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SOLICITATION AMENDMENT
MODIFICATION DE L'INVITATION

The referenced document is hereby revised; unless otherwise indicated, all other terms and conditions of the Solicitation remain the same.

Ce document est par la présente révisé; sauf indication contraire, les modalités de l'invitation demeurent les mêmes.

Title - Sujet		
HF AUDIO SYSTEM REPLACEMENT FY13/14		

Solicitation No. - N° de l'invitation	Amendment No. - N° modif.
W8474-136546/C	003

Client Reference No. - N° de référence du client	Date
W8474-136546	2016-06-02

GETS Reference No. - N° de référence de SEAG
PW-$$QD-017-25829

File No. - N° de dossier	CCC No./N° CCC - FMS No./N° VME
017qd.W8474-136546	

Solicitation Closes - L'invitation prend fin	Time Zone Fuseau horaire
at - à **02:00 PM** on - le **2016-06-27**	Eastern Daylight Saving Time EDT

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Nom et titre de la personne autorisée à signer au nom du fournisseur/
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The purpose of this amendment is to:

1. Modify Annex A – Statement of Work.
2. Modify Annex B – Performance Specifications.
3. Modify Annex G – Bid Compliance Matrix.
4. Answer bidders' questions.

The following shall form part of the RFP:

1. **Reference Annex A – Statement of Work:**

   Delete current version of Annex A.

   Insert version 001 of the Annex A as attached herewith.

2. **Reference Annex B – Performance Specifications:**

   Delete current version of Annex B.

   Insert version 001 of the Annex B as attached herewith.

3. **Reference Annex G – Compliance Matrix:**

   Delete current version of Annex G.

   Insert version 001 of the Annex E as attached herewith.

All other terms and conditions of the RFP remain unchanged.

See the attached revised terms and conditions document. Revisions are indicated in green font, whereas a word "deleted" has been inserted in red font wherever any text has been deleted.

Annex G, in excel format, will be provided at a later date when all changes to specifications will have finalized.

Bidders' Questions Received as of May 9th 2016.

Q1.   Reference: RFP Part 3 – Article 1.1

         Please confirm the copies required for Section IV – Certifications.

A1.   Only one copy of each certification is required.

Q2.   **Reference Annex B – Para 5.10 and 5.11**

How many HF modem patches can take place simultaneously in a center?

A2.   Two HF modem patches may take place simultaneously at each operator console or position. Therefore, the number of simultaneous audio patches that may be handled by any centre is a function of twice the number of operator consoles within that centre. The audio patch panel requirement is designed to provide DND with sufficient interconnection flexibility.

Q3.   **Reference Appendix A3 and Annex B – Paragraph 12.2**

What Application Link Enabling (ALE) integration is required? The Interface description document of Appendix A3 does not describe the set up and tear down of ALE session calls but instead describes the full range of HF Radio RRC HF parameters settings that would usually be handled by ALE?

The radio GUI as presented in section 12.2 Annex B does not describe the means of accessing radios using ALE?

A3.   "Application Link Enabling" is not required or specified. The requirement and standard for Automatic Link Establishment (ALE) is specified in Annex B, Paragraph. 2.1.

Q4.   **Reference Annex B – Para 5.6.5, 5.7.5 and 7.3.5**

Can LEMO or PJ7 connectors for microphones and headsets be used instead of XLR connectors?

A4.   LEMO connectors are acceptable if they conform to XLR dimensions and standards. PJ7 connectors are not acceptable because they usually do not have a latching mechanism, and they are usually not robust enough for use by military operators.

Q5.   **Reference Annex A – Paragraph 13**

At every center is the IP Telephony gateway equipment, that supports Foreign Exchange Office (FXO) interface and VOIP telephony, provided as GFE or does it form part of the current tender deliverables?

A5.   There is no IP Telephony gateway equipment at any location at this time. Therefore it will not be provided as GFE under this project. IP Telephony gateways are not required as deliverables of this RFP.

Q6.   **Reference: Annex A - Paragraph 1.5.2.2**

Para 1.5.2.2 requests that the "contractor MUST replace the Operators Consoles including associated equipment". Following the site visit, information was received that existing Operator consoles will remain. Please confirm that all existing operator consoles will remain. Please also confirm the amount of space that will be made available for new console hardware within the existing consoles.

A6.   The "associated equipment" referred to in Para 1.5.2.2 is the legacy equipment listed in Para 1.2.2.2. Console furniture, or other equipment not appearing in the list in Para 1.2.2.2 are not

intended to be replaced. The console furniture seen at the site visit is standard, but there may be some minor variation in equipment placement from one console to another, which prohibits specifying a maximum space allocation for this system.

Q7.   **Reference: Annex A – Paragraph 24**

The Project Acceptance Test is not listed as a Milestone within Annex C. Is this to be included as part of Annex C Milestone 9 for the completion MACS Trenton install or will a new milestone be created for Project Acceptance?

A7.   The Project Acceptance Test is considered a part of Annex C Milestone 9 for the completion MACS Trenton install.

Q8.   **Reference: Annex A – Paragraph 14**

Will DND allow for a take on trial at each site to ascertain the functionality of all GFE that will remain?

A8.   Take on trials may be included in the Site Audits described in Paragraph 14 of the SOW. GFE functionality might change (at DND's discretion) between the time of the Site Audits and any project installations. DND will take appropriate measures to ensure that GFE conforms to the specifications in Annex B at minimum.

Q9.   **Reference: Annex B - Paragraph 5.5.8**

Must have requirement of NEMA 4 restricts the monitor type and enclosure that can be utilised. Is this the required IP rating for all LCD monitors to be installed within the operator consoles?

A9.   The front panel Ingress Protection (IP) requirement per Para 5.5.8.

Q10.   **Reference: Annex B - Paragraph 5.5.10 & 7.2.9**

Can the maximum brightness exceed 450cd/m2 but be controlled by software for a maximum of 450 cd/m2?

A10.   Para 5.5.10 & 7.2.9 must be amended to read "be able to set the monitor's brightness at the maximum setting of 450 cd/m^2 or brighter."

Q11.   **Reference: Annex B – Paragraph 5.5.6 & 7.2.5**

Is the 15" LCD a minimum screen size? Would a larger display be acceptable if it meets all the requirements at Annex B Para 5.5?

A11.   15" LCD is the screen size required as per Para 5.5.6 & 7.2.5. Smaller screens would risk loss of functionality, and larger screens would risk exceeding space constraints.

Q12.   **Reference: Annex B - Paragraph 6.1**

The Compliance Matrix states at para 6.10 that "The HF Audio System must be provided with electronic circuit cards that have front panel access and are easy to replace." Is the design intent simply to have easily removable cards and would top panel or rear panel access be acceptable?

A12.   This is confirmation that the design intent is to have easily removable cards. Top panel access

would not have easily removable cards if access is obstructed by other equipment mounted above it in the rack. Rear panel access would not have easily removable cards if access is obstructed by cabling. Hence the requirement for front panel access.

Q13.   **Reference: Annex B - Paragraph 14.2**

It is noted in requirement 14.2 that the CIPISM solution must be contained within a 19" rack, please clarify the maximum Rack unit space allowed to install the CIPISM at each site?

A13.   Annex B Para 14.1 has been amended to read "The HF Audio System CIPISM must be mountable in a 19" inch rack that must be supplied by the contractor."

Annex B Para 14.2 has been amended to read "Each of the CIPISM installations must be contained in a single 19" inch rack that must be supplied by the contractor."

Therefore the maximum rack unit space allowed to install the CIPISM at each site will be determined by the Contractor's CIPISM design.

Q14.   **Reference: Annex B - Paragraph 4.4:**

"The HF Audio Systems must support radio operation, where each operator console must fully operate (transmit and receive) on one receiver-transmitter radio pair in normal operations".

Does this mean a 'local' Tx/Rx pair or any pair on the network?

A14.   This means any Tx/Rx pair on the network.

Q15.   **Reference: Annex B - Paragraph 5.6.6:**

"Stereo headsets with one channel used for A/G, and the other channel used for G/G communications"

Please confirm that this is the required design intent as it is generally normal practice for one channel to be used for monitoring and the other for operating.

A15.   This is confirmation of the stated design intent to facilitate phone-patch. Monitoring will be achieved later through a separate RFP as it is not part of this project.

ANNEX B – Version 01

PERFORMANCE SPECIFICATIONS

FOR

HIGH FREQUENCY AUDIO SYSTEMS REPLACEMENT PROJECT

DEPARTMENT OF NATIONAL DEFENCE

TABLE OF CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS

The following acronyms and abbreviations are used in this document:

AGC	Automatic Gain Control
C	Celsius
CAF	Canadian Armed Forces
COTS	Commercial off The Shelf
CS	Communications Server
CSA	Canadian Standards Association
CSN	Canadian Switched Network
DC	Direct Current
dB	Decibel
dBm	Decibel/Milliwatt
DSL	Digital Subscriber Line
GFE	Government Furnished Equipment
GUI	Graphical User Interface
HF	High Frequency
Hz	Hertz
I/O	Input/Output
IP	Internet Protocol
LAN	Local Area Network
LED	Light Emitting Diode
LRU	Lowest Replaceable Unit
MHz	Megahertz
MPLS	Multiprotocol Label Switching
MOS	Mean Opinion Score
PBX	Private Branch Exchange
PTT	Push-to-Talk
RCP	Radio Control Processor
RF	Radio Frequency
RLPA	Rotatable Log Periodic Antenna
RX	Receive
SOW	Statement of Work
SQ	Squelch
TC	Transmit Controller
TX	Transmit
UDP	User Datagram Protocol
USB	Upper Side Band
V	Volts
VoIP	Voice over Internet Protocol
W	Watt

1   PURPOSE

1.1   The purpose of this document is to provide the performance and functional specifications for the High Frequency (HF) Audio Systems Replacement Project.

1.2   The performance and functional specifications of the HF Audio System listed herein are not based on a specific preconceived system, but are necessitated by the overarching requirements of the Canadian Armed Forces (CAF) Strategic HF Systems of which the HF Audio Systems are a part.

1.3   The performance and functional requirements may not constitute an exhaustive specification list since it is based on a Department of National Defence conceptual system design, nonetheless, the contractor must ensure that its proposed solution is progressive and technologically advanced.

1.4   The intent of the performance specifications is to be less prescriptive to allow the contractor to be innovative and deliver an economical customized Commercial off the Shelf (COTS) system, which meets and/or exceeds the performance specifications.

1.5   The Contractor must fully meet/exceed the performance and functional requirements of the system as described in this document.

2   APPLICABLE STANDARDS

2.1   The HF Audio Systems must support Automatic Link Establishment (ALE) radio operation in accordance with MIL-STD-188-141.

2.2   The HF Audio Systems must support the EUROCAE ED 137 Voice over Internet Protocol (VoIP) Air Traffic Management (ATM) standard.

3   GENERAL SYSTEM REQUIREMENTS

3.1   The HF Audio System equipment must be comprised of COTS products.

3.2   All HF Audio System equipment must be of current technology.

3.3   The HF Audio System architecture must be a proven technology, and similar systems must have been previously commercially deployed and operational.

3.4   The HF Audio System must comply with ED 137B, Part 1, "Radio".

3.5   The HF Audio Systems must be designed based on open system architecture and standardized Ethernet and TCP/IP technology.

3.6   The HF Audio Systems must be capable of operating over an IP/MPLS based metallic landline or a non-metallic communication link such as a satellite link, a microwave link or a fiber optic cable.

3.7   The HF Audio Systems must provide multiple user access as defined in this document
         and Annex A – Statement of Work (SOW)

3.8   The HF Audio Systems must store the password and user account data in a secure
         database that must be in an encrypted format.

3.9   The HF Audio Systems must have a distributed architecture with intelligent end-points
         that hold a complete and valid copy of the overall HF Audio System communication dial-
         plan and its own configuration data during operation.

3.10   The HF Audio Systems must be software driven and HF Audio System components must
         be updateable by firmware/software update.

3.11   The HF Audio System software must remain updated on all equipment. Software
         uploads must occur automatically upon device boot-up, system boot-up and when
         triggered manually by a system administrator.

3.12   All HF Audio System critical components (Console to IP Interface and Switch
         Mainframe (CIPISM), Radio to IP Interface Controllers (RIPIs), consoles, servers and/or
         gateways) must be capable of supporting Session Initiation Protocol (SIP) protocol
         between operator, receiver and transmitter sites to support future IP capability.

3.13   The HF Audio Systems must use common IP protocols to transport voice data and remote
         control signals.

3.14   All HF Audio System configurable settings must be stored in such a way that they are not
         lost due to a power failure.

3.15   The HF Audio Systems must be compatible with existing radios that currently use E&M
         audio & Ethernet Radio Control Processors (RCPs) for control of the radios.

3.16   The HF Audio Systems must be compatible with Ethernet radios for future expansion.

3.17   The HF Audio Systems must be capable of converting operator & technician radio setting
         parameters to the XML information exchange file transfer protocol to enable the HF
         Audio Systems to control the CAF HF radio equipment via the RCPs.

3.18   The HF Audio Systems must support IP data rates consistent with the RCP interfaces.

3.19   The HF Audio Systems must be able to connect to both VoIP and legacy telephony
         networks.

4   RADIO OPERATIONS REQUIREMENTS

4.1   Each HF Audio System must connect Operator Consoles under IP/MPLS protocols with the other systems located at the other stations and support facilities.

4.2   Each HF Audio System must be capable of hosting remote operations from off-site Operator Consoles.

4.3   Each HF Audio System must be capable of mapping discrete ports for the radio equipment interface at local and remote sites.

4.4   The HF Audio Systems must support radio operation, where each operator console must fully operate (transmit and receive) on one receiver-transmitter radio pair in normal operations.

4.5   The HF Audio Systems must not permit more than one operator to transmit on a given radio transmitter at any given time.

4.6   The HF Audio Systems must support transmitter-only and receiver-only operation, allowing independent audio routing for Radio Transmitters and Receivers.

4.7   The HF Audio Systems must support radio receiver monitoring, where each operator console position is capable of monitoring as many receivers as available within the system.

4.8   The HF Audio Systems must be capable of de-selecting specific frequencies in operation.

4.9   The HF Audio Systems must be capable of re-assigning the de-selected frequencies to other operator/s.

4.10   The HF Audio Systems must be capable of preventing the operator the de-select any of the frequencies without first re-assigning them to other operator/s.   This is to prevent the disabling of specific frequencies in operation.

4.11   The HF Audio Systems must support full-duplex data operation, where the transmitter and receiver are configured on separate frequencies to support full-duplex data services. Full duplex data services perform simultaneous transfer of information in both directions. In full duplex mode, the receiver equipment must not be permitted to be muted during transmitter operation.

4.12   The HF Audio Systems must support half-duplex data operation, where the transmitter and receiver are configured on separate frequencies and transmission occurs in one direction at a time. Half duplex mode must allow selection of the communication channel between two parties in each direction. The receiver equipment must automatically be muted when the transmitter is operating.

4.13   The HF Audio Systems must support Simplex Data Transmission. Simplex data services perform data transmissions from one party to another on a common frequency. In simplex mode the receiver equipment must get automatically muted during transmissions.

4.14   The HF Audio Systems must support broadcast operation as follows:

   a. Voice broadcasts where a single operator may transmit on multiple radio transmitters simultaneously; and
   b. Data broadcasts where a single data modem or external audio source may transmit continuously on one or more selected transmitters.

4.15   If voice broadcasts are made, where a single operator transmits on multiple radio transmitters, potentially located at multiple sites, Real Time Protocol must be used to time stamp voice packets. The time stamp information must be used to ensure that system time delay differences are within 10 ms to prevent broadcast echo.

4.16   The HF Audio Systems must have the capability to adjust system time delay between the Operator Consoles and the Radio Equipment.

4.17   The HF Audio Systems must enable radio operators to provide radio-phone patches with external telephone subscribers.

4.18   The HF Audio Systems must enable radio operators to monitor radio-phone patches.

4.19   The HF Audio Systems must be one hundred percent non-blocking.

4.20   The HF Audio Systems must provide intercom capability between operators in the same operator centre, without blocking telephone access.

4.21   The HF Audio Systems must provide instant recall recording capability at each operator console position to be able to record and playback the last 30 minutes of radio and telephony communication that took place at that operator console.

4.22   The HF Audio System must support legal recording as described in ED 137B, Part 4, "Recording".

4.23   The HF Audio System must provide a connection for a Voice-logging Recorder at each console to record all A/G/A calls, and relief briefings.

4.24   The HF Audio System recording outputs must be available in analogue mode 0dB/600 ohms, and in digital TCP/IP mode.

4.25   The HF Audio System must support an "unattended position" alarm. The HF Audio System must detect when any operator is not logged into an active console position, and register an "unattended position" alarm. When no operator is logged into a console, the loudspeakers must continue to emit audio from the last-connected receiver(s) at that position.

5   OPERATOR CONSOLE EQUIPMENT REQUIREMENTS

5.1   The Operator Console Equipment must enable operators to directly (not via the transmitter control processors) activate Push-to-Talk (PTT) with HF radio transmitters.

5.2   The Operator Consoles must enable operators to control HF Radio Receiver and Transmitter operating parameters via the RCPs.

5.3   The Operator Consoles must enable operators to control HF Radio Receiver Antenna Matrix and Transmitter Antenna Matrix operating parameters via the RCPs.

5.4   The Operator Consoles must be capable of answering and initiating an on-site Private Branch Exchange (PBX) call using a headset and the operator Graphical User Interface (GUI).

5.5   Operator Computer

The Operator Computer for each Operator Console must:

5.5.1   be equipped with a keyboard, mouse and a colour touch-screen monitor.

5.5.2   be at each operator console must be must be mountable in/on the existing furniture.

5.5.3   run on a contemporary Windows or LINUX operating system.

5.5.4   be based on open system architecture and standardized Ethernet and TCP/IP technology.

5.5.5   be equipped with a 802.3 Ethernet Local Area Network (LAN) interface to the on-site CIPISM.

5.5.6   have 15" Liquid Crystal Display (LCD) enabled with touch-screen technology.

5.5.7   be capable of operating by the touch of a finger, stylus or gloved hand.

5.5.8   be National Electrical Manufacturers Association (NEMA) 4/IP65 compliant for front panel ingress protection.

5.5.9   capable of a minimum 800X600/1024X768 display resolution.

5.5.10   able to set the monitor's brightness at the setting of 450 cd/m2 or brighter.

5.5.11   able to set contrast ratio at 500:1 or greater.

5.6   Operator Headsets

The Operator Headsets for each Operator Console must be:

5.6.1   provided with adjustable headbands.

5.6.2   designed for voice communications.

5.6.3   provided with adjustable angle boom microphones.

5.6.4   provided with replaceable ear-pads and microphone windscreens.

5.6.5   equipped with latching XLR connectors with strain relief.

5.6.6   stereo headsets with one channel used for A/G, and the other channel used for G/G communications.

5.6.7   configurable for both radio and telephony calls.

5.6.8   PTT activated.

5.7   Operator Microphones

The Operator Microphones for each Operator Console must be:

5.7.1   boom mounted or gooseneck desktop microphones.

5.7.2   designed for voice communications.

5.7.3   adjustable for height and distance from the operator.

5.7.4   provided with replaceable windscreens console.

5.7.5   equipped with latching XLR connectors with strain relief.

5.7.6   PTT activated.

5.8   Operator Console Loudspeakers

The Operator Console Loudspeakers for each Operator Console must:

5.8.1   be designed for voice communications.

5.8.2   operate at power levels up to 30 dBm.

5.8.3   be equipped with individually adjustable volume controls.

5.8.4   be equipped with latching XLR connectors with strain relief.

5.9   Operator Push-To-Talk (PTT) Footswitch

The Operator PTT Footswitch must:

5.9.1   enable HF transmission by activation of PTT.

5.9.2   be connected the operator console equipment connection panel.

5.10   **HF Modems Government Furnished Equipment (GFE)**

The HF Audio System must:

5.10.1   be provided with ports to connect to HF modems Government Furnished Equipment (GFE) that will be located at Operator Consoles.

5.10.2   support HF modem connectivity at the Operator Console by providing two (2) 600 ohm balanced receive audio lines from the HF Audio System with dynamic range from -40 dBm to +10 dBm (0 dBm nominal).

5.10.3   support HF modem connectivity at the Operator Console by providing two (2) 600 ohm balanced transmit audio lines with configurable range from -30 dBm to +10 dBm (0 dBm nominal).

5.10.4   support HF modem connectivity at the Operator Console by providing two (2) 4W E&M RJ11 terminations for key-line connections.

5.11   **Operator Console Equipment Connection Panel**

The Connection Panel for each Operator Console must be:

5.11.1   19" rack mountable to be able to fit into the existing furniture.

5.11.2   equipped with a RJ45 802.3 Ethernet LAN jack for the Operator Computer to be able connect to the CIPISM.

5.11.3   equipped with two (2) latching XLR connector ports for the Operator Headsets be able to connect to the CIPISM.

5.11.4   equipped with a latching XLR connector port for the Operator Microphone to be able to connect to the CIPISM.

5.11.5   equipped with two (2) latching XLR connector ports for the Operator Console Loudspeakers to be able to connect to the CIPISM.

5.11.6   equipped with a connector port for the PTT Foot-switch to be able to connect to the CIPISM.

5.11.7   equipped with a RJ11 2W telephone circuit port for the Operator Console Telephone Set to be able to connect to the CIPISM.

5.11.8   equipped with a RJ45 VoIP SIP interface port for the Operator Console VoIP Telephone Set to be able to connect to the CIPISM.

5.11.9   equipped with two (2) RJ11 ports for the HF Modem receive audio line to be able to connect to the CIPISM.

5.11.10   equipped with two (2) RJ11 ports for the HF modem transmit audio line to be able to connect to the CIPISM.

5.11.11   equipped with two (2) RJ11 4W E&M ports for the HF Modem key-line to be able to connect to the CIPISM.

5.11.12   equipped with HF Modem feed-through ports for ease of connection/disconnection of the HF modems (GFE). These connectors will not be connected to the HF Audio System. They will be used for connecting the HF modem control lines directly to the RCPs and for connecting the HF modem data lines directly to data inputs and outputs. The Connection Panel for each Operator Console must be:

5.11.12.1   equipped with two (2) EIA RS-232 connectors for HF modem synchronous/asynchronous serial control interfaces;

5.11.12.2   equipped with two (2) EIA RS-422/423 connectors for HF modem synchronous/asynchronous serial input/output data interfaces; and

5.11.12.3   equipped with two (2) 10/100 Base-T (IEEE 802.3) RJ45 terminations for Ethernet links to the HF modems.

6   SYSTEM MAINTAINABILITY REQUIREMENTS

The HF Audio System must:

6.1   provide the RIPI and the CIPISM with 100% redundant architecture.

6.2   not result in degradation of RIPI and/or CIPISM operation longer than 60 seconds.

6.3   continue to operate in degraded mode while the automatic switch-over is completed to return the system to full operational mode.

6.4   not sever the on-going communication while transitioning over to the standby mode is completed.

6.5   provide RIPI and CIPISM that must self-recover (reboot) after a complete power failure within 2 minutes and restore its last configuration without operator's intervention.

6.6   provide RIPIs and CIPISMs that remain fully operational during any Lowest Replaceable Unit (LRU) replacement.

6.7   provide RIPIs and CIPISMs that are reliable to a minimum 99.999% Mean Time Between Failure.

6.8   provide RIPIs and CIPISMs that provide error and status indicator LEDs on their front panel in the modules and power supplies.

6.9   provide RIPIs and CIPISMs that provide automatic fault detection and isolation by Built-In Self-Test (BIST).

6.10   provide RIPIs and CIPISMs that provide electronic circuit cards that have front panel access and are easy to replace.

6.11   provide RIPIs and CIPISMs that have keyed circuit boards to prevent incorrect insertion.

7   TECHNICIAN CONSOLE EQUIPMENT AND INTERFACES

7.1   The Technician Console must:

7.1.1   connect to the on-site CIPISM.

7.1.2   provide technicians with the connectivity to evaluate HF Audio System operations.

7.1.3   connect technician consoles under IP/MPLS protocols with the other systems located at the other stations and support facilities.

7.1.4   enable the technician to assess the control and connectivity of the HF Radio Receivers and Transmitters operations via the RCPs to the extent made possible by their instruction sets.

7.1.5   enable the technician to assess the control and connectivity of the HF Radio Receivers Antenna Matrices and Transmitter Antenna Matrices via the RCPs to the extent made possible by their instruction sets.

7.1.6   enable the technician to assess the control and connectivity of the HF Radio Ancillary Equipment via their existing control lines to the extent made possible by their instruction sets.

7.1.7   be installed in the same 19" equipment rack as the CIPISM, or in a rack adjacent to it.

7.2   The Technician Computer Terminals must:

7.2.1   be equipped with a19" rack drawer keyboard, mouse and a colour touch-screen monitor.

7.2.2   run on a contemporary Windows or LINUX Operating System.

7.2.3   be based on open system architecture and standardized Ethernet and TCP/IP technology.

7.2.4   be equipped with a 802.3 Ethernet LAN interface to the on-site CIPISM.

7.2.5   be 15" Liquid Crystal Display (LCD) enabled with touch-screen technology.

7.2.6   be capable of operating by the touch of a finger, stylus or gloved hand.

7.2.7   be NEMA 4/IP65 compliant for front panel ingress protection.

7.2.8   have a minimum resolution of 800X600/1024X768.

7.2.9   be able to set the monitor's brightness at the setting of 450 cd/m2 or brighter.

7.2.10   be able to set contrast ratio at 500:1 or greater.

7.3   Technician Headsets at each technician console must:

7.3.1   have adjustable headbands.

7.3.2   be designed for voice communications.

7.3.3   have adjustable angle boom microphones.

7.3.4   have replaceable ear-pads and microphone windscreens.

7.3.5   be equipped with latching XLR connectors with strain relief.

7.3.6   be stereo headsets with one channel used for A/G, and the other channel used for G/G communications.

7.3.7   be configurable for both radio and telephony calls.

7.3.8   be PTT activated.

7.4   Technician Console Loudspeakers at each technician console must:

7.4.1   must be designed for voice communications.

7.4.2   operate at power levels up to 30 dBm.

7.4.3   be equipped with individually adjustable volume controls.

7.4.4   be equipped with latching XLR connectors with strain relief.

7.5   Technician Console Equipment Connection Panel at each technician console must be:

7.5.1   19" rack mountable in the same rack as the technician console.

7.5.2   equipped with a RJ45 802.3 Ethernet LAN jack to the HF Audio System for the technician computer terminal.

7.5.3   equipped with two (2) latching XLR connector ports to the HF Audio System for the Technicians Headsets.

7.5.4   equipped with two (2) latching XLR connector ports to the HF Audio System for the technician console loudspeakers.

7.5.5   equipped with a RJ11 2W telephone circuit port to the HF Audio System for the technician console telephone set.

7.5.6   equipped with a RJ45 VoIP SIP interface port to the HF Audio System for the technician console VoIP telephone set.

8   CIPISMs REQUIREMENTS

Each CIPISM must:

8.1   have a scalable design so that site requirements can be expanded. (number of radios, types of telecom interfaces in use, number of Input/Output (I/O) ports, number of serial ports etc.)

8.2   be able to connect directly and remotely to Ethernet radios. RIPI connections must not be required by the HF Audio System for Ethernet radios.

8.3   be able to connect to Ethernet radios without additional IP to analogue media conversion.

8.4   be equipped with a minimum of three (3) distinct Ethernet IEEE 803.2 CIPISM to RIPI ports for connecting RIPIs over GFE trunks.

8.5   include a port to RIPI that must be provided with a redundant failover interface.

8.6   include a port to RIPI that must be able to spread the load on remaining communication links when a telecommunications link connected to a RIPI fails.

8.7   include a port to RIPI that must be capable of a data rate of 10 and 100 Mbps (10/100baseT User Datagram Protocol (UDP)), half duplex or full duplex, auto-negotiable, as per ISO/IEC 8802-3 ANSI/IEEE 802.3.

8.8   include a port to RIPI that must operate over connections limited to 512 kbps.

8.9   be provided the capability of changing RIPI ports to new or different digital communications technologies such as Digital Subscriber Line (DSL), T1 or modem etc. to transfer the audio and data between CIPISMs and remote sites.

