. Radar simulation software must consider the following input data:
   a. Frequency
   b. Transmitted power
   c. Antenna geometry/feeding and related parameters
   d. Airport layout,
   e. Digital terrain model of the area within the RADAR operative area
   f. Obstacles geometry and parameters

(h) . EMI

EMI simulation software must have the capability to solve problems related to the radiated components of the electromagnetic interference.

i. The software must be able to perform the following task:
   a. Rx and TX equipment modeling starting from constructor data sheets.;
   b. CAD modeling the environment;
   c. Interference ratio analysis;
   d. Electric field: the value of electromagnetic field (in V/m).
   e. S/ (N+I) ratio: the ratio of signal to Noise+ Interference on the selected point.
   f. Critical systems: it is indicated all the possible transmitters that can interfere with on board receiver.
   g. Interference zones: the region in which it is possible to interfere with on board receiver
   h. Interference contours: the contour of interference zones.
   i. Interference margins
v. EMI software must have the capability to perform simulation for fixed interfered object

and moving interfered object.

(i) WIND FARM.

Wind Farm simulation software must have capability to:

i. evaluate the effects of wind farm effects, in terms of false echoes, on the PSR (Primary Surveillance Radar), SSR (Secondary Surveillance Radar) and VOR.

ii. perform false echo analysis in order to evaluate if the metallic supports of the wind turbines give arise to the false echoes for a fixed aircraft domain.

iii. Execute a PSR or SSR Wind Farm Post Processing, with the following outputs:

a. False target Probability and the total
b. False Target percentage of occurrences
c. STC Map
d. Air Traffic Statistics

(3) Output of Simulation Software:

(a) Standard Cartesian diagrams or 2D surface mapping of each parameter (color coded).
(b) Flight inspection style outputs.

(4) The numerical tools shall cover the whole aeronautical frequency band and be based on themost sophisticated and widely known computational electromagnetic techniques, such as:

(a) Geometrical Theory of Diffraction (GTD/UTD)
(b) Physical Optics (PO/PTD/ITD)
(c) Method of Moments (MOM)
(d) Deygout Method
(e) Parabolic Equations (PE)

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