LEGAL NOTICE NO. 38

THE CIVIL AVIATION ACT

(Cap. 394)

THE CIVIL AVIATION (COMMUNICATION SYSTEMS) REGULATIONS, 2025

ARRANGEMENT OF REGULATIONS

PART I –PRELIMINARY

THE CIVIL AVIATION ACT

(Cap. 394)

THE CIVIL AVIATION (COMMUNICATION SYSTEMS) REGULATIONS, 2025

IN EXERCISE of the powers conferred by section 82 of the Civil Aviation Act, the Cabinet Secretary for Roads and Transport makes the following Regulations—

THE CIVIL AVIATION (COMMUNICATION SYSTEMS) REGULATIONS 2025

PART I- PRELIMINARY PROVISIONS

Citation.

1. These Regulations may be cited as the Civil Aviation (Communication Systems) Regulations, 2025.

Interpretation.

2. In these Regulations unless the context otherwise requires–

"Adaptive modulation" means a system's ability to communicate with another system using multiple burst profiles and a system's ability to subsequently communicate with multiple systems using different burst profiles;

"ADS" means an abbreviation for automatic dependent surveillance;

"Aerodrome" means a defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft;

"aeronautical administrative communications" means communications necessary for the exchange of aeronautical administrative messages;

"Aeronautical Information Publication (AIP)" means publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation;

"aeronautical operational control" means Communication required for the exercise of authority over the initiation, continuation, diversion or termination of flight for safety, regularity and efficiency reasons;

"Aeronautical Mobile Airport Communications System (AeroMACS)" means a high-capacity data link supporting mobile and fixed communications on the aerodrome surface;

"AeroMACS downlink (DL)" means the transmission direction from the base station (BS) to the mobile station (MS);

"AeroMACS uplink (UL)" means the transmission direction from the mobile station (MS) to the base station (BS);

"AeroMACS handover" means the process in which a mobile station (MS) migrates from the air-interface provided by one base station (BS) to the air-interface provided by another BS. A break-before-make AeroMACS handover is where service with the target BS starts after a disconnection of service with the previous serving BS;

"aeronautical telecommunication network" means a global internetwork architecture that allows ground, air-ground and avionic data sub-networks to exchange digital data for the safety of air navigation and for the regular, efficient and economic operation of air traffic services;

"Air traffic service" means a generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service);

"Aircraft address" means a unique combination of 24 bits available for assignment to an aircraft for the purpose of air-ground communications, navigation and surveillance;

"aircraft data circuit-terminating equipment" means an aircraft specific data circuit-terminating equipment that is associated with an airborne data link processor and it operates a protocol unique to Mode S data link for data transfer between air and ground;

"aircraft data link processor" means an aircraft-resident processor that is specific to a particular air-ground data link (e.g. Mode S) and which provides channel management, and segments and/or reassembles messages for transfer and it is connected to one side of aircraft elements common to all data link systems and on the other side to the air-ground link itself;

"aircraft earth station" means a mobile earth station in the aeronautical mobile-satellite service located on board an aircraft;

"aircraft/vehicle" means a machine or device capable of atmospheric flight, or a vehicle on the airport surface movement area (i.e. runways and taxiways);

"aircraft" means the term aircraft may be used to refer to Mode S emitters (such as aircraft/vehicles), where appropriate;

"air-initiated protocol" means a procedure initiated by a Mode S aircraft installation for delivering a standard length or extended length downlink message to the ground;

"application entity" means a set of International Standards/ Open Systems Interconnection communication capabilities of a particular application process;

"Aeronautical Telecommunication Network end-system" means an Aeronautical Telecommunication Network host in Internet Protocol Suite terminology;

"Aeronautical Telecommunication Network host" means an Aeronautical Telecommunication Network end-system in Open Systems Interconnection terminology;

"Aeronautical Telecommunication Network security services" means a set of information security provisions allowing the receiving end system or intermediate system to unambiguously identify (i.e. authenticate) the source of the received information and to verify the integrity of that information;

"ATN" means an abbreviation for Aeronautical Telecommunication Network;

"Air Traffic Services inter-facility data communication" means an automated data exchange between air traffic services units in support of flight notification, flight coordination, transfer of control and transfer of communication;

"Air Traffic Services message handling service" means an Aeronautical Telecommunication Network application consisting of procedures used to exchange Air Traffic Services messages in store-and-forward mode over the Aeronautical Telecommunication Network such that the conveyance of an Air Traffic Services message is in general not correlated with the conveyance of another Air Traffic Services message by the service provider;

"Air Traffic Services Message Handling System" means the set of computing and communication resources implemented by Air Traffic Services organizations to provide the Air Traffic Services message handling service;

"ATSEP" means Air Traffic Safety Electronics Personnel;

"authorized path" means a communication path suitable for a given message category;

"automatic dependent surveillance — contract" means a means by which the terms of an automatic dependent surveillance — contract agreement will be exchanged between the ground system and the aircraft, via a data link, specifying under what conditions automatic dependent surveillance — contract reports would be initiated, and what data would be contained in the reports;

"automatic dependent surveillance-broadcast" means a means by which aircraft, aerodrome vehicles and other objects can automatically transmit and/or receive data such as identification, position and additional data, as appropriate, in a broadcast mode via a data link;

"automatic terminal information service" means the automatic provision of current, routine information to arriving and departing aircraft throughout 24 hours or a specified portion thereof;

"Base station (BS)" means a generalized equipment set providing connectivity, management and control of the mobile station (MS);

"BDS" means an abbreviation for Comm-B Data Selector;

"bit error rate (BER)" means the number of bit errors in a sample divided by the total number of bits in the sample, generally averaged over many such samples;

"broadcast" means a transmission of information relating to air navigation that is not addressed to a specific station or stations

"broadcast" means the protocol within the Mode S system that permits uplink messages to be sent to all aircraft in coverage area, and downlink messages to be made available to all interrogators that have the aircraft wishing to send the message under surveillance;

"burst" means a time-defined, contiguous set of one or more related signal units which may convey user information and protocols, signalling, and any necessary preamble;

"burst profile" means a set of parameters that describe the uplink or downlink transmission properties associated with an interval usage code and each profile contains parameters such as modulation type, forward error correction (FEC) type, preamble length, guard times, etc;

"capability report" means information identifying whether the transponder has a data link capability as reported in the capability field of an all-call reply or squitter transmission;

"carrier-to-multipath ratio" means the ratio of the carrier power received directly, i.e. without reflection, to the multipath power, i.e. carrier power received via reflection;

"carrier-to-noise density ratio" means the ratio of the total carrier power to the average noise power in a 1 Hertz bandwidth, usually expressed in decibel-Hertz;

"channel rate accuracy" means this is relative accuracy of the clock to which the transmitted channel bits are synchronized;

Note: For example, at a channel rate of 1.2 kilobits/s, maximum error of one part in 106 implies the maximum allowed error in the clock is $\pm 1.2 \times 10\text{-}3$ Hertz.

"channel rate" means the rate at which bits are transmitted over the Radio Frequency channel and these bits include those bits used for framing and error correction, as well as the information bits. For burst transmission, the channel rate refers to the instantaneous burst rate over the period of the burst;

"circuit mode" means a configuration of the communications network which gives the appearance to the application of a dedicated transmission path;

"close-out" means a command from a Mode S interrogator that terminates a Mode S link layer communication transaction;

"cluster of interrogators" means two or more interrogators with the same interrogator identifier (II) code, operating cooperatively to ensure that there is no interference to the required surveillance and data link performance of each of the interrogators, in areas of common coverage;

"CNS" means Communication, Navigation and Surveillance;

"comm-A" means a 112-bit interrogation containing the 56-bit MA message field and this field is used by the uplink standard length message and broadcast protocols;

"comm-B" means a 112-bit reply containing the 56-bit MB message field and this field is used by the downlink standard length message, ground-initiated and broadcast protocols;

"Comm-B Data Selector" means the 8-bit Comm-B Data Selector code determines the register whose contents are to be transferred in the MB field of a Comm-B reply and It is expressed in two groups of 4 bits each, BDS1 (most significant 4 bits) and BDS2 (least significant 4 bits);

"comm-C" means a 112-bit interrogation containing the 80-bit MC message field and this field is used by the uplink extended length message protocol;

"comm-D" means a 112-bit reply containing the 80-bit MD message field and this field is used by the downlink extended length message protocol;

"connection establishment delay" means connection establishment delay, as defined in ISO 8348, includes a component, attributable to the called subnetwork service user, which is the time between the SN- CONNECT indication and the SN-CONNECT response;

Note: This user component is due to actions outside the boundaries of the satellite subnetwork and is therefore excluded from the Aircraft Maintenance Systems(R)S specifications.

"connection" means a logical association between peer-level entities in a communication system;

"controller pilot data link communications" means a means of communication between controller and pilot, using data link for Air Traffic Control communications;

"Convolutional turbo codes (CTC)" means type of forward error correction (FEC) code;

"COSPAS-SARSAT" means Space System for Search of vessels in distress) – (Search and Rescue Satellite-Aided Tracking);

"current slot" means the slot in which a received transmission begins;

"data circuit-terminating equipment" means a network provider equipment used to facilitate communications between data terminal equipment;

"data link capability report" means information in a Comm-B reply identifying the complete Mode S communications capabilities of the aircraft installation;

"data link entity" means a protocol State machine capable of setting up and managing a single data link connection;

"data link initiation capability" means a data link application that provides the ability to exchange addresses, names and version numbers necessary to initiate data link applications;

"data link service sub-layer" means the sub-layer that resides above the media access control Mean Aerodynamic Chord sub-layer;

Note: For Very High Frequency Digital Link Mode 4, the data link service sub-layer resides above the Visual Segment Surface sub-layer. The data link service manages the transmit queue, creates and destroys data link entities for connection oriented communications, provides facilities for the link management entity to manage the data link service and provides facilities for connectionless communications.

"data link-automatic terminal information service" means the provision of automatic terminal information service via data link;

"data signalling rate" means data signalling rate refers to the passage of information per unit of time, and is expressed in bits/second.

Note: $\sum_{i=1}^{i=m} \frac{1}{T_i} \log_2 n_i$ *given by the formula:*

where m is the number of parallel channels, T_i is the minimum interval for the i^{th} channel expressed in seconds, ni is the number of significant conditions of the modulation in the i^{th} channel.

"data terminal equipment" a data terminal equipment is an endpoint of a sub-network connection;

"data transfer delay (95^{th} percentile)" means the 95^{th} percentile of the statistical distribution of delays for which transit delay is the average;

"data transfer delay (95^{th} percentile)" means the 95th percentile of the statistical distribution of delays for which transit delay is the average;

"data transit delay" means in accordance with ISO 8348, the average value of the statistical distribution of data delays and this delay represents the sub-network delay and does not include the connection establishment delay;

"degree of standardized test distortion" means the degree of distortion of the restitution measured during a specific period of time when the modulation is perfect and corresponds to a specific text;

"designated operational coverage area" means the area in which a particular service is provided and in which the service is afforded frequency protection;

"Domain" means a set of end systems and intermediate systems that operate according to the same routing procedures and that is wholly contained within a single administrative domain;

"doppler shift" means the frequency shift observed at a receiver due to any relative motion between transmitter and receiver;

"downlink extended length message" means extended length downlink communication by means of 112-bit Mode S Comm-D replies, each containing the 80-bit Comm-D message field (MD);

"downlink" means the transmission of data from an aircraft to the ground and Mode S air-to-ground signals are transmitted on the 1 090 Megahertz reply frequency channel;

"effective margin" means that margin of an individual apparatus which is measured under actual operating conditions;

"end-to-end" means pertaining or relating to an entire communication path, typically from the interface between the information source and the communication system at the transmitting end to the interface between the communication system and the information user or processor or application at the receiving end;

"end-user" means an ultimate source and/or consumer of information;

"energy per symbol to noise density ratio" means the ratio of the average energy transmitted per channel symbol to the average noise power in a 1 Hertz bandwidth, usually expressed in decibels;

Note: For A-BPSK and A-QPSK, one channel symbol refers to one channel bit.

