

VOICE COMMUNICATION SYSTEM FOR KAUNAS ATCC AND PALANGA ATCC
TECHNICAL SPECIFICATION

1. Preamble
 - 1.1 This document contains the technical specification of the Voice Communication System (hereinafter referred to as "VCS" or "System"), which the Public limited liability company "Oro navigacija" (hereinafter referred to as "the Customer") intends to purchase to provide air traffic services at Kaunas ATCC and Palanga ATCC.
2. System Overview
 - 2.1 General
 - 2.1.1 The VCS shall be operationally proven, shall have a high availability, shall be fully re-configurable and shall represent state of the art VoIP based technology.
 - 2.1.2 The VCS shall consist of the following segments:
 - Air-Ground Communications for voice contact between pilots and air traffic controllers,
 - Ground-Ground Communications for voice contact between controllers within the same unit and with other units.
 - 2.1.3 The following voice communication facilities shall be available:
 - Voice interconnection between internal users,
 - Voice interconnection between internal users and external units,
 - A/G radio channel selection and operation,
 - Monitoring and control facilities,
 - Legal voice recording to external voice recorder.
 - 2.1.4 The VCS shall have technically integrated functional parts for telephone and radio connections from operator working positions.
 - 2.2 System Locations
 - 2.2.1 The VCS cabinet shall be installed in technical room of Kaunas ATCC.
 - 2.2.2 The operator working positions (OWP) shall be installed in Kaunas ATCC, Palanga ATCC and Vilnius ACC as is specified in Annex 1.
 - 2.2.3 The VCS monitoring and control workstations – technical control terminals (TCT) shall be installed in Kaunas TR and TCS rooms, Palanga TCS room and Vilnius TCS room.
 - 2.3 Scope of the System
 - 2.3.1 The total number of the OWPs shall be twenty (20) and shall be installed at the following sites of the Customer:
 - 2.3.1.1 Kaunas:
 - APP/TWR room – 5 OWPs,
 - Backup ACC room – 5 OWPs,
 - TCS room – 1 OWP.

2.3.1.2 Palanga:

- APP/TWR room – 3 OWPs,
- TCS room – 1 OWP.

2.3.1.3 Vilnius:

- ACC room (backup) – 4 OWPs,
- TCS room – 1 OWP.

2.3.2 The names, roles, number, and composition of the OWPs are given in Annex 1.

2.3.3 The OWPs shall be suitable for installation on the desktop of controller working position (movable TSS with adjustable tilt housing, sockets for audio devices, mounting of loudspeakers, cabling, etc).

2.3.4 The desktop OWPs shall be adaptable to the place. TSSs and loudspeakers shall be placed on the desktop of the table, as well audio devices. If OWP has additional parts (communication unit, redundant power supply, etc.) they shall be installed inside console.

2.3.5 The box with 2 sockets for audio devices (1 for handset and 1 for headset or hand microphone) shall be installed on the bottom of the desktop, which shall be attached firmly.

2.4 Existing Radio Installations

2.4.1 The existing VHF Air-Ground communication system of the Customer consists of the local and remote radio sites as is specified in Annex 2.

2.4.2 Local and remote radios are VoIP compatible according to EUROCAE ED-137C and are connected to the protected IP network of the Customer.

2.5 Interoperability, Compatibility and Conformity

2.5.1 The VCS and its subsystems shall meet all associated interoperability requirements according to EUROCAE ED-137C Interoperability Standards for VoIP ATM Components.

2.5.2 VCS shall be compatible to connect the IP based radios via IP network according to EUROCAE ED-137C.

2.5.3 The VCS shall meet with the regulatory material of EASA Detailed Specifications and Acceptable Means of Compliance & Guidance Material for certification or declaration of design compliance of ATM/ANS ground equipment (DS-GE.CER/DEC) and the Supplier shall provide evidence on this.

3. System Functional Requirements

3.1 General

3.1.1 This section describes the telephone and radio functionality required at a working position.

3.1.2 The VCS shall support all functions and shall be possible to assign any or all functions to any working position.

3.1.3 It is envisaged the “display field” shall be on individual keys or be an area of the HMI where all information is displayed, or a combination of both.

3.1.4 The “active call area” shall be a key, or number of keys, where any call other than a DA call, could appear for the purpose of initiating a subsequent function.

3.2 Ground Telephone Operational Functions

3.2.1 Definitions

- 3.2.1.1 Terminal Busy: the condition that arises when an incoming call has reached the B-party OWP but there is no resource available to present the call to the user. The Terminal busy condition shall not arise on a DA call but is possible for an IA call in the event that the incoming call queue is full.
- 3.2.1.2 Network Busy: the condition that arises when there is no spare capacity within the network that is providing connectivity between one VCS and another. This identification may arise as a consequence of either network congestion or (exceptionally) as a result of a command from a System Management Terminal. Throughout these requirements, the term “congestion” is used synonymously with “network busy”.
- 3.2.1.3 Call Parties: the terms A-party, B-party and C-party are used throughout these specifications to identify the users involved in a telephone call, as follows:
- A-party: the user who initiates a telephone call – the calling party,
 - B-party: the user who first receives the telephone call – the called party,
 - C-party: any other party involved in an established call.
- 3.2.1.4 Dynamic Display: a device used for the visual presentation of operational information such as caller identities, call status and programmable touch-keys.
- 3.2.1.5 Facility: the term “facility” is used to describe the function to be carried out.
- 3.2.1.6 Feature: the term “feature” gives further details or the particular attributes of the facility.
- 3.2.1.7 Key: throughout these requirements, the term “key” is to mean a physical button or an appearance on a touchscreen and is used to refer to a single activation device such as a key, switch, button or an icon.
- 3.2.1.8 Monitor: the audio monitor facility is a means by which it is possible for one controller to be able to listen to the audio/voice activities at the OWP of another controller who is usually not physically adjacent.
- 3.2.1.9 Normal/Abnormal: the terms “normal” and “abnormal” refer to when the Performance criteria defined for each facility are either met or infringed respectively.
- 3.2.1.10 Supervisory Tones: the various supervisory tones and announcements shall apply:
- Dial – returned to a user when that user indicates to the system readiness to dial (for example, taking the telephone set off-hook).
 - Ringing – returned to the A-party after successful call establishment and prior to call acceptance.
 - Terminal busy – returned to the A-party if all available voice paths to a user are occupied.
 - Congestion – returned to the A-party if a call cannot be completed to the required B-party due to all appropriate inter-VCS links being occupied or otherwise unavailable.
 - Number Unobtainable – returned to the A-party if a terminal is “Out of Service” or the B-party address is unassigned.
 - Interrupt warning – injected into the voice path to warn a party of the imminent priority interruption of an established call.
 - Intrusion warning – injected into the voice path to warn a party of the imminent priority conferencing of an established call.

- 3.2.1.11 User: an Air Traffic Controller or other operational person carrying out the duties of Air Traffic Management.
- 3.2.2 Access methods of telephone facility by which calls can be made:
- Direct Access (DA),
 - Instantaneous Access (IA),
 - Indirect Access (IDA).
- 3.2.3 Direct Access Calls
- 3.2.3.1 With this facility the operation of a single key by the A-party is all that is required to initiate a call. The means by which, when accessing a single key, a connection shall be established to a predetermined destination.
- 3.2.3.2 At least 120 DA keys on each OWP shall be available.
- 3.2.3.3 The B-party address is assigned and fixed semi-permanently in the A-party VCS and is thus uniquely associated with each key and each key is labelled as such.
- 3.2.3.4 Dial tone and outgoing signalling tones are not given to the A-party.
- 3.2.3.5 Ringing tone shall be given (and/or visually indicated).
- 3.2.3.6 Busy tone shall be given if appropriate.
- 3.2.3.7 "Out-of-service" shall be given should the call fail for any reason other than Busy.
- 3.2.3.8 The B-party shall be alerted to the presence of the incoming call by audio and or visual means as determined by the B-party VCS.
- 3.2.3.9 The A-party identity shall be indicated to the B-party either by association with a key assigned and fixed semi-permanently in the B-party VCS or by means of a dynamic display.
- 3.2.3.10 The B-party shall accept the incoming call by means of a single action associated with a key or dynamic display. Due to the exclusive one-to-one assignments of the keys between the A and B-parties or reserved capacity in the B-party dynamic display, it is abnormal for the A-party to encounter the B-party busy; this is a fundamental attribute of the DA Facility.
- 3.2.3.11 Under normal conditions the B-party can receive one or more DA calls and by observing the identities of the respective A-parties, together with defined operational procedure or (more likely) operational experience, the B-party shall deal with each call appropriately in the appropriate sequence.
- 3.2.3.12 At the end of a call either the A-party or the B-party shall be able to deselect/clear.
- 3.2.3.13 DA shall be designed to meet the requirements for Direct Controller-Controller Voice Communication which stipulates that communication be established between radar controllers within 2 seconds in 99% of the time.
- 3.2.3.14 The delay interval between the A-party initiating the call and the B-party receiving the call alert/indication shall be maximum of 2 seconds.
- 3.2.4 Instantaneous Access Calls
- 3.2.4.1 IA is a means of "establishing" a telephone communication between two Users where there is an operational requirement for this.
- 3.2.4.2 With this facility the operation of a single key by the A-party is all that is required to initiate a call.
- 3.2.4.3 The B-party address is assigned and configured in the A-party VCS and is thus uniquely associated with a particular key and labelled with the B-party's identity.

- 3.2.4.4 Dial tone and out-going signalling tones shall not be given to the A-party. Ringing tone shall not be given to the A-party.
- 3.2.4.5 "Out-of-Service" tone shall be given to the A-party should the call fail for any reason including any busy conditions encountered.
- 3.2.4.6 The A-party identity is indicated to the B-party either by association with a key assigned and fixed semi-permanently in the B-party VCS or by means of a dynamic display. Due to the usually urgent nature of IA calls any visual and/or audible alerts shall be distinctive from other types of call.
- 3.2.4.7 An audible alert shall be generated at the B-party VCS in accordance with the following options:
- no audible alert,
 - alert of fixed duration.
- 3.2.4.8 The B-party VCS automatically accepts the incoming call without any intervention required by the User. This occurs regardless of the B-party being engaged on any other type of call. Thus B-party busy is totally abnormal and should result in "Out-of-Service" tone being given to the A-party. At this stage the speech channel from the A-party to the B-party is established.
- 3.2.4.9 The B-party may respond to the A-party by activation of a key associated with the incoming call. This action enables the return speech path if it occurs during the current call. Otherwise, it is treated as a new IA call.
- 3.2.4.10 If the B-party responds during the current call, this has the effect of preventing the call from being cleared until both parties clear the call. Without B-party response, the call is cleared when the A-party terminates the IA call.
- 3.2.4.11 Call clearing has no effect on other calls in progress at either the A-party or the B-party.
- 3.2.4.12 IA shall be designed to meet the requirements of Instantaneous Controller-Controller Voice Communication which stipulates that two-way direct communication be established between non-physically adjacent controllers within 1 second or less in 99% of the time.
- 3.2.4.13 The delay interval between the A-party initiating the call and the A-party to B-party speech path being established shall be maximum of 1 second.
- 3.2.5 Indirect Access Calls
- 3.2.5.1 The Indirect Access (IDA) facility shall be supported as both Internal and External Facilities using, where required, both private (PABX) and public (PSTN) telephone services.
- 3.2.5.2 The IDA facility shall enable A-party to enter a complete B-party address on a telephone dialling keypad to select a network and to cause a call attempt to be made to the supplied address. This is equivalent to normal dialled telephone operation.
- 3.2.5.3 Ringing tone and busy tone are given to the A-party as appropriate. A suitable mechanism (Out-of-service tone) shall be provided to inform the A-party, should the call fail for any reason other than Busy.
- 3.2.5.4 It may be possible for calls from more than one A-party to be presented to a B-party simultaneously.
- 3.2.5.5 It is possible for either the B-party or the A-party to terminate an established IDA call.
- 3.2.5.6 In addition to dialling the B-party address in full, the following PABX-type facilities are also used to establish IDA calls:

- 3.2.5.6.1 Abbreviated Dialling within the phonebook: entering a short code (up to four digits, a character string of unrestricted length or a specific labelled key) on a telephone dialling keypad, shall cause a call attempt to be made from the A-party to a predefined B-party associated with the supplied code.
- 3.2.5.6.2 Last Number Redial via call history: operation of a key shall cause a call attempt to be made from the A-party to the B-party to which the most recent previous call attempt (successful or unsuccessful) was made.
- 3.2.6 Call Priority
- 3.2.6.1 The Call Priority facility shall be supported for deployment as both Internal and External Facilities.
- 3.2.6.2 The call priority facility is a means of attaching an indicator (or flag) to a telephone call to show that it is "urgent" as opposed to "routine". It is intended for use when it is necessary to make an urgent call concerning the safety of aircraft (i.e., an emergency) and to enable, if necessary, the interruption of less urgent calls in progress at the time. Thus, calls can be made with or without priority so that there are two types as follows:
- priority calls,
 - routine calls.
- 3.2.6.3 The ultimate decision and responsibility as to whether a call is a Priority Call rests with the A-party in accordance with local operational procedures. There are 2 ways in which a priority call can be made:
- manually before the call is first placed: before making the call, operation of a priority key will set the call to "Priority". This method is used when the call is already known to be urgent,
 - automatic setting of priority: calls from either a particular OWP or individual keys are pre-configured "Priority" in the VCS. This configuration would be established as a contingency for use in special situations only. This type of configuration shall be an easily selectable option by means of the system management terminal.
- 3.2.6.4 At the OWP receiving a Priority Call the following sequence of events shall take place:
- distinctive and prominent audible and/or visual alerts clearly indicate to the B-party that a priority call has been received,
 - the B-party applies discretion as to how the priority call is dealt with, but normally it would be answered as quickly as the prevailing operational circumstances allow.
- 3.2.6.5 If a priority call cannot proceed due to congestion (all available circuits, links or channels being busy), the priority call shall interrupt an established unprotected routine call (should one exist), thus allowing the priority call to proceed. Before the established routine call is interrupted, all parties engaged in that call shall receive an interrupt warning tone.
- 3.2.7 Call Intrusion
- 3.2.7.1 The Call Intrusion facility shall be supported. Call Intrusion will be established by bi-lateral agreement but shall be supported for deployment as both Internal and External Facilities.
- 3.2.7.2 At the OWP receiving a Priority Call, the following sequence of events shall take place:
- The B-party receives, immediately, a pre-defined warning tone, via their telephone equipment, that an intrusion is imminent because of a Priority Call being received. If the call is not accepted this tone may be repeated, periodically, after specified time interval.

- The B-party applies discretion whether to release resources to permit the Priority Call to be answered. The B-party may do this by either clearing a call already in progress or by placing a call on hold.
- If the B-party releases resources, as described above, the Priority Call shall be either answered automatically or presented as a Priority Call as specified by the B-party.
- If the B-party does not release resources within the pre-defined time interval the A-party shall be connected in telephone conference at the OWP, and the warning tone stopped.

3.2.7.3 It shall be possible for any user to be protected against intrusion by other users. This protection shall be selectable either individually on a B-party, user-by-user basis, or as a single parameter for all users connected to a VCS.

3.2.8 Call Interruption

3.2.8.1 The Call Interruption facility shall be supported:

3.2.8.1.1 In IP networks appropriate measures shall be taken to assure the establishment of priority calls.

3.2.8.1.2 If the event that Call Interruption does occur in any part of the system all parties engaged in a call to be interrupted shall receive the current indications, by way of an interrupt warning tone before the established routine call is interrupted.

3.2.9 Simultaneous Calls

3.2.9.1 A Simultaneous Call occurs when two Users call each other at the same time. Simultaneous calls may arise because of any type of call (IA, DA, and IDA) but the outcome will vary depending upon the specific situation and outcome for both Users shall be a "User Busy" indication.

3.2.9.2 There is specific simultaneous call situation with Users connected to the same VCS. In this situation, within the performance criteria stipulated for DA and IA calls, a simultaneous call attempt shall result in both Users being connected.

3.2.10 Call Queuing

3.2.10.1 The Call Queuing shall be supported to provide a means for a User to have several incoming calls placed in a queue so that the order of their arrival and some means of identifying their origin can be easily determined.

3.2.10.2 Although the means of indicating the order of arrival is implementation specific, it is common for some form of stacking arrangement to be used. Consideration needs to be given to the maximum size of queue that would be considered manageable. Typically, a queue would be 5 or 6 calls deep.

3.2.10.3 The specific Calling Party Identity shall be provided to controllers wherever possible. If it is not possible to provide the specific Calling Party identity, it is recommended that a general identity shall indicate the generic source of the call.

3.2.10.4 The basic attributes of the Call Queuing facility are as follows:

- all calls in the queue are in a calling (ringing) condition until answered,
- a manual process may be used for selecting the next call to be answered but this does not preclude some form of first-in-first-out automatic selection,

- additional indications shall be used to identify Priority Calls that have arrived in the queue. Such indications might include a unique flag against the queue entry, a different display attribute (e.g. flashing characters or a unique colour) and a distinctive audible alert.
- 3.2.10.5 Although it will usually be IDA calls that are directed to the Call Queuing facility, in some exceptional circumstances (most commonly fault or call diversion conditions) DA calls may also be placed in a call queue. In these cases, some additional means of identifying the call as a DA call shall be given.
- 3.2.11 Outgoing Calls Last Number Redial
- 3.2.11.1 This function shall enable the user to make a call to the last destination called by accessing a single key within the call history and not redialling the complete number or the abbreviated dialling “code”.
- 3.2.12 End Function
- 3.2.12.1 It shall be possible to terminate a call by a single key press.
- 3.2.12.2 Ending a call shall terminate the active call currently in progress and the visual indication shall be extinguished.
- 3.2.13 Supplementary Telephone Services, as described below, shall be supported between ATS units within the Network:
- 3.2.13.1 The Call Transfer shall enable a user involved in an active call to establish a new call between the other user in the active call and a third party. This function shall enable any call made or received at a working position to be manually redirected to any other party. A Transfer key shall be available, and it shall be possible to transfer any active call at a position to another working position.
- 3.2.13.2 Call Conference: any OWP shall be able to initiate and manage a Conference. The Conference facility shall enable a minimum of 3 Users and a maximum of 7 Users to speak together. Conferences including external users may be established via external lines of varying types. The system shall support conferences with a maximum of 7 Users, up to 6 of which may be external users connected via external lines. At any stage, any of the Users may leave the conference by de-selecting a key. In such cases the remaining Users shall stay interconnected.
- 3.2.13.3 Multi Destination Call shall provide direct and immediate communications from a single supervisor position to two or more predefined OWPs. The speech is unidirectional and without a monitoring. Multi Destination Call and their Origin should be indicated at the OWP.
- 3.2.13.4 Call Hold allows a user to disconnect temporarily from an established call-in order to carry out other telephony functions before returning to the original established call.
- 3.2.13.5 Call Pickup enables a user to answer a call that is in the alerting phase (ringing) at another user's terminal.
- 3.2.13.6 Call Diversion enables a user to re-route all incoming calls to another user / OWP in the following circumstances:
- Unconditionally,
 - if a busy condition is detected at the B-party,
 - if the B-party fails to answer an incoming call within a predetermined time (no reply).
- 3.2.13.7 Position Monitor: the communications of one user position may be monitored at another user position. Monitoring includes all incoming and outgoing ATS audio.

3.2.13.8 Redial allows the dialling of a previously used destination number again.

3.3 Radio Functions

3.3.1 Definitions

3.3.1.1 User – an Air Traffic Controller or other operational person carrying out the duties of Air Traffic Management.

3.3.1.2 PTT Key – Push to Talk Key – a physical device for carrying out a Push-To-Talk (PTT) action.

3.3.1.3 A/C Call Indication – A/C Call is a term used at the OWP meaning that a transmission is being received on a particular frequency. This event is usually indicated by means of a lamp or other display device.

3.3.1.4 Radio Channel – the term “Radio Channel” is used to specify the frequency in conjunction with a specific radio location when in fact the actual frequency used.

3.3.2 Radio Access

3.3.2.1 Radio access at OWP shall be activated by the operation of a key associated with a particular frequency.

3.3.2.2 The key shall enable a particular radio frequency to be in one of four modes:

- Off/Deselected
- Receive only (Rx)
- Transmit and receive (Tx/Rx)
- Cross-coupled

3.3.2.3 A user shall be able to Select or Deselect any Frequency assigned to the working position.

3.3.2.3.1 Assign a particular frequency:

- there shall be a visual indication that the particular frequency has been assigned to the working position,
- actual frequency shall be displayed in a display field,
- frequency shall be assigned to the working position but shall not be active.

3.3.2.3.2 Operation of Deselection – re-operate the assigned Frequency key:

- visual indication showing the frequency is assigned at the working position shall be extinguished,
- actual frequency displayed shall be removed from the display field,
- frequency shall no longer be assigned to the working position.

3.3.3 Receiving – Frequency Active

3.3.3.1 When “Rx” mode has been selected the User shall hear any transmissions that are made on that frequency. At the same time the presence of the carrier frequency, regardless of speech modulation, shall also cause the A/C call visual indication at the OWP.

3.3.4 Audio Device Selection – Rx Mode

3.3.4.1 This facility shall enable the User to select whether transmissions received from aircraft are audible via the hand-held devices and the loudspeaker at the OWP (by adjusting the volume). The generic audio output for security reasons shall be adjustable via configuration setting only.

3.3.4.2 For safety reasons, the system shall have to ensure that:

- Once the audio device selection for a specific radio channel at a OWP has been completed, this shall be indicated to the user,
- The selection of audio through a headset shall only be allowed if the headset jacks are plugged in the OWP. Compliance with this requirement shall enable the radio channels selected in the headset to be automatically deselected from the headset and selected in the loudspeaker when the jacks are removed. The loudspeaker volume shall be adjustable by the User, but with a limited minimum according to operational requirements; some means of indicating that the loudspeaker volume is at minimum shall be provided. These measures shall guarantee that the audio can be heard at the OWP,
- It shall not be possible to select a frequency without having an audio device (headset or loudspeaker) connected,
- Any frequencies that have been enabled on the VCS shall not go unmonitored by always ensuring that they are Rx selected on at least one (typically a supervisor's) OWP,
- Jack-coded plug-in devices (such as headsets) shall be commonly used to determine which (if any) audio devices are connected.

3.3.5 Transmitting

3.3.5.1 When both receive and transmit (Tx/Rx) mode has been selected the User shall transmit on the frequency by operating a PTT key. It shall not be possible to transmit on a frequency without receive also being selected.

3.3.5.2 These functions are associated with each frequency and shall enable transmission and reception on an individual frequency. These functions shall only be active once the particular frequency has been selected.

3.3.5.3 Rx selection – an Rx key shall be available and associated with each frequency assigned to the working position.

3.3.5.4 Operation – operate the Rx key associated with the required frequency. There shall be a visual indication that the frequency is in receive mode. All transmissions from aircraft and other working positions transmitting on the particular frequency, shall be received on a loudspeaker or headset/handset at the working position.

3.3.5.5 Re-operate the Rx key – the visual indication showing that the frequency is in receive mode shall be extinguished. Incoming transmissions shall be disconnected from the selected audio device.

3.3.5.6 Tx selection – a Tx key shall be available and associated with each frequency assigned to the working position.

3.3.5.7 Operation – operate the Tx key associated with the required frequency. There shall be a visual indication that the frequency is in transmit mode. A transmitter shall be connected to the frequency.

3.3.5.8 Re-operate the Tx key – the visual indication showing that the frequency is in transmit mode shall be extinguished. The frequency shall be disconnected from the transmitter.

3.3.6 Side Tone

3.3.6.1 When transmitting, Side Tone is the User's own speech fed, at reduced level, into the User's earpiece in Handset or Headsets. Local generated side tone is recommended to avoid echo triggered by network delays.

3.3.7 Multiple Frequencies

3.3.7.1 An OWP shall have radio access to several frequencies, each of which can be set individually in one of the four modes. Thus, simultaneous reception on more than one frequency is

possible. Similarly simultaneous transmission on more than one frequency is possible by operation of a common PTT key.

3.3.8 Transmitter/Receiver Selection

3.3.8.1 The VCS shall support the following 3 options for Tx/Rx selection:

3.3.8.1.1 Option 1 – individual transmitter and receiver selection is a VCS configurable parameter. The User has no means of selection available at the OWP.

3.3.8.1.2 Option 2 – the User selects at the OWP which transmitter and receiver combinations are in use on each frequency.

3.3.8.1.3 Option 3 – the User selects at the OWP which transmitter and receiver locations shall be active. Best Signal Selection (BSS) may be used to automatically the specific receiver signal transferred to loudspeaker/headset.

3.3.9 Switching Capabilities of Radios

3.3.9.1 In case of failure of any transmitters and/or receivers, the VCS shall provide the following switching capabilities:

- Automatic switching to alternative transmitters or receivers which could be in different locations to those that have failed.
- Manual switching or Manual switching inhibition of any transmitters or receivers.

3.3.9.2 The system management facility shall provide means by which any round-trip propagation delay may be considered to trigger an alarm. This delay shall be configurable by maintenance personnel.

3.3.10 Frequency Cross-Coupling

3.3.10.1 The User shall be able to select two or more radio frequencies in a cross-coupled group.

3.3.10.2 When an aircraft transmits on frequency F1 and is received on the ground, it shall be retransmitted on frequency F2. For the User on the ground at the OWP where coupling has been enabled, when the user transmits on either frequency F1 or F2 transmissions shall occur on both frequencies at the same time.

3.3.10.3 The original aircraft transmission on frequency F1 only shall be fed to the User at the OWP where the cross-coupling has been enabled – not the received signal by retransmission on any other frequencies. The received transmission on frequency F1 is termed the “incoming frequency”.

3.3.10.4 Users shall be given clear indications of which frequencies are being employed in cross-coupled mode.

3.3.10.5 Single coupling group shall be possible per each working position. Of the frequencies in these groups, it shall be impossible to simultaneously assign the same radio frequency to more than one group.

3.3.10.6 To prevent cross-coupling chains, means shall be provided to ensure that a particular frequency can only be included in one cross-coupling session.

3.3.10.7 If a frequency is already cross-coupled on one OWP the system shall prevent it being cross coupled at another OWP – regardless of its location. The system shall also present clear information, on the OWP of the User being prevented from cross coupling the frequency, that the cross-coupling procedure has been refused and thus not executed.

3.3.10.8 The system shall support both duplex and simplex cross-coupling functionality. All received frequencies in duplex mode may be re-transmitted on all the other frequencies in the cross-

coupled group - but only one at a time. The received frequency re-transmitted is always presented at the OWP. Received frequencies in simplex mode are never re-transmitted on other frequencies in the cross-coupled group.

3.3.11 Status Notification

- 3.3.11.1 When a User selects a frequency on a OWP terminal in receive mode, the system shall have the capability to make available to the User the following information about the Rx status:
- Confirmation that the Rx is available and ready for use – including the existence or failure of the logical link to the Rx site,
 - The identity of the Rx selected.
- 3.3.11.2 When a User selects a frequency in transmit mode, the system shall have the capability to make available to the User the following information about the Tx status:
- Rx status notification,
 - Confirmation that the Tx is available and ready for use – including the existence of a logical link to the Tx site,
 - The identity of the Tx selected.
- 3.3.11.3 In the event of a frequency selection action being rejected, Users shall be informed as to the cause of that rejection. Possible causes for rejection shall include the following:
- The total number of Users with that transmitter selected would exceed the total permissible,
 - The transmitter is not available.
- 3.3.11.4 It is assumed that the unavailability of a logical link (Tx and/or Rx) would be notified in accordance with Rx status notification and Tx status notification and detection of end-to-end connection loss.

3.3.12 Frequency Monitoring

- 3.3.12.1 This function shall enable any working position to monitor all radio traffic on channels that are available at the working position, even if they have been selected at other working positions.
- 3.3.12.2 Operation:
- select the radio channel to be monitored,
 - operate the Rx key associated with that frequency,
 - there shall be a visual indication that the frequency is in receive mode.
- 3.3.12.3 All transmissions from aircraft and working positions shall be received on the selected audio device for that frequency. The above Operations shall be repeated for each frequency to be monitored.
- 3.3.12.4 To discontinue monitoring a particular frequency:
- re-operate the particular Rx key associated with that frequency,
 - visual indication showing that the frequency is in receive mode shall be extinguished,
 - all transmissions from aircraft and working positions shall be disconnected from the selected audio device for that frequency.

3.3.13 Best Signal Selection

- 3.3.13.1 Best Signal Selection (BSS) function shall be implemented in the system to handle multi receiver frequencies. This function shall consider the audio signal quality and the relative delay between the incoming signals.
- 3.3.13.2 It shall be possible for BSS functionality for each frequency (channel) to be manually deselected at the OWP, supervisor position or engineering management system.
- 3.3.13.3 It shall be possible to deselect one or more individual receivers from BSS at the OWP, supervisor position or engineering management system.
- 3.3.13.4 If a change of receiver is permitted after original BSS operation, the intelligibility and integrity of the received signal to the controller shall not be degraded.
- 3.3.13.5 In situations where BSS is used, time delay differences due to the reception of the same signal received from different radio sites shall be compensated for if greater than BSS input delay differential max.
- 3.3.13.6 In situations where mixed received signals are used in preference to BSS, time delay differences due to the reception of the same signal received from different radio sites may result in echoes at OWP that shall be compensated for if greater than 10 ms. Variation of differential delay shall not affect voice quality of the message received.
- 3.3.13.7 A selection therefore shall be made to route the best signal of the receivers to the controller. When a message is received on any or all the radios in a BSS group, the VCS shall evaluate the quality of the signal from each of the receivers in that group. The system shall isolate the signal with the best quality and shall direct only that signal to the selected output audio devices. Any transmissions made from the operator panel on that frequency group, shall be directed to the transmitter site associated with the selected receiver.
- 3.3.13.8 The operator shall receive a visual indication of the selected radio site.
- 3.3.13.9 If the operator attempts to transmit on the BSS frequency prior to any message being received on that frequency a default site shall be selected.
- 3.3.13.10 It shall be possible to override the BSS function from the panel and to select any site of the group.
- 3.3.14 Short-Term Recording
 - 3.3.14.1 The system shall provide short-term recording at OWP level and instant replay function of the last radio and telephone communications (minimum 60 minutes duration).
- 3.4 Human Machine Interface
 - 3.4.1 General
 - 3.4.1.1 Each User shall interface with the VCS through an OWP which provides a means of communication for both Ground Telephone and Air-Ground applications.
 - 3.4.1.2 Depending upon the type of ATS functions and tasks to be executed at the positions at the ATS unit, each console shall be provided with the necessary terminal equipment to fulfil the communication requirements.
 - 3.4.1.3 The communication equipment at all positions shall be identical in respect of functions and performance, the quantity in respect of assigned telephone keys or access to frequencies may be different.
 - 3.4.1.4 The terminal equipment, separated into operating panels and control/interface equipment, shall be installed into the ATS working positions (OWP).
 - 3.4.2 Activation and Presentation Devices

- 3.4.2.1 An OWP uses a range of activation and presentation devices to provide access to all of the user-functions implemented by a VCS.
- 3.4.2.2 Activation devices:
- Touch-sensitive screens (TSS),
 - For the A/G PTT operation shall be mechanical keys, including those that are integrated into hand microphones, handsets, and free or clip-on lapel switches integrated into a headset cable.
- 3.4.2.3 The ability to re-configure the layout of a User's VCS panel is a requirement that prescribes the use of dynamic LCD displays for both activation and presentation with segmented touch-sensitive screens (TSS).
- 3.4.3 Operator Position Panels
- 3.4.3.1 Each operator position shall have functional panel as required to manage the operational functions of the VCS for telephone (G/G) and a radio (A/G) communication.
- 3.4.3.2 The panels shall be of limited size between 11 to 14 inch in diagonal and shall be identical in all positions.
- 3.4.3.3 All operational functions shall be easily accessed.
- 3.4.3.4 The function keys shall be of solid construction, and they shall be designed so that different functions are easily distinguishable.
- 3.4.3.5 The key size shall be large enough to permit clear texts and shall be in size between 20x20 mm and 30x30 mm.
- 3.4.3.6 The pressure point shall be distinct and precise and shall give good tactile feedback.
- 3.4.3.7 All telephone DA, IDA and IC functions shall be integrated into one panel.
- 3.4.3.8 Each telephone terminal and its DA key allocation shall be agreed in detailed functional specification.
- 3.4.3.9 Indirect Access (IDA) and Common Control (CC) function shall be part of the panel contains the basic element of the terminal. It shall handle indirect calls and integrate to some extent general control functions like volume control, conference, transfer, hold, etc.
- 3.4.3.10 All incoming calls for which no DA keys are available at the position shall be routed to the queue for at least to 3 calls.
- 3.4.3.11 The called position shall be free to choose the sequence of acceptance.
- 3.4.3.12 The identity of the caller shall be displayed.
- 3.4.4 DA/Intercom
- 3.4.4.1 For each OWP, a certain number of opposite positions (internal or remote) shall exist with which frequent and urgent telephone communications are necessary. To facilitate access to telephone and Intercom, the DA feature shall be required.
- 3.4.4.2 Each access facility shall consist of an appropriate key with a display containing two lines with at least 5 characters each.
- 3.4.4.3 The character shall be readable, and its height shall be at least 3 mm.
- 3.4.4.4 To each access facility a telephone address or an Intercom address shall be attributed.
- 3.4.4.5 Shall be possible to clearly distinguish between telephone and Intercom.

