**AIR TRAFFIC AND NAVIGATION SERVICES CO. LTD**



**Request for QUOTATION FOR THE APPOINTMENT OF A SERVICE PROVIDER FOR TRIPOLI NAFISAT TERMINAL INSTALLATION, TESTING AND COMMISSION AT TRIPOLI INTERNATIONAL AIRPORT.**

**REQUEST FOR QUOTATION NO:** **ATNS-CS- TRIPOLI NAFISAT-260922**

**Tripoli NAFISAT VSAT Terminal Installation**

**Volume 2 - Part 2**

**TECHNICAL REQUIREMENT SPECIFICATIONS**

**26 September 2022**

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**ABBREVIATIONS**

|  |  |
| --- | --- |
| AC | Alternating Current |
| ACELP | Algebraic Code Excited Linear Prediction |
| ADPCM | Adaptive Differential Pulse Code Modulation |
| AFTN | Aeronautical Fixed Telecommunications Network |
| ATN | Aeronautical Telecommunications Network |
| ATNS | Air Traffic and Navigation Services Company |
| ATS/DS | Air Traffic Services/Direct Speech |
| BITE | Built in Test Equipment |
| bps | Bits per second |
| CAA | Civil Aviation Authority |
| CMIP | Common Management Information Protocol |
| CMP | Configuration Management Plan |
| DCE | Data Communications Equipment |
| DP | Documentation Plan |
| DTE | Data Terminal Equipment |
| DTMF | Dual Tone Multi Frequency |
| E+M | Ear plus Mouth |
| EIRP | Effective Isotropic Radiated Power |
| ET | Engineering Technician |
| FAD | Frame-relay access device |
| FAT | Factory Acceptance Test |
| FEC | Forward Error Correction |
| FM | Frequency Modulation |
| FR | Frame Relay |
| FXO | Foreign Exchange Office |
| FXS | Foreign Exchange Service |
| GHz | Giga Hertz |
| ICAO | International Civil Aviation Organization |
| IEC | International Electro-technical Commission |
| IF | Intermediate Frequency |
| IS | INTELSAT Satellite |
| kVA | Kilo-Volt-Ampere |
| LCC | Life Cycle Costing |
| LRU | Line Replacement Unit |
| LSA | Logistic Support Analysis |
| MDF | Multi Distribution Frame |
| MHz | Mega Hertz |
| MOU | Memorandum of Understanding |
| MTBF | Mean Time between Failures |
| NAFISAT | North East AFI VSAT sub-network |
| NMS | Network Management System |
| OEM | Original Equipment Supplier |
| OJT | "On-the-Job Training |
| PBU | Period of Beneficial Use |
| PHS&T | Packaging, Handling, Storage and Transportation |
| PTT | Press-to-Talk |
| RCMS | Remote Control and Monitoring System |
| RF | Radio Frequency |
| RFT | Request for RFQ |
| SADC | Southern African Development Community |
| SADC2 | SADC VSAT II Sub-network |
| SAT | Site Acceptance Test |
| SCPC | Single Channel per Carrier |
| MCPC | Multiple Channel per Carrier |
| SNMP | Simple Network Management Protocol |
| SSI | Station Standing Instructions |
| TEP | Test Equipment Plan |
| TP | Training Plan |
| U | One Equipment Rack Height |
| UPS | Uninterruptible Power Supply |
| VHF | Very High Frequency |
| VSAT | Very Small Aperture Terminal |
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**10. vsat TERMINAL INSTALLATION**

**10.1 Introduction**

1. The existing NAFISAT VSAT network was upgraded during 2015/16 is based on the NDSatcom SKYWAN IDU7000 MF-TDMA technology. Memotec FAD equipment provides the interfaces to the user equipment, which are mainly based on legacy protocols (I).

The ATNS VSAT network is divided into three (3) distinct sub-networks consisting of a sub-network covering the North East African and adjacent region States participating in the NAFISAT MOU, a sub-network covering the Southern African Development Community (SADC) States and a sub-network covering continental South Africa (Refer to paragraphs 1.0 to 9.0) (I).