"equivalent isotropically radiated power" means the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna (absolute or isotropic gain);

"extended Golay Code" means an error correction code capable of correcting multiple bit errors;

"extended length message" means a series of Comm-C interrogations (uplink extended length message) transmitted without the requirement for intervening replies, or a series of Comm-D replies (downlink extended length message) transmitted without intervening interrogations;

"flight information service" means a service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flights;

" FCS" means an abbreviation for frame check sequence;

"forward error correction" means the process of adding redundant information to the transmitted signal in a manner which allows correction, at the receiver, of errors incurred in the transmission;

"frame" means the basic unit of transfer at the link level and inIn the context of Mode S subnetwork, a frame can include from one to four Comm-A or Comm-B segments, from two to sixteen Comm-C segments, or from one to sixteen Comm-D segments;

"frame" means the link layer frame is composed of a sequence of address, control, FCS and information fields and For Very High Frequency Digital Link Mode 2, these fields are bracketed by opening and closing flag sequences, and a frame may or may not include a variable-length information field;

"frequency assignment" means a logical assignment of centre frequency and channel bandwidth programmed to the base station (BS);

"gain-to-noise temperature ratio" means the ratio, usually expressed in dB/K, of the antenna gain to the noise at the receiver output of the antenna subsystem;

Note: The noise is expressed as the temperature that a 1 ohm resistor must be raised to produce the same noise power density.

"gaussian filtered frequency shift keying" means a continuous-phase, frequency shift keying technique using two tones and a Gaussian pulse shape filter;

"general formatter/manager" means the aircraft function responsible for formatting messages to be inserted in the transponder registers which is also responsible for detecting and handling error conditions such as the loss of input data;

"global signalling channel" means a channel available on a worldwide basis which provides for communication control;

"ground data circuit-terminating equipment" means a ground specific data circuit-terminating equipment associated with a ground data link processor which operates a protocol unique to Mode S data link for data transfer between air and ground;

"ground data link processor" means a ground-resident processor that is specific to a particular air-ground data link (e.g. Mode S), and which provides channel management, and segments and/or reassembles messages for transfer;

Note: It is connected on one side (by means of its DCE) to ground elements common to all data link systems, and on the other side to the air-ground link itself.

"ground earth station" means an earth station in the fixed satellite service, or, in some cases, in the aeronautical mobile-satellite service, located at a specified fixed point on land to provide a feeder link for the aeronautical mobile satellite service;

"ground-initiated Comm-B" means the ground-initiated Comm-B protocol allows the interrogator to extract Comm-B replies containing data from a defined source in the MB field;

"ground-initiated protocol" means a procedure initiated by a Mode S interrogator for delivering standard length or extended length messages to a Mode S aircraft installation;

"high performance receiver" means a universal access transceiver receiver with enhanced selectivity to further improve the rejection of adjacent frequency Distance Measuring Equipment interference ;

"IPS" means an abbreviation for Internet Protocol Suite;

"link layer" means the layer that lies immediately above the physical layer in the Open Systems Interconnection protocol model;

Note: The link layer provides for the reliable transfer of information across the physical media. It is subdivided into the data link sub-layer and the media access control sub-layer;

"link management entity" means a protocol State machine capable of acquiring, establishing and maintaining a connection to a single peer system;

Note: A link management entity establishes data link and sub-network connections, "hands-off" those connections, and manages the media access control sub-layer and physical layer. An aircraft link management entity tracks how well it can communicate with the ground stations of a single ground system. An aircraft Very High Frequency Digital Link management entity instantiates an link management entity for each ground station that it monitors. Similarly, the ground Very High Frequency Digital Link management entity instantiates and link management entity for each aircraft that it monitors. A link management entity is deleted when communication with the peer system is no longer viable.

"link protocol data unit" means data unit which encapsulates a segment of an high frequency network protocol data unit;

"link" means a link connects an aircraft data link entity and a ground data link entity and is uniquely specified by the combination of aircraft direct link service address and the ground direct link service address and a different sub-network entity resides above every link endpoint;

"low modulation rates" means modulation rates up to and including 300 bauds;

"M burst" means a management channel data block of bits used in Very High Frequency Digital Link Mode 3 and the burst contains signalling information needed for media access and link status monitoring;

"margin" means the maximum degree of distortion of the circuit at the end of which the apparatus is situated which is compatible with the correct translation of all the signals which it may possibly receive;

"M-ary phase shift keying modulation" means a digital phase modulation that causes the phase of the carrier waveform to take on one of a set of M values;

"media access control" means the sub-layer that acquires the data path and controls the movement of bits over the data path;

"media access protocol data unit" means data unit which encapsulates one or more LPDUs;

"medium modulation rates" means modulation rates above 300 and up to and including 3 000 bauds;

"mobile station (MS)" means a station in the mobile service intended to be used while in motion or during halts at unspecified points;

"mode 2" means a data-only Very High Frequency Digital Link mode that uses D8PSK modulation and a carrier sense multiple access control scheme;

"mode 3" means a voice and data Very High Frequency Digital Link mode that uses D8PSK modulation and a TDMA media access control scheme;

"mode 4" means a data-only Very High Frequency Digital Link mode using a GFSK modulation scheme and self-organizing time division multiple access;

"mode S air-initiated Comm-B protocol" means a procedure initiated by a Mode S transponder for transmitting a single Comm-B segment from the aircraft installation;

"mode S broadcast protocols" means procedures allowing standard length uplink or downlink messages to be received by more than one transponder or ground interrogator respectively;

"mode S ground-initiated Comm-B protocol" means a procedure initiated by a Mode S interrogator for eliciting a single Comm-B segment from a Mode S aircraft installation, incorporating the contents of one of 255 Comm-B registers within the Mode S transponder;

"mode S multisite-directed protocol" means a procedure to ensure that extraction and close-out of a downlink standard length or extended length message is affected only by the particular Mode S interrogator selected by the aircraft;

"mode S packet" means a packet conforming to the Mode S sub-network standard, designed to minimize the bandwidth required from the air-ground link;

Note: ISO 8208 packets may be transformed into Mode S packets and vice-versa.

"mode S specific protocol" means a protocol that provides restricted datagram service within the Mode S sub-network;

"mode S specific services entity" means an entity resident within an XDLP to provide access to the Mode S specific services;

"mode S specific services" means a set of communication services provided by the Mode S system which are not available from other air-ground sub-networks, and therefore not interoperable;

"mode S sub-network" means a means of performing an interchange of digital data through the use of secondary surveillance radar Mode S interrogators and transponders in accordance with defined protocols;

"modulation rate" means the reciprocal of the unit interval measured in seconds which is expressed in bauds;

"M-PSK symbol" means one of the M possible phase shifts of the M-PSK modulated carrier representing a group of log2 M coded chips;

"network" means an abbreviation "N" in ISO 8348;

Note: the word "network" and its abbreviation "N" may be replaced by the word "sub-network" and its abbreviation "SN", respectively, wherever they appear in relation to the sub-network layer packet data performance.

"Notice to airmen (NOTAM)" means a notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned;

"optimum sampling point" means the optimum sampling point of a received universal access transceiver bit stream is at the nominal centre of each bit period, when the frequency offset is either plus or minus 312.5 kilohertz;

"partial usage sub-channelization (PUSC)" means a technique in which the orthogonal frequency division multiplexing (OFDM) symbol subcarriers are divided and permuted among a subset of sub-channels for transmission, providing partial frequency diversity;

"packet" means the basic unit of data transfer among communication devices within the network layer;

"peak envelope power" means the peak power of the modulated signal supplied by the transmitter to the antenna transmission line;

"physical layer protocol data unit" means data unit passed to the physical layer for transmission, or decoded by the physical layer after reception;

"physical layer" means the lowest level layer in the Open Systems Interconnection protocol model and the physical layer is concerned with the transmission of binary information over the physical medium;

"point-to-point" means pertaining or relating to the interconnection of two devices particularly end-user instruments;

Note: A communication path of service intended to connect two discrete end-users are distinguished from broadcast or multipoint service.

"power measurement point" means a cable that connects the antenna to the UAT equipment;

Note: The power measurement point is the end of that cable that attaches to the antenna. All power measurements are considered as being made at the power measurement point unless otherwise specified. The cable connecting the UAT equipment to the antenna is assumed to have 3 decibels of loss.

"quality of service" means the information relating to data transfer characteristics used by various communications protocols to achieve various levels of performance for network users;

"RF" means an abbreviation for Radio Frequency;

"reed-Solomon code" means an error correction code capable of correcting symbol errors;

"reliable link service" means a data communications service provided by the sub-network which automatically provides for error control over its link through error detection and requested retransmission of signal units found to be in error;

"required communication performance" means a statement of the performance requirements for operational communication in support of specific Air Traffic Management functions;

"residual error rate" means the ratio of incorrect, lost and duplicate sub-network service data units to the total number of sub-network service data units that were sent;

"segment" means a portion of a message that can be accommodated within a single MA/MB field in the case of a standard length message, or MC/MD field in the case of an extended length message;

"self-organizing time division multiple access" means a multiple access scheme based on time-shared use of a radio frequency channel employing discrete contiguous time slots as the fundamental shared resource and a set of operating protocols that allows users to mediate access to these time slots without reliance on a master control station;

"Service data unit (SDU)" means a unit of data transferred between adjacent layer entities, which is encapsulated within a protocol data unit (PDU) for transfer to a peer layer;

"Service flow" means a unidirectional flow of media access control layer (MAC) service data units (SDUs) on a connection that is providing a particular quality of service (QoS);

"service volume" means a part of the facility coverage where the facility provides a particular service in accordance with relevant SARPs and within which the facility is afforded frequency protection;

"SLM" means an abbreviation for standard length message;

"slotted aloh" means a random access strategy whereby multiple users access the same communications channel independently, but each communication must be confined to a fixed time slot;

"spot beam" means satellite antenna directivity whose main lobe encompasses significantly less than the earth's surface that is within line-of-sight view of the satellite;

"squitter protocol data unit" means data packet which is broadcast every 32 seconds by a high frequency data link ground station on each of its operating frequencies, and which contains link management information;

"SSR" means an abbreviation for secondary surveillance radar;

"standard length message" means an exchange of digital data using selectively addressed Comm-A interrogations and/or Comm-B replies;

"standard universal access transceiver receiver" means a general purpose universal access transceiver receiver satisfying the minimum rejection requirements of interference from adjacent frequency distance measuring equipment;

"sub network service data unit" means an amount of sub network user data, the identity of which is preserved from one end of a sub network connection to the other;

"SN" means an abbreviation for subnetwork;

"subnetwork connection" means a long-term association between an aircraft data terminal equipment and a ground data terminal equipment using successive virtual calls to maintain context across link handoff;

"subnetwork dependent convergence function" means a function that matches the characteristics and services of a particular subnetwork to those characteristics and services required by the internetwork facility;

"subnetwork entity" means packet layer entity as defined in ISO 8208;

"subnetwork entry time" means the time from when the mobile station starts the scanning for BS transmission, until the network link establishes the connection, and the first network user "protocol data unit" can be sent;

"subnetwork layer" means the layer that establishes, manages and terminates connections across a subnetwork;

"subnetwork management entity" means an entity resident within a GDLP that performs subnetwork management and communicates with peer entities in intermediate or end-systems;

"subnetwork service data unit" means an amount of subnetwork user data, the identity of which is preserved from one end of a subnetwork connection to the other;

"subnetwork" means an actual implementation of a data network that employs a homogeneous protocol and addressing plan, and is under the control of a single authority;

"Subscriber station (SS)" means a generalized equipment set providing connectivity between subscriber equipment and a base station (BS);

"successful message reception" means the function within the universal access transceiver receiver for declaring a received message as valid for passing to an application that uses received universal access transceiver messages;

"synchronous operation" means operation in which the time interval between code units is a constant;

"system" means a Very High Frequency Digital Link-capable entity. A system comprises one or more stations and the associated Very High Frequency Digital Link management entity and the system may either be an aircraft system or a ground system;

"time division duplex (TDD)" means a duplex scheme where uplink and downlink transmissions occur at different times but may share the same frequency;

"time division multiple access" means a multiple access scheme based on time-shared use of an RF channel employing—

(a) discrete contiguous time slots as the fundamental shared resource; and

(b) a set of operating protocols that allows users to interact with a master control station to mediate access to the channel;

"time division multiplex" means a channel sharing strategy in which packets of information from the same source but with different destinations are sequenced in time on the same channel;

"timeout" means the cancellation of a transaction after one of the participating entities has failed to provide a required response within a pre-defined period of time;

"total voice transfer delay" means the elapsed time commencing at the instant that speech is presented to the aircraft earth station or ground earth station and concluding at the instant that the speech enters the interconnecting network of the counterpart aircraft earth station or ground earth station including vocoder processing time, physical layer delay, RF propagation delay and any other delays within an AMS(R)S sub network;

"transit delay" means in packet data systems, the elapsed time between a request to transmit an assembled data packet and an indication at the receiving end that the corresponding packet has been received and is ready to be used or forwarded;

"universal access transceiver ground uplink message" means a message broadcasted by ground stations, within the ground segment of the universal access transceiver frame, to convey flight information such as text and graphical weather data, advisories, and other aeronautical information, to aircraft that are in the service volume of the ground station;

"uplink extended length message" means extended length message uplink communication by means of 112-bit Mode S Comm-C interrogations, each containing the 80-bit Comm-C message field (MC);

"uplink" means a term referring to the transmission of data from the ground to an aircraft. Mode S ground-to-air signals are transmitted on the 1 030 Megahertz interrogation frequency channel;

"user group" means a group of ground and/or aircraft stations which share voice and/or data connectivity;

"UTC" means Coordinated Universal Time;

"Very High Frequency Digital Link management entity" means a Very High Frequency Digital Link -specific entity that provides the quality of service requested by the ATN-defined SN_SME;

" Very High Frequency Digital Link Mode 4 burst" means a Very High Frequency Digital Link Mode 4 burst composed of a sequence of source address, burst ID, information, slot reservation and frame check sequence fields, bracketed by opening and closing flag sequences;

"Very High Frequency Digital Link Mode 4 DLS system" means a Very High Frequency Digital Link system that implements the Very High Frequency Digital LinkMode 4 DLS and subnetwork protocols to carry ATN packets or other packets;

"Very High Frequency Digital Link Mode 4 specific services (VSS) sublayer" means the sublayer that resides above the media access control sublayer and provides VDL Mode 4 specific access protocols including reserved, random and fixed protocols;

"VDL station" means an aircraft-based or ground-based physical entity, capable of VDL Mode 2, 3 or 4;

"VDL" means VHF Digital Link;

"VHF digital link (VDL)" means a constituent mobile subnetwork of the aeronautical telecommunication network, operating in the aeronautical mobile VHF frequency band and may provide non-ATN functions such as, for instance, digitized voice;

"VHF" means Very High Frequency;

"vocoder" means a low bit rate voice encoder/decoder;

"voice unit" means device that provides a simplex audio and signalling interface between the user and Very High Frequency Digital Link;

"voice-automatic terminal information service" means the provision of ATIS by means of continuous and repetitive voice broadcasts;

"VSS user" means a user of the Very High Frequency Digital Link Mode 4 specific services;

"XDCE" means a general term referring to both the aircraft data circuit-terminating equipment and the ground data circuit-terminating equipment; and

"XDLP" means a general term referring to both the aircraft data link processor and the ground data link processor.

Application

3. (1) These Regulations shall apply to a person providing Communication, Navigation and Surveillance Services within designated air spaces and at aerodromes.

(2) These Regulations do not apply to a person providing Communication, Navigation and Surveillance Services to state aircraft.

PART II- GENERAL REQUIREMENTS FOR PROVISION OF COMMUNICATION, NAVIGATION AND SURVEILLANCE SERVICES

Requirements for CNS Facilities.

4. The minimum requirements for planning, installation, commissioning, training, operations and maintenance of the Communications, Navigation and Surveillance (CNS) facilities shall be in accordance with–

(a) these Regulations;

(b) the requirements of the Manual of Implementing Standards (CNS);

(c) the Manual of Operations as provided for in regulation 13.

Certification of ANS Provider.

5. A person who wishes to provide air navigation services or operate a facility to support an air traffic service shall have an air navigation service providers certificate issued in accordance with the Civil Aviation (Certification of Air Navigation Service Providers) Regulations.

Approval Requirement

6. (1) A person shall not provide air navigation services or operate Communication, Navigation and Surveillance facilities or systems in the designated airspace and aerodromes unless the systems or facilities have been approved by the Authority.

(2) A CNS provider shall notify the Authority of its intention to procure, install, use, decommission, upgrade or relocate any communication, navigation and surveillance facility or facilities in the designated airspace and aerodromes not less than thirty days prior to the date of start of the process.

(3) The Authority shall approve installation, use, decommissioning, upgrading or relocation of all the communication, navigation and surveillance facility or facilities in the designated airspace and aerodromes.

Inspections and Audits

7. (1) The Authority shall carry out safety inspections and audits on Communication Navigation and Surveillance facilities, documents and records of the Communication Navigation and Surveillance facilities to determine compliance in accordance with these Regulations.

(2) An inspector of the Authority shall have unrestricted access to the facilities, installations, records and documents of the service provider to determine compliance with these Regulations and required procedures.

Siting and Installation.

8. (1) A CNS provider shall—

(a) establish procedures to ensure that the communication, navigation and surveillance systems—

(i) are operated, maintained, available and reliable in accordance with the requirements specified by the Authority;

(ii) are designed to meet the applicable operational specification for that facility;

(iii) are installed and commissioned as specified by the Authority; and

(iv) conform to the applicable system characteristics and specification standards specified by the Authority; and

(b) determine the site for installation of a new facility based on operational requirements, construction aspects and maintainability.

(2) The facilities under sub-regulation (1) shall be installed by licensed AITs with relevant ratings for the facilities.

Commissioning Requirement.

9. A CNS provider shall—

(a) establish procedures to ensure that each new facility—

(i) is commissioned to meet the specifications for that facility; and

(ii) is in compliance with applicable standards;

(b) ensure that the system performance of the new facility has been validated by the necessary tests, and that all parties involved with the operations and maintenance of the facility, including its maintenance contractors have accepted and are satisfied with the results of the tests;

(c) ensure that procedures include documentation of tests conducted on the facility prior to the commissioning, including those that test the compliance of the facility with the applicable standards and any flight check required.

Availability and Reliability of CNS facilities

10. (1) A CNS Provider shall be responsible for the provision of communication, navigation and surveillance services and facilities to ensure that the telecommunication information and data necessary for the safe, regular and efficient operation of air navigation is available.

(2) The functional specification of each of the CNS provider's telecommunication services shall include the following values or characteristics for each service–

(a) availability;

(b) reliability;

(c) accuracy;

(d) integrity;

(e) mean time between failure (MTBF); and

(f) mean time to repair (MTTR).

(2) The values mentioned in sub-regulation (2) shall be derived or measured from either or both of–

(a) the configuration of each service; and

(b) the known performance of each service.

(3) The CNS provider shall describe in the operations manual the method used to calculate each of the values.

(4) 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) The performance of technical facilities shall be monitored, reviewed and reported against these Regulations.

(6) The CNS provider shall ensure that a facility is installed with main and standby power supply and adequate air conditioning to ensure continuity of operation appropriate to the service being provided.

Interface arrangement for support services.

11. A CNS service provider shall formalize interface arrangements where applicable with external organizations in the form of service level agreements, detailing the following–

(a) interface and functional specifications of the support service;

(b) service level of the support service such as availability, accuracy, integrity and recovery time of failure of service; and

(c) monitoring and reporting of the operational status of the service to the service provider.

Record Keeping and documentation.

12. (1) A CNS service provider shall–

(a) hold copies of relevant equipment manuals, technical standards, practices, instructions, maintenance procedures, site logbooks, systems backup data, equipment and test gear inventory and any other documentation that are necessary for the provision and operation of the facility;

(b) establish a procedure for the control of the documentation required under these Regulations;

(c) keep records under the control of the relevant key personnel;

(d) control access to the records system to ensure appropriate security.

(2) The CNS provider shall ensure that data and voice for air navigation service operational systems are recorded continuously and procedures established for the retention and utilization of these recordings for analysis.

(3) A CNS provider shall maintain all documents and records which are necessary for the operation and maintenance of the service and make available copies of these documents to personnel where needed.

(4) These documents shall include–

(a) a copy of these Regulations;

(b) the CNS provider's operations manual;

(c) International Civil Aviation Organization Annex 10 Volumes I to V, International Civil Aviation Organization Document 8071 - Manual on Testing of Radio Navigation Aids, and other relevant International Civil Aviation Organization documents;

(d) records of malfunction and safety incident reports;

(e) records of internal audit reports;

(f) agreements with other organizations

(g) records of investigation into serious incidents;

(h) records of staff deployment, duty and leave rosters;

(i) records of equipment spares;

(j) records of job description, training programme and plan of each staff member; and

(k) all related air navigation service technical standards and technical guidance material developed by the Authority.

(5) A document retained for this regulation shall be retained for at least three years if paper based and one hundred and eighty days if computer based.

(6) The CNS provider shall establish a process for the authorization and amendment of these documents to ensure that they are constantly updated and ensure that–

(a) the currency of the documentation can be readily determined;

(b) amendments of the documentation are controlled in accordance with established quality management principles;

(c) only current versions of documents are available; and

(d) the person authorising the creation and any revision is identified.

(7) The CNS provider shall ensure that where documents are held as computer based records and where paper copies of computer based records are made, they are subjected to the same control as paper documents

(8) A CNS provider shall establish procedures to identify, collect, index, store, maintain, and dispose records covering–

(a) the performance and maintenance history of each facility;

(b) the establishment of the periodic test programmes for each facility;

(b) each item of test equipment required for the measurement of critical performance parameters;

(c) each reported or detected facility malfunction;

(d) each internal quality assurance review; and

(e) each person who is authorised to place facilities into operational service.

Operations Manual.

13. (1) A CNS provider shall develop an operations manual that demonstrates the CNS Provider's compliance with these Regulations.

(2) The contents of the operations manual shall contain–

(a) the information required of the CNS Provider in accordance with these regulations;

(b) an organization chart of the CNS Provider and its maintenance contractors, if any, that shows the position of each personnel and the name, qualification, experience, duties and responsibilities of personnel who are responsible for ensuring the compliance of the organization with the requirements provided under these Regulations;

(c) an overall operation and maintenance plan for the aeronautical telecommunication service, and for each facility, an operation and maintenance plan, as described in these regulations document;

(d) for each facility, information on the compliance of the facility with these regulations and the applicable aeronautical telecommunication standards; and

(e) the system performance target of each facility, such as its availability and reliability.

(3) The operations manual shall consist of a main manual covering the main areas that need to be addressed, as well as separate supporting documents and manuals (such as the operation and maintenance plan of each facility) that are referred to in the main manual.

(4) The CNS provider shall control the distribution of the operations manual and ensure that it is amended whenever necessary to maintain the accuracy of the information in the operations manual and to keep its contents up to date.

(5) A CNS provider shall establish an operation and maintenance plan for each facility which shall include–

(a) a procedure for the periodic inspection and testing of each facility to verify that it meets the operational and performance specifications of that facility;

(b) details of flight test, if necessary, such as the standards and procedures to be used and flight test interval, which shall be in compliance with guidelines specified by the Authority;

(c) the interval between periodic inspection and flight test and the basis for that interval and whenever the interval is changed, the reasons for such change shall be documented;

(d) the operation and maintenance instructions for each facility;

(e) an analysis of the number of personnel required to operate and maintain each facility taking into account the workload required;

(f) the corrective plan and procedures for each facility, including such as whether the repair of modules and component are undertaken in-house or by equipment manufacturers; and the spare support plan for each facility;

(g) the maintenance plan or the operating and maintenance instructions for each facility specifying the test equipment requirements for all levels of operation and maintenance undertaken.

Periodic inspection and testing, security of ANSP facilities

14. (1) A CNS provider shall establish a procedure for the periodic inspection and testing of the communication, navigation and surveillance systems to verify that each facility meets the applicable operational requirements and performance specifications for that facility.

(2) A CNS provider shall ensure –

(a) that appropriate inspection, measuring and test equipment are available for staff to maintain the operation of each facility

(b) the control, calibration and maintenance of such equipment so that they have the precision and accuracy necessary for the measurements and tests to be performed.

(3) Periodic inspection shall include–

(a) security of the facility and site;

(b) adherence to the approved maintenance programme;

(c) upkeep of the equipment, building, site and site services; and

(d) adequacy of facility records and documentation.

(4) The CNS Provider shall implement the security programme for the Communication, Navigation and Surveillance Systems in line with the ANSP's security procedures manual as contained in the Civil Aviation (Certification of Air Navigation Service Providers) Regulations.

(5) The security programme required under sub regulation (4) shall specify the physical security requirements, practices, and procedures to be followed for the purposes of minimising the risk of destruction of, damage to, or interference with the operation of communication, navigation and surveillance facility.

(6) A CNS provider shall make a test transmission if:

(a) the transmission is necessary to test a service, facility or equipment; and

(b) within a reasonable time before commencing the transmission, the users have been informed about the transmission;

(c) at the commencement of the transmission, the service provider identifies the transmission as a test transmission; and

(d) the transmission contains information identifying it as a test transmission.

(7) A CNS provider shall ensure that–

(a) communication navigation and surveillance systems and services are protected against service attacks to a level consistent with the application service requirements;

(b) all end-systems supporting air navigation security services shall be capable of authenticating the identity of peer end-systems, authenticating the source of messages and ensuring the data integrity of the messages;

(c) strategies and best practices on the protection of critical information and communications technology systems used for civil aviation purposes are developed and implemented;

(d) policies are established to ensure that, for critical aviation systems–

(i) system architectures are secure by design;

(ii) systems are resilient;

(iii) methods for data transfer are secured, ensuring integrity and confidentiality of data;

(iv) system monitoring, and incident detection and reporting, methods are implemented; and

(v) forensic analysis of cyber incidents is carried out.

Flight Inspection and facility check after accident or incident

15. A CNS provider shall–

(a) ensure that radio navigation aids are available for use by aircraft engaged in air navigation and that the radio navigation aids are subjected to periodic ground and flight inspections;

(b) establish a procedure to check and accurately record the operating condition of any communication, navigation and surveillance facility that may have been used by an aircraft that is involved in an accident or incident.

CNS Personnel Training and Other Requirements

16. (1) A CNS Provider shall–

(a) ensure that it employs sufficient number of personnel who possess the skills and competencies required in the provision of the aeronautical telecommunication service;

(b) provide in the Manual of Air Navigation Services Operations an analysis of the personnel required to perform the Communication Navigation and surveillance services for each facility taking into account the duties and workload required;

(c) develop job descriptions for each of its staff that depict the job purpose, key responsibilities, and outcome to be achieved of each staff;

(d) develop an overall training policy and programme for the organization that shall lay down;

(e) designate an officer in charge of training and/or on-the-job training at the operational stations;

(f) maintain individual training records for each of its staff;

(g) conduct an annual review of the training plan for each staff at the beginning of the year to identify any gaps in competency and changes in training requirement and prioritize the type of training required for the coming year; and

(h) ensure that the training requirements of these regulations are similarly applied to its maintenance contractors, if any.

(2) The On-the-Job Training officer in sub-regulation 1(e) shall have satisfactorily completed the on-the-Job Training instructional techniques course.

(3) A person shall not perform a function related to the installation, training, operation or maintenance of any communication, navigation and a surveillance system unless—

(a) that person has successfully completed training in the performance of that function in line with the Air Traffic Safety Electronics Personnel competency-based training requirements;

(b) the CNS provider is satisfied that the technical person is competent in performing that function; and

(c) that person has been certified in accordance with requirements of the appropriate Civil Aviation Regulations.

Radio frequency management and interference reporting.

17. A CNS provider shall–

(a) establish a procedure for the management and protection of aeronautical radio spectrum;

(b) designate a responsible person to control any frequency allocation within the aeronautical radio spectrum to ensure that there is no conflict and interference to any radio stations or facility;

(c) ensure that there is no wilful transmission of unnecessary or anonymous radio signals, messages or data by any of its radio stations;

(d) establish procedures with the communication authority to address occurrence of radio frequency interference;

(e) ensure that any frequency interference occurrences are reported, investigated and follow-up actions taken to prevent recurrence;

(f) keep updated records of all allocated frequencies; and ensure that no facility providing radio signals for the purpose of aviation safety shall be allowed to continue in operation, if there is a suspicion or any cause to suspect that the information being provided by that facility is erroneous.

Facility malfunction incident and operational status of CNS systems.

18. (1) A CNS provider shall establish procedures for the reporting, collection and notification of facility malfunction incidents and safety incidents.

(2) The procedures in sub-regulation (1) shall be documented in the Manual of Air Navigation Services Operations.

(3) A CNS provider shall compile reports of incidents and review such reports periodically with its maintenance contractors to–

(a) determine the cause of the incidents and determine any adverse trends;

(b) implement corrective and preventive actions where necessary to prevent recurrence of the incidents; and

(c) implement any measures to improve the safety performance of the aeronautical telecommunication service.

(4) The CNS provider shall–

(a) report any serious service failure or safety incident to the Authority and investigate such incidents in order to establish how and why the incident happened, including possible organizational contributing factors and to recommend actions to prevent a recurrence; and

(b) ensure that information on the operational status of each communication, navigation and surveillance facility that is essential for the enroute, approach, landing, and take-off phases of flight is provided to meet the operational needs of the service being provided.

Proficiency certification program.

19. (1) A CNS provider shall develop proficiency certification program for Air Traffic Safety Electronics Personnel engaged in the installation, training, operations and maintenance of Communication, Navigation and Surveillance systems in accordance with guidelines specified by the Authority.

(2) The Authority shall certify Air Traffic Safety Electronics Personnel involved in the installation, training, operations and maintenance of Communication, Navigation and Surveillance systems in accordance with the appropriate Civil Aviation Regulations.

Safety case, notification of Aeronautical facility status and interruption to service

20. (1) The CNS provider shall ensure that for safety critical systems, including automated air traffic control systems, communication systems and instrument landing systems, the commissioning of such systems shall include the conduct of a safety case or equivalent.

(2) The CNS provider shall ensure that human factors principles are observed in the design, operations and maintenance of aeronautical telecommunication facilities.

(3) A CNS provider shall, as soon as possible—

(a) forward to the Aeronautical Information Services—

(i) information on the operational details of any new facility for publication in the Aeronautical Information Publication;

(ii) information concerning any change in the operational status of any existing facility, for the issue of a Notice to Airmen; and

(b) ensure that the information forwarded under sub-paragraph (a) has been accurately published.

(4) A CNS provider shall–

(a) establish a procedure to be used in the event of interruption to or when upgrading communication, navigation and surveillance systems;

(b) specify an acceptable recovery time for each service.

PART III– AERONAUTICAL TELECOMMUNICATION NETWORK

Support of aeronautical telecommunicatio n network application.

21. (1) An Aeronautical Telecommunication Network shall specifically and exclusively be used to provide digital data communications services to air traffic service provider organizations and aircraft operating agencies in support of–

(a) air traffic services communications with aircraft;

(b) air traffic services communications between air traffic service units;

(c) aeronautical operational control communications; and

(d) aeronautical administrative communications.

(2) Aeronautical Telecommunication Network communication services in sub-regulation (1) shall support Aeronautical Telecommunication Network applications.

Requirements for implementation of Aeronautical Telecommunicatio n Network

22. (1) Requirements for implementation of the Aeronautical Telecommunication Network shall be made on the basis of regional air navigation agreements.

(2) The agreements in sub-regulation (1) shall specify the area in which the communication standards for the Aeronautical

Telecommunication Network/Open System Interconnection or the Aeronautical Telecommunication Network /Internet Protocol Suite are applicable.

(3) The Aeronautical Telecommunication Network shall either use International Organization for Standardization, communication standards for Open Systems Interconnection or use the Internet Society communications standards for the Internet Protocol Suite.

(4) The Aeronautical Fixed Telecommunication Network/Aeronautical Message Handling System gateway shall ensure the interoperability of Aeronautical Fixed Telecommunication Network stations and networks with the Aeronautical Telecommunication Network.

(5) An authorized path(s) for the Aeronautical Fixed Telecommunication Network shall be defined on the basis of a predefined routing policy.

(6) The Aeronautical Telecommunication Network shall–

(a) transmit, relay and deliver messages in accordance with the priority classifications and without discrimination or undue delay;

(b) provide means to define data communications that can be carried only over authorized paths for the traffic type and category specified by the user;

(c) provide communication in accordance with the rescribed Required Communication Performance;

(d) operate in accordance with the communication priorities specified in the Manual of Implementing Standards (CNS);

(e) enable exchange of application information when one or more authorized paths exist;

(f) notify the appropriate application processes when no authorized path exists;

(g) make provisions for the efficient use of limited bandwidth sub-networks;

(h) enable an aircraft intermediate system to connect to a ground intermediate system via different sub-networks

(i) enable an aircraft intermediate system to connect to different ground intermediate systems;

(j) enable the exchange of address information between applications;

(k) be accurate to within 1 second of UTC where the absolute time of day is used.

Aeronautical Telecommunicatio n Network Applications Requirements

23. (1) The Aeronautical Telecommunication Network (ATN) shall support the Data Link Initiation Capability applications when air-ground data links are implemented.

(2) The Aeronautical Telecommunication Network / Open System Interconnection end-system shall support the following

Directory Services application functions when Aeronautical Message Handling System and security protocols are implemented–

(a) directory information retrieval; and

(b) directory information modification.

Air-ground applications.

24. The Aeronautical Telecommunication Network shall be capable of supporting one or more of the following applications-

(a) Automatic Dependent Surveillance – Contract;

(b) Controller Pilot Data Link Communication; and

(c) Flight Information Service including Automatic Terminal Information Service and Meteorological Reports.

Ground-Ground Applications

25. The Aeronautical Telecommunication Network shall be capable of supporting the following applications–

(a) Air Traffic Service Interfacility Data Communication; and

(b) Air Traffic Service Message Handling Services applications.

PART IV –ATN COMMUNICATION SERVICE REQUIREMENTS

ATN/ Internet Protocol Suite upper layer communications service

26. An Aeronautical Telecommunication Network host shall be capable of supporting the Aeronautical Telecommunication Network /Internet Protocol Suite upper layers including an application layer.

ATN /Open System Interconnection upper layer communications service.

27. An Aeronautical Telecommunication Network /Open System Interconnection end-system shall be capable of supporting the Open System Interconnection Upper Layer Communications Service including session, presentation and application layers.

ATN/Internet Protocol Suite communications service

28. (1) An Aeronautical Telecommunication Network host shall be capable of supporting the Aeronautical Telecommunication Network -/Internet Protocol Suite including–

(a) transport layer in accordance with Transmission Control Protocols and User Datagram Protocols; and

(b) network layer in accordance with Internet Protocol version 6.

(2) An Internet Protocol Suite router shall support the Aeronautical Telecommunication Network layer in accordance with Internet Protocol (version 6) and multiprotocol extensions.

ATN/Open System Interconnection communications service.

29. (1) An Aeronautical Telecommunication Network /Open System Interconnection end-system shall be capable of supporting the Aeronautical Telecommunication Network including the –

(a) transport layer in accordance with International Organization for Standardization Transport Protocol Class 4 and optionally Connectionless Transport Protocol; and

(b) network layer in accordance with International Organization for Standardization, Connectionless Network Protocol.

(2) An ATN Intermediate System shall support the Aeronautical Telecommunication Network layer in accordance with International Organization for Standardization, Connectionless Network Protocol

and International Organization for Standardization, Inter-domain routing protocol.

ATN naming and addressing requirements.

30. (1) The Aeronautical Telecommunication Network shall provide-

(a) provisions for unambiguous application identification and addressing

(b) means to unambiguously address all Aeronautical Telecommunication Network end-systems and intermediate systems.

(2) The Aeronautical Telecommunication Network addressing and naming plans shall allow Authority and Organizations to assign addresses and names within their own administrative domains.

ATN security requirements.

31. (1) The Aeronautical Telecommunication Network shall–

(a) make provisions whereby only the controlling Air Traffic Services unit may provide Air Traffic Control instructions to aircraft operating in its airspace;

(b) enable the recipient of a message to identify the originator of that message; and

(c) be protected against service attacks to a level consistent with the application service requirements.

(2) Aeronautical Telecommunication Network end-systems supporting Aeronautical Telecommunication Network security services shall be capable of authenticating the identity of peer end-systems, authenticating the source of messages and ensuring the data integrity of the messages.

PART IV–AERONAUTICAL MOBILE-SATELLITE (ROUTE) SERVICE

Aeronautical Mobile-Satellite (Route) Service

32. (1) A mobile-satellite system intended to provide Aeronautical Mobile-Satellite (Route) Service shall conform to the requirements of these Regulations.

(2) An Aeronautical Mobile-Satellite (Route) Service system shall support packet data service, voice service or both.

(3) Requirements for mandatory carriage of AMS(R)S system equipment including the level of system capability shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation timescales for the carriage of equipment and the level of system capability shall include the performance of the Aircraft Earth Station, the satellite and the Ground Earth Station.

(4) The agreements specified in sub regulation (3) shall provide at least a notice of two years of mandatory carriage of airborne systems.

(5) The Authority shall coordinate with national authorities and service providers the implementation aspects of an Aeronautical Mobile-Satellite (Route) Service system that permit worldwide interoperability and optimum use, as appropriate.

Radio Frequency Characteristics.

33. (1) When providing Aeronautical Mobile-Satellite (Route) Service communications, an Aeronautical Mobile-Satellite (Route) Service system shall operate only in frequency bands which are appropriately allocated to Aeronautical Mobile-Satellite (Route) Service and protected by the International Telecommunications Union Radio Regulations.

(2) The total emissions of the Aircraft Earth Station necessary to meet designed system performance shall be controlled to avoid harmful interference to other systems necessary to support safety and regularity of air navigation, installed on the same or other aircraft.

(3) Emissions from an Aeronautical Mobile-Satellite (Route) Service system Aircraft Earth Station shall not cause harmful interference to an Aircraft Earth Station providing Aeronautical Mobile-Satellite (Route) Service on a different aircraft.

(4) The Aircraft Earth Station equipment shall operate properly in an interference environment causing a cumulative relative change in its receiver noise temperature ($\Delta T/T$) of 25 per cent.

Priority and pre-emptive access

34. (1) Every aircraft earth station and ground earth station shall be designed to ensure that messages transmitted in accordance with Civil Aviation (Communication Procedures) Regulations including their order of priority, are not delayed by the transmission and reception of other types of messages.

(2) As a means to comply with the sub regulation (1), message types not defined in the Civil Aviation (Communication Procedures) Regulations shall be terminated without warning, to allow messages specified in the Civil Aviation (Communication Procedures) Regulations to be transmitted and received.

All Aeronautical Mobile-Satellite (Route) Service data packets and all Aeronautical Mobile-Satellite (Route) Service voice calls shall be identified as to their associated priority.

(3) The system shall provide voice communications priority over data communications within the same message category.

Signal acquisition and tracking

35. (1) The Aircraft Earth Station, Ground Earth Station and satellites shall properly acquire and track service link signals when the aircraft is moving at a ground speed of up to 1 500 km/h (800 knots) along any heading.

(2) The Aircraft Earth Station, Ground Earth Station and satellites shall properly acquire and track service link signals when the component of the aircraft acceleration vector in the plane of the satellite orbit is up to 0.6 g.

Performance Requirements

Designated Operational Coverage

36. An Aeronautical Mobile-Satellite (Route) Service system shall provide Aeronautical Mobile-Satellite (Route) Service throughout its designated Operational coverage.

Failure notification

37. An Aeronautical Mobile-Satellite (Route) Service system shall–

(a) provide timely predictions of the time, location and duration of any resultant outages until full service is restored in the event of a service failure; and

(b) annunciate a loss of communications capability within 30 seconds of the time when it detects such a loss.

Aviation Electronic System requirements

38. The Aircraft Earth Station shall meet the relevant performance requirements specified in regulations 39 and 42 for aircraft –

(a) in straight and level flight throughout the designated operational coverage of the satellite system; or

(b) attitudes of +20/-5 degrees of pitch and +/-25 degrees of roll throughout the Designated Operational Coverage of the satellite system.

Packet data service performance

39. (1) If the system provides AMS(R)S packet data service, it shall meet the standards of regulations 40 and 41.

(2) Where an Aeronautical Mobile-Satellite (Route) Service system provides packet data service, it shall be capable of operating as a constituent mobile sub network of the Aeronautical Telecommunication Network.

Delay Parameters

40. (1) Connection establishment delay shall not be greater than 70 seconds.

(2) Data transit delay values shall be based on a fixed sub-network service data unit length of 128 octets in accordance with ISO 8348 and shall be defined as average values.

(3) Data transit delay from aircraft shall not be greater than 40 seconds for the highest priority data service.

(4) Data transit delay from aircraft shall not be greater than 28 seconds for the lowest priority data service.

(5) Data transit delay to aircraft shall not be greater than 12 seconds for the highest priority data service.

(6) Data transit delay to aircraft shall not be greater than 28 seconds for the lowest priority data service.

(7) Data transfer delay (95th percentile), shall not be greater than 80 seconds for the highest priority data service.

(8) Data transfer delay (95th percentile) from-aircraft, shall not be greater than 60 seconds for the lowest priority data service.

(9) Data transfer delay (95th percentile) to-aircraft shall not be greater than 15 seconds for the highest priority data service.

(10) Data transfer delay (95th percentile) to-aircraft shall not be greater than 30 seconds for the lowest priority data service.

(11) The connection release delay (95th percentile) shall not be greater than 30 seconds in either direction.

Integrity

41. (1) The residual error rate in the from-aircraft direction shall not be greater than 10-4 per sub-network service data unit.

(2) The residual error rate in the to-aircraft direction shall not be greater than 10-6 per sub-network service data unit.

(3) The probability of a Sub Network Connection provider-invoked Sub Network Connection release shall not be greater than 10-4 over any one-hour interval.

(4) The probability of a sub-network connection provider-invoked reset shall not be greater than 10-1 over any one-hour interval.

Voice service performance

42. The system that provides Aeronautical Mobile-Satellite (Route) Service voice service shall meet the requirements in regulations 43, 44 and 45.

Call processing delay.

43. (1) The 95th percentile of the time delay for a GES to present a call origination event to the terrestrial network interworking interface after a call origination event has arrived at the AES interface shall not be greater than 20 seconds.

(2) The 95th percentile of the time delay for an AES to present a call origination event at its aircraft interface after a call origination event has arrived at the terrestrial network interworking interface shall not be greater than 20 seconds.

Voice Quality

44. (1) The voice transmission shall provide overall intelligibility performance suitable for the intended operational and ambient noise environment.

(2) The total allowable transfer delay within an Aeronautical Mobile-Satellite (Route) Service sub network shall not be greater than 0.485 seconds.

Voice Capacity

45. The Aeronautical Mobile-Satellite (Route) Service system shall have sufficient available voice traffic channel resources such that an Aircraft Earth Station- or Ground Earth Station originated Aeronautical Mobile-Satellite (Route) Service voice call presented to the system shall experience a probability of blockage of no more than 10^{-2}.

Security

46. The Aeronautical Mobile-Satellite (Route) Service system shall provide features for the protection–

(a) of messages in transit from tampering.

(b) against denial of service, degraded performance characteristics, or reduction of system capacity when subjected to external attacks; or

(c) unauthorized entry.

System Interfaces

47. An Aeronautical Mobile-Satellite (Route) Service system shall allow sub-network users to address Aeronautical Mobile-Satellite (Route) Service communications to specific aircraft by means of the ICAO 24-bit aircraft address.

Packet data service interfaces

48. A system that provides Aeronautical Mobile-Satellite (Route) Service packet data service shall provide–

(a) an interface to the Aeronautical Telecommunication Network; and

(b) a Connectivity Notification function.

PART VI- SECONDARY SURVEILLANCE RADAR MODE S AIR-GROUND DATA LINK

Air Ground data link communication.

49. Where air ground data link communication is used by the SSR Mode S, the following shall be implemented–

(a) the Mode S characteristics shall be as specified in Manual of Implementing Standards (CNS);

(b) the DCE and XDCE state tables shall be as specified in the Manual of Implementation of Standards (CNS);

(c) the Mode S packet formats shall be as specified in the Manual of Implementation of Standards (CNS).

PART VII- VERY HIGH FREQUENCY AIR-GROUND DIGITAL LINK

Radio channels and functional channels

50. (1) An aircraft station shall be capable of tuning to any of the channels in the range specified in regulation 52 within 100 milliseconds after the receipt of an autotune command.

(2) An aircraft station for Very High Frequency Digital Link Mode 3, shall be able to tune to any channel in the range specified in regulation 52 within 100 milliseconds after the receipt of any tuning command

(3) A ground station shall be capable of operating on its assigned channel within the radio frequency range detailed in regulation 52.

(4) Frequency 136.975Megahertz shall be reserved as a worldwide common signalling channel for VHF Air-Ground Digital Link Mode 2.

System Capabilities

51. (1) The Very High Frequency Air-Ground Digital Link system shall provide code-independent and byte-independent transfer of data.

(2) The Very High Frequency Air-Ground Digital Link system shall provide link layer data broadcast services Mode 2 or voice and data broadcast services Mode 3.

(3) For Very High Frequency Air-Ground Digital Link Mode 3, the data broadcast service shall support network multicasting capability originating from the ground.

(4) The Very High Frequency Air-Ground Digital Link system shall establish and maintain a reliable communications path between the aircraft and the ground system while allowing but not requiring manual intervention.

(5) A Very High Frequency Air-Ground Digital Link -equipped aircraft shall transition from one ground station to another when circumstances dictate.

(6) The Very High Frequency Air-Ground Digital Link Mode 3 system shall support a transparent, simplex voice operation based on a "Listen-Before-Push-To-Talk" channel access.

Air-ground VHF digital link communications system characteristics

52. (1) The radio frequencies used for Air-ground VHF digital link communications shall be selected from the radio frequencies in the band 117.975–137 Megahertz.

(2) The lowest assignable frequency used for Air-ground Very High Frequency digital link communications shall be 118.000 Megahertz, and the highest assignable frequency shall be 136.975 Megahertz and the separation between assignable frequencies shall be 25 kiloHertz.

(3) The design polarization of emissions shall be vertical.

System characteristics of the ground installations for VHF Air-Ground Digital Link.

53. The Very High Frequency Air ground Digital link system characteristics for ground installation shall be as specified in the Manual of Implementing Standards (CNS).

System characteristics of the aircraft installation

54. The Very High Frequency Air ground Digital link system characteristics for aircraft installation shall be as specified in the Manual of Implementing Standards (CNS).

Physical Layer Protocols and services

55. The Very High Frequency Air ground Digital Link systems physical layer protocols and services shall–

(a) be as specified in the Manual of Implementing Standards (CNS) for aircraft and ground stations;

(b) be as specified in the Manual of Implementing Standards (CNS) for both mobile and ground stations of Mode 4 unless otherwise stated.

Link Layer Protocols and services

56. The Very High Frequency Air ground Digital Link systems link layer protocols and services shall be as specified in the Manual of Implementing Standards (CNS).

Sub-network Layer Protocols and services

57. The Very High Frequency Air ground Digital Link systems sub-network layer protocols and services shall be as specified in the Manual of Implementing Standards (CNS).

The VHF Data Link Mobile Sub Network Dependent Convergence Function

58. (1) The Very High Frequency Digital Link Mode 2 mobile Sub Network Dependent Convergence Function shall be the standard mobile Sub Network Dependent Convergence Function.

(2) The Very High Frequency Digital Link Mode 2 mobile Sub Network Dependent Convergence Function shall –

(a) support maintaining context across sub network calls;

(b) use the same context across all Switched Virtual Circuits negotiated to a Data Terminal Equipment, when negotiated with the same parameters; or

(c) support at least 2 Switched Virtual Circuits sharing a context.

VDL Mode 3

59. The Very High Frequency Digital Link Mode 3 shall support

VDL Mode 3 Sub Network Dependent Convergence Function.

(a) the standard International Standard Organization, ISO 8208 Sub Network Dependent Convergence Function; and

(b) the denoted frame-based Sub Network Dependent Convergence Function.

Voice Unit for Mode 3 Services

60. (1) The voice unit shall provide for a simplex, "push-to-talk" audio and signalling interface between the user and the Very High Frequency Digital Link and two separate mutually exclusive voice circuit types shall be supported.

(2)The two separate mutually exclusive voice circuit types in sub regulation (1) are-

(a) Dedicated circuits; and

(b) Demand assigned circuits.

(3) Dedicated circuits in sub regulation (2) (a) shall provide service to a specific user group on an exclusive basis with no sharing of the circuit with other users outside the group and access shall be based on a "listen-before-push-to-talk" discipline.

(4) Demand assigned circuits in sub regulation (2) shall provide voice circuit access which is arbitrated by the ground station in response to an access request received from the aircraft station and allow dynamic sharing of the channel resource increasing trunking efficiency.

(5) The voice unit operation shall support a priority override access for authorized ground users.

(6) The voice unit operation shall support notification to the user of the source of a received message.

(7) The voice unit shall support a coded squelch operation that offers some degree of rejection of undesired co-channel voice messages based on the burst time of arrival.

Voice Unit for Mode 3 speech encoding, parameters and procedures.

61. The Very High Frequency Digital Link Mode 3 shall use the Advanced Multi-Band Excitation, 4.8 kilobits per second encoding or decoding algorithm, version number AMBE-ATC-10, developed by Digital Voice Systems, Incorporated for voice communications.

VDL MODE 4

VDL Mode 4 radio channels

62. (1) A Very High Frequency Digital Link Mode 4 transmitter or receiver shall be capable of tuning to any of the 25 kiloHertz channels from 112 Megahertz to 137 Megahertz.

(2) A Very High Frequency Digital Link Mode 4 station shall be capable of receiving two channels simultaneously.

(3) Very High Frequency Digital Link Mode 4 stations shall use two assigned frequencies as Global Signalling Channels, to support user communications and link management functions.

VDL Mode 4 System capabilities

63. (1) The Very High Frequency Digital Link Mode 4 system shall–

(a) support ATN/IPS-compliant sub network services;

(b) provide code-independent and byte-independent transfer of data;

(c) provide link layer broadcast services;

(d) provide link layer point-to-point services;

(e) provide air-air communications, without ground support, as well as air-ground communications;

(f) establish and maintain a reliable communications path between the aircraft and the ground system while allowing, but not requiring, manual intervention when supporting air-ground operations;

(g) provide the capability for deriving time from time-of-arrival measurements of received Very High Frequency Digital Link Mode 4 transmissions whenever externally derived estimates of time are unavailable.

(2) A mobile Very High Frequency Digital Link Mode 4 DLS station shall transition from one ground Very High Frequency Digital Link Mode 4 DLS station to another as required.

(3) Mobile and ground Very High Frequency Digital Link Mode 4 stations shall access the physical medium operating in simplex mode.

Coordination of channel utilization

64. Transmissions shall be scheduled relative to UTC, to ensure efficient use of shared channels and to avoid unintentional slot re-use on a regional basis.

PART VIII: AERONAUTICAL MOBILE AIRPORT COMMUNICATION SYSTEM (*AEROMACS*)

Aeromacs general operations.

65. An AeroMacs shall–

(a) conform to the requirements of this Part and the following Parts of these Regulations;

(b) only 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 voice services;

(k) support multiple service flows simultaneously;

(l) support adaptive modulation and coding;

(m) support handover between different AeroMACS BSs during aircraft movement or on degradation of connection with current BS;

(n) keep total accumulated interference levels with limits defined by the International Telecommunication Union — Radiocommunication Sector (ITU-R) as required by national/international rules on frequency assignment planning and implementation;

(o) support a flexible implementation architecture to permit link and network layer functions to be located in different or same physical entities.

General radio characteristics

66. (1) An AeroMACS shall operate –

(a) in time division duplex (TDD) mode;

(b) with a 5 MHz channel bandwidth.

(2) AeroMACS MS antenna polarization shall be vertical.

(3) AeroMACS BS antenna polarization shall have a vertical component.

(4) AeroMACS shall–

(a) operate without guard bands between adjacent AeroMACS channels;

(b) operate according to the orthogonal frequency division multiple access method;

(c) support both segmented partial usage sub-channelization (PUSC) and PUSC with all carriers as subcarrier permutation methods.

Frequency bands

67. (1) AeroMACS equipment shall operate in the band from 5 030 MHz to 5 150 MHz in channels of 5 MHz bandwidth.

(2) The mobile equipment shall operate at centre frequencies offset from the preferred frequencies, with an offset of 250 kHz step size.

Radiated Power

68. (1) The maximum mobile station equivalent isotropic radiated power (EIRP) shall not exceed 30 dBm.

(2) The maximum base station EIRP in a sector shall not exceed 39.4 dBm.

(3) In order to meet ITU requirements, the total base station EIRP in a sector shall be decreased from that peak, considering the antenna characteristics, at elevations above the horizon.

Minimum receiver sensitivity

69. An AeroMACS receiver sensitivity shall comply with requirements specified in the Manual of CNS Implementing Standards.

Spectral mask and emissions

70. (1) The power spectral density of the emissions when all active subcarriers are transmitted in the channel shall be attenuated below the maximum power spectral density as follows–

(a) on any frequency removed from the assigned frequency between 50 and 55 per cent of the authorized bandwidth: 26 + 145 log (per cent of BW/50) dB;

(b) on any frequency removed from the assigned frequency between 55 and 100 per cent of the authorized bandwidth: 32 + 31 log (per cent of (BW)/55) dB;

(c) on any frequency removed from the assigned frequency between 100 and 150 per cent of the authorized bandwidth: 40 +57 log (per cent of (BW)/100) dB; and

(d) on any frequency removed from the assigned frequency beyond 150 per cent of the authorized bandwidth: 50 dB.

(2) AeroMACS shall implement power control.

(3)AeroMACS minimum rejection for adjacent (+/–5MHz) channel, measured at BER=10-6 level for a victim signal power 3 dB higher than the receiver sensitivity, shall be 10 dB for 16 QAM 3/4.

(4) AeroMACS minimum rejection for adjacent (+/–5MHz) channel, measured at BER=10-6 level for a victim signal power 3 dB higher than the receiver sensitivity, shall be 4 dB for 64 QAM 3/4.

(5) AeroMACS minimum rejection for second adjacent (+/–10MHz) channel and beyond, measured at BER=10-6 level for a victim signal power 3 dB higher than the receiver sensitivity, shall be 29 dB for 16 QAM 3/4.

(6)AeroMACS minimum rejection for second adjacent (+/–10MHz) channel and beyond, measured at BER=10-6 level for a victim signal power 3 dB higher than the receiver sensitivity, shall be 23 dB for 64 QAM ¾.

Frequency tolerance

71. (1) AeroMACS BS transmitter frequency tolerance shall be better than +/- 2 × 10-6 of nominal channel frequency.

(2) AeroMACS MS transmitter centre frequency shall be locked to that of the BS transmission centre frequency with a tolerance better than 2 per cent of the subcarrier spacing.

(3) AeroMACS MS shall track the frequency of the BS and shall defer any transmission if synchronization is lost or exceeds the tolerances given above.

AeroMACS communications service provider

72. (1) The maximum unplanned service outage duration on a per aerodrome basis shall be 6 minutes.

(2) The maximum accumulated unplanned service outage time on a per aerodrome basis shall be 240 minutes/year.

The maximum number of unplanned service outages shall not exceed 40 per year per aerodrome.

(3) The probability that a transaction will be completed once started shall be at least 0.999 for AeroMACS over any one-hour interval.

Doppler shift

73. AeroMACS shall operate with a Doppler shift induced by the movement of the MS up to a radial speed of 92.6 km (50 NM) per hour, relative to the BS.

Delay

74. (1) Subnetwork entry time shall be less than 90 seconds.

(2) Subnetwork entry time shall be less than 20 seconds.

(3) The from-MS data transit delay (95th percentile) for the highest priority data service, shall be less than or equal to 1.4 seconds over a window of 1 hour or 600 SDUs, whichever is longer.

(4) The to-MS data transit delay (95th percentile) for the highest priority data service, shall be less than or equal to 1.4 seconds over a window of 1 hour or 600 SDUs, whichever is longer.

Integrity

75. (1) AeroMACS BS and MS shall support mechanisms to detect and correct corrupt SNSDUs.

AeroMACS BS and MS shall only process SNSDUs addressed to themselves.

(2) The residual error rate, to/from MS shall be less than or equal to 5×10^{-8} per SNSDU.

(3) The maximum bit error rate shall not exceed 10^{-6} after CTC-FEC, if the received signal is equal to or greater than the minimum sensitivity level for the modulations scheme used, as provided in regulation 69.

Security

76. (1) AeroMACS shall provide a capability to protect–

(a) the integrity of messages in

(b) the availability of the system;

(c) the confidentiality of messages in transit.

(2) AeroMACS shall provide–

(a) an authentication capability;

(b) a capability to ensure the authenticity of messages in transit.

(c) a capability to authorize the permitted actions of users of the system.

If AeroMACS provide interfaces to multiple domains, AeroMACS shall provide capability to prevent intrusion from lower integrity domain to higher integrity domain.

PART IX- AERONAUTICAL FIXED TELECOMMUNICATION NETWORK

Characteristics of Interregional Aeronautical

77. Interregional Aeronautical Fixed Service circuits being implemented or upgraded shall employ high quality telecommunications service and the modulation rate shall take into

account traffic volumes expected under both normal and alternate route conditions. Fixed Service circuits

78. The technical provisions related to international ground – ground data interchange at medium and higher signalling rates for AFTN networks shall be as specified in the Manual of Implementation of Standards (CNS). Technical provisions relating to international ground-ground data interchange at medium and higher signalling rates.

79. (1) The aircraft address shall be one of 16 777 214 twenty-four-bit aircraft addresses allocated by International Civil Aviation Organization to the State of Registry or common mark registering authority and assigned as specified in the Manual of Implementation of Standards (CNS). Aircraft Addressing System.

(2) Non-aircraft transponders that are installed on aerodrome surface vehicles, obstacles or fixed Mode S target detection devices for surveillance or radar monitoring purposes shall be assigned 24-bit aircraft addresses.

(3) Mode S transponders used in accordance with sub regulation (2) shall not have any negative impact on the performance of existing Air Traffic Services surveillance systems and ACAS.

PART X – POINT-TO-MULTIPOINT COMMUNICATIONS

80. Point-to-multipoint telecommunication service via satellite to support the dissemination of Aeronautical Information shall be based on full-time, non-pre-emptible, protected services as defined in the relevant Telecommunication Standardization Sector of the International Telecommunications Union Recommendations. Service via satellite for the dissemination of Aeronautical Information

81. System characteristics shall include the following— Service via satellite for the dissemination of World Area Forecast System products

(a) frequency — C-band, earth-to-satellite, 6 Gigahertz band, satellite-to-earth, 4 Gigahertz band;

(b) capacity with effective signalling rate of not less than 9 600 bits/s;

(c) bit error rates — better than 1 in 10^7;

(d) forward error correction; and

(e) availability 99.95 per cent.

PART X – HIGH FREQUENCY DATA LINK SYSTEM

82. The High Frequency Data Link system shall – System architecture

(a) consist of one or more ground and aircraft station subsystems, which implement the High Frequency Data Link protocol specified in regulation 84;

(b) include a ground management subsystem regulations 85.

83. The High Frequency Data Link aircraft station subsystem and the High Frequency Data Link ground station subsystem shall include the following functions– Aircraft and Ground Station Subsystems

(a) High Frequency transmission and reception;

(b) data modulation and demodulation; and

(c) High Frequency Data Link protocol implementation and frequency selection.

Operational coverage

84. Frequency assignments for High Frequency Data Link shall be protected throughout their Designated Operational Coverage area.

Requirements for carriage of High Frequency Digital Link equipment.

85. (1) Requirements for mandatory carriage of High Frequency Data Link equipment shall be made on the basis of regional air navigation agreements that specify the airspace of operation and the implementation timescale.

(2) The agreement in sub regulation (1) shall provide advance notice of at least two years for the mandatory carriage of airborne systems.

Ground station networking.

86. High Frequency Data Link ground station subsystems shall interconnect through a common ground management subsystem.

Ground station synchronization.

87. (1) Synchronization of High Frequency Data Link ground station subsystems shall be to within ±25 ms of UTC.

(2) For any station not operating within ±25 ms of UTC, appropriate notification shall be made to all aircraft and ground station subsystems to allow for continued system operation.

Quality of service.

88. (1) The undetected error rate for a network user packet which contains between 1 and 128 octets of user data shall be equal to or less than 1 in 10^6.

(2) Transit and transfer delays for network user packets of 128 octets shall not exceed the values of the specifications in Table 11-1 as provided in the Manual of Implementation of Standards (CNS).

High Frequency Data Link Protocol

89. The High Frequency Data Link protocol shall consist of a physical layer, a link layer, and a sub-network layer, as specified in the Manual of Implementation of Standards (CNS).

Ground Management Subsystem

90. The ground management subsystem shall–

(a) perform the functions necessary to establish and maintain communications channels between the High Frequency Data Link ground and aircraft station subsystems.

(b) interface with the ground station subsystem in order to exchange control information required for frequency management, system table management, log status management, channel management, and Quality of Service data collection.

PART XI – UNIVERSAL ACCESS TRANSCEIVER

Universal Access Transceiver system characteristics of aircraft and

91. The Universal Access Transmitter physical layer and system characteristics of aircraft and ground stations shall be as specified in the Manual of Implementation of Standards (CNS).

ground stations

92.Requirements for mandatory carriage of Universal Access Transmitter equipment shall be made on the basis of regional air navigation agreements which specify the airspace of operation and the implementation timescales for the carriage of equipment, including the appropriate lead time.

Mandatory carriage requirements

PART XII – AERONAUTICAL MOBILE SERVICE

93. (1) The characteristics of the air-ground Very High Frequency communication system used in the International Aeronautical Mobile Service shall be in conformity with the specifications contained in the Manual of Implementation of Standards (CNS).

Air-Ground VHF communication system characteristics.

(2) The systems characteristics for both ground and airborne installation shall conform to the specifications contained in the Manual of Implementation of Standards (CNS).

94. The characteristics of the air-ground High Frequency Single Side Band system, where used in the Aeronautical Mobile Service, shall be in conformity with the specifications of the Manual of Implementation of Standards (CNS).

Single side band High Frequency Communication System Characteristics

95. (1) Where a Select - Calling system is installed, the system characteristics contained in the Manual of Implementing Standards (CNS) shall be applied.

Selective - Calling System.

(2) Aeronautical Stations which are required to communicate with Select - Calling equipped aircraft shall have Select - Calling encoders in accordance with the red group specified in the table of tone frequencies in the Manual of Implementing Standards (CNS).

(3) Select - Calling codes using the tones Red P, Red Q, Red R, and Red S shall be assigned.

PART XIII –AERONAUTICAL SPEECH CIRCUITS

96. (1) The use of circuit switching and signalling to provide speech circuits to interconnect Air Traffic Services units not interconnected by dedicated circuits shall be by agreement between the Administrations concerned.

Technical provisions relating to International Aeronautical speech circuit switching and signalling for ground-ground applications.

(2) The application of aeronautical speech circuit switching and signalling shall be made on the basis of regional air navigation agreements.

(3) The Air Traffic Control communication requirements defined in the Civil Aviation (Air Traffic Services) Regulations shall be met by implementation of one or more of the following basic three call types–

instantaneous access;

(a) direct access; and

(b) indirect access.

(4) order to meet the Subject to sub regulation (3), the following functions shall be provided in requirements specified in Civil Aviation (Air Traffic Services) Regulations.

(a) means of indicating the calling or called party identity;

(b) means of initiating urgent or priority calls; and

(c) conference capabilities.

(5) The characteristics of the circuits used in aeronautical speech circuit switching and signalling shall conform to appropriate international standards and Telecommunication Standardization Sector of the International Telecommunications Union recommendations.

(6) Digital signalling systems shall be used wherever their use can be justified in terms of any of the following–

(a) improved quality of service;

(b) improved user facilities; or

(c) reduced costs where quality of service is maintained.

(7) The characteristics of supervisory tones to be used such as ringing, busy, number unobtainable shall conform to appropriate Telecommunication Standardization Sector of the International Telecommunications Union, recommendations.

(8) To take advantage of the benefits of interconnecting regional and national aeronautical speech networks, the international aeronautical telephone network numbering scheme shall be used.

PART XIV– EMERGENCY LOCATOR TRANSMITTER FOR SEARCH AND RESCUE

Operating frequencies

97. (1) All installations of emergency locator transmitters operating on 406 Megahertz shall meet the provisions specified in regulation 88.

(2) All installations of emergency locator transmitters operating on 121.5 Megahertz shall meet the provisions specified in regulation 87.

(3) Emergency locator transmitters shall operate on 406 Megahertz and 121.5 Megahertz simultaneously.

(4) All emergency locator transmitters installed on or after 1 January 2002 shall operate simultaneously on 406 Megahertz and 121.5 Megahertz.

(5)The technical characteristics for the 406 Megahertz component of an integrated emergency locator transmitters shall be in accordance with regulation 99.

(6) The technical characteristics for the 121.5Megahertz component of an integrated emergency locator transmitters shall be in accordance with regulation 90.

Emergency Locator transmitters Register

98. (1) The Authority shall make arrangements to have a 406 Megahertz Emergency Locator transmitters register and shall ensure that the register is updated whenever necessary.

(2) Register information regarding the Emergency Locator transmitters shall be immediately available to search and rescue authorities.

(3) Emergency Locator transmitters register information shall include the following–

(a) transmitter identification expressed in the form of an alphanumerical code of 15 hexadecimal characters;

(b) transmitter manufacturer, model and serial number;

(c) COSPAS-SARSAT type approval number;

(d) name, address and emergency telephone number of the owner and operator;

(e) name, address and telephone number of other emergency contacts to whom the owner or the operator is known;

(f) aircraft manufacturer and type; and

(g) colour of the aircraft.