8.10   be equipped with an Ethernet IEEE 803.2 inter-CIPISM (CIPISM to CIPISM) port for connecting CIPISMs at all other CAF HF stations and support facilities over a GFE trunk.

8.11   Each inter-CIPISM port must be provided with a redundant failover interface.

8.12   Each inter-CIPISM port must operate at 1.544 Mbps throughput or greater, but must also be operable at fractional T1 speeds.

8.13   Each inter-CIPISM port must operate over connections limited to 512 kbps.

8.14   be equipped with an Ethernet IEEE 803.2 Canadian Switched Network (CSN) PBX port for connecting CIPISMs to the local CSN PBX for Ground Ground telephone functionality, and for AGA phone patch functionality. This connectivity must not change existing dial-up phone numbers or addresses.

8.15   Each CSN PBX port must be provided with a redundant failover interface.

8.16   Each CSN PBX port must operate at 1.544 Mbps throughput or greater, but must also be operable at fractional T1 speeds.

8.17   Each CSN PBX port must operate over connections limited to 512 kbps.

8.18   be capable of connecting, and passing radio control signals to and from the on-site GFE RCPs in accordance with control commands originating at operator consoles.

8.19   have an Ethernet IEEE 803.2 LAN network interface for connecting CIPISMs to the RCPs.

8.20   Each RCP LAN port must be provided with a redundant failover interface.

8.21   Each RCP LAN port must operate at 1.544 Mbps throughput or greater, but must also be operable at fractional T1 speeds.

8.22   Each RCP LAN port must operate over connections limited to 512 kbps.

8.23   connect with on-site operator and technician consoles.

8.24   be equipped with a minimum of twelve RJ11 phone ports to connect with on-site operator and technician consoles.

8.25   be equipped with a minimum of twelve RJ11 phone ports to connect with the on-site legal voice recording system.

8.26   be equipped with a minimum of nine RJ45 IEEE 802.3 jacks to connect with on-site operator and technician console (GFE) VoIP phone-sets.

8.27   incorporate a concentrator device such as a multiplexer to optimize trunked traffic links to the RIPIs, other CIPISMs, VoIP PBXs and RCP LANs.

8.28   support a standard TCP/IP stack.

9   **RIPI REQUIREMENTS**

Each RIPI must:

9.1   have a scalable design so that it can be adjusted to the site requirements such as number of radios, types of telecom interfaces in use, number of I/O ports, number of serial ports etc.. Cascaded RIPIs must not use any site infrastructure to do so.

9.2   be capable of a data rate of 10 and 100 Mbps (10/100baseT UDP), half duplex or full duplex, auto-negotiable, as per ISO/IEC 8802-3 ANSI/IEEE 802.3 on the rear telecommunications links between the RIPI and the CIPISM.

9.3   include a port that must operate over connections limited to 512 kbps.

9.4   have the ability to simultaneously and selectively use a minimum of 3 dedicated rear telecommunications links to different CIPISMs on a pre-determined priority basis, at any given time.

9.5   have the capability of changing inter-site rear telecommunications links to new or different digital communications technologies such as DSL, T1 or modem etc. to transfer the audio and data between CIPISMs and remote sites.

9.6   incorporate a concentrator device such as a multiplexer to optimize trunked traffic links from the CIPISM.

9.7   be able to spread the load on remaining communication links when a telecommunications link connected to a CIPISM fails.

9.8   **Transmit Site RIPI Interfaces**

Each Transmit Site RIPI Interface must:

9.8.1   interface to a minimum of 8 in-service HF transmitters.

9.8.2   provide in-service HF Transmitters with adjustable audio levels of -30dBm to +5.3 dBm into 600 ohms on an analogue audio pair (300Hz to 3400 Hz).

9.8.3   as a minimum, provide 60 dB isolation between each transmit channel path.

9.8.4   key in-service HF transmitters using a PTT signal and reference pair.

9.8.5   be capable of keying in-service HF transmitters from open collector or dry contact I/O points.

9.8.6   be capable of keying in-service HF transmitters by using a Direct Current (DC) output signal settable to accept either of the following signal types on an individual basis as follows:

9.8.6.1   for +24V signalling, an active output state in the form of a dry contact closure must switch 24VDC rated for 250 mA, and an inactive output state shall be indicated by an open circuit with respect to the associated reference wire; and

9.8.6.2   for GND signalling, an active output state must be indicated by the presence of a short circuit (low impedance) with respect to the associated reference wire, and an inactive output state must be indicated by an open circuit with respect to the associated reference wire.

9.8.7   be capable of generating and filtering narrowband tones for PTT for tone signalling.

9.8.8   generate a user selectable PTT tone signal at 2304Hz, 2504Hz, and/or 2604Hz, at +/- 2 Hz maximum, mixed with the voice output signal Each transmit site RIPI, when tone signalling generation is enabled.

9.8.9   be user selectable to -10 dB +/-8dB minimum with respect to the audio line level setting when tone signalling generation is enabled.

9.8.10   generate the tone level that must be adjustable in 1dB steps when tone signalling generation is enabled.

9.8.11   provide 60 dB attenuation for the PTT tone below the audio level, as a minimum.

9.8.12   have PTT tones that must differ from the receive site RIPI squelch (SQ) tones when tone signalling is enabled.

9.9   Receive Site RIPI Interfaces

The Receive Site RIPI Interfaces must:

9.9.1   interface to a minimum of 24 in-service HF receivers.

9. 9.2   provide in-service HF receivers with adjustable audio levels of -30dBm to +5.3 dBm into 600 ohms on an analogue audio pair (300Hz to 3400 Hz).

9. 9.3   provide 60 dB isolation between each receive channel path, as a minimum.

9. 9.4   generate SQ tones must different from the transmit site RIPI PTT tones for tone signalling.

9. 9.5   be capable of detecting and filtering narrowband tones for SQ (in band signalling) for tone signalling.

9. 9.6   detect the presence of a user selectable tone signal at 2304Hz, 2504Hz, and/or or 2604Hz, at +/-30Hz minimum, mixed with the voice signal, at any level within the range of -5 dBm to -40 dBm if tone signalling detection characteristics are enabled.

9. 9.7   The HF Audio System notch filter minimum characteristics must be as follows:

9.9.7.1   The notch circuit bandwidth response must not be wider than +/- 150 Hz from the selected tone center frequency when measured at 3 dB below the audio level reference signal of 1004 Hz;

9.9.7.2   The notch circuit bandwidth response must not be narrower than +/- 20 Hz from the selected tone signal center frequency when measured at 60 dB below the audio level reference signal of 1004 Hz; and

9.9.7.3   It must be possible to disable the notch filter in the field when in-band SQ signalling is not used.

9. 9.8   The HF Audio System detected tone must be validated to avoid false signalling.

10   END TO END SYSTEM PERFORMANCE

10.1   The HF Audio System must support split-site radio interconnection, where transmitter audio and PTT signals are separated from the receiver audio and muting signals.

10.2   End-to-End HF Audio System performance measurement must be exclusive of government supplied telecommunications infrastructure.

10.3   End-to-End HF Audio System performance for connections to analogue radios must be measured with the CIPISM connected directly to the RIPI.

10.4   End-to-End HF Audio System latency time from the operator console point to the radio demarcation point must be less than 130 ms as per ED 137.

10.5   The HF Audio System must statically compensate for voice packet jitter of up to 300 milliseconds in increment of 10 ms.

10.6   As a minimum, each HF Audio System must provide a 32 dB signal to noise ratio (noise with tone) at any level setting, measured with a 1004 Hz reference tone, using a 15 kHz flat response (no weighting) over a range of +3dBm to -25 dBm for a G.711 PCM.

10.7   The HF Audio System must not generate more than 20 dBrnc idle channel noise on analogue ports.

10.8   The HF Audio System must not generate more 2% audio distortion on analogue ports for G.711 PCM.

10.9   As a minimum, voice compressed circuits on the HF Audio System must meet the following Mean Opinion Score (MOS) performance using the Perceptual Evaluation of Speech Quality, as per ITU-T P862, over all telecom link types when used with a minimum Block Error Rate of 1 per 100:

Item No.	Vocoder	Minimum MOS
10.9.1	PCM G711	3.7
10.9.2	32K ADPCM G726	3.6
10.9.3	16K LD-CELP G.728	3.6
10.9.4	8 KBPS C-CELP G.729/G.729a	3.6
10.9.5	6.3 KBPS G.723.1	3.6
10.9.6	5.3 KBPS G.723.1	3.5

10.10   The audio frequency response of the HF Audio System must be within 3.0 dB of a 1004 Hz reference tone applied at the highest output level between 300-3400 Hz.

10.11   The HF Audio System must reduce audio signals below 100 Hz by 50 dB from the highest output level between 300-3400 Hz.

10.12   The HF Audio System must reduce audio signals above 5 kHz Hz by 50 dB from the highest output level between 300-3400 Hz.

10.13   The HF Audio System must be capable of passing analogue voice or modem tones.

10.14   The HF Audio System, when passing modem signals, must support V.34 bis protocol and voice compression techniques using 16 kbps and lower rates as described below:

10.14.1   64 KBPS as per G.711 to G.714, selectable as A-law and/or u-Law;
10.14.2   32 KBPS ADPCM as per G.726 & G.727;
10.14.3   16KBPS LD-CELP as per G.728;
10.14.4   8 KBPS C-CELP as per G.729/G.729a;
10.14.5   6.3 KBPS as per G.723.1; and
10.14.6   5.3 KBPS as per G.723.1.

10.15   The time interval from keying-on a transmitter until the transmitted Radio Frequency (RF) signal amplitude has increased to 90 percent of its steady-state value (attack time) must not exceed 10 ms as per MIL-STD-188-141C. Therefore, the HF Audio Systems must ensure that system time delay differences between the PTT port and the audio port are within 10 ms.

10.16   The time interval from keying-off a transmitter until the transmitted (RF) signal amplitude has decreased to 10 percent of its steady-state value (release time) must not exceed 10 ms as per MIL-STD-188-141C. Therefore, the HF Audio Systems must ensure that system time delay differences between the PTT port and the audio port are within 10 ms.

10.17   The end-to-end HF Audio System PTT activating delay must be less than 130 ms as per ED 137. The delay duration is defined as the time between detecting PTT key activation at the operator console and the activation of the transmitter at the radio side.

11   SYSTEM ALARMS AND EVENT LOGS

11.1   The HF Audio System must store event records in a daily log format for each individual workstation and critical component.

11.2   The HF Audio System must record system operation events as follows:

11.2.1   HF Audio System logins;
11.2.2   Unsuccessful HF Audio System logins;
11.2.3   Event log database modifications;
11.2.4   Telephone calls;
11.2.5   Radio frequency selections;

11.2.6   PTT actions; and
11.2.7   Configuration changes.

11.3   The HF Audio System must record system alarm events as follows:

11.3.1   Link fault detection on the link between the CIPISM and operator consoles;
11.3.2   Link fault detection on the link between the CIPISM and technician consoles;
11.3.3   Link fault detection on the link between the CIPISM and station RIPIs;
11.3.4   Link fault detection on the link between the station RIPIs and the radio equipment
            that they are connected to;
11.3.5   Link fault detection on the link between the local station CIPISM and CIPISMs at
            other CAF HF stations; and
11.3.6   HF Audio System critical component faults.

11.4   The events stored in the event log must be time-stamped.

11.5   The HF Audio System must store the event log in the system for a minimum of one
        month.

11.6   The HF Audio System must not permit any attempt to delete event records before 30
        days.

12   USER ACCESS PRIVILEGE LEVELS

12.1   The GUIs must provide the following user access privilege levels:

12.1.1   Radio Operator;
12.1.2   Radio Operator Supervisor;
12.1.3   Radio Technician; and
12.1.4   System Administrator.

12.2   Radio Operator GUI Requirements

The HF Audio System must be provided with an operator Graphical GUI. The Operator
GUI must allow control the HF Audio Systems, and must control HF Radio Equipment as
specified in this document. The HF Audio System must allow the operators to be able to
login to any of the local Operator Consoles.

The Operator GUI must:

12.2.1   operate on the SUN® JVM Engine or any equivalent modern engine to provide
            maximum stability and platform independence.

12.2.2   display system status information including the time of day, the state of the systems
            links, and current login information.

12.2.3   allow the operator to adjust brightness and screen contrast.

12.2.4   allow the operator to change the operator's password.

12.2.5   allow the operator to change and set COM ports.

12.2.6   allow the operator to specify the server address and port, and to name the
             workstation.

12.2.7   include a LAN status indicator that indicates the computer's state of connection to
             the HF Audio Systems LAN, indicating whether:

12.2.7.1   the connection is made with the HF Audio System Server;
12.2.7.2   the operator's computer is in progress of making a link; or
12.2.7.3   that there is no connection.

12.2.8   include a CIPISM connection status indicator that indicates the computer's state of
             connection(s) to the CIPISM, indicating whether:

12.2.8.1   the connection is made;
12.2.8.2   the operator's computer is in progress of making a link; or
12.2.8.3   that there is no connection.

12.2.9   have the capability to minimize the interface screen.

12.2.10   be capable of copying settings from another operator.

12.2.11   include a status indicator that indicates the name of the current display.

12.2.12   consist of multiple pages with a means of rapidly switching between pages in the
             current display.

12.2.13   provide a Help menu that opens the HF Audio System user manual in a window.

12.2.14   be able to display instant text messages between operator console positions.

12.2.15   have the text message distribution technology that must provide text formatting
             capabilities (Font: size, colour and bold, line breaks and paragraphs).

12.2.16   indicate detailed status information about the transmitter selected, including:

12.2.16.1   selected frequency;
12.2.16.2   modulation;
12.2.16.3   output power level;
12.2.16.4   operational mode (standby, operational, ready);
12.2.16.5   keyed/unkeyed status; and
12.2.16.6   existing fault conditions.

12.2.17   allow the operator to select transmitter output power from 0 - 100% maximum
             transmitter output power in 10% steps.

12.2.18   allow the operator to select transmitter frequency within 1.5 - 30MHz range with 10
             Hz resolution.

12.2.19   allow the operator to select Upper Side Band (USB), LSB, AME, or ISB modulations.

12.2.20   allow the operator to use PTT for radio calls.

12.2.21   indicate the source of the PTT while each PTT is activated, as one of the following:

12.2.21.1   Headset/handset/microphone ID;
12.2.21.2   Footswitch PTT;
12.2.21.3   HF modem activated PTT; or
12.2.21.4   GUI activated PTT.

12.2.22   indicate when a transmitter is selected. The indication must occur when the PTT is pressed and the PTT confirm signal is received.

12.2.23   display an error if an operator attempts to transmit on a given radio transmitter that is already in use by another operator.

12.2.24   indicate detailed status information about the transmit antenna matrix (all cross connections, interlocks and faults), including:

12.2.24.1   in operational mode ("local" or "remote");
12.2.24.2   in fault mode ("no fault", "summary fault", or "connection fault"); and
12.2.24.3   power supply status ("PS fault" or as "PS normal").

12.2.25   indicate transmit antenna matrix row status, including:

12.2.25.1   column row is connected to; and
12.2.25.2   interlock status.

12.2.26   indicate when a transmit antenna matrix column is connected to the ground strip.

12.2.27   allow the operator to select and connect a transmit antenna matrix row to a selected column.

12.2.28   allow the operator to select and disconnect a transmit antenna matrix row from a selected column.

12.2.29   indicate detailed status information about the receiver selected, including:

12.2.29.1   selected frequency;
12.2.29.2   modulation;
12.2.29.3   SQ threshold level;
12.2.29.4   Automatic Gain Control (AGC) speed;
12.2.29.5   RF gain; and
12.2.29.6   existing fault conditions.

12.2.30   allow the operator to select receiver frequency within 1.5 - 30MHz range with 10 Hz resolution.

12.2.31   allow the operator to select USB, LSB, AME, or ISB demodulations.

12.2.32   allow the operator to select active reception (squelch).

12.2.33   allow the operator to select the desired SQ threshold level in percent, where 100% means maximum level and 0% means no SQ.

12.2.34   continue to indicate that SQ is set on a radio frequency for three (3) seconds after the actual reception ends.

12.2.35   allow the operator to select receiver off/slow/med/fast AGC levels.

12.2.36   allow the operator to select a receiver gain of -30 dB to +15 dB in one dB steps.

12.2.37   allow the operator to view a list (array) of receive antenna matrix output ports connected to a selected input port.

12.2.38   allow the operator to select and connect a receive antenna matrix input port to selected output ports.

12.2.39   allow the operator to select and disconnect a receive antenna matrix input port from selected output ports.

12.2.40   indicate if a receiver or transmitter is in maintenance mode.

12.2.41   allow at least 8 different radio parameter groups to be defined for an individual operator .

12.2.42   allow identifying the radio parameter group buttons by means such as color-coding or icons, logically grouping radio frequencies, radio equipment, and HF Audio System communications ports together.

12.2.43   allow the operator to display the allocation of at least 30 radio frequency buttons.

12.2.44   allow identifying the radio frequency buttons by means such as color-coding or icons, logically grouping the radio frequencies with radio equipment, and HF Audio System communications ports.
        .
12.2.45   allow the operator to display which transmitters and receivers are selected for use on a user-specified radio frequency.

12.2.46   allow the operator to individually select and deselect transmitters and receivers for use.

12.2.47   allow the operator to select and use two (2) headsets/microphones, two (2) loudspeakers, operator console telephone set (GFE), and two (2) HF modems (GFE). Any subset of these audio devices must also be supported.

12.2.48   allow the operator to individually adjust audio volume for headsets/handsets and

loudspeakers.

12.2.49   allow the operator to individually adjust audio volume of the received audio from individual frequencies assigned to that console.

12.2.50   provide volume controls that must not allow for a complete muting of the headset/handset and speaker.

12.2.51   display an indication of an incoming call or if there is audio activity for each of the frequencies assigned to the operator position.

12.2.52   allow the operator to select audio routing of demodulated radio signals, identified by frequency of reception, to the following audio outputs according to the operator selection:

12.2.52.1   To the left and/or right audio channel of the stereo headsets; or
12.2.52.2   To any combination of positional loudspeakers.

12.2.53   allow the operator to select transmitter-only and receiver-only operation, allowing independent audio routing for radio transmitters or receivers.

12.2.54   allow the operator to select radio receiver monitoring, where the operator may monitor any receivers available within the system.

12.2.55   notify the operator if a monitored frequency is de-selected that is not being monitored by another operator in the system.

12.2.56   allow the operator to select full-duplex data operation to support full-duplex data services, where the transmitter and receiver are configured on separate frequencies and simultaneous transfer of information in both directions is required. In this mode, the   receiver equipment must not be muted during transmitter operation
.

12.2.57   allow the operator to select half-duplex data operation, where the transmitter and receiver are configured on separate frequencies and transmission occurs in one direction at a time. This option must allow selection of the communication channel between two parties in each direction. The receiver equipment must be muted when the transmitter is operating.

12.2.58   allow the operator to select simplex data operation, or the transmission from one party at a time on a common frequency, where the receiver equipment must be muted during transmissions.

12.2.59   allow the operator to select broadcast operations as follows:

12.2.59.1   Voice broadcasts where a single operator may transmit on multiple radio transmitters simultaneously; and
12.2.59.2   Data broadcasts where a single data modem or external audio source may transmit continuously on one or more selected transmitters;

12.2.60   include a transmit button on the active display that selects all the active frequencies
             to broadcast at that position.

12.2.61   allow the operator to adjust system time delay between the operator consoles and the
             radio equipment.

12.2.62   allow the operator to select A/G (radio) and G/G (telephone, audio and message
             routing) controls.

12.2.63   allow the operator to select the means of coupling, also known as patch, which
             allows an operator to link audio between resources. All parties using these resources
             must be able to communicate without the intervention of the operator who created the
             patch.

12.2.64   allow the operator to select audio routing of G-G signals, identified by telephone
             number, to the following audio outputs according to the operator selection:

12.2.64.1   To the left and/or right audio channel of the stereo headsets; or
12.2.64.2   To any combination of positional loudspeakers.

12.2.65   allow the operator to individually select transmitters, receivers, and telephone
             circuits to set up phone patches with external telephone callers.

12.2.66   allow the operator to use PTT for telephony calls.

12.2.67   allow the operator to select the call for call-control, call barge-in and call monitoring.

12.2.68   allow the operator to switch between the following button display modes:

12.2.68.1   Radio only;
12.2.68.2   Telephony only;
12.2.68.3   Mixed radio-telephony button layout; and
12.2.68.4   Intercom between local consoles.

12.2.69   allow the operator to select intercoms between console positions in the same operator
             centre, without blocking telephone access within an operator site.

12.2.70   allow the operator to activate instant recall recording of all active incoming audio to
             that position for increments of five seconds up to a cumulative maximum of 30
             minutes. The instant recall recording menu must allow selection of individual radio
             or telephony communications for playback.

12.2.71   indicate detailed status information about the rotatable log periodic antenna (RLPA)
             selected, including:

12.2.71.1   Azimuth – current bearing selected;
12.2.71.2   Rotating – antenna is rotating;
12.2.71.3   Busy – antenna controller is busy;
12.2.71.4   Local – antenna controller is in local mode;
12.2.71.5   CW Limit fault;

12.2.71.6   CCW Limit fault;
12.2.71.7   Emergency Limit fault; and
12.2.71.8   Fault - antenna exceeded the maximum rotate time the last time it was
               commanded to rotate.

12.2.72   allow the operator to select and rotate a RLPA to a given azimuth bearing from 0° to
             359° in 1° increments. During the rotation operation, the detailed status information
             about the RLPA must be displayed.

12.2.73   allow the operator to select transmitter output power from 0 - 100% maximum
             transmitter output power in 10% steps.

12.2.74   indicate all selected elements within a selected sector of a beverage rosette antenna.

12.2.75   allow the operator to select and connect an element within a selected sector of a
             beverage rosette antenna.

12.2.76   allow the operator to select and disconnect an element within a selected sector of a
             beverage rosette antenna.

12.3   **Radio Operator Watch Supervisor GUI Requirements**

         The Watch Supervisor GUI must:

12.3.1   allow the Radio Operator to login to the HF Audio System with watch supervisor use
             privileges at any of the local operator consoles.

12.3.2   allow the Watch Supervisor to change an operator's configuration file. Any change
             to an operator's configuration file made by the watch supervisor must be indicated to
             the operator on his GUI and the operator must be able to acknowledge.

12.3.3   provide a Help menu that opens the HF Audio System user manual in a window.

12.3.4   have an alarm that notifies the watch supervisor of critical frequencies that are not
             monitored by any operator consoles in that operator centre. If an operator logs out of
             the HF Audio System, the watch supervisor must receive an "unattended position"
             alarm. If activated, all audio from the unattended position must be routed to the
             watch supervisor loudspeakers.

12.3.5   allow operator's watch supervisor to selectively monitor either G/G audio, A/G
             audio, or
             the sum of G/G and A/G audio from other monitored operator consoles by using a
             position monitoring function.

12.3.6   allow the watch supervisor to monitor the audio of up to 12 operators.

12.3.7   have the following capabilities:

12.3.7.1   monitor;

12.3.7.2   barge in, allowing the watch supervisor to override and talk to a monitored operator. All radio communication in progress and the far end party (ies) on the active call in progress must not be able to hear the watch supervisor talking to the operator; or

12.3.7.3   barge over, allowing the watch supervisor PTT to over-ride a monitored operator PTT and communicate with the selected transmitter radio(s) at the monitored position.

12.4   Radio Technician GUI Requirements

12.4.1   The Radio Technician GUI must indicate:

12.4.1.1   HF Audio System telecom links are normal;
12.4.1.2   HF Audio System telecom link faults that have not caused a loss of service;
12.4.1.3   HF Audio System telecom link faults that have caused limited loss of service;
12.4.1.4   HF Audio System telecom link faults that have caused complete loss of service;
12.4.1.5   If the HF Audio System has been placed in a maintenance mode; and
12.4.1.6   Loss of a HF Audio System device power source (either AC or DC).

12.4.2   be specifically designed for the technician console.

12.4.3   control and support radio maintenance of the HF Audio Systems.

12.4.4   allow technicians to login to the technician GUI at the technician console and at any of the local operator consoles.

12.4.5   operate on the SUN® JVM Engine or any equivalent modern engine to provide maximum stability and platform independence.

12.4.6   have the capability to minimize the interface screen.

12.4.7   include a LAN status indicator that indicates the computer's state of connection to the HF Audio Systems LAN, indicating whether:

12.4.7.1   the connection is made with the HF Audio System Server;
12.4.7.2   the technician's computer is in progress of making a link; or
12.4.7.3   that there is no connection.

12.4.8   include a CIPISM connection status indicator that indicates the technician console's state of connection(s) to the CIPISM, indicating whether:

12.4.8.1   the connection is made;
12.4.8.2   the technician's console is linking, or
12.4.8.3   that there is no connection.

12.4.9   include a display status indicator that indicates the name of the current display.

12.4.10   provide a Help menu that opens the HF Audio System user manual in a window.

12.4.11   be able to sending and receiving text messages to/from system users.

12.4.12   have the text message distribution technology that must provide text formatting capabilities (Font: size, colour and bold, line breaks, and paragraphs).

12.4.13   provide technicians with the capability to access HF audio system operating parameters.

12.4.14   have same functionality as the operator's GUI except for the stand-alone microphone and the PTT footswitch functionality.

12.4.15   be capable of copying settings from another technician.

12.4.16   support the following capabilities simultaneously, but on separate GUI pages or screens:

12.4.16.1   System page, displaying system status information including the time of day, the state of the systems links, and current login information;
12.4.16.2   Screen page, allowing the operator to adjust button brightness and screen contrast;
12.4.16.3   Password page to change the technician's password;
12.4.16.4   Communications page to set COM ports;
12.4.16.5   Network page to specify the server address and port, and to name the Workstation;
12.4.16.6   Technician console GUI configuration;
12.4.16.7   Operator console position GUI configurations;
12.4.16.8   HF Audio System core configuration;
12.4.16.9   HF Audio System telecommunications link status;
12.4.16.10   HF Audio System advanced configuration to adjust system and trunk parameters such as equipment configuration, telecommunications link configuration and call routing;
12.4.16.11   HF Audio System critical component hardware and software status;
12.4.16.12   HF Audio System hardware and software modifications and changes, including version changes;
12.4.16.13   HF Audio System diagnostics and alarm management; and
12.4.16.14   HF Audio System event log database configuration.

12.4.17   provide technicians with the capability to independently configure, monitor, maintain and troubleshoot all HF Audio System critical components.

12.4.18   permit retrieval and transferral of complete HF Audio System critical component configurations from one technician console to another.

12.4.19   permit complete configuration replication (imaging) from one HF Audio System critical component to another for quick device setup.

12.4.20   permit HF Audio System critical component parameter configuration editing.

12.4.21   be capable of displaying the software version of the CIPISM and RIPIs.

12.4.22   permit new software versions to be downloaded into the CIPISM and the RIPIs.

12.4.23   permit complete HF Audio System critical component configuration storage for
               backup purposes.

12.4.24   permit retrieval and display of the software version of any HF Audio System critical
               component.

12.4.25   provide technicians with the capability to set-up HF Audio System equipment, run
               hardware & software diagnostics, and report on the status of HF Audio System
               critical components.

12.4.26   provide HF Audio System status graphics and provide various indicators that relay
               the state of the system devices.

12.4.27   provide diagnostic capability to the critical component LRU level.

12.4.28   report and display Built-in Self Test (BIST) alarms reported by the HF Audio System
               event log.

12.4.29   indicate whether the device is working properly, degraded or faulty. This may be
               accomplished by colour indicators or icons on a system map (green, yellow, or red,
               for example).

12.4.30   provide a detailed diagnostics screen when the technician clicks on the device status
               indicator.

12.4.31   indicate that HF Audio System critical components are in a degraded mode if they
               are unable to carry all the functions for which they are configured, including
               redundancy.

12.4.32   display the inter- and intra-system link states.

12.4.33   be provided with the capability to search the event log for connected CAF HF
               equipment IDs, or timeframes stored in the event log database.

12.4.34   provide information about the event log database, event log disc space usage and
               disk space available.

12.4.35   permit the technician to recall alarms and event logs.

12.4.36   permit HF Audio System devices to be placed in a maintenance mode to suspend
               reporting of alarms and automatic actions.

12.5   System Administrator GUI Requirements

The HF Audio Systems must be provided with a system administration GUI. The system
administration GUI must control and support system administration and user access of the
HF Audio Systems.

The System Administrator GUI must:

12.5.1   provide system administrators with the capability to provide access to any system, at any system location, to all other system users.

12.5.2   provide system administrators with the capability to access all systems at all user privilege levels.

12.5.3   provide system administrators with the capability to verify the proper operation of all controls, displays, indicators, control signal paths, and information signal paths at all operator and technician consoles.

12.5.4   provide a Help menu that opens the HF Audio System user manual in a window.

12.5.5   provide system administrators with the capability to view and print the HF Audio System event log.

12.5.6   provide system administrators with the capability to add comments to the event log file through a notes section.

12.5.7   provide system administrators with the following capabilities:

12.5.7.1   Customize the system administration GUI;
12.5.7.2   Create users on the HF Audio System;
12.5.7.3   Assign user permissions and passwords;
12.5.7.4   Modify user profiles;
12.5.7.5   Activate or deactivate user features;
12.5.7.6   Send instant messages to operators;
12.5.7.7   Notify operators of configuration changes;
12.5.7.8   Monitor up to six operators at any given time;
12.5.7.9   Create/modify operator console sectors;
12.5.7.10   View system diagnostics;
12.5.7.11   Create and modify global event log and HF Audio System database elements;
12.5.7.12   Create, modify, import or export the system HF Audio System user profile database; and
12.5.7.13   Create backup archives of the databases and log files.

12.5.8   provide system administrator with the capability to download software updates to any CIPISM and RIPI at any system location.

12.5.9   provide system administrators with the capability to display text feeds from an HTTP server.

12.5.10   provide the text message distribution technology that must provide text formatting capabilities (Font: size, colour and bold, line breaks, and paragraphs).

12.5.11   provide system administrators with the capability to refer to the maintenance history of each system by accessing and reviewing the HF Audio System event logs.

12.5.12   provide system administrators with the capability to view the operational status of all HF Audio System critical components and to view the operational status and connection status of any interconnected CAF HF System interfaces.

13   POWER REQUIREMENTS

13.1   The HF Audio System must be operable using 115 VAC, 60 Hz primary power.

13.2   Each individual HF Audio System device must be equipped with two redundant power feeds with zero delay load sharing in the event of failure.

13.3   Interruption of one power feed must not power down the equipment or affect operation.

13.4   The HF Audio System must include protection against AC power surges.

13.5   The HF Audio System devices must operate within the following tolerances:

13.5.1   Voltage frequency of 47 Hz to 63 Hz;
13.5.2   Voltage tolerance: ± 10%;
13.5.3   Voltage transient: ± 8% of nominal, not to exceed 100ms; and
13.5.4   Phase regulation: ± 1 electrical degree.

14   RACK SPACE CONSTRAINTS

14.1   The HF Audio System CIPISM must be mountable in a 19" inch rack that must be supplied by the contractor.

14.2   Each of the CIPISM installations must be contained in a single 19" inch rack that must be supplied by the contractor.

14.3   The HF Audio System RIPIs must be mountable in a 19" inch rack.

14.4   The HF Audio System RIPIs must not exceed 16 Rack Units.

14.5   Each individual HF Audio System technician computer to be installed at the technician equipment rack must not be larger than four 19" Rack Units.

15   ENVIRONMENTAL REQUIREMENTS

15.1   The HF Audio System must meet the following environmental requirements while operational or when stored or being transported:

15.1.1   Operating:

15.1.1.1   Temperature: 5°C to 40°C
15.1.1.2   Ambient Relative Humidity: 10% to 90% non-condensing; and

15.1.2   Storage and Transportation:

15.1.2.1   Temperature: -20°C to 55°C
15.1.2.2   Altitude: Up to 4 000 m for transportation.

16   ELECTROMAGNETIC COMPATIBILITY

16.1   The HF Audio System must comply with EN 55024: 2010 for immunity to electrostatic discharge (ESD), electrical fast transients and continuous radio frequency disturbances.

16.2   The HF Audio Systems must comply with electromagnetic compatibility tests and limits of FCC Part 15.

17   SAFETY

17.1   The HF Audio System equipment must comply with CAN/CSA-C22.2.

17.2   The HF Audio System equipment must comply with No. 60950-1-07/UL 60950-1 – Information Technology Equipment – Safety – Pt 1: General Requirements.

ANNEX G - COMPLIANCE MATRIX - Version 1
COMPLIANCE WITH ANNEX A - STATEMENT OF WORK

A	B	C	E
Reference	**Description**	**Compliant or Non-Compliant**	**Bidder's Comments**
Annex A	Statement of Work		

ANNEX G – COMPLIANCE MATRIX – Version 1
COMPLIANCE WITH ANNEX B – PERFORMANCE SPECIFICATIONS

A	B	C	D	E	F
Annex B Reference	Description	Proposed Part No./s	Compliant or Non-Compliant	Reference in Proposal (Document, Page No. Etc.)	Bidder's Comments
1	**PURPOSE**				
1.1	The purpose of this document is to provide the performance and functional specifications for the High Frequency (HF) Audio Systems Replacement Project.				
1.2	The performance and functional specifications of the HF Audio System listed herein are not based on a specific preconceived system, but are necessitated by the overarching requirements of the Canadian Armed Forces (CAF) Strategic HF Systems of which the HF Audio Systems are a part.				
1.3	The performance and functional requirements may not constitute an exhaustive specification list since it is based on a Department of National Defence conceptual system design, nonetheless, the contractor must ensure that its proposed solution is progressive and technologically advanced.				
1.4	The intent of the performance specifications is to be less prescriptive to allow the contractor to be innovative and deliver an economical customized Commercial off the Shelf (COTS) system, which meets and/or exceeds the performance specifications.				
1.5	The Contractor must fully meet/exceed the performance and functional requirements of the system as described in this document.				
2	**APPLICABLE STANDARDS**				
2.1	The HF Audio Systems must support Automatic Link Establishment (ALE) radio operation in accordance with MIL-STD-188-141.				
2.2	The HF Audio Systems must support the EUROCAE ED 137 Voice over Internet Protocol (VoIP) Air Traffic Management (ATM) standard.				
3	**GENERAL SYSTEM REQUIREMENTS**				
3.1	The HF Audio System equipment must be comprised of COTS products.				
3.2	All HF Audio System equipment must be of current technology.				
3.3	The HF Audio System architecture must be a proven technology, and similar systems must have been previously commercially deployed and operational.				
3.4	The HF Audio System must comply with ED 137B, Part 1, "Radio".				
3.5	The HF Audio Systems must be designed based on open system architecture and standardized Ethernet and TCP/IP technology.				
3.6	The HF Audio Systems must be capable of operating over an IP/MPLS based metallic landline or a non-metallic communication link such as a satellite link, a microwave link or a fiber optic cable.				
3.7	The HF Audio Systems must provide multiple user access as defined in this document and Annex A - Statement of Work (SOW)				
3.8	The HF Audio Systems must store the password and user account data in a secure database that must be in an encrypted format.				
3.9	The HF Audio Systems must have a distributed architecture with intelligent end-points that hold a complete and valid copy of the overall HF Audio System communication dial-plan and its own configuration data during operation.				
3.10	The HF Audio Systems must be software driven and HF Audio System components must be updateable by firmware/software update.				
3.11	The HF Audio System software must remain updated on all equipment. Software uploads must occur automatically upon device boot-up, system boot-up and when triggered manually by a system administrator.				
3.12	All HF Audio System critical components (Console to IP Interface and Switch Mainframe (CIPISM), Radio to IP Interface Controllers (RIPIs), consoles, servers and/or gateways) must be capable of supporting Session Initiation Protocol (SIP) protocol between operator, receiver and transmitter sites to support future IP capability.				
3.13	The HF Audio Systems must use common IP protocols to transport voice data and remote control signals.				
3.14	All HF Audio System configurable settings must be stored in such a way that they are not lost due to a power failure.				
3.15	The HF Audio Systems must be compatible with existing radios that currently use E&M audio & Ethernet Radio Control Processors (RCPs) for control of the radios.				
3.16	The HF Audio Systems must be compatible with Ethernet radios for future expansion.				

3.17	The HF Audio Systems must be capable of converting operator & technician radio setting parameters to the XML information exchange file transfer protocol to enable the HF Audio Systems to control the CAF HF radio equipment via the RCPs.
3.18	The HF Audio Systems must support IP data rates consistent with the RCP interfaces.
3.19	The HF Audio Systems must be able to connect to both VoIP and legacy telephony networks.
4	**RADIO OPERATIONS REQUIREMENTS**
4.1	Each HF Audio System must connect Operator Consoles under IP/MPLS protocols with the other systems located at the other stations and support facilities.
4.2	Each HF Audio System must be capable of hosting remote operations from off-site Operator Consoles.
4.3	Each HF Audio System must be capable of mapping discrete ports for the radio equipment interface at local and remote sites.
4.4	The HF Audio Systems must support radio operation, where each operator console must fully operate (transmit and receive) on one receiver-transmitter radio pair in normal operations.
4.5	The HF Audio Systems must not permit more than one operator to transmit on a given radio transmitter at any given time.
4.6	The HF Audio Systems must support transmitter-only and receiver-only operation, allowing independent audio routing for Radio Transmitters and Receivers.
4.7	The HF Audio Systems must support radio receiver monitoring, where each operator console position is capable of monitoring as many receivers as available within the system.
4.8	The HF Audio Systems must be capable of de-selecting specific frequencies in operation.
4.9	The HF Audio Systems must be capable of re-assigning the de-selected frequencies to other operator/s.
4.10	The HF Audio Systems must be capable of preventing the operator the de-select any of the frequencies without first re-assigning them to other operator/s. This is to prevent the disabling of specific frequencies in operation.
4.11	The HF Audio Systems must support full-duplex data operation, where the transmitter and receiver are configured on separate frequencies to support full-duplex data services. Full duplex data services perform simultaneous transfer of information in both directions. In full duplex mode, the receiver equipment must not be permitted to be muted during transmitter operation.
4.12	The HF Audio Systems must support half-duplex data operation, where the transmitter and receiver are configured on separate frequencies and transmission occurs in one direction at a time. Half duplex mode must allow selection of the communication channel between two parties in each direction. The receiver equipment must automatically be muted when the transmitter is operating.
4.13	The HF Audio Systems must support Simplex Data Transmission. Simplex data services perform data transmissions from one party to another on a common frequency. In simplex mode the receiver equipment must get automatically muted during transmissions.
4.14	The HF Audio Systems must support broadcast operation as follows:
	a. Voice broadcasts where a single operator may transmit on multiple radio transmitters simultaneously; and
	b. Data broadcasts where a single data modem or external audio source may transmit continuously on one or more selected transmitters.
4.15	If voice broadcasts are made, where a single operator transmits on multiple radio transmitters, potentially located at multiple sites, Real Time Protocol (RTP) must be used to time stamp voice packets. The time stamp information must be used to ensure that system time delay differences are within 10 ms to prevent broadcast echo.
4.16	The HF Audio Systems must have the capability to adjust system time delay between the Operator Consoles and the Radio Equipment.
4.17	The HF Audio Systems must enable radio operators to provide radio-phone patches with external telephone subscribers.
4.18	The HF Audio Systems must enable radio operators to monitor radio-phone patches.
4.19	The HF Audio Systems must be one hundred percent non-blocking.
4.20	The HF Audio Systems must provide intercom capability between operators in the same operator centre, without blocking telephone access.
4.21	The HF Audio Systems must provide instant recall recording capability at each operator console position to be able to record and playback the last 30 minutes of radio and telephony communication that took place at that operator console.
4.22	The HF Audio System must support legal recording as described in ED 137B, Part 4, "Recording".
4.23	The HF Audio System must provide a connection for a Voice-logging Recorder at each console to record all A/G/A calls, and relief briefings.
4.24	The HF Audio System recording outputs must be available in analogue mode 0dB/600 ohms, and in digital TCP/IP mode.

#	Requirement		
4.25	The HF Audio System must support an "unattended position" alarm. The HF Audio System must detect when any operator is not logged into an active console position, and register an "unattended position" alarm. When no operator is logged into a console, the loudspeakers must continue to emit audio from the last-connected receiver(s) at that position.		
5	**OPERATOR CONSOLE EQUIPMENT REQUIREMENTS**		
5.1	The Operator Console Equipment must enable operators to directly (not via the transmitter control processors) activate Push-to-Talk (PTT) with HF radio transmitters.		
5.2	The Operator Consoles must enable operators to control HF Radio Receiver and Transmitter operating parameters via the RCPs.		
5.3	The Operator Consoles must enable operators to control HF Radio Receiver Antenna Matrix and Transmitter Antenna Matrix operating parameters via the RCPs.		
5.4	The Operator Consoles must be capable of answering and initiating an on-site site Private Branch Exchange (PBX) call using a headset and the operator Graphical User Interphase (GUI).		
5.5	**Operator Computer**		
	The Operator Computer for each Operator Console must:		
5.5.1	be equipped with a keyboard, mouse and a colour touch-screen monitor.		
5.5.2	be at each operator console must be must be mountable in/on the existing furniture.		
5.5.3	run on a contemporary Windows or LINUX operating system.		
5.5.4	be based on open system architecture and standardized Ethernet and TCP/IP technology.		
5.5.5	be equipped with a 802.3 Ethernet Local Area Network (LAN) interface to the on-site CIPISM.		
5.5.6	have 15" Liquid Crystal Display (LCD) enabled with touch-screen technology.		
5.5.7	be capable of operating by the touch of a finger, stylus or gloved hand.		
5.5.8	be National Electrical Manufacturers Association (NEMA) 4/IP65 compliant for front panel ingress protection.		
5.5.9	capable of a minimum 800X600/1024X768 display resolution.		
5.5.10	able to set the monitor's brightness at the setting of 450 cd/m2 or brighter.		
5.5.11	able to set contrast ratio at 500:1 or greater.		
5.6	**Operator Headsets**		
	The Operator Headsets for each Operator Console must be:		
5.6.1	provided with adjustable headbands.		
5.6.2	designed for voice communications.		
5.6.3	provided with adjustable angle boom microphones.		
5.6.4	provided with replaceable ear-pads and microphone windscreens.		
5.6.5	equipped with latching XLR connectors with strain relief.		
5.6.6	stereo headsets with one channel used for A/G, and the other channel used for G/G communications.		
5.6.7	configurable for both radio and telephony calls.		
5.6.8	PTT activated.		
5.7	**Operator Microphones**		
	The Operator Microphones for each Operator Console must be:		
5.7.1	boom mounted or gooseneck desktop microphones.		
5.7.2	designed for voice communications.		
5.7.3	adjustable for height and distance from the operator.		
5.7.4	provided with replaceable windscreens console.		
5.7.5	equipped with latching XLR connectors with strain relief.		
5.7.6	PTT activated.		
5.8	**Operator Console Loudspeakers**		
	The Operator Console Loudspeakers for each Operator Console must:		
5.8.1	be designed for voice communications.		
5.8.2	operate at power levels up to 30 dBm.		
5.8.3	be equipped with individually adjustable volume controls.		
5.8.4	be equipped with latching XLR connectors with strain relief.		
5.9	**Operator Push-To-Talk (PTT) Footswitch**		
	The Operator PTT Footswitch must:		
5.9.1	enable HF transmission by activation of PTT.		
5.9.2	be connected the operator console equipment connection panel.		
5.10	**HF Modems (GFE)**		
	The HF Audio System must:		

#	Requirement
5.10.1	be provided with ports to connect to HF modems Government Furnished Equipment (GFE) that will be located at Operator Consoles.
5.10.2	support HF modem connectivity at the Operator Console by providing two (2) 600 ohm balanced receive audio lines from the HF Audio System with dynamic range from –40 dBm to +10 dBm (0 dBm nominal).
5.10.3	support HF modem connectivity at the Operator Console by providing two (2) 600 ohm balanced transmit audio lines with configurable range from –30 dBm to +10 dBm (0 dBm nominal).
5.10.4	support HF modem connectivity at the Operator Console by providing two (2) 4W E&M RJ11 terminations for key-line connections.
5.11	**Operator Console Equipment Connection Panel**
	The Connection Panel for each Operator Console must be:
5.11.1	19" rack mountable to be able to fit into the existing furniture.
5.11.2	equipped with a RJ45 802.3 Ethernet LAN jack for the Operator Computer to be able connect to the CIPISM.
5.11.3	equipped with two (2) latching XLR connector ports for the Operator Headsets be able to connect to the CIPISM.
5.11.4	equipped with an latching XLR connector port for the Operator Microphone to be able to connect to the CIPISM.
5.11.5	equipped with two (2) latching XLR connector ports for the Operator Console Loudspeakers to be able to connect to the CIPISM.
5.11.6	equipped with a connector port for the PTT Foot-switch to be able to connect to the CIPISM.
5.11.7	equipped with an RJ11 2W telephone circuit port for the Operator Console Telephone Set to be able to connect to the CIPISM.
5.11.8	equipped with an RJ45 VoIP SIP interface port for the Operator Console VoIP Telephone Set to be able to connect to the CIPISM.
5.11.9	equipped with two (2) RJ11 ports for the HF Modem receive audio line to be able to connect to the CIPISM.
5.11.10	equipped with two (2) RJ11 ports for the HF modem transmit audio line to be able to connect to the CIPISM.
5.11.11	equipped with two (2) RJ11 4W E&M ports for the HF Modem key-line to be able to connect to the CIPISM.
5.11.12	equipped with HF Modem feed-through ports for ease of connection/disconnection of the HF modems (GFE). These connectors will not be connected to the HF Audio System. They will be used for connecting the HF modem control lines directly to the RCPs and for connecting the HF modem data lines directly to data inputs and outputs. The Connection Panel for each Operator Console must be:
5.11.12.1	equipped with two (2) EIA RS-232 connectors for HF modem synchronous/asynchronous serial control interfaces;
5.11.12.2	equipped with two (2) EIA RS-422/423 connectors for HF modem synchronous/asynchronous serial input/output data interfaces; and
5.11.12.3	equipped with two (2) 10/100 Base-T (IEEE 802.3) RJ45 terminations for Ethernet links to the HF modems.
6	**SYSTEM MAINTAINABILITY REQUIREMENTS**
	The HF Audio System must:
6.1	provide the RIPI and the CIPISM with 100% redundant architecture.
6.2	not result in degradation of RIPI and/or CIPISM operation longer than 60 seconds.
6.3	continue to operate in degraded mode while the automatic switch-over is completed to return the system to full operational mode.
6.4	not sever the on-going communication while transitioning over to the standby mode is completed.
6.5	provide RIPI and CIPISM that must self-recover (reboot) after a complete power failure within 2 minutes and restore its last configuration without operator's intervention.
6.6	provide RIPIs and CIPISMs that remain fully operational during any Lowest Replaceable Unit (LRU) replacement.
6.7	provide RIPIs and CIPISMs that are reliable to a minimum 99.999% Mean Time Between Failure.
6.8	provide RIPIs and CIPISMs that provide error and status indicator LEDs on their front panel in the modules and power supplies.
6.9	provide RIPIs and CIPISMs that provide automatic fault detection and isolation by Built-In Self-Test (BIST).
6.10	provide RIPIs and CIPISMs that provide electronic circuit cards that have front panel access and are easy to replace.
6.11	provide RIPIs and CIPISMs that have keyed circuit boards to prevent incorrect insertion.
7	**TECHNICIAN CONSOLE EQUIPMENT AND INTERFACES**
7.1	**The Technician Console must:**

#	Requirement
7.1.1	connect to the on-site CIPISM.
7.1.2	provide technicians with the connectivity to evaluate HF Audio System operations.
7.1.3	connect technician consoles under IP/MPLS protocols with the other systems located at the other stations and support facilities.
7.1.4	enable the technician to assess the control and connectivity of the HF Radio Receivers and Transmitters operations via the RCPs to the extent made possible by their instruction sets.
7.1.5	enable the technician to assess the control and connectivity of the HF Radio Receivers Antenna Matrices and Transmitter Antenna Matrices via the RCPs to the extent made possible by their instruction sets.
7.1.6	enable the technician to assess the control and connectivity of the HF Radio Ancillary Equipment via their existing control lines to the extent made possible by their instruction sets.
7.1.7	be installed in the same 19" equipment rack as the CIPISM, or in a rack adjacent to it.
7.2	**The Technician Computer Terminals must:**
7.2.1	be equipped with a19" rack drawer keyboard, mouse and a colour touch-screen monitor.
7.2.2	run on a contemporary Windows or LINUX Operating System.
7.2.3	be based on open system architecture and standardized Ethernet and TCP/IP technology.
7.2.4	must be equipped with a 802.3 Ethernet LAN interface to the on-site CIPISM.
7.2.5	be 15" Liquid Crystal Display (LCD) enabled with touch-screen technology.
7.2.6	be capable of operating by the touch of a finger, stylus or gloved hand.
7.2.7	be NEMA 4/IP65 compliant for front panel ingress protection.
7.2.8	have a minimum resolution of 800X600/1024X768.
7.2.9	be able to set the monitor's brightness at the setting of 450 cd/m2 or brighter.
7.2.10	be able to set contrast ratio at 500:1 or greater.
7.3	**Technician Headsets at each technician console must:**
7.3.1	have adjustable headbands.
7.3.2	be designed for voice communications.
7.3.3	have adjustable angle boom microphones.
7.3.4	have replaceable ear-pads and microphone windscreens.
7.3.5	be equipped with latching XLR connectors with strain relief.
7.3.6	be stereo headsets with one channel used for A/G, and the other channel used for G/G communications.
7.3.7	be configurable for both radio and telephony calls.
7.3.8	be PTT activated.
7.4	**Technician Console Loudspeakers at each technician console must:**
7.4.1	must be designed for voice communications.
7.4.2	operate at power levels up to 30 dBm.
7.4.3	be equipped with individually adjustable volume controls.
7.4.4	be equipped with latching XLR connectors with strain relief.
7.5	**Technician Console Equipment Connection Panel at each technician console must be:**
7.5.1	19" rack mountable in the same rack as the technician console.
7.5.2	equipped with a RJ45 802.3 Ethernet LAN jack to the HF Audio System for the technician computer terminal.
7.5.3	equipped with two (2) latching XLR connector ports to the HF Audio System for the Technicians Headsets.
7.5.4	equipped with two (2) latching XLR connector ports to the HF Audio System for the technician console loudspeakers.
7.5.5	equipped with an RJ11 2W telephone circuit port to the HF Audio System for the technician console telephone set.
7.5.6	equipped with an RJ45 VoIP SIP interface port to the HF Audio System for the technician console VoIP telephone set.
8	**CIPISMs REQUIREMENTS**
	Each CIPISM must:
8.1	have a scalable design so that site requirements can be expanded. (number of radios, types of telecom interfaces in use, number of Input/Output (I/O) ports, number of serial ports etc.)
8.2	be able to connect directly and remotely to Ethernet radios. RIPI connections must not be required by the HF Audio System for Ethernet radios.
8.3	be able to connect to Ethernet radios without additional IP to analogue media conversion.

#	Requirement
8.4	be equipped with a minimum of three (3) distinct Ethernet IEEE 803.2 CIPISM to RIPI ports for connecting RIPIs over GFE trunks.
8.5	include a port to RIPI that must be provided with a redundant failover interface.
8.6	include a port to RIPI that must be able to spread the load on remaining communication links when a telecommunications link connected to a RIPI fails.
8.7	include a port to RIPI that must be capable of a data rate of 10 and 100 Mbps (10/100baseT User Datagram Protocol (UDP)), half duplex or full duplex, auto-negotiable, as per ISO/IEC 8802-3 ANSI/IEEE 802.3.
8.8	include a port to RIPI that must operate over connections limited to 512 kbps.
8.9	be provided the capability of changing RIPI ports to new or different digital communications technologies such as Digital Subscriber Line (DSL), T1 or modem etc. to transfer the audio and data between CIPISMs and remote sites.
8.10	be equipped with an Ethernet IEEE 803.2 inter-CIPISM (CIPISM to CIPISM) port for connecting CIPISMs at all other CAF HF stations and support facilities over a GFE trunk.
8.11	Each inter-CIPISM port must be provided with a redundant failover interface.
8.12	Each inter-CIPISM port must operate at 1.544 Mbps throughput or greater, but must also be operable at fractional T1 speeds.
8.13	Each inter-CIPISM port must operate over connections limited to 512 kbps.
8.14	be equipped with an Ethernet IEEE 803.2 Canadian Switched Network (CSN) PBX port for connecting CIPISMs to the local CSN PBX for Ground Ground (GG) telephone functionality, and for AGA phone patch functionality. This connectivity must not change existing dial-up phone numbers or addresses.
8.15	Each CSN PBX port must be provided with a redundant failover interface.
8.16	Each CSN PBX port must operate at 1.544 Mbps throughput or greater, but must also be operable at fractional T1 speeds.
8.17	Each CSN PBX port must operate over connections limited to 512 kbps.
8.18	be capable of connecting, and passing radio control signals to and from the on-site GFE RCPs in accordance with control commands originating at operator consoles.
8.19	have an Ethernet IEEE 803.2 LAN network interface for connecting CIPISMs to the RCPs.
8.20	Each RCP LAN port must be provided with a redundant failover interface.
8.21	Each RCP LAN port must operate at 1.544 Mbps throughput or greater, but must also be operable at fractional T1 speeds.
8.22	Each RCP LAN port must operate over connections limited to 512 kbps.
8.23	connect with on-site operator and technician consoles.
8.24	be equipped with a minimum of twelve RJ11 phone ports to connect with on-site operator and technician consoles.
8.25	be equipped with a minimum of twelve RJ11 phone ports to connect with the on-site legal voice recording system.
8.26	be equipped with a minimum of nine RJ45 IEEE 802.3 jacks to connect with on-site operator and technician console (GFE) VoIP phone-sets.
8.27	incorporate a concentrator device such as a multiplexer to optimize trunked traffic links to the RIPIs, other CIPISMs, VoIP PBXs and RCP LANs.
8.28	support a standard TCP/IP stack.
9	**RIPI REQUIREMENTS**
9.1	Each RIPI must: have a scalable design so that it can be adjusted to the site requirements such as number of radios, types of telecom interfaces in use, number of I/O ports, number of serial ports etc.. Cascaded RIPIs must not use any site infrastructure to do so.
9.2	be capable of a data rate of 10 and 100 Mbps (10/100baseT UDP), half duplex or full duplex, auto-negotiable, as per ISO/IEC 8802-3 ANSI/IEEE 802.3 on the rear telecommunications links between the RIPI and the CIPISM.
9.3	include a port that must operate over connections limited to 512 kbps.
9.4	have the ability to simultaneously and selectively use a minimum of 3 dedicated rear telecommunications links to different CIPISMs on a pre-determined priority basis, at any given time.
9.5	have the capability of changing inter-site rear telecommunications links to new or different digital communications technologies such as DSL, T1 or modem etc. to transfer the audio and data between CIPISMs and remote sites.
9.6	incorporate a concentrator device such as a multiplexer to optimize trunked traffic links from the CIPISM.
9.7	be able to spread the load on remaining communication links when a telecommunications link connected to a CIPISM fails.
9.8	**Transmit Site RIPI Interfaces** Each Transmit Site RIPI Interface must:

#	Description
9.8.1	interface to a minimum of 8 in-service HF transmitters.
9.8.2	provide in-service HF Transmitters with adjustable audio levels of -30dBm to +5.3 dBm into 600 ohms on an analogue audio pair (300Hz to 3400 Hz).
9.8.3	as a minimum, provide 60 dB isolation between each transmit channel path.
9.8.4	key in-service HF transmitters using a PTT signal and reference pair.
9.8.5	be capable of keying in-service HF transmitters from open collector or dry contact I/O points.
9.8.6	be capable of keying in-service HF transmitters by using a DC output signal settable to accept either of the following signal types on an individual basis as follows:
9.8.6.1	For +24V signalling, an active output state in the form of a dry contact closure must switch 24VDC rated for 250 mA, and an inactive output state shall be indicated by an open circuit with respect to the associated reference wire; and
9.8.6.2	For GND signalling, an active output state must be indicated by the presence of a short circuit (low impedance) with respect to the associated reference wire, and an inactive output state must be indicated by an open circuit with respect to the associated reference wire.
9.8.7	be capable of generating and filtering narrowband tones for PTT for tone signalling.
9.8.8	generate a user selectable PTT tone signal at 2304Hz, 2504Hz, and/or 2604Hz, at +/-2 Hz maximum, mixed with the voice output signal Each transmit site RIPI, when tone signalling generation is enabled.
9.8.9	be user selectable to -10 dB +/-8dB minimum with respect to the audio line level setting when tone signalling generation is enabled.
9.8.10	generate the tone level that must be adjustable in 1dB steps when tone signalling generation is enabled.
9.8.11	provide 60 dB attenuation for the PTT tone below the audio level, as a minimum.
9.8.12	have PTT tones that must differ from the receive site RIPI squelch (SQ) tones when tone signalling is enabled.
9.9	**Receive Site RIPI Interfaces**
	The Receive Site RIPI Interfaces must:
9.9.1	interface to a minimum of 24 in-service HF receivers.
9.9.2	provide in-service HF receivers with adjustable audio levels of -30dBm to +5.3 dBm into 600 ohms on an analogue audio pair (300Hz to 3400 Hz).
9.9.3	provide 60 dB isolation between each receive channel path, as a minimum.
9.9.4	generate SQ tones must different from the transmit site RIPI PTT tones for tone signalling.
9.9.5	be capable of detecting and filtering narrowband tones for SQ (in band signalling) for tone signalling.
9.9.6	detect the presence of a user selectable tone signal at 2304Hz, 2504Hz, and/or 2604Hz, at +/-30Hz minimum, mixed with the voice signal, at any level within the range of -5 dBm to -40 dBm if tone signalling detection characteristics are enabled.
9.9.7	The HF Audio System notch filter minimum characteristics must be as follows:
9.9.7.1	The notch circuit bandwidth response must not be wider than +/-150 Hz from the selected tone center frequency when measured at 3 dB below the audio level reference signal of 1004 Hz;
9.9.7.2	The notch circuit bandwidth response must not be narrower than +/- 20 Hz from the selected tone signal center frequency when measured at 60 dB below the audio level reference signal of 1004 Hz; and
9.9.7.3	It must be possible to disable the notch filter in the field when in-band SQ signalling is not used.
9.9.8	The HF Audio System detected tone must be validated to avoid false signalling.
10	**END TO END SYSTEM PERFORMANCE**
10.1	The HF Audio System must support split-site radio interconnection, where transmitter audio and PTT signals are separated from the receiver audio and muting signals.
10.2	End-to-End HF Audio System performance measurement must be exclusive of government supplied telecommunications infrastructure.
10.3	End-to-End HF Audio System performance for connections to analogue radios must be measured with the CIPISM connected directly to the RIPI.
10.4	End-to-End HF Audio System latency time from the operator console point to the radio demarcation point must be less than 130 ms as per ED 137.
10.5	The HF Audio System must statically compensate for voice packet jitter of up to 300 milliseconds in increment of 10 ms.
10.6	As a minimum, each HF Audio System must provide a 32 dB signal to noise ratio (noise with tone) at any level setting, measured with a 1004 Hz reference tone, using a 15 kHz flat response (no weighting) over a range of +3dBm to -25 dBm for a G.711 PCM.
10.7	The HF Audio System must not generate more than 20 dBrnc idle channel noise on analogue ports.
10.8	The HF Audio System must not generate more 2% audio distortion on analogue ports for G.711 PCM.

#	Description
10.9	As a minimum, voice compressed circuits on the HF Audio System must meet the following Mean Opinion Score (MOS) performance using the Perceptual Evaluation of Speech Quality (PESQ), as per ITU-T P862, over all telecom link types when used with a minimum Block Error Rate of 1 per 100:
10.9.1	PCM G711 Minimum MOS 3.7
10.9.2	32K ADPCM G726 Minimum MOS 3.6
10.9.3	16K LD-CELP G.728 Minimum MOS 3.6
10.9.4	8 KBPS C-CELP G.729/G.729a Minimum MOS 3.6
10.9.5	6.3 KBPS G.723.1 Minimum MOS 3.6
10.9.6	5.3 KBPS G.723.1 Minimum MOS 3.5
10.10	The audio frequency response of the HF Audio System must be within 3.0 dB of a 1004 Hz reference tone applied at the highest output level between 300-3400 Hz.
10.11	The HF Audio System must reduce audio signals below 100 Hz by 50 dB from the highest output level between 300-3400 Hz.
10.12	The HF Audio System must reduce audio signals above 5 kHz Hz by 50 dB from the highest output level between 300-3400 Hz.
10.13	The HF Audio System must be capable of passing analogue voice or modem tones.
10.14	The HF Audio System, when passing modem signals, must support V.34 bis protocol and voice compression techniques using 16 kbps and lower rates as described below:
10.14.1	64 KBPS as per G.711 to G.714, selectable as A-law and/or u-Law;
10.14.2	32 KBPS ADPCM as per G.726 & G.727;
10.14.3	16KBPS LD-CELP as per G.728;
10.14.4	8 KBPS C-CELP as per G.729/G.729a;
10.14.5	6.3 KBPS as per G.723.1; and
10.14.6	5.3 KBPS as per G.723.1.
10.15	The time interval from keying-on a transmitter until the transmitted Radio Frequency (RF) signal amplitude has increased to 90 percent of its steady-state value (attack time) must not exceed 10 ms as per MIL-STD-188-141C. Therefore, the HF Audio Systems must ensure that system time delay differences between the PTT port and the audio port are within 10 ms.
10.16	The time interval from keying-off a transmitter until the transmitted RF signal amplitude has decreased to 10 percent of its steady-state value (release time) must not exceed 10 ms as per MIL-STD-188-141C. Therefore, the HF Audio Systems must ensure that system time delay differences between the PTT port and the audio port are within 10 ms.
10.17	The end-to-end HF Audio System PTT activating delay must be less than 130 ms as per ED 137. The delay duration is defined as the time between detecting PTT key activation at the operator console and the activation of the transmitter at the radio side.
11	**SYSTEM ALARMS AND EVENT LOGS**
11.1	The HF Audio System must store event records in a daily log format for each individual workstation and critical component.
11.2	The HF Audio System must record system operation events as follows:
11.2.1	HF Audio System logins;
11.2.2	Unsuccessful HF Audio System logins;
11.2.3	Event log database modifications;
11.2.4	Telephone calls;
11.2.5	Radio frequency selections;
11.2.6	PTT actions; and
11.2.7	Configuration changes.
11.3	The HF Audio System must record system alarm events as follows:
11.3.1	Link fault detection on the link between the CIPISM and operator consoles;
11.3.2	Link fault detection on the link between the CIPISM and technician consoles;
11.3.3	Link fault detection on the link between the CIPISM and station RIPIs;
11.3.4	Link fault detection on the link between the station RIPIs and the radio equipment that they are connected to;
11.3.5	Link fault detection on the link between the local station CIPISM and CIPISMs at other CAF HF stations; and
11.3.6	HF Audio System critical component faults.
11.4	The events stored in the event log must be time-stamped.
11.5	The HF Audio System must store the event log in the system for a minimum of one month.
11.6	The HF Audio System must not permit any attempt to delete event records before 30 days.
12	**USER ACCESS PRIVILEGE LEVELS**

12.1	**The GUIs must provide the following user access privilege levels:**
12.1.1	Radio Operator;
12.1.2	Radio Operator Supervisor;
12.1.3	Radio Technician; and
12.1.4	System Administrator.
12.2	**Radio Operator GUI Requirements**
	The HF Audio System must be provided with an operator Graphical User Interface (GUI). The Operator GUI must allow control the HF Audio Systems, and must control HF Radio Equipment as specified in this document. The HF Audio System must allow the operators to be able to login to any of the local Operator Consoles.

The Operator GUI must: |
12.2.1	operate on the SUN® JVM Engine or any equivalent modem engine to provide maximum stability and platform independence.
12.2.2	display system status information including the time of day, the state of the systems links, and current login information.
12.2.3	allow the operator to adjust brightness and screen contrast.
12.2.4	allow the operator to change the operator's password.
12.2.5	allow the operator to change and set COM ports.
12.2.6	allow the operator to specify the server address and port, and to name the workstation.
12.2.7	include a LAN status indicator that indicates the computer's state of connection to the HF Audio Systems LAN, indicating whether:
12.2.7.1	the connection is made with the HF Audio System Server;
12.2.7.2	the operator's computer is in progress of making a link; or
12.2.7.3	that there is no connection.
12.2.8	include a CIPISM connection status indicator that indicates the computer's state of connection(s) to the CIPISM, indicating whether:
12.2.8.1	the connection is made;
12.2.8.2	the operator's computer is in progress of making a link; or
12.2.8.3	that there is no connection.
12.2.9	have the capability to minimize the interface screen.
12.2.10	be capable of copying settings from another operator.
12.2.11	include a status indicator that indicates the name of the current display.
12.2.12	consist of multiple pages with a means of rapidly switching between pages in the current display.
12.2.13	provide a Help menu that opens the HF Audio System user manual in a window.
12.2.14	be able to display instant text messages between operator console positions.
12.2.15	have the text message distribution technology that must provide text formatting capabilities (Font: size, colour and bold, line breaks and paragraphs).
12.2.16	indicate detailed status information about the transmitter selected, including:
12.2.16.1	selected frequency;
12.2.16.2	modulation;
12.2.16.3	output power level;
12.2.16.4	operational mode (standby, operational, ready);
12.2.16.5	keyed/unkeyed status; and
12.2.16.6	existing fault conditions.
12.2.17	allow the operator to select transmitter output power from 0 - 100% maximum transmitter output power in 10% steps.
12.2.18	allow the operator to select transmitter frequency within 1.5 - 30MHz range with 10 Hz resolution.
12.2.19	allow the operator to select USB, LSB, AME, or ISB modulations.
12.2.20	allow the operator to use PTT for radio calls.
12.2.21	indicate the source of the PTT while each PTT is activated, as one of the following:
12.2.21.1	Headset/handset/microphone ID;
12.2.21.2	Footswitch PTT;
12.2.21.3	HF modem activated PTT; or
12.2.21.4	GUI activated PTT.
12.2.22	indicate when a transmitter is selected. The indication must occur when the PTT is pressed and the PTT confirm signal is received.
12.2.23	display an error if an operator attempts to transmit on a given radio transmitter that is already in use by another operator.

Clause	Requirement
12.2.24	indicate detailed status information about the transmit antenna matrix (all cross connections, interlocks and faults), including:
12.2.24.1	in operational mode ("local" or "remote");
12.2.24.2	in fault mode ("no fault", "summary fault", or "connection fault"); and
12.2.24.3	power supply status ("PS fault" or as "PS normal").
12.2.25	indicate transmit antenna matrix row status, including:
12.2.25.1	column row is connected to; and
12.2.25.2	interlock status.
12.2.26	indicate when a transmit antenna matrix column is connected to the ground strip.
12.2.27	allow the operator to select and connect a transmit antenna matrix row to a selected column.
12.2.28	allow the operator to select and disconnect a transmit antenna matrix row from a selected column.
12.2.29	indicate detailed status information about the receiver selected, including:
12.2.29.1	selected frequency;
12.2.29.2	modulation;
12.2.29.3	SQ threshold level;
12.2.29.4	Automatic Gain Control (AGC speed;
12.2.29.5	RF gain; and
12.2.29.6	existing fault conditions.
12.2.30	allow the operator to select receiver frequency within 1.5 – 30MHz range with 10 Hz resolution.
12.2.31	allow the operator to select USB, LSB, AME, or ISB demodulations.
12.2.32	allow the operator to select active reception (squelch).
12.2.33	allow the operator to select the desired SQ threshold level in percent, where 100% means maximum level and 0% means no SQ.
12.2.34	continue to indicate that SQ is set on a radio frequency for three (3) seconds after the actual reception ends.
12.2.35	allow the operator to select receiver off/slow/med/fast AGC levels.
12.2.36	allow the operator to select a receiver gain of -30 dB to +15 dB in one dB steps.
12.2.37	allow the operator to view a list (array) of receive antenna matrix output ports connected to a selected input port.
12.2.38	allow the operator to select and connect a receive antenna matrix input port to selected output ports.
12.2.39	allow the operator to select and disconnect a receive antenna matrix input port from selected output ports.
12.2.40	indicate if a receiver or transmitter is in maintenance mode.
12.2.41	allow at least 8 different radio parameter groups to be defined for an individual operator.
12.2.42	allow identifying the radio parameter group buttons by means such as color-coding or icons, logically grouping radio frequencies, radio equipment, and HF Audio System communications ports together.
12.2.43	allow the operator to display the allocation of at least 30 radio frequency buttons.
12.2.44	allow identifying the radio frequency buttons by means such as color-coding or icons, logically grouping the radio frequencies with radio equipment, and HF Audio System communications ports.
12.2.45	allow the operator to select and use two (2) headsets/microphones, two (2) loudspeakers, an operator console telephone set (GFE), and two (2) HF modems (GFE). Any subset of these audio devices must also be supported.
12.2.46	allow the operator to individually select and deselect transmitters and receivers for use.
12.2.47	allow the operator to individually select audio volume for headsets/handsets and loudspeakers.
12.2.48	allow the operator to individually adjust audio volume for headsets/handsets and loudspeakers.
12.2.49	allow the operator to individually adjust audio volume of the received audio from individual frequencies assigned to that console.
12.2.50	provide volume controls that must not allow for a complete muting of the headset/handset and speaker.
12.2.51	display an indication of an incoming call or if there is audio activity for each of the frequencies assigned to the operator position.
12.2.52	allow the operator to select audio routing of demodulated radio signals, identified by frequency of reception, to the following audio outputs according to the operator selection:
12.2.52.1	To the left and/or right audio channel of the stereo headsets; or
12.2.52.2	To any combination of positional loudspeakers.
12.2.53	allow the operator to select transmitter-only and receiver-only operation, allowing independent audio routing for radio transmitters or receivers.

Clause	Requirement
12.2.54	allow the operator to select radio receiver monitoring, where the operator may monitor any receivers available within the system.
12.2.55	notify the operator if a monitored frequency is de-selected that is not being monitored by another operator in the system.
12.2.56	allow the operator to select full-duplex data operation to support full-duplex data services, where the transmitter and receiver are configured on separate frequencies and simultaneous transfer of information in both directions is required. In this mode, the receiver equipment must not be muted during transmitter operation.
12.2.57	allow the operator to select half-duplex data operation, where the transmitter and receiver are configured on separate frequencies and transmission occurs in one direction at a time. This option must allow selection of the communication channel between two parties in each direction. The receiver equipment must be muted when the transmitter is operating.
12.2.58	allow the operator to select simplex data operation, or the transmission from one party at a time on a common frequency, where the receiver equipment must be muted during transmissions.
12.2.59	allow the operator to select broadcast operations as follows:
12.2.59.1	Voice broadcasts where a single operator may transmit on multiple radio transmitters simultaneously; and
12.2.59.2	Data broadcasts where a single data modem or external audio source may transmit continuously on one or more selected transmitters;
12.2.60	include a transmit button on the active display that selects all the active frequencies to broadcast at that position.
12.2.61	allow the operator to adjust system time delay between the operator consoles and the radio equipment.
12.2.62	allow the operator to select A/G (radio) and G/G (telephone, audio and message routing) controls.
12.2.63	allow the operator to select the means of coupling, also known as patch, which allows an operator to link audio between resources. All parties using these resources must be able to communicate without the intervention of the operator who created the patch.
12.2.64	allow the operator to select audio routing of G-G signals, identified by telephone number, to the following audio outputs according to the operator selection:
12.2.64.1	To the left and/or right audio channel of the stereo headsets; or
12.2.64.2	To any combination of positional loudspeakers.
12.2.65	allow the operator to individually select transmitters, receivers, and telephone circuits to set up phone patches with external telephone callers.
12.2.66	allow the operator to use PTT for telephony calls.
12.2.67	allow the operator to select the call for call-control, call barge-in and call monitoring.
12.2.68	allow the operator to switch between the following button display modes:
12.2.68.1	Radio only;
12.2.68.2	Telephony only;
12.2.68.3	Mixed radio-telephony button layout; and
12.2.68.4	Intercom between local consoles.
12.2.69	allow the operator to select intercoms between console positions in the same operator centre, without blocking telephone access within an operator site.
12.2.70	allow the operator to activate instant recall recording of all active incoming audio to that position for increments of five seconds up to a cumulative maximum of 30 minutes. The instant recall recording menu must allow selection of individual radio or telephony communications for playback.
12.2.71	indicate detailed status information about the rotatable log periodic antenna selected, including:
12.2.71.1	Azimuth – current bearing selected;
12.2.71.2	Rotating – antenna is rotating;
12.2.71.3	Busy – antenna controller is busy;
12.2.71.4	Local – antenna controller is in local mode;
12.2.71.5	CW Limit fault;
12.2.71.6	CCW Limit fault;
12.2.71.7	Emergency Limit fault; and
12.2.71.8	Fault – antenna exceeded the maximum rotate time the last time it was commanded to rotate.
12.2.72	allow the operator to select and rotate a rotatable log periodic antenna to a given azimuth bearing from 0° to 359° in 1° increments. During the rotation operation, the detailed status information about the rotatable log periodic antenna must be displayed.
12.2.73	allow the operator to select transmitter output power from 0 - 100% maximum transmitter output power in 10% steps.
12.2.74	indicate all selected elements within a selected sector of a beverage rosette antenna.
12.2.75	allow the operator to select and connect an element within a selected sector of a beverage rosette antenna.
12.2.76	allow the operator to select and disconnect an element within a selected sector of a beverage rosette antenna.

12.3	**Radio Operator Watch Supervisor GUI Requirements**
	The Watch Supervisor GUI must:
12.3.1	allow the Radio Operator to login to the HF Audio System with watch supervisor use privileges at any of the local operator consoles.
12.3.2	allow the Watch Supervisor to change an operator's configuration file. Any change to an operator's configuration file made by the watch supervisor must be indicated to the operator on his GUI and the operator must be able to acknowledge.
12.3.3	provide a Help menu that opens the HF Audio System user manual in a window.
12.3.4	have an alarm that notifies the watch supervisor of critical frequencies that are not monitored by any operator consoles in that operator centre. If an operator logs out of the HF Audio System, the watch supervisor must receive an "unattended position" alarm. If activated, all audio from the unattended position must be routed to the watch supervisor loudspeakers.
12.3.5	allow operator's watch supervisor to selectively monitor either G/G audio, A/G audio, or the sum of G/G and A/G audio from other monitored operator consoles by using a position monitoring function.
12.3.6	allow the watch supervisor to monitor the audio of up to 12 operators.
12.3.7	have the following capabilities:
12.3.7.1	monitor;
12.3.7.2	barge in, allowing the watch supervisor to override and talk to a monitored operator. All radio communication in progress and the far end party (ies) on the active call in progress must not be able to hear the watch supervisor talking to the operator; or
12.3.7.3	barge over, allowing the watch supervisor PTT to over-ride a monitored operator PTT and communicate with the selected transmitter radio(s) at the monitored position.
12.4	**Radio Technician GUI Requirements**
12.4.1	The Radio Technician GUI must indicate:
12.4.1.1	HF Audio System telecom links are normal;
12.4.1.2	HF Audio System telecom link faults that have not caused a loss of service;
12.4.1.3	HF Audio System telecom link faults that have caused limited loss of service;
12.4.1.4	HF Audio System telecom link faults that have caused complete loss of service;
12.4.1.5	If the HF Audio System has been placed in a maintenance mode; and
12.4.1.6	Loss of a HF Audio System device power source (either AC or DC).
12.4.2	be specifically designed for the technician console.
12.4.3	control and support radio maintenance of the HF Audio Systems.
12.4.4	allow technicians to login to the technician GUI at the technician console and at any of the local operator consoles.
12.4.5	operate on the SUN® JVM Engine or any equivalent modem engine to provide maximum stability and platform independence.
12.4.6	have the capability to minimize the interface screen.
12.4.7	include a LAN status indicator that indicates the computer's state of connection to the HF Audio Systems LAN, indicating whether:
12.4.7.1	the connection is made with the HF Audio System Server;
12.4.7.2	the technician's computer is in progress of making a link; or
12.4.7.3	that there is no connection.
12.4.8	include a CIPISM connection status indicator that indicates the technician console's state of connection(s) to the CIPISM, indicating whether:
12.4.8.1	the connection is made;
12.4.8.2	the technician's console is linking, or
12.4.8.3	that there is no connection.
12.4.9	include a display status indicator that indicates the name of the current display.
12.4.10	provide a Help menu that opens the HF Audio System user manual in a window.
12.4.11	be able to sending and receiving text messages to/from system users.
12.4.12	have the text message distribution technology that must provide text formatting capabilities (Font: size, colour and bold, line breaks, and paragraphs).
12.4.13	provide technicians with the capability to access HF audio system operating parameters.
12.4.14	have same functionality as the operator's GUI except for the stand-alone microphone and the PTT footswitch functionality.
12.4.15	be capable of copying settings from another technician.
12.4.16	support the following capabilities simultaneously, but on separate GUI pages or screens:
12.4.16.1	System page, displaying system status information including the time of day, the state of the systems links, and current login information;
12.4.16.2	Screen page, allowing the operator to adjust button brightness and screen contrast;

12.4.16.3	Password page to change the technician's password;	
12.4.16.4	Communications page to set COM ports;	
12.4.16.5	Network page to specify the server address and port, and to name the Workstation;	
12.4.16.6	Technician console GUI configuration;	
12.4.16.7	Operator console position GUI configurations;	
12.4.16.8	HF Audio System core configuration;	
12.4.16.9	HF Audio System telecommunications link status;	
12.4.16.10	HF Audio System advanced configuration to adjust system and trunk parameters such as equipment configuration, telecommunications link configuration and call routing;	
12.4.16.11	HF Audio System critical component hardware and software status;	
12.4.16.12	HF Audio System hardware and software modifications and changes, including version changes;	
12.4.16.13	HF Audio System diagnostics and alarm management; and	
12.4.16.14	HF Audio System event log database configuration.	
12.4.17	provide technicians with the capability to independently configure, monitor, maintain and troubleshoot all HF Audio System critical components.	
12.4.18	permit retrieval and transferral of complete HF Audio System critical component configurations from one technician console to another.	
12.4.19	permit complete configuration replication (imaging) from one HF Audio System critical component to another for quick device setup.	
12.4.20	permit HF Audio System critical component parameter configuration editing.	
12.4.21	be capable of displaying the software version of the CIPISM and RIPIs.	
12.4.22	permit new software versions to be downloaded into the CIPISM and the RIPIs.	
12.4.23	permit complete HF Audio System critical component configuration storage for backup purposes.	
12.4.24	permit retrieval and display of the software version of any HF Audio System critical component.	
12.4.25	provide technicians with the capability to set-up HF Audio System equipment, run hardware & software diagnostics, and report on the status of HF Audio System critical components.	
12.4.26	provide HF Audio System status graphics and provide various indicators that relay the state of the system devices.	
12.4.27	provide diagnostic capability to the critical component LRU level.	
12.4.28	report and display Built-in Self Test (BIST) alarms reported by the HF Audio System event log.	
12.4.29	indicate whether the device is working properly, degraded or faulty. This may be accomplished by colour indicators or icons on a system map (green, yellow, or red, for example).	
12.4.30	provide a detailed diagnostics screen when the technician clicks on the device status indicator.	
12.4.31	indicate that HF Audio System critical components are in a degraded mode if they are unable to carry all the functions for which they are configured, including redundancy.	
12.4.32	display the inter- and intra-system link states.	
12.4.33	be provided with the capability to search the event log for connected CAF HF equipment IDs, or timeframes stored in the event log database.	
12.4.34	provide information about the event log database, event log disc space usage and disk space available.	
12.4.35	permit the technician to recall alarms and event logs.	
12.4.36	permit HF Audio System devices to be placed in a maintenance mode to suspend reporting of alarms and automatic actions.	
12.5	**System Administrator GUI Requirements**	
	The HF Audio Systems must be provided with a system administration GUI. The system administration GUI must control and support system administration and user access of the HF Audio Systems. The System Administrator GUI must:	
12.5.1	provide system administrators with the capability to provide access to any system, at any system location, to all other system users.	
12.5.2	provide system administrators with the capability to access all systems at all user privilege levels.	
12.5.3	provide system administrators with the capability to verify the proper operation of all controls, displays, indicators, control signal paths, and information signal paths at all operator and technician consoles.	
12.5.4	provide a Help menu that opens the HF Audio System user manual in a window.	
12.5.5	provide system administrators with the capability to view and print the HF Audio System event log.	
12.5.6	provide system administrators with the capability to add comments to the event log file through a notes section.	
12.5.7	provide system administrators with the following capabilities:	
12.5.7.1	Customize the system administration GUI;	
12.5.7.2	Create users on the HF Audio System;	

#	Description		
12.5.7.3	Assign user permissions and passwords;		
12.5.7.4	Modify user profiles;		
12.5.7.5	Activate or deactivate user features;		
12.5.7.6	Send instant messages to operators;		
12.5.7.7	Notify operators of configuration changes;		
12.5.7.8	Monitor up to six operators at any given time;		
12.5.7.9	Create/modify operator console sectors;		
12.5.7.10	View system diagnostics;		
12.5.7.11	Create and modify global event log and HF Audio System database elements;		
12.5.7.12	Create, modify, import or export the system HF Audio System user profile database; and		
12.5.7.13	Create backup archives of the databases and log files.		
12.5.8	provide system administrator with the capability to download software updates to any CIPISM and RIPI at any system location.		
12.5.9	provide system administrators with the capability to display text feeds from an HTTP server.		
12.5.10	provide the text message distribution technology that must provide text formatting capabilities (Font: size, colour and bold, line breaks, and paragraphs).		
12.5.11	provide system administrators with the capability to refer to the maintenance history of each system by accessing and reviewing the HF Audio System event logs.		
12.5.12	provide system administrators with the capability to view the operational status of all HF Audio System critical components and to view the operational status and connection status of any interconnected CAF HF System interfaces.		
13	**POWER REQUIREMENTS**		
13.1	The HF Audio System must be operable using 115 VAC, 60 Hz primary power.		
13.2	Each individual HF Audio System device must be equipped with two redundant power feeds with zero delay load sharing in the event of failure.		
13.3	Interruption of one power feed must not power down the equipment or affect operation.		
13.4	The HF Audio System must include protection against AC power surges.		
13.5	The HF Audio System devices must operate within the following tolerances:		
13.5.1	Voltage frequency of 47 Hz to 63 Hz;		
13.5.2	Voltage tolerance: ± 10%;		
13.5.3	Voltage transient: ± 8% of nominal, not to exceed 100ms; and		
13.5.4	Phase regulation: ± 1 electrical degree.		
14	**RACK SPACE CONSTRAINTS**		
14.1	The HF Audio System CIPISM must be mountable in a 19" inch rack that must be supplied by the contractor.		
14.2	Each of the CIPISM installations must be contained in a single 19" inch rack.		
14.3	The HF Audio System RIPIs must be mountable in a 19" inch rack that must be supplied by the contractor.		
14.4	The HF Audio System RIPIs must not exceed 16 Rack Units.		
14.5	Each individual HF Audio System technician computer to be installed at the technician equipment rack must not be larger than four 19" Rack Units.		
15	**ENVIRONMENTAL REQUIREMENTS**		
15.1	The HF Audio System must meet the following environmental requirements while operational or when stored or being transported:		
15.1.1	Operating:		
15.1.1.1	Temperature: 5°C to 40°C		
15.1.1.2	Ambient Relative Humidity: 10% to 90% non-condensing; and		
15.1.2	Storage and Transportation:		
15.1.2.1	Temperature: -20°C to 55°C		
15.1.2.2	Altitude: Up to 4 000 m for transportation.		
16	**ELECTROMAGNETIC COMPATIBILITY**		
16.1	The HF Audio System must comply with EN 55024: 2010 for immunity to electrostatic discharge (ESD), electrical fast transients and continuous radio frequency disturbances.		
16.2	The HF Audio Systems must comply with electromagnetic compatibility tests and limits of FCC Part 15.		
17	**SAFETY**		
17.1	The HF Audio System equipment must comply with CAN/CSA-C22.2.		
17.2	The HF Audio System equipment must comply with No. 60950-1-07/UL 60950-1 – Information Technology Equipment – Safety – Pt 1: General Requirements.		