- 3.4.4.6 Selection or deselection of an access facility shall be activated by the action of the allocated key.
- 3.4.5 Radio Panel
 - 3.4.5.1 In the operator working positions all radio functions shall be activated via one R/T panel, which shall be integrated to OWP panel.
 - 3.4.5.2 It shall enable access to at least 8 radio channels for transmission and reception by way of loudspeaker or headset, or handset.
 - 3.4.5.3 The radio channels assigned to a working position shall be configurable from any one of the Technical Control Terminals.
 - 3.4.5.4 Reconfiguration of the assigned channels for each position shall also be possible from these control terminals.
 - 3.4.5.5 The frequency allocated to a radio channel shall be indicated with 6 characters plus decimal point (e.g. "123.455") and the letter "M" that means main or "S" that means standby and any other letter indicates the station symbol.
 - 3.4.5.6 This indication shall be present as soon as, and as long as the frequency is allocated to the particular radio channel.
 - 3.4.5.7 Via an input action on the radio panel by pressing an appropriate key, the allocated radio channel shall be selectable for the monitoring of the reception (Rx mode).
 - 3.4.5.8 Any audio communication on this channel shall be routed to the operators' headset, or handset or to the loudspeaker according to the operator's selection.
 - 3.4.5.9 This selection of a particular radio channel shall be indicated on the associated position and all other positions with access to the same radio channel as well.
 - 3.4.5.10 The presence of a received A/G communication shall be indicated visually as squelch indication.
- 3.4.6 Transmitter Activation (Traffic Mode)
 - 3.4.6.1 This function enables access to the transmitter. The push-to-talk shall be authorised for the radio channel. Before transmitting on a radio channel, this has to be selected in "Traffic Mode".
 - 3.4.6.2 When radio channels, more than one, are selected in "Traffic Mode", the operator shall be able to transmit at the same time on all these channels by only pressing the PTT switch.
 - 3.4.6.3 While the operator is pressing the PTT switch, the status of operating radio channels shall not be allowed to be modified. It shall be allowed to deselect a radio channel while PTT is active.
 - 3.4.6.4 Transmitter activation shall only be possible if a headset or hand microphone or handset is connected to the working position.
- 3.4.7 Touch Sensitive Screen
 - 3.4.7.1 The operator position shall be equipped with a touch-sensitive screen (TSS), where DA, IDA, IC, R/T, and CC facilities shall be implemented.
 - 3.4.7.2 The TSS shall have adjustable tilt to give the operator possibility to change viewing angle for better view of the TSS.
 - 3.4.7.3 The panel shall be adaptable to the operational requirements and each operator action on the input device shall produce a visual change to indicate that it has been considered.

- 3.4.7.4 This panel shall give a clear indication of all the facilities selected by the operator and the status of channels and/or lines, i.e. "busy state", "transmit in progress", "receive state", etc.
- 3.4.7.5 As this panel will cover a number of configuration facilities, the "default" screen shall display the basic configuration that is expected to be most frequently used during normal operation.
- 3.4.7.6 The address of the caller shall be indicated to the called party.
- 3.4.7.7 A brightness control shall be provided for the TSS in order that the operator can adjust the visual indications according to the environmental lighting.
- 3.4.7.8 The panel shall contain a volume control for independent volume adjustment for the connected audio devices.
- 3.4.7.9 In any case, the minimum volume obtainable shall be clearly different from zero.
- 3.4.8 Audible Indication
 - 3.4.8.1 All incoming calls shall be announced by means of a continuous tone. For this purpose, each terminal shall be equipped with a buzzer.
 - 3.4.8.2 It shall be possible to make adjustments of the level. In addition, it shall be possible to switch off the continuous tone by a simple key Operation, but a visual indication of "buzzer off" is necessary.
 - 3.4.8.3 Any further incoming calls shall activate the buzzer for a time of approximately 1.0 second.
 - 3.4.8.4 It shall be possible to have a differentiation in tone for different classes of communications.
- 3.4.9 Audible Tones at Working Positions
 - 3.4.9.1 Ring-Back Tone
 - 3.4.9.1.1 After establishing a connection and prior to the acceptance of the call by the called terminal, a ring-back tone shall be sent to the calling user. To check that the connection to the called system is already established and to minimise the acceptance delay, the ring-back shall be sent from the called system.
 - 3.4.9.1.2 The ring-back tone shall consist of a sequence in which the tone period is shorter than the silent period.
 - 3.4.9.2 Interrupt Warning Tone
 - 3.4.9.2.1 If an established call is subject to a priority interruption, the parties concerned shall be warned of the imminent interruption.
 - 3.4.9.2.2 For this purpose, an interrupt warning tone shall be generated and heard for some seconds.
 - 3.4.9.3 Terminal Busy Tone
 - 3.4.9.3.1 If a terminal is busy, the line to the calling exchange shall be released and the calling terminal shall receive from its own system a busy tone indicating that the system will automatically initiate a repetition of the call.
 - 3.4.9.3.2 The busy tone shall be a rapid sequence of the same tone in which the duration of the tone is theoretically equal to that of the silence between tones.
 - 3.4.9.4 Unserviceable Tone

- 3.4.9.4.1 If a terminal is out of service, not available or if the number dialled has not been allocated, a special tone shall be heard by the calling terminal. The line shall be released, and the calling exchange shall provide the appropriate tone.
- 3.4.10 Audio Devices
- 3.4.10.1 The audio devices of OWP are specified in the respective table of the Annex 1 and shall be as following:
- Headsets
 - Hand-held microphones
 - Hand Microphone Telephones (Handsets)
 - Loudspeakers
- 3.4.11 Management of Mixed A/G Radio and Ground Telephone Communications
- 3.4.11.1 In OWPs if headsets will be used, incoming Ground Telephone calls shall be routed to earpiece.
- 3.4.11.2 While a Ground Telephone call is in progress Ground Telephone speech a parallel A/G Radio call shall be presented in addition. When the controller replies by activation of his PTT key, the pilot shall receive the transmission in the usual way.
- 3.4.11.3 Ground telephone calls shall never be mixed inadvertently with A/G Radio transmissions to the pilot.
- 3.4.12 Audio Devices Common Modules
- 3.4.12.1 Common modules shall be available for the connection of headsets, handsets, hand microphones and loudspeakers as well as for the control of these audio devices.
- 3.4.12.2 Headsets, handsets and hand-held microphones shall be supplied with identical plugs for connection to the audio jacks and shall be interchangeable.
- 3.4.12.3 Radio and telephone communications shall be operated via headsets, handsets, hand-held microphones and loudspeakers.
- 3.4.13 Headsets
- 3.4.13.1 Monoaural headsets will be used for R/T and telephone communications.
- 3.4.13.2 The monoaural headset shall have single earphone and noise-cancelling microphone. It shall be provided with a coiled cable, equipped with a PTT switch and a clip for fixing it to the operator's jacket. The clip shall be strong enough to carry the full cable weight and PTT switch.
- 3.4.13.3 Headset shall be made to use either with left ear or with right ear and microphone position shall be adjustable.
- 3.4.13.4 The length of the cable, if spread, shall be between 1,5 and 2,5 meters measured from the fixing clip to the connecting plug.
- 3.4.13.5 The PTT switch shall be mounted near the fixing clip. Between clip and headset straight cabling will be used.
- 3.4.13.6 Headset samples shall be provided for selection.
- 3.4.14 Handset

- 3.4.14.1 The Bidder shall propose handsets, which are professional of high quality, lightweight, robust enough and shall be of high degree of reliability.
- 3.4.14.2 Handsets shall be supplied with rest pad or holder. If holder is functionally active, the active telephone call shall be terminated when handset is put on holder.
- 3.4.14.3 Microphone shall be noise cancelling to prevent mutual influences between controllers. The handset shall be provided with a PTT switch, which operates the microphone with radio transmission.
- 3.4.14.4 The handset shall be provided with a coiled cable 1,5 meters length, if spread. The cable shall be terminated with the same connecting plug as for the headsets.
- 3.4.14.5 Handsets samples shall be provided for selection.
- 3.4.15 Hand-held Microphone
 - 3.4.15.1 The hand-held microphone shall be equipped with a PTT switch. Microphone shall be noise cancelling to prevent mutual influences between controllers. The cable shall be same length as for the handsets and shall be terminated with the same connecting plug as for the handsets.
 - 3.4.15.2 Hand-held microphones samples shall be provided for selection. Hand-held microphones shall be supplied with either hook or holder or rest pad to put when idle.
- 3.4.16 Loudspeaker
 - 3.4.16.1 Each OWP shall have 2 loudspeaker panels with configurable audio output.
 - 3.4.16.2 Volume control at the OWP shall be easy reachable and shall be operated electronically or mechanically.
 - 3.4.16.3 With the volume in minimum position, the audio level shall remain sufficient for monitoring purpose.
 - 3.4.16.4 Loudspeaker panels shall be a box type, suitable for desktop and console rail mounting.
 - 3.4.16.5 Loudspeakers shall be connected directly to the sockets with locking mechanism of audio devices common modules.
 - 3.4.16.6 Loudspeakers shall be supplied with desktop or rail fixing accessories which shall be agreed with the Customer.
- 3.4.17 Connection of Headsets, Hand microphones and Handsets
 - 3.4.17.1 The headsets, hand-held microphones, and handsets shall be plugged into sockets which shall be installed at the operating consoles of each OWP. The sockets shall be installed in a small box and shall be mounted at the bottom side of the desktop on the left of the operating positions.
 - 3.4.17.2 The connectors plugged into the sockets shall not protrude outside the front side of the table shelf. Installation places of the connector boxes may vary from position to position and shall be agreed with the Customer.
 - 3.4.17.3 The sockets can be used in an interchangeable way between audio devices.
 - 3.4.17.4 The sockets shall have connector locking mechanism and shall be easily connected and disconnected.
- 3.4.18 Monitoring

- 3.4.18.1 A means of monitoring shall be provided to enable a suitably authorised user to listen in on voice communication from one or more other user terminals.
- 3.4.19 Human Engineering Requirements
- 3.4.19.1 The following specifications identifies some important human engineering aspects that shall be considered for Human Machine Interfaces (HMI):
- 3.4.19.2 The interaction between a controller and the HMI shall leave the controller in no doubt about the next action to be taken in implementing the current function.
- 3.4.19.3 An HMI shall make it clear to the controller what type of input is required at any particular instant.
- 3.4.19.4 An HMI shall immediately make it clear to the controller that invalid data has been entered.
- 3.4.19.5 Any message, instruction or information shall be displayed for a sufficient period to allow the controller to read it.
- 3.4.19.6 Display attributes such as colours, bolding, flashing and highlighting shall only be used in those situations where the impact they cause is essential. Over-use can be distracting and can lead to important messages being ignored.
- 3.4.19.7 The status of all function keys and DA keys shall always be obvious.
- 3.4.19.8 Any change in the status of a function key or DA key shall be highlighted by an appropriate means.
- 3.4.19.9 The availability of a particular function or service shall be shown by the status of the indicator associated with the key that activates the service.
- 3.4.19.10 The indicator associated with a DA key, or an Instantaneous Access key shall use different attributes (for example, lit, unlit, coloured and flashing) to distinguish between:
- An active call-in progress,
 - No active call or service in progress (idle),
 - Priority calls,
 - Busy/congestion.
- 3.4.19.11 The indicator associated with the A/C call shall be distinctive to enable active frequencies to be easily identified.
- 3.4.19.12 A distinctive and clear indicator showing any frequencies that have been cross coupled shall be provided.
- 3.4.19.13 A set of keys grouped to represent a standard telephone dial-pad shall be available for the entry of numeric (address) data.
- 3.4.19.14 The displays/indicators shall have:
- Wide viewing angle,
 - Adjustable Brightness (day, night, sun glance operation etc),
 - Low light reflections obscuring visibility,
 - Adjustable tone volume.
- 3.4.20 Physical Environmental Considerations
- 3.4.20.1 The keys, panels and displays associated with a VCS are usually located in a combined Work Position that houses the HMI of many other systems comprising the OWP. Care should be taken to ensure that the various components can co-exist in the physical environment intended and that the environment itself is suitable.

- 3.4.20.2 Particular consideration shall be given to addressing the following known problems:
- 3.4.20.2.1 Electrical interference from adjacent units,
- 3.4.20.2.2 Inadequate ventilation and excessive heat generation, the latter of which may demand air conditioning for components that would otherwise not need it,
- 3.4.20.2.3 Noise generation by cooling or storage devices shall be avoided, thus no fan or mechanical disk drives shall be used for VCS operator position equipment,
- 3.4.20.2.4 All touchable equipment (keys, switches, touch sensor devices etc.) shall be of such kind that it doesn't feel cold or hot.
- 3.5 VCS System Management
- 3.5.1 General
- 3.5.1.1 A VCS shall be connected to terminal devices which can be used for system management tasks. The Management Functions have been classified into Management Functional Areas (as per ISO's OSI Management or equivalent):
- Performance management,
 - Fault (or maintenance) management,
 - Configuration management,
 - Security management.
- 3.5.2 Performance Management
- 3.5.2.1 Performance management provides functions to evaluate and report upon the behaviour of telecommunication equipment and on the effectiveness of the external links, network or VCS. Its role is to gather statistical data for the purpose of monitoring and correcting the behaviour and effectiveness of these and to aid in the planning and analysis phases.
- 3.5.2.2 Performance management relates to the following set of functions:
- 3.5.2.2.1 Performance monitoring: the collection of data concerning the performance of the VCS.
- 3.5.2.2.2 Traffic Measurement: the collection of traffic data statistics from VCS. Traffic data reports may be sent upon threshold triggering, periodically or on demand.
- 3.5.2.2.3 Status Monitoring Functions:
- Service availability of the VCS,
 - Status of controls,
 - Line busy/idle status,
 - Control Functions,
 - Quality of service (QoS) observations.
- 3.5.3 Fault Management
- 3.5.3.1 Fault management functions enable the detection, isolation and correction of abnormal operation of the telecommunication network and its environment.
- 3.5.3.2 Fault management relates to the following set of functions:
- 3.5.3.2.1 Alarm Surveillance: the capability to monitor failures in near real time. When a failure occurs, fault management determines the nature and severity of the fault and may also determine the effect of the fault on the services supported by the faulty equipment.
- 3.5.3.2.2 Fault Location: the ability to augment the initial failure information by use of additional failure localization routines.

3.5.4 Configuration Management

3.5.4.1 Configuration management provides functions to exercise control over, identify, collect data from and provide data to a VCS and procedures that are necessary to bring equipment into service.

3.5.4.2 Configuration management relates to the following set of functions:

3.5.4.2.1 Re-configuration: procedures that are necessary to adapt User-facilities like frequencies, DA-key etc. to the actual traffic situation. With particular regard to “user configuration management”, a common requirement is to be able to build and store a particular combination of ground telephone and radio frequency assignments in accordance with a particular operational “role”. Roles may be assigned to a particular OWP by the System Management Terminal or invoked by the User.

3.5.4.2.2 Status and control: the capability to monitor and control certain aspects of the VCS on demand. Examples include checking or changing the service state of VCS sub-parts (in service, out of service, stand-by) and initiating diagnostics tests. When associated with failure conditions, these functions are corrective. Status and control functions can also be part of routine maintenance when execute automatically or on a scheduled periodic basis.

3.5.4.2.3 Installation: the extension or reduction of system hardware and software components. An important aspect of this function is the ability to make modifications to the configuration while the VCS continues to operate.

3.5.4.3 Configuration of Telephone and Radio Access Keys

3.5.4.3.1 Configuration management shall permit the multiple assignment of an access key appearance on more than one OWP.

3.5.4.4 Alpha-numeric Identification Labels

3.5.4.4.1 To facilitate the presentation of a caller’s identity as an alpha-numeric string (e.g., caller’s name or operational identifier) rather than simply digits representing the caller’s AGVN number, it shall be possible to associate an external number with an alpha-numeric string which can be substituted when a call arrives from that source.

3.5.4.5 Recovery after System Failure

3.5.4.5.1 On recovery from loss of power to a VCS or any other fault causing an interruption to service, the VCS shall be returned to the configuration established prior to the failure or, if this is not possible, to a predefined configuration.

3.5.5 Security Management

3.5.5.1 Security management shall provide the functions necessary to ensure adequate security of the installation and the prevention of misuse of a VCS by unauthorised users that compromises the operational integrity.

3.5.5.2 Safeguards are necessary to protect their own air traffic management as well as other (external) users. This requirement relates to the security of all systems and services that contribute to the provision of VCS services.

3.5.5.3 Security can be considered from the perspective of two general categories: physical security and system security.

3.5.5.4 Appropriate physical security measures, like those usually employed throughout facilities associated with the management of air traffic, shall be taken to protect the areas and systems used to provide communications services.

- 3.5.5.5 Within system security category all items of communications equipment within a particular operational location are included, such as VCS and line transmission and network equipment.
- 3.5.5.6 VCS shall provide support for identification and authentication of authorised users, in particular, management and maintenance personnel.
- 3.5.6 Control Terminals
- 3.5.6.1 The central system shall be connected to 3 control terminals for technical and operational control.
- 3.5.6.2 The connection between the system and each terminal shall be via LAN and therefore the system shall support an interface to a LAN. Not all terminals need access to all functions, several degrees of access and priority are required. This priority shall be allocated by way of software.
- 3.5.6.3 Inputs made on certain terminals shall be indicated on all other ones with the same information displayed.
- 3.5.6.4 For the purpose to monitor, control and do configuration, a Technical Control Terminal (TCT) shall be installed in the Technical Supervisor Room of ATC building in Kaunas airport.
- 3.5.6.5 For the voice communication system it shall allow pre-programming in advance, loading of different system configurations and on-line reconfiguration by using TCT.
- 3.5.6.6 The TCT shall be based on workstation with a hard disk, display, keyboard, mouse, and USB. The diagonal of the display shall be 24 inches to be sufficient for convenient configuration, management and control of the system.
- 3.5.6.7 Two Operational Control Terminals (OCT) equipped as the TCT shall be mainly used for monitoring purpose but also can be used as TCT if logged in with the administrator rights.
- 3.5.6.8 One OCT shall be installed remotely in the Technical Supervisor Room of ATC building in Palanga airport, and the second OCT shall be installed remotely in the Technical Supervisor Room of a main building of Oro navigacija in Vilnius.
- 3.5.7 System On-line Reconfiguration
- 3.5.7.1 Sometimes one or more elements of an ATC OWP may be “out of service” due to maintenance or technical problems. Such problems must be solved without any disruption to air traffic control by transferring operation to another unused ATC OWP. Such circumstances can be managed by an on-line reconfiguration feature and the dynamic labelling address information.
- 3.5.7.2 The VCS on-line Reconfiguration shall be one or both of the following:
- Centralised: Controlled from the OCT and TCT,
 - Non-centralised: Controlled by authorised users who will split or merge their own roles to another OWP.
- 3.5.7.3 On-line Reconfiguration within a centre shall not have technical or operational impact on adjacent centres.
- 3.5.7.4 On-line Reconfiguration within a centre shall not have impact on calls that are already established.

- 3.5.7.5 Incoming and outgoing telephone calls, being established during an on-line reconfiguration, shall be routed to either the original destination or the new destination (after reconfiguration).
- 3.5.7.6 Any action of the supervisor shall be executed without influence on the normal system operation, existing connections shall not be disturbed, and new connections shall not be delayed.
- 3.5.7.7 Off-line Reconfiguration
- 3.5.7.7.1 Whenever an off-line reconfiguration is required, the downtime of the system shall be kept to a strict minimum, some seconds can be accepted.
- 3.5.7.8 User's Reconfiguration
- 3.5.7.8.1 The system shall have the ability for a quick, on-line reconfiguration of the ATC sectors, to meet changing demands according to the time of day and the air traffic pattern.
- 3.5.7.8.2 For this purpose, up to three different configurations shall be pre-programmed in the system which can be called up by the OCT.
- 3.5.7.9 Restart
- 3.5.7.9.1 All user specified data, which are entered into the system via the control terminal, and which represent the actual status of the system, shall be stored in non-volatile and protected memory space.
- 3.5.7.9.2 In case of a system breakdown, it shall be possible to restart the system by means of a "reset".
- 3.5.7.9.3 The system restart time shall be as short as possible via "menu" techniques from one of the control terminals.
- 3.5.7.9.4 After a power break, an automatic reset shall occur without loss of data and the status shall not be affected.
- 3.5.8 Monitoring and Control of the System
- 3.5.8.1 The correct functioning of the system requirement shall be performed by:
- Efficient self-checking capabilities,
 - Periodical failure check procedure of all units not continuously in operation,
 - Starting of fault diagnostic programs in case of failure detection,
 - Functional unit reconfiguration to enable fail-safe degradation of system operation,
 - Indication of failure messages and saving.
- 3.5.8.2 Fault Indication
- 3.5.8.2.1 The system shall run continuous diagnostic checks on the system's operation and, if a malfunction is detected, it shall raise an alarm. This alarm shall be displayed on the TCT and OCT.
- 3.5.8.2.2 The failure message shall contain:
- Time (delay, hour, minutes) of failures,
 - Type of failure,
 - Equipment involved,
 - Information about the connection concerned (origin and destination),

- Any other relevant information permitting quick repair actions and failure analysis.

3.5.8.3 Remote Diagnostic Tests

- 3.5.8.3.1 Remote diagnostic tests in the case of an equipment failure shall be possible from the control terminals via the maintenance and control system.
 - 3.5.8.3.2 The results shall be displayed on a TCT and be recorded in the log.
 - 3.5.8.3.3 This diagnostic shall be able to trace a failure up to Line Replaceable Unit level.
- 3.5.8.4 The System monitoring and control facility shall be able generate on request reports about System statuses (system operational, system malfunctions, system failures, etc.) during selected period at least 5 months in the past.

4. Technical Requirements

4.1 System Architecture and Technology

- 4.1.1 The VCS design shall be based upon the application and adaptation of proven modern technology and architecture (hardware and software) with the objective of optimizing overall system performance over the lifetime, minimising technical risks, and meeting the safety requirements of the user.
- 4.1.2 The technology utilised shall meet the requirements for a system that is reliable and resilient to failure. In addition, the technology shall support the requirements for rapid communications and a high degree of flexibility.
- 4.1.3 It is imperative that all hardware, software, and firmware that is to be utilized shall be totally proven in an operational environment that has similar, if not more stringent requirements than those stated within this Specification.
- 4.1.4 In particular, the design of the system shall be such that failure of units shall never cause a complete outage of the total system.
- 4.1.5 The internal architecture of the VCS shall be based on IP/Ethernet technology and shall meet the operational, reliability, maintainability, availability, and performance requirements as stated throughout this Specification.
- 4.1.6 The VCS shall comply with EUROCAE WG-67 defined requirements ED-136 of using Voice over Internet Protocol (VoIP) for providing ATM voice services and ED-137C Interoperability standards for VoIP ATM Components.
- 4.1.7 Between VoIP components, required interfaces shall be defined to guarantee their functional and technical interoperability.
- 4.1.8 The VCS architecture shall ensure there are a sufficient number of simultaneous voice paths to carry the maximum offered voice traffic and therefore shall not block any offered voice traffic due to the lack of voice paths.
- 4.1.9 The system shall be able to adapt to changes in the number of terminals and lines, changes in the volume and type of voice traffic and configuration changes.
- 4.1.10 There shall be no degradation in system performance and any on-line changes shall be implemented without disruption to unaffected system elements.
- 4.1.11 The system shall have decentralized structure where the individual modules and interfaces, as far as possible.

4.1.12 The system to be offered shall be modular in design to be adaptable in the event of re-arrangements of positions, frequency channels and functions. It shall also be flexible in its channel-to-position allocation part.

4.2 System Software

4.2.1 The software shall be designed to provide reliability, error detection, fault tolerance and recovery. To achieve these requirements, it is envisaged it shall be necessary to provide redundant software for essential functions and duplicated storage of programs and data.

4.2.2 The system software architecture shall be such that is able to provide the necessary functional and technical parameters according to these requirements.

4.2.3 The Operating System software shall provide the capability for real-time execution, file management, command procedures and various utilities.

4.2.4 The application software shall include software that is unique to a specific function, for example, call processing or call control.

4.2.5 The system configuration data shall consist of all details of variables and configuration parameters of the system.

4.2.6 The system maintenance software shall be available when the system requires reports on diagnostics, testing, etc. This software shall run in background and shall have no detrimental effect on any system processing.

4.2.7 The system maintenance software shall provide self-diagnostic capabilities, with the ability to detect failures, and automatically or with operator intervention isolate any defective modules and take out of service any defective communication path or communication link.

4.2.8 The system maintenance software shall include facilities for activity and event logging. It shall be possible to extract this information from the system in a suitable format, for offline statistical analysis, for evidence of system operation for a certain period of time without in any way effecting the operational service.

4.2.9 The software design shall be functionally and operationally modular to:

- facilitate system expansion, modification, and configuration control,
- facilitate fault detection, diagnosis, containment, recovery, and fault tolerance,
- facilitate changes to the lowest practical level without large scale program re-assemblies,
- allow all configuration data to be held in separate data files.

4.3 Reliability and Availability

4.3.1 The system shall provide all required communication functions for the control centre for 24 hours a day, seven days a week since no air traffic control unit can afford to ever be deprived of communication.

4.3.2 The availability of the system shall be 99,999% or better.

4.3.3 To achieve the required degree of reliability, duplication of system units with automatic switchover and fault indication as well, as decentralisation of system functions, avoiding a single point of failure shall be considered.

4.3.4 Supplier shall specify MTBF values of whole system and functional parts of the system.

4.4 Modularity

- 4.4.1 The system design and construction shall be modular. All hardware modules shall be completely removable from the system without the requirement for any disassembly other than the simple disconnection of connectors or the release of simple locking devices.
- 4.4.2 Faults in one unit shall thus never influence the proper operation of other units.
- 4.4.3 It shall be possible to remove and replace any hardware module without the need to switch off the power supply to the module or any other hardware module.
- 4.4.4 As a minimum, visual indication shall be provided on each hardware module to indicate the status of the module, that is, whether it is in or out of service.
- 4.4.5 To ensure the high reliability of the system operation, especially when it is based on the Internet protocol, a double system LAN shall be used.
- 4.5 Accessibility
 - 4.5.1 The physical design of the system shall permit ease of access to all hardware modules for the purpose of replacement or testing.
 - 4.5.2 It shall also be possible to remove and replace any hardware module without the need to interrupt operation of the VCS system.
- 4.6 Maintainability
 - 4.6.1 Suitable means of self-diagnostics to ensure rapid fault detection and isolation shall be anticipated.
 - 4.6.2 Automatic or manual (off-line) testing of routines shall be capable. Faulty units shall thus be immediately identified and shall be easily replaceable.
- 4.7 Safety Requirements
 - 4.7.1 System Safety Assessment
 - 4.7.1.1 During the process of the System implementation the Supplier shall carry out safety assessment of the System and shall prepare functional hazard assessment (FHA), preliminary system safety assessment (PSSA) and system safety assessment (SSA) documents.
 - 4.7.2 Software Safety Assessment
 - 4.7.2.1 Required System software assurance level shall be SWAL4 or better according to EUROCAE ED-153.
 - 4.7.2.2 Supplier shall provide an assessment of compliance with the applicable software assurance level.
 - 4.7.3 Equipment Safety
 - 4.7.3.1 The VCS equipment shall be designed to meet the requirements of EN 62368-1:2014 - Audio/video, information and communication technology equipment - Part 1: Safety requirements.
- 4.8 Electromagnetic Compatibility (EMC)
 - 4.8.1 VCS equipment shall meet the general requirements for EMC imposed by Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast).

- 4.8.2 VCS equipment shall also be capable of operating in the proximity of high-power radar transmitters.
- 4.9 Voice Quality
- 4.9.1 The speech quality using VoIP in an ATM environment is an important aspect from the user perception as well as technical requirements on transmission characteristics and shall meet ED-136 Voice over Internet Protocol (VoIP) Air Traffic Management (ATM) System Operational and Technical Requirements, chapter 6.
- 4.9.2 The system shall achieve a Mean Opinion Score (MOS) > 4.0 for all air-ground and ground-ground communications.
- 4.9.3 The system shall ensure that during any communication, the User's own echo is within the acceptable area of the ITU-T G.131 recommendation for both telephone (reflected echo) and radio (sidetone).
- 4.9.4 The voice delays through any interface of the VCS shall not exceed the values described in ED-136 Voice over Internet Protocol (VoIP) Air Traffic Management (ATM) System Operational and Technical Requirements.
- 4.9.5 The audio background noise level in earpiece of the headset or handset, or loudspeaker generated by the voice communication system with no input signal to the system shall be as low as it is possible and shall be specified.
- 4.10 Telephone Communication
- 4.10.1 VCS shall be equipped with telephony interfaces for interconnection with IP based PABX or PSTN and for interconnection with IP based VCS according to EUROCAE ED-137C via AGVN.
- 4.10.2 The number of required telephone connections is specified in Annex 3.
- 4.10.3 The VCS shall support the following user numbering and addressing schemes:
 - ETSI EN 300 189 V1.2.1, Private Integrated Services Network (PISN); Addressing,
 - EUROCONTROL "ATS Ground Voice Network Implementation and Planning Guidelines",
 - EUROCONTROL "Session initiation protocol addressing in ATM VoIP",
 - ICAO "Manual on Air Traffic Services (ATS) Ground-To-Ground Voice Switching and Signalling" (Doc 9804 AN/762),
 - Mnemonic Addressing Scheme based on relevant ATS information (User, ATS sector, ATS radio frequency, ATS radio site, ATSU, ICAO site identifier, ANSP or ATS Organisation).
- 4.10.4 Each extension user may be allocated one or more unique numbers within the scope of the VCS numbering scheme.
- 4.11 Radio Control System
- 4.11.1 The operation of the radio control system shall be simple and straightforward. For any frequency channel selected at a frequency activation module, a permanent connection through the system inside the centre shall be established.
- 4.11.2 The radio interfaces shall be the link between the VCS radio control system and the radios. The radio interfaces take care of the complete communication for the radio channels involved and shall perform the following functions:
 - Interconnection the VCS to VoIP radios via an IP network according to ED-137C,

- handle the transmission of keying and audio signals from the working positions to the transmitters,
- handle the reception of audio and squelch signals from the receivers,
- handle the transmissions in both directions of data concerning status indications, switching commands.

4.11.3 Radio interfaces shall support redundant connectivity to the main and standby radios.

4.12 Supporting Facilities and Interfacing to the Supporting Facilities

4.12.1 Connection Check

4.12.1.1 The system shall provide means to automatically ensure all telephone and radio interconnections are operational and ready for use.

4.12.1.2 The system shall check, continuously, that both telephone and radio call setups are possible to all ATSU and Transmitter/Receiver locations that have been configured, such that any end-to-end connection loss to these locations shall be detected within 3 seconds and the event noted by the System Management facility within that time.

4.12.2 Secure External Connections

4.12.2.1 Session Border Controller (SBC) constitute a key element to enhance security and availability of VoIP in ATM interconnections between ANSPs via IP networks for the provision of inter-centre telephony and for the ground segment of voice radio communications.

4.12.2.2 VCS shall be equipped with SBC facility according to Eurocontrol implementation guidelines – Session border controller in ATM VoIP.

4.12.3 Legal Voice Recording

4.12.3.1 Voice recording of all communications at OWP level shall be available on external voice recorder of the Customer and shall be IP based and meet ED-137C requirements for recording.

4.12.3.2 The System shall provide a means by which two autonomous voice recordings can be made. Both recordings shall be identical in all respects.

4.12.3.3 For the purposes of imprinting date and timestamp information with the recorded voice (to enable the time and date of re-played voice messages to be precisely identified), the System shall be synchronous with the date and time data source.

4.12.4 Power Supply

4.12.4.1 The VCS system shall be fed from two independent 230 V and 50 Hz AC power supply lines. These power inputs will interface with an uninterruptible power supply (UPS) units provided by the Customer.

4.12.4.2 The cabinet shall be equipped with the power distribution unit (PDU), which allows distribution of the power inside the cabinet. PDU shall have metering of the voltage function, load current and the power and shall have remote control by SNMP and MODBUS RTU/TCP protocols.

4.12.4.3 In case of power loss, the telephone and radio functions of VCS shall be capable of normal operation within 2 minutes of power recovery.

4.12.5 Central Time Source

- 4.12.5.1 The VCS shall be supplied with the Time Reference System (Clock System) GNSS synchronized.
- 4.13 Environmental Conditions
 - 4.13.1 The VCS shall keep normal functionality within nominal operational conditions – temperature range from +10°C to +40°C, humidity up to 80%.
- 5. Training
 - 5.1 Supplier shall provide technical and operational training for the Customers personnel.
 - 5.2 The language of training and training material shall be Lithuanian or English.
 - 5.3 Technical Training
 - 5.3.1 Technical training shall be provided at the Supplier's premises before FAT for dedicated Customers technical personnel up to 6 attendees.
 - 5.3.2 Duration of the technical training shall be of at least 40 hours to cover theoretical course, covering standards and technologies employed in the VCS, system architecture, composition, configuration, maintenance and fault detection, as well practical training to provide system configuration, reconfiguration, maintenance, and troubleshooting.
 - 5.3.3 The Supplier shall send the training program to the Customer for review at least 3 weeks before the training.
 - 5.3.4 Each training attendee shall be supplied with the training material.
 - 5.3.5 The technical training attendees after the training shall be tested and shall receive the training certificates with test results.
 - 5.4 Operational Training
 - 5.4.1 Supplier shall organize operational training at the Customer's premises after a successful SAT – 1 group in Kaunas site and 1 group in Palanga site, and 1 group Vilnius site. Each group could contain up to 12 attendees.
 - 5.4.2 Operational training shall cover theoretical course and practical exercises how to use all devices of the OWP, how to organize, establish and control all possible communications. Each training attendee shall be supplied with the training documentation.
 - 5.4.3 After successful training completion operational training attendees shall receive the certificates.
- 6. Spare Parts
 - 6.1 The Supplier shall offer necessary spare parts, modules, devices, etc. for replacement of faulty parts on site by the Customer's technical personnel.
 - 6.2 Additionally spare HMIs, headsets, handsets, and microphones shall be offered. The preferred number of audio devices is specified in Annex 1.
- 7. Delivery
 - 7.1 The Supplier shall deliver the VCS to the Customer after successful completion of the FAT under CIP conditions according to INCOTERMS 2020.
 - 7.2 Delivery address is Oro uosto str. 4, Karmėlava, Kauno r.

8. System Installation

8.1 Installation Works

8.1.1 The Supplier shall install delivered VCS. Installation shall be done in following Customer's places:

- The VCS Cabinet shall be installed in the Equipment Room of the Kaunas ATC Centre,
- Operator working positions shall be installed in places as described in Annex 1.

8.1.2 The Supplier shall do redundant system cabling:

8.1.2.1 at Kaunas site:

- between VCS Cabinet and OWPs,
- between VCS Cabinet and the Customer's IP network access point,
- between VCS Cabinet and the TCT.

8.1.2.2 at Palanga site:

- between the Customer's IP network access point and OWPs,
- between the Customer's IP network access point and TCT.

8.1.2.3 at Vilnius site:

- between the Customer's IP network access point and OWPs,
- between the Customer's IP network access point and TCT.

8.1.3 Twisted pair Ethernet and Fiber Optic (FO) lines are equally acceptable.

8.1.4 The Supplier shall include in the supply list necessary network devices to interconnect the VCS system with all OWPs.

8.1.5 All internal system cables shall be labelled in both ends and the cable list shall be added to the system description.

8.1.6 The Customer has its own country wide IP network, which shall be used by the Supplier to establish necessary IP connections between VCS cabinet in Kaunas and remote sites with OWPs, radios, PABX and NewPENS access point.

9. System Tests

9.1 Factory Acceptance Testing (FAT)

9.1.1 The fully equipped system in its initial configuration shall be tested at the factory to demonstrate for the Customer's representatives how the system meets all the specified requirements. The Supplier shall issue FAT procedure and coordinate it to the Customer at least two weeks before FAT. Testing shall be performed according to agreed FAT procedure.

9.1.2 The system's testing results shall be presented in the FAT certificate and signed by both parties.

9.1.3 In case, if according to FAT procedure at least one or more of the system tests fails, it shall be noted in the FAT certificate. The Supplier shall do efforts to fix all system discrepancies and shall report to the Customer via email about the elimination of these discrepancies.

9.2 Site Acceptance Testing (SAT)

9.2.1 Properly installed and configured VCS on site shall undergo acceptance testing to demonstrate that system operates in accordance with the specifications outlined in this document and is suitable for operation without remarks.

- 9.2.2 The Supplier shall present SAT procedure to the Customer at least one week before testing to coordinate and agree by both parties.
- 9.2.3 After successful site testing, the SAT certificate shall be signed by both parties. If at least one or more non-conformances to the SAT procedure are found during the on-site tests, this shall be recorded in the SAT certificate, where it shall be indicated how long the non-conformities will be corrected.
- 9.2.4 If site testing fails, Supplier shall fix system malfunctions as soon as it is possible, but not later than 30 calendar days and shall repeat the tests again.

10. System Warranty and Lifetime

- 10.1 The warranty period of the VCS hardware and software shall be at least 24 months. The warranty period shall begin from the date of signature of the Transfer and Acceptance Act by both parties after the System installation and positive site acceptance tests results.
- 10.2 During the warranty period the Supplier shall provide at its own expenses technical support and repair services of the VCS.
- 10.3 The Supplier shall declare VCS lifetime, it shall be long enough but at least 10 years.

11. Warranty Support

- 11.1 During warranty period of VCS, the Supplier shall undertake the liability to provide System hardware (including firmware) repair service (HRS) and System software support service (SWS¹).
- 11.2 HRS provision
- 11.2.1 Having identified System hardware failures, the Customer shall notify the Supplier about the failure in written².
- 11.2.2 The Supplier shall notify the Customer about the readiness to receive the part in written not later than within 2 working days from the written notification of the Customer and shall grant the Customer a number for the repair order.
- 11.2.3 Having received the repair order number, the Customer shall ship the faulty part to the Supplier and shall notify him about the shipment in written. The shipment expenses shall be covered by the Customer.
- 11.2.4 The Supplier shall deliver the repaired or, in case if the part is irreparable, the new part to the Customer not later than within 30 calendar days. The part return expenses shall be covered by the Supplier.
- 11.2.5 HRS is considered completed when the customer receives the part, tests it, and gets positive result.
- 11.3 SWS provision

¹ SWS is a service supporting smooth operation of the software, which comprises solving System software problems, error correction, installation, updating, configuration and other assistance related to the use of the software and problems encountered when using the System with the Software.

² The communication shall be carried out by e-mail.

- 11.3.1 When providing the SWS service the Supplier shall undertake the liability to provide support by solving the System software operational problems and ensuring smooth operation of System software on Supplier's working hours.
- 11.3.2 The Customer shall notify the Supplier in written about System software operation failures.
- 11.3.3 The Supplier shall notify the Customer in written not later than within 2 working days after the notification from the Customer about the SWS service: (1) method of delivery³, (2) works necessary to be done, (3) work completion terms.
- 11.3.4 The Supplier shall be liable to provide the SWS service not later than in 5 working days from the notification about operational failures.
- 11.3.5 SWS shall be considered provided, when the Customer confirms in written that the System operates properly.

12. After Warranty Support

- 12.1 After the end of warranty period of VCS, the Supplier shall undertake the liability to provide System hardware repair services (HRS), supply new parts (when used faulty parts are irreparable, or the repair is not cost-efficient) and System software support services (SWS) for period up to 120 months from the System SAT.
- 12.2 The HRS and SWS services shall be procured only when the need arises and shall not exceed the maximum sum allocated for the acquisition of the respectful services. Hourly rates for HRS and SWS services shall be offered.
- 12.3 Having identified System hardware failures, the Customer shall undertake the liability to procure HRS (or new parts) in accordance with need, submitting orders to the Supplier pursuant to the following procedure:
 - 12.3.1 The Customer shall notify the Supplier about the failure in written⁴.
 - 12.3.2 The Supplier shall notify the Customer about the readiness to receive the part in written not later than within 2 working days from the written notification of the Customer and shall grant the Customer a number for the repair order or, in case the failed part is irreparable, shall notify the Customer about it in written.
 - 12.3.3 Having received the repair order number, the Customer shall ship the faulty part to the Supplier and shall notify him about the shipment in written.
 - 12.3.4 The Supplier shall assess the malfunction and provide the repair price offer in written not later than within 5 working days from the reception of the malfunctioning part. At the request of the Customer, the Supplier shall be liable to submit repair price justification.
 - 12.3.5 The Customer shall evaluate the received information and shall notify the Supplier in written, whether the Customer is willing to repair the faulty part or the part must be replaced with a new part after the Supplier indicates the price of the new part (in case the Supplier does not indicate the price of the new part – at the rates indicated in the sales location, catalogue or internet website of the Supplier or, in case they are not published, at the rates offered by the

³ The SWS can be provided by telephone, e-mail, via remote connection or by arriving to the System installation site.

⁴ The communication shall be carried out by e-mail.

Supplier and acceptable to the Customer). In all the cases the equipment or part thereof repair price or the new part price shall be coordinated with the Customer in advance in written. The equipment or part thereof repair price must not be higher than the price of the same new part.

- 12.3.6 In case the part thereof is no longer manufactured, and it cannot be repaired or replaced, the Supplier shall be liable to offer replacing the faulty part thereof with an equivalent. In case of instant malfunctioning of the server, which was installed and operating in high reliability mode, in order to ensure full compatibility, the entire set (2 units) must be replaced.
- 12.3.7 Not later than within 30 calendar days from the confirmation of the order of the Customer, i.e., from written confirmation to repair the malfunctioning part or the day of ordering the new part, the Supplier shall deliver the repaired or new part to the Customer. Along with the delivered part or using the e-mail the Supplier shall provide the Customer with a note on transfer and acceptance of the repair services or new part transfer. The part shipment and return expenses shall be covered by the Customer.
- 12.3.8 HRS shall be considered provided, when the Parties sign the act on transfer and acceptance.
- 12.3.9 The Customer shall be entitled to revoke the order by notifying the Supplier about it in written before the written confirmation of the Customer regarding the repair of the faulty part without reimbursing any expenses incurred by the Supplier.
- 12.3.10 The Supplier shall grant a warranty of 6 months to repaired parts. The warranty term shall be calculated from signing the act on transfer and acceptance of the services. In case the repair has been performed improperly, the Supplier shall be liable to eliminate the identified deficiencies during the warranty term (i.e. to repair the equipment or part or provide a new analogue) at own expense not later than within 35 days from the day of sending a written notification about the deficiencies to the Supplier. The part delivery expenses shall be covered by the Supplier.
- 12.3.11 The Supplier shall grant a warranty of 24 months for the new parts. The warranty period shall be calculated from the day of reception new part, i.e., from signing the act on transfer and acceptance. The part with defects or deficiencies identified during the warranty period shall be replaced free of charge with new part not later than within 30 days from the day of shipping a written notification of the Customer about the deficiencies to the Supplier. The part shipment expenses shall be reimbursed by the Supplier.
- 12.4 When providing the SWS service the Supplier shall undertake the liability to provide support by solving the System software operational problems and ensuring smooth operation of System software on Supplier's working hours.
- 12.5 Having identified System software operation problems, the Customer shall procure the SWS service in accordance with the need pursuant to the following procedure:
- 12.5.1 The Customer shall notify the Supplier in written about System software operation failures.
- 12.5.2 The Supplier shall notify the Customer in written not later than within 2 working days after the notification from the Customer about the need of SWS service: (1) method of delivery⁵, (2) SWS works necessary to be done, (3) work completion terms, (4) the SWS service price, in accordance with the established rate.

⁵ The SWS can be provided by telephone, e-mail, via remote connection or by arriving to the System installation site.

- 12.5.3 Having evaluated the offer of the Supplier regarding the SWS services, the Customer shall notify the Supplier in written, whether the Customer agrees with the submitted offer (in case of disagreement – shall indicate the reasons). The Supplier shall be liable to submit another offer for the provision of the SWS service within 5 working days from the disagreement of the Customer, which would be acceptable for the Customer and the Customer shall be liable to notify the Supplier about the consent.
- 12.5.4 SWS shall be considered provided, when the Parties sign the act on transfer and acceptance.

13. Documentation

The following system documentation in electronic form (in pdf format) shall be supplied:

- 13.1 System Description.
- 13.2 System Specification (detailed).
- 13.3 Interface Control Document.
- 13.4 Installation Manual (including detailed information and schematics of power supply and network interconnections).
- 13.5 Configuration Manual.
- 13.6 Maintenance Manual.
- 13.7 Control and Monitoring Manual.
- 13.8 User Manual.
- 13.9 Software Licenses (If applicable).

14. References

- 14.1 ICAO Convention on International Civil Aviation, Annex 10, Volume III, Part II, Chapter 4: Aeronautical Speech Circuits.
- 14.2 ICAO Convention on International Civil Aviation, Annex 11, Chapter 6: Air Traffic Services Requirements for Communications.
- 14.3 ICAO Manual on Air Traffic Services (ATS) Ground-To-Ground Voice Switching and Signalling (Doc 9804 AN/762).
- 14.4 EN 300 189: Private Integrated Services Network (PISN); Addressing.
- 14.5 ISO/IEC 7498-4: Information processing systems - Open Systems Interconnection - Basic Reference Model - Part 4: Management framework.
- 14.6 ISO/IEC 11573: Information technology - Telecommunications and information exchange between systems - Synchronization methods and technical requirements for Private Integrated Services Networks.
- 14.7 EUROCAE ED-153 Guidelines for ANS Software Safety Assurance.
- 14.8 EUROCAE ED-136 Voice over Internet Protocol (VoIP) Air Traffic Management (ATM) System Operational and Technical Requirements.
- 14.9 EUROCAE ED-137C Interoperability Standards for VoIP ATM Components.
- 14.10 Eurocontrol implementation guidelines – Session border controller in ATM VoIP.
- 14.11 Commission Delegated Regulation (EU) 2023/1768 of 14 July 2023 laying down detailed rules for the certification and declaration of air traffic management/air navigation services systems and air traffic management/air navigation services constituents.
- 14.12 EASA Detailed Specifications and Acceptable Means of Compliance & Guidance Material for certification or declaration of design compliance of ATM/ANS ground equipment (DS-GE.CER/DEC).

- 14.13 EN 62368-1:2014 - Audio/video, information and communication technology equipment - Part 1: Safety requirements.
- 14.14 Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast).

Description of OWPs						
	Name, role	Control and audio devices				
		HMI type	Loudspeaker	Handset	Headset (monoaural)	Hand-held microphone
Kaunas, backup ACC						
1	ACCU	Desktop	2	1	1	-
2	ACCU2	Desktop	2	1	1	-
3	ACCL	Desktop	2	1	1	-
4	ACCL2	Desktop	2	1	1	-
5	ACC SUP	Desktop	2	1	1	-
Kaunas, ATCC						
6	APP	Desktop	2	1	1	1
7	APP2	Desktop	2	1	1	1
8	TWR	Desktop	2	1	1	1
9	TWR2	Desktop	2	1	1	1
10	APP/TWR SUP	Desktop	2	1	1	-
11	TCS	Desktop	2	1	1	-
Palanga, ATCC						
12	APP	Desktop	2	1	1	1
13	TWR	Desktop	2	1	1	1
14	APP/TWR SUP	Desktop	2	1	1	-
15	TCS	Desktop	2	1	1	-
Vilnius, backup ACC						
16	ACCU	Desktop	2	1	1	-
17	ACCU2	Desktop	2	1	1	-
18	ACCL	Desktop	2	1	1	-
19	ACCL2	Desktop	2	1	1	-
20	TCS	Desktop	2	1	1	-
In the working positions:		20	40	20	20	6
Spare:		4	4	15	10	3
Total:		24	44	35	30	9

Radio channels, equipment, and sites

	Name	Channel	Transmitter	Receiver	Location of radios
Kaunas backup ACC					
1	ACCU_KAU	132.280	M/S	M/S	Kaunas
2	ACCU_VIL	132.280	M/S	M/S	Vilnius
3	ACCU_PAL	132.280	M/S	M/S	Palanga
4	ACCL_KAU	133.305	M/S	M/S	Kaunas
5	ACCL_VIL	133.305	M/S	M/S	Vilnius
6	ACCL_PAL	133.305	M/S	M/S	Palanga
7	ACCM_KAU	133.430	M/S	M/S	Kaunas
8	ACCM_VIL	133.430	M/S	M/S	Vilnius
9	ACCM_PAL	133.430	M/S	M/S	Palanga
10	EMG	121.500	M/S	M/S	Kaunas
Kaunas ATCC					
1	APP	124.205	M/S	M/S	Kaunas
2	TWR	118.505	M/S	M/S	Kaunas
3	SMC	121.605	M/S	M/S	Kaunas
4	ATIS	129.055	-	M	Kaunas
5	EMG	121.500	M/S	M/S	Kaunas
Palanga ATCC					
1	APP	124.305	M/S	M/S	Palanga
2	TWR	118.305	M/S	M/S	Palanga
3	SMC	121.905	M/S	M/S	Palanga
4	ATIS	127.805	-	M	Palanga
5	EMG	121.500	M/S	M/S	Palanga
6	FIS_PAL	125.730	M/S	M/S	Palanga
7	FIS_TEL	125.730	M/S	M/S	Telšiai
8	FIS_SIL	125.730	M/S	M/S	Šilutė
Vilnius ACC (backup)					
1	ACCU_KAU	132.280	M/S	M/S	Kaunas
2	ACCU_VIL	132.280	M/S	M/S	Vilnius
3	ACCU_PAL	132.280	M/S	M/S	Palanga
4	ACCL_KAU	133.305	M/S	M/S	Kaunas
5	ACCL_VIL	133.305	M/S	M/S	Vilnius
6	ACCL_PAL	133.305	M/S	M/S	Palanga
7	ACCM_KAU	133.430	M/S	M/S	Kaunas
8	ACCM_VIL	133.430	M/S	M/S	Vilnius
9	ACCM_PAL	133.430	M/S	M/S	Palanga
10	EMG	121.500	M/S	M/S	Kaunas
Additional channels to the radios of neighbour ANSP partners and internal development - 10 radio channels.					

VoIP telephone connections

No of Positions	Connection	Network	Protocol	Notes
Kaunas backup ACC				
5	NewPENS	AGVN	ATS-SIP	
5	PABX	LAN	SIP	(Or PSTN SIP)
Kaunas ATCC				
6	NewPENS	AGVN	ATS-SIP	
6	PABX	LAN	SIP	(Or PSTN SIP)
Palanga ATCC				
6	NewPENS	AGVN	ATS-SIP	
6	PABX	LAN	SIP	(Or PSTN SIP)
Vilnius ACC (backup)				
5	NewPENS	AGVN	ATS-SIP	
5	PABX	LAN	SIP	(Or PSTN SIP)
Connections				
Totally	NewPENS - 22			
	PABX - 22			

Abbreviations

A/C	– Aircraft
A/G	– Air-Ground
ACC	– Area Control Centre
ACCL	– Area Control Centre Lower Airspace Controller
ACCL2	– Area Control Centre Lower Airspace Controller Assistant
ACCM	– Area Control Centre Middle Airspace Controller
ACCM2	– Area Control Centre Middle Airspace Controller Assistant
ACCU	– Area Control Centre Upper Airspace Controller
ACCU2	– Area Control Centre Upper Airspace Controller Assistant
ACC SUP	– Area Control Centre Supervisor
AGVN	– Air Traffic Services Ground Voice communications Network
ANS	– Air Navigation Services
APP	– Approach Controller
ATC	– Air Traffic Control
ATCC	– Air Traffic Control Centre
ATIS	– Aerodrome Terminal Area Information Service
ATM	– Air Traffic Management
ATS	– Air Traffic Services
ATSU	– Air Traffic Services Unit
BSS	– Best Signal Selection
CC	– Common Control
DA	– Direct Access
EMG	– Emergency
FAT	– Factory Acceptance Testing
FO	– Fiber Optic
G/G	– Ground-Ground
HMI	– Human Machine Interface
HRS	– Hardware Repair Service
IA	– Instantaneous Access
IC	– Intercom or Internal Communications
IDA	– Indirect Access
IP	– Internet Protocol
MBTF	– Mean Time Between Failures
M/S	– Main and Standby
OCT	– Operational Control Terminal
OWP	– Operator (Controller or other) Working Position
PABX	– Private Automatic Branch Exchange
PSTN	– Public Switched Telephone Network
PTT	– Press-to-transmit, or Push-to-talk
R/T	– Radio Telephony
RTP	– Real Time Transfer Protocol
Rx	– Receiver
SAT	– Site Acceptance Testing
SBC	– Session Border Controller
SIP	– Session Initiation Protocol
SMC	– Surface Movement Control
SUP	– Supervisor
SWS	– Software Support Service
TCS	– Technical Control Service

TCT	– Technical Control Terminal
TSS	– Touch Sensitive Screen
TR	– Technical Room
TWR	– Aerodrome Tower Controller
TWR2	– Aerodrome Tower Controller Assistant
Tx	– Transmitter
VCS	– Voice Communication System
VoIP	– Voice over Internet Protocol