Specification for the 121.5 Megahertz component of Emergency Locator Transmitter

99. (1) Emergency Locator Transmitters shall operate on 121.5 Megahertz and the frequency tolerance shall not exceed plus or minus 0.005 per cent.

(2) The emission from an Emergency Locator transmitters under normal conditions and attitudes of the antenna shall be vertically polarized and essentially omni-directional in the horizontal plane.

(3) Over a period of 48 hours of continuous operation, at an operating temperature of minus 20°C, the Peak Effective Radiated Power shall at no time be less than 50 mW.

(4) The type of emission shall be A3X and any other type of modulation that meets the requirements of sub regulations (5), (6) and (7) shall be used provided that the emission does not prejudice precise location of the beacon by homing equipment.

(5) The carrier shall be amplitude modulated at a modulation factor of at least 0.85.

(6) The modulation applied to the carrier shall have a minimum duty cycle of 33 per cent.

(7) The emission shall have a distinctive audio characteristic achieved by amplitude modulating the carrier with an audio frequency sweeping downward over a range of not less than 700 Hertz within the range 1 600 Hertz to 300 Hertz and with a sweep repetition rate of between 2 Hertz and 4 Hertz.

(8) The emission shall include a clearly defined carrier frequency distinct from the modulation sideband components; in particular, at least 30 per cent of the power shall be contained at all

times within plus or minus 30 Hertz of the carrier frequency on 121.5 Megahertz.

Specification for the 406 Megahertz component of Emergency Locator Transmitter

100.(1) Emergency Locator Transmitters shall operate on one of the frequency channels assigned for use in the frequency band 406.0 to 406.1 Megahertz.

(2) The period between transmissions shall be 50 seconds plus or minus 5 per cent.

(3) Over a period of 24 hours of continuous operation at an operating temperature of –20°C, the transmitter power output shall be within the limits of 5 W plus or minus 2 dB.

(4) The 406 Megahertz Emergency Locator Transmitters shall be capable of transmitting a digital message.

Transmitter identification coding

101.(1) Emergency locator transmitters operating on 406 Megahertz shall be assigned a unique coding for identification of the transmitter or aircraft on which it is carried.

(2) The emergency locator transmitter shall be coded in accordance with either the aviation user protocol or one of the serialized user protocols specified in the Manual of Implementation of Standards (CNS)h and shall be registered with the appropriate the Authority.

PART XV- EXEMPTIONS

Requirements for application for exemption.

102.(1) A person may apply to the Authority for an exemption from any requirement of these Regulations.

(2) Unless in case of emergency, a person requiring exemptions from any of these Regulations shall make an application to the Authority at least sixty days prior to the proposed effective date, giving the following information—

(a) name and contact address including electronic mail and fax if any;

(b) telephone number;

(c)a citation of the specific requirement from which the applicant seeks exemption;

(d) justification for the exemption;

(e)a description of the type of operations to be conducted under the proposed exemption

(f) the proposed duration of the exemption;

(g) an explanation of how the exemption would be in the public interest;

(h) a detailed description of the alternative means by which the applicant will ensure a level of safety equivalent to that established by the regulation in question;

(i) a safety risk assessment carried out in respect of the exemption applied for;

(j) if the applicant handles international operations and seeks to operate under the proposed exemption, an indication whether the exemption would contravene any provision of the Standards and Recommended Practices of the International Civil Aviation Organization; and

(k) any other information that the Authority may require.

(3) Where the applicant seeks emergency processing of an application for exemption, the application shall contain supporting facts and reasons for not filing the application within the time specified in sub regulation (2) and satisfactory reason for deeming the application an emergency.

(4) The Authority may in writing, refuse an application made under sub regulation (3), where in the opinion of the Authority, the reasons given for emergency processing are not satisfactory.

(5) The application for exemption shall be accompanied by fee determined by the Authority.

Review and publication.

103.(1) The Authority shall review the application for exemption made under regulation 102 for accuracy and compliance and if the application is satisfactory, the Authority shall publish a detailed summary of the application for comments, within a specified time, in either—

(a) the Kenya *Gazette;* or

(b) aeronautical information circular; or

(c) a daily newspaper with national circulation.

(2) Where application requirements have not been fully complied with, the Authority shall request the applicant in writing, to comply prior to publication or making a decision under sub regulation (3).

(3) If the request is for emergency relief, the Authority shall publish the decision as soon as possible after processing the application.

Evaluation of the request.

104. (1) Where the application requirements have been satisfied, the

Authority shall conduct an evaluation of the request to include-

(a) determination of whether an exemption would be in the public interest;

(b) a determination, after a technical evaluation of whether the applicant's proposal would provide a level of safety equivalent to that established by the regulation, although where the Authority decides that a technical evaluation of the request would impose a significant burden on the Authority's technical resources, the Authority may deny the exemption on that basis;

(c) a determination of whether a grant of the exemption would contravene these Regulations; and

(d) a recommendation based on the preceding elements, of whether the request should be granted or denied, and of any conditions or limitations that should be part of the exemption.

(2) The Authority shall notify the applicant in writing of, the decision to grant or deny the request and publish a detailed summary of its evaluation and decision.

(3) The summary referred to in sub-regulation (2) shall specify the duration of the exemption and any conditions or limitations of the exemption.

(4) If the exemption affects a significant population of the aviation community of the Kenya the Authority shall publish the summary in aeronautical information circular.

PART XVI–GENERAL PROVISIONS

Drug and alcohol testing and reporting.

105.(1) Any person who performs any function directly or indirectly under these Regulations may be tested for drug or alcohol usage.

(2) A person who—

(a) refuses to submit to a test to indicate the percentage by weight of alcohol in the blood; or

(b) refuses to submit to a test to indicate the presence of narcotic drugs, marijuana, or depressant or stimulant drugs or substances in the body, when requested by a law enforcement officer or the Authority, or refuses to furnish or to authorise the release of the test results requested by the Authority,

that person shall—

(i) be denied any licence, certificate, rating, qualification, or authorisation issued under these Regulations for a period of up to one year from the date of that refusal; or

(ii) have their licence, certificate, rating, qualification, or authorisation issued under these Regulations suspended or revoked.

(3) Any person who is convicted for the violation of any local or national statute relating to the growing, processing, manufacture, sale, disposition, possession, transportation, or importation of narcotic drugs, marijuana, or depressant or stimulant drugs or substances, shall—

(a) be denied any license, certificate, rating, qualification, or authorisation issued under these Regulations for a period of up to one year after the date of conviction; or

(b) have their licence, certificate, rating, qualification, or authorisation issued under these Regulations suspended or revoked.

Change of Name.

106.(1) An Air Navigation Services Provider holder of a certificate issued under these Regulations may apply to the Authority for—

(a) replacement of the certificate if lost or destroyed;

(b) change of name on the certificate; or

(c) an endorsement on the certificate.

(2) when applying under paragraph (1), the holder of a certificate shall submit to the Authority—

(a) the original certificate or a copy thereof in case of loss; and

(b) a court order, or other legal document verifying the name change.

(3) The Authority shall return to the holder of a certificate, with the appropriate changes applied for, if any, the originals specified under paragraph (2) and, where necessary, retain copies thereof.

Change of address.

107.(1) A holder of an air navigation services provider certificate issued under these Regulations shall notify the Authority of the change in the physical and mailing address and shall do so in the case of —

(a) physical address, at least fourteen days in advance; and

(b) mailing address upon the change.

(2) A person who does not notify the Authority of the change in the physical and mailing address within the time frame specified in sub-regulation (1) shall not exercise the privileges of the certificate.

Replacement of documents.

108. A person may apply to the Authority in the prescribed form for replacement of documents issued under these Regulations if such documents are lost or destroyed.

Use and retention of documents and records.

109.(1) A person shall not—

(a) use any certificate or exemption issued or required by or under these Regulations which has been forged, altered, cancelled, or suspended, or to which he is not entitled;

(b) forge or alter any certificate or exemption issued or required by or under these Regulations;

(c) lend any certificate or exemption issued or required by or under these Regulations to any other person;

(d) make any false representation for the purpose of procuring for himself or any other person the grant, issue, renewal or variation of any such certificate or exemption;

(e) mutilate, alter, render illegible or destroy any records, or any entry made therein, required by or under these Regulations to be maintained, or knowingly make, or procure or assist in the making of, any false entry in any such record, or wilfully omit to make a material entry in such record.

(2) All records required to be maintained by or under these Regulations shall be recorded in a permanent and indelible material.

(3) A person shall not issue any certificate or exemption under these Regulations unless he is authorised to do so by the Authority.

A person shall not issue any certificate referred to in sub-regulation (3) unless he has satisfied himself that all statements in the certificate are correct, and that the applicant is qualified to hold that certificate.

Reports of violation.

110.(1) Any person who knows of a violation of the Act, or any Regulations, rules, or orders issued there under, shall report it to the Authority.

(2) The Authority may determine the nature and type of investigation or enforcement action that need to be taken.

Failure to comply with direction.

111. Any person who fails to comply with any direction given to him by the Authority or by any authorised person under any provision of these Regulations shall be deemed for the purposes of these Regulations to have contravened that provision.

Aeronautical fees.

112.(1) The Authority shall notify in writing the fees to be charged in connection with the issue, renewal or variation of any certificate, test, inspection or investigation required by, or for the purpose of these Regulations any orders, notices or proclamations made there under.

(2) Upon an application being made in connection with which any fee is chargeable in accordance with the provisions of sub-regulation (1), the applicant shall be required, before the application is accepted, to pay the fee so chargeable.

(3) If, after that payment has been made, the application is withdrawn by the applicant or otherwise ceases to have effect or is refused, the Authority shall not refund the payment made.

PART XVII – OFFENCES AND PENALTIES

Contravention of Regulations.

113. A person who contravenes any requirement under these Regulations may have his certificate or exemption cancelled or suspended.

Penalties.

114. (1) A person who contravenes any provision of these Regulations, orders, notices or proclamations made there under shall, upon conviction, be liable to a fine not exceeding one million shillings or to imprisonment for a term not more than six months or both, and in the case of a continuing contravention, each day of the contravention shall constitute a separate offence.

(2) If it is proved that an act or omission of any person, which would otherwise have been a contravention by that person of a provision of these Regulations, orders, notices or proclamations made there under was due to any cause not avoidable by the exercise of reasonable care by that person, the act or omission shall be deemed not to be a contravention by that person of that provision.

Appeals.

115.Where any person is aggrieved by any order made under these Regulations that person may, within twenty-one days of such order being made, appeal against the order to the Tribunal.

Revocation of L.N No. 146 of 2018.

116.The Civil Aviation (Communication Systems) Regulations, 2018 are hereby revoked.

Transitional Provisions

117.(1) A license, certificate, approval or any other document issued to an operator prior to the commencement of these Regulations shall continue in force as if it was issued under these Regulations until it expires or is cancelled by the Authority.

(2) Notwithstanding any other provision of these Regulations, a person who at the commencement of these Regulations, is carrying out any acts, duties or operations affected by these Regulations shall, within one year from the date of commencement, comply with the requirements of these Regulations or cease to carry out such acts, duties or operations.

Made on the 15th December, 2025.

DAVIS CHIRCHIR,
Cabinet Secretary for Roads and Transport.

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