The interconnectivity of Aeronautical Fixed Services are based on the ICAO AFI Plan and provides communication between the Area Control Centres in the SADC and NAFISAT member states. The ATNS network also provides interconnectivity with the neighbouring AFISNET VSAT network which are based on MCPC technology at this stage, both networks utilize INTELSAT IS10-02, East Hemi Beam transponder 23/23 for the space segment. Diagram 10.6 shows a typical ATNS remote terminal, indicating the existing NDSatcom/Memotec equipment as well as the MCPC interface equipment (I).

1. This document describes the technical requirements for the installation of Tripoli NAFISAT VSAT terminal. In the remainder of this document the following terminology will be applicable (I):

10.1.2.1 The **ATNS network** refers to the combination of all three VSAT **sub-networks,** as defined above.

10.1.2.2 The **current or existing platform** refers to the SKYWAN IDU7000 MF-TDMA technology platform.

10.1.2.4 **Terminal installation** means the installation of outdoor and indoor including related interconnection based on the existing technology platform.

1. **Hubless Mesh Networking.** Networking consists of a single VSAT hubless mesh transmission technology platform that covers the three regions or sub-networks as indicated in paragraph 10.1.1 (M).
2. The proposed terminal installation shall be part of the existing network shall ensure continued operation for all three sub-networks as indicated in 10.1.1 (M).
3. **Configuration of Sub-Network.** It shall be possible to set-up, configure, operate and manage sub-networks on the installed single VSAT transmission technology platform and network (M).
4. **Additional MCPC Connectivity.** Additional point-to-point Multiple Channel per Carrier (MCPS) satellite transmission equipment for establishing specific point-to-point transmission links to identified sites outside the area covered by the ATNS VSAT network as required shall be cater for (I).

**10.2 NAFISAT VSAT Terminal Installation**

ATNS requires to install and commission Tripoli NAFISAT VSAT terminal. This terminal shall form part of the NAFISAT VSAT network used for fixed aeronautical ATS/DS, AFTN and ATN communications between main Air Traffic Control Centres in the North East African Region.

1. **Technology Platform.**  The existing platform is based on the ND Satcom SKYWAN IDU7000 technology platform (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **No Single Point of Failure.** Hubless network operation with no potential single point of network failure (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Single Satellite Hop Communications.** Meshed voice and data communications paths over a single satellite hop (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **High Speed Carrier Transmission.** Single high speed carrier transmission from any network terminal at any time (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **High Speed Carrier Reception.** Simultaneous reception of at least two (2) high speed carriers by any network terminal at any time (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Modem Symbol rate.** 200 KBaud or higher, variable in 1 KBaud increments (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**10.3 Satellite Transponder Access and Usage**

The VSAT Terminal Installation shall access the available satellite transponder capacity based on:

1. **Multiplexing of Carriers.** Time and/or frequency multiplexing of the transmission carriers (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Main Network Synchronisation.** Main network synchronisation from any one or more allocated standard network terminal for time multiplexing of transmission carriers (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Standby Network Synchronisation.** Standby network synchronisation from any one or more allocated standard network terminal for time multiplexing of transmission carriers (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Main/Standby Switch-over.** Switch over to the standby network synchronisation after failure of the main network synchronisation shall be accomplished in less than 5 seconds (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Bandwidth-on-Demand Capacity.** Dynamic assignment of the available transmission capacity per network terminal (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Bandwidth-on-Demand Calculation.** A transmission capacity calculation algorithm in relation to the actual user traffic demand of network terminals at any point in time (M)

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**10.4 VSAT Terminal Configuration**

10.4.1. The installation and commissioning shall be based on the existing outdoor/indoor equipment configuration of the existing remote terminals (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**10.5 VSAT Terminal Redundancy**

The VSAT terminal shall be installed and commissioned, based on the following existing equipment redundancy.

1. **Outdoor Redundancy Configuration.** Outdoor equipment is provided in a full 1+1 redundancy configuration with protection switching as shown in the diagram 10.6 below (I).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Protection Switching.** The RF protection and switching equipment consist of a monitoring and redundancy control unit, a waveguide/co-axial cable protection switching unit and waveguide/co-axial direction switches (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Monitoring and Redundancy Control.** The monitoring and redundancy control unit monitor alarms and status information of the RF up/down-converter and solid state power/low noise amplifier equipment and initiate switching commands to the waveguide/co-axial cable protection switching unit (I).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Indoor Redundancy Configuration.** Indoor equipment shall be supplied and installed in the existing non-redundant configuration. Should redundancy in indoor equipment is required at specific sites, such redundancy will be negotiated with the successful Contractor after contract award (M)

**10.5.5 Standard Site Installation and Commissioning**

10.5.5.1 VSAT terminal site shall be installed to ensure continued operation for at least 10 years from the date of commissioning. For bidding purposes the quotation for the site works will be based on a Standard Site Installation, and will consist of the work as described below (Refer to Diagram 10.6 below for a graphical presentation of the hardware installation requirements). The bidder must also quote for a site survey to finalise the installation specifications. (refer to paragraph 12.2 in this document). The required Standard Site Installation is described in the following paragraphs (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**10.6.1 Outdoor Equipment Installation**

1. Installation of 60-Watt RFT equipment/power supply (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Installation of mechanical support structure, RF cables and components and will be compatible with and accept 60-Watt RFT installation (also refer to paragraph 10.8.8 below) (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Installation of the RF protection switches (receive/transmit) (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Installation of waveguide moisture canisters (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Sealing of cable all connectors (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Installation and testing of the antenna earth system to supplier’s specification. The testing will involve the measurement of the earth resistance to ensure that it complies with the manufacturer’s requirements. The measured earth resistance should be typically 5 Ohms or less (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Installation of antenna shall include the following (M):
   1. Civil works. Antenna concrete platform according to manufacturer's recommendations. Earthing system as per manufacturer’s specification.
   2. Antenna mechanical assembly.
   3. Antenna assembly.
   4. Antenna satellite alignment.
   5. installation of feed horn cover
   6. Mechanical supports and tightening where required.
   7. Cable connection and labelling.
   8. Replace bird spikes
   9. sealing of all cable conduits

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**10.6.2 Indoor Equipment Installation**

1. Terminal installation based the current platform ND Satcom MF-TDMA SKYWAN IDU7000 satellite modem technology platform. The new equipment racks shall be compliant to the requirements as stated in paragraph 10.12 in this document (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

* 1. Installation of Compatible Multiplexer equipment with the SKYWAN FAD 9220/9230/8400 Access Devices (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

* 1. Provision must be made for interfacing with legacy protocols for existing ATS/DS, AFTN, as described in paragraph 9 of Volume 2, Part 1 of the RFQ documentation (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

* 1. Engineering voice and data circuits for NAFISAT shall be incorporated as per paragraph 9.5.2. (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

* 1. The Compatible Multiplexer equipment shall be used to allow continued communication with AFISNET terminals in neighbouring VSAT networks (M):

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Active splitter and combiner equipment are installed at the sites mentioned in paragraph 10.6.2.5 (M)

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Installation of Network Management System (NMS) as described in paragraph 11.1 below (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**10.6.4 UPS Installation**

10.6.4.1 Provisions for UPS shall be provided. Should it be established during the site surveys that a suitable local Uninterrupted Power is available at a particular site, it is proposed that the new VSAT indoor cabinet be connected to that supply, in which case it will not be required to provide new UPS equipment for that site (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

10.6.2 The requirements for the UPS installation are described in paragraph 10.11 below (I).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**10.4.4 On-Site Training**

On-site training will be provided at the time of the installation of the individual remote sites. The training conducted will include for both theoretical and practical training in order to provide the technical personnel to operate and maintain the remote sites to the required network availability specifications. The individual site-training program will include but not be limited to (M):

1. Basic overview and operation.
2. Handbooks handling and use.
3. Basic installation and configuration.
4. VSAT terminal operation.
5. Failure identification and localisation.
6. Maintenance procedures and actions.
7. Preventative maintenance procedures.
8. Actions and procedures during transfer of operation to the new terminal.

Please also refer to paragraph 12.4 below for more information.

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**10.6.5 Testing**

Each site will be individually tested and commissioned to show conformance to the network design and VSAT technology as offered. Commissioning test will include but not be limited to (M):

1. Coordination with INTELSAT regarding activities related to bringing up a service, registration, configurations, commissioning and verification of the operational status in accordance with paragraph 17.3 in this document (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Physical inspection of the indoor and outdoor installation work (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Station verification testing and registration as required by the satellite operator (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Technical and operational network performance testing (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. AFTN, ATS/DS and ATN interconnectivity testing from and between a particular site and the adjacent sites.

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Software testing of the network management terminal functionality.

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Incoming AC Mains verification and VSAT terminal UPS and Power Supply testing, where supplied.

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| **COMPLIANCE (C/PC/NC/Noted)** |  |



**10.7 VSAT Outdoor Antenna Equipment Installation**

The terminal outdoor antenna equipment shall be installed as indicated in paragraph 10.6.1 and based on the following requirements:

10.7.1 Antenna Equipment Mounting Frame and Supports. All mountings and structural supports shall be installed and tested (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

10.7.2 **Lightning and Earthing Protection.** Installed lightning and grounding/earthing protection shall be inspected tested, including but not be limited to, antenna lightning spike, lightning spike down conductor, antenna earth straps and earth rods, and refurbished where required (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

19.7.3 **Antenna Size.** Antenna sizes at the sites will be used in the EIRP calculation in relation to the voice and data traffic generated from that particular site. (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**10.8 VSAT Outdoor RF Equipment Installation**

The VSAT remote terminal shall be equipped with new RF transmit and receive equipment compliant to and based on:

1. **Transmit and Receive Redundancy.** RF transmit and receive outdoor equipment shall be provided in the redundancy configuration as given in paragraph 10.5 above (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Transmitter Input Frequency.** The input to the RF up-converter and solid state power amplifier shall be compatible with the existing L-band or new combiner equipment and output of the indoor modulator offered (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Transmitter Output Frequency.** The output of the solid state power amplifier shall cover the frequency range 5.85 - 6.425 GHz (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Receiver Output Frequency.** The output of the RF down-converter and low noise amplifier shall be compatible with the existing L-band or new splitter and input of the indoor demodulator offered (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **RF Equipment Power Supply.** the RF up/down-converter and solid state/low noise power amplifier DC power supply unit shall be installed (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **RF Equipment Redundancy Control and Monitoring.** The RF up/down-converter and solid state power/low noise amplifier shall be provided with remote control and monitoring functionality for interconnecting to the RF protection assembly as described in paragraph 10.5 above (D).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **RF Equipment Operating Temperature.** The RF up/down-converter and solid state power/low noise amplifier shall be capable of operating between -40°C to + 55°C (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **RF Transmitter Size.** As indicated in paragraph 10.6.1.1 the size of the RF up-converter and solid state power amplifier must be 60W. This and the existing antenna sizes shall be taken into account when calculating the EIRP in relation to the voice and data traffic generated from that particular site (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Transmitter Input Back-off.** Provision shall be made in the calculations for at least a 1 dB input back-off for each individual RF carrier transmitted through the RF up-converter and solid state power amplifier (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Antenna Foundation.**  Antenna foundation shall constructed as the manufacturer’s specification (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Underground Cable Ducting.** New underground ducting for running RF interfacility coaxial, mains and signal control cables shall be constructed. 100m of cable sleeve and 6 manholes shall be provisioned for.

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Equipment Building Cable Entrance.** The existing building cable entrances will be used (I).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Cable Duct Entrance/Exit**. The underground cable duct/sleeve and cable terminating at the antenna base/pedestal and equipment building cable entrance shall be sealed to prevent access for rodents, insects and dust (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Cable Lightning Protection and Earthing.** RF inter-facility and signal outdoor cabling lightning protection and cable earthing assemblies shall be provisioned for (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Cable Termination Point Waterproofing.** Where cable are terminated with a specific connector onto a termination point or position on outdoor equipment, such cable connection shall be waterproofed with self-adhesive black weather resistant tape (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Cable Marking and Labelling.** Cables shall be marked and labelled in accordance with an agreed upon cabling marking and labelling system and the approved installation cabling diagram (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Antenna RF Radiation Marking.** Antenna and RF outdoor equipment shall be provided with radiation warning markings in accordance with the manufacturer's specifications (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**10.9 VSAT Indoor Baseband/IF Equipment Installation**

VSAT remote terminal installation shall be provided with baseband/IF transmit and receive equipment compliant to and based on:

1. **Integrated Indoor Unit.** The new VSAT MF-TDMA indoor modulator, demodulator, control unit and processor shall be housed in a single integrated, equipment 19” rack mountable, unit (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **User Interface Ports.** The integrated indoor unit, individual modulator and individual demodulator shall have at least the following user ports:
   1. Four (4) IEEE 802.3, 10/100/1000 BaseT, RJ-45 port for interconnecting to individual user LAN type networks and multiplexer/router/switch equipment (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

* 1. USB – A 2.0 port for image updates and configuration loading (M)

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

10.9.3 **User Access Interfaces.** The baseband access device/router shall provide all physical access interfaces to user type equipment and shall provide for but not be limited to:

* 1. 2-Wire FXS (or FXO where required), loop start and/or ground start telephony interfaces with DTMF signalling. 2-Wire interfaces shall either be user selectable via software control or be an individual swappable interface (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

* 1. 4-Wire E+M Type I, II or V telephony interfaces with DTFM signalling (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

* 1. EIA RS-232, V.10/V.11, V.24/V28, asynchronous data interfaces (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

* 1. X.21/V.11, V35, RS-232/V.11, synchronous data interfaces, DCE/DTE user selectable (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

* 1. IEEE 802.3, 10/100 BaseT Ethernet interfaces (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Multiple Access Interfaces.** The baseband access device/router shall have multiple access interfaces per physical chassis unit (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Expandability.** The baseband access device/router shall be stackable or daisy-chainable to provide for the correct number of voice and data ports as required for each individual site indicated in Volume 1/Part 2, paragraphs 1.0 to 8.0 (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Cable trunking.** Where required, standard white high impact resistant PVC miniature indoor trunking shall be installed and used to distribute access and mains supply cables between the indoor equipment racks and the End-User equipment and mains distribution boxes (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Cable Lightning Protection and Earthing.** All new voice and data cables shall be provided with lightning, earthing and surge protection (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Cable Marking and Labelling**. All cables installed shall be marked and labelled in accordance with an agreed upon cabling marking and labelling system and the approved installation cabling diagram (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**10.11 VSAT Indoor UPS Installation**

VSAT remote terminal on the ATNS VSAT network must be provided with an uninterruptible standby power supply unit (UPS) subject to and based on the following requirements:

1. **UPS Units.** UPS Unit need to be installed shall be confirmed during the physical site surveys. For the purposes of the RFQ response, the bidder shall include for the supply of UPS unit. (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Local Uninterrupted Power**. Should it be established during the site surveys that a suitable local Uninterrupted Power is available at a particular site, it is proposed that the new VSAT indoor cabinet be connected to that supply (I).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Configuration.** True "on-line" double isolation/conversion technology consisting of rectifier/charger sub-system, battery sub-system, conversion sub-system (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Input Feed.** The UPS shall be capable of accepting a single phase input mains power feed of 220/240 ± 15% Volt AC and input frequency of 45 to 60 Hz (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Output Feed.** The constant delivered output mains feed shall be user selectable at 220 V AC, 230 V AC and 240 V AC (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Efficiency.** The conversion efficiency shall be in excess of 90 % (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Frequency Tolerance.** Output Free running Frequency shall be ± 0.1 % or less (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Size per Site.** Each UPS shall be sized according to the individual site's power consumption at maximum load and shall be either 6 kVA or 10 5kVA in accordance with the power supply and consumption sizing. Larger UPS's shall be supplied and installed only at those sites the power consumption is in excess of 10 kVA (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Status and Alarm Indications.** The UPS shall have front panel display of status and alarm indications (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Remote Access Interface.** The UPS shall have a standard RS-232/V.10 V.24/V.28 asynchronous data interface for connection to the Network Management System or other computer system for remote management functionality (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Software Configurable.** The UPS shall be fully software controllable, configurable and manageable through resident SNMP client facilities (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Standby Batteries.** The UPS shall be provided with a set of standby batteries to provide for a maximum of 20 minute standby time (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Type of Batteries.** Standby batteries shall be non-"lead-acid", maintenance free and immune to memory AH capacity reduction effects (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Charging of Batteries.** Batteries shall be capable of deep discharge/charge cycles (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **19" Rack Mountable.** The UPS's and standby batteries supplied shall be 19" rack mountable. Where it is not possible to supply rack mountable UPS's and batteries, the UPS size and battery shall be such as to be installed loose standing in the bottom of one of the equipment racks supplied (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**10.12 VSAT Terminal Indoor Equipment Racks Installation**

The new equipment racks for the indoor equipment shall be compliant to and based on the following requirements:

1. **Equipment Rack Size.** The maximum height of a 19" equipment rack used for the installation of indoor equipment shall not exceed 42 U (rack units). 19" inch equipment racks shall be at least 600-mm deep (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Equipment Rack Construction.** The new equipment rack shall be of a modular frame construction with two mild steel side panels, rear hinged, but removable, mild steel door and a front hinged, but removable glass door. The colour of the equipment rack shall be goose grey in accordance with BS4800 00A05 (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Equipment Rack Mains Power.** A 2U panel with at least 2 isolating circuit breakers shall be used to distribute/isolate the 220/240 V AC power feed from the UPS to the new 19” equipment rack. The 2U-power panel shall be installed at the front and bottom of the new 19” equipment rack. One isolating circuit breaker shall feed the forced ventilation fan tray. The other isolating circuit breaker shall feed the multiple plug mains distribution panel at the back of the equipment cabinet (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Mains Distribution Panel.** The new equipment rack shall be provided with a mains power distribution panel or strip installed at the rear and side of the equipment rack. The power distribution panel or strip shall provide IEC 320 type socket outlets for distributing mains to the individual indoor equipment sets installed in the equipment rack. Three (3) spare IEC 320 sockets per distribution panel shall be available after the rack has been fully populated (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Ventilation.** A forced ventilation fan tray with at least four (4) ventilation fans shall be provided and installed at the top of each new 19” rack. The fan tray shall be connected to one of the mains feed isolating circuit breakers (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Filter Ventilation Grille.** A filter ventilation grille shall be installed at the bottom of the new equipment rack. The filter ventilation grille shall conform to IEC 297 and be fitted with a washable polyfoam filter (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Vented Trays.** All indoor equipment shall be installed in the new equipment rack on standard fixed vented shelving (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Sliding Keyboard Drawers.** Computer keyboardsshall be installedin rack mounted sliding drawer trays (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Cable Tray.** A steel multi-punched cable tray shall be installed at the rear and opposite side of the power distribution panel. The steel cable tray shall be used for distributing low level signal type and equipment interconnecting cables. The cable tray shall run the full length of the equipment rack (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Single Cable Hoops.** Single steel cable hoops shall be installed and fixed to one of the rear new equipment rack modular pillars. The steel cable hoops shall be used to thread/ distribute RF and IF cables to the individual equipment sets (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Equipment Earthing.** It is preferred that all equipment racks and cabinets be connected to the building earth via a separate earthing cable or strap. Care shall be taken that the building earth and the electrical mains earth are at equipotential. This shall be confirmed and measured during the site visit/survey (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**10.13 VSAT Terminal Indoor MCPC Equipment**

NAFISAT remote sites as included in the NAFISAT sub-network of the ATNS VSAT network are provided with additional MCPC ground terminal equipment compliant to and in accordance with:

1. **MCPC Circuit Summary.** The following table provides a summary of the present existing ATS/DS and AFTN circuits between the AFISNET sites and the NAFISAT and SADC2 remote sites (Refer to paragraphs 1.0 to 9.0 of Volume 2, Part 1 for additional information (I):

| **AFISNET SITE** | **NAFISAT SITE** | **SADC2 SITE** | **TYPE OF CIRCUIT** |
| --- | --- | --- | --- |
| N'Djamena | Tripoli | - | ATS/DS & AFTN |
| Niamey | Tripoli | - | ATS/DS & AFTN |
|  | Tripoli | Johannesburg | Engineering |

|  |  |
| --- | --- |
| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **VSAT Remote Terminal with MCPC functionality.** Diagram 10.6 in paragraph 10.6 above shows a typical block diagram of the remote VSAT terminal to incorporating connectivity to the AFISNET, as identified in the table under 10.13.1 above (I).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Multi-port Active Combiner.** Multiport L-band active transmit combiner (N-to-1) are provided to combine the VSAT network carriers onto the up-converter and solid state power amplifier outdoor equipment (M).

|  |  |
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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Multi-port Active Splitter.** Multiport L-band active receive splitters (1-to-N) are provided to split/distribute the received VSAT network carriers onto the down-converter and low noise receive outdoor equipment (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Modem.**  The Datum modems shall be connected in accordance with the table under 10.13.1 above (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Modem Baseband Input/Output.**  The Datum modems input/output be connected to the Memotec Multiplexer (compatible) equipment(M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**10.14 Remote Site Installation Procedures**

10.14.1 This is a new site and installation procedures shall be established and agreed upon. The installation procedures shall form part of the installation specification (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

10.14.2 On-site training will then be conducted as detailed in paragraph 14.2 which will be followed by the testing as described in paragraph 18.4 (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**11. ATNS VSAT NETWORK TECHNICAL REQUIREMENTS**

**11.1 ATNS VSAT Network Management**

The VSAT terminal installed shall provide for comprehensive network management features with different functionality levels. The network management system provided for the ATNS VSAT network shall be compliant to and based on:

1. **Network Main/Standby NMS Configuration.** The network management system shall be configurable in a main and standby configuration at the ATNS VSAT network level (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Sub-network Main/Standby NMS Configuration.** The network management system shall be configurable in a main and standby configuration at the ATNS VSAT sub-network level (M)

|  |  |
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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **NMS Main Terminal Role at Network Level.** The VSAT remote terminals shall be capable of being allocated the main network management system terminal at the network level (M).

|  |  |
| --- | --- |
| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **NMS Standby Terminal Role at Network Level.** The VSAT terminals shall be capable of being allocated the standby network management system terminal at the network level. The network management system, allocated to the VSAT terminal that is assigned as the standby network management system, shall be capable of managing, reporting on status information and configuration of all remote VSAT terminals on the network (M).

|  |  |
| --- | --- |
| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **NMS Main Terminal Role at Sub-network Level.** The VSAT terminals shall be capable of being allocated the main network management system terminal at the sub-network level. The network management system, allocated to the VSAT terminal that is assigned as the main sub-network management system, shall be capable of managing and reporting on status information of all remote VSAT terminals on the sub-network (M).

|  |  |
| --- | --- |
| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **NMS Standby Terminal Role at Sub-network Level.** The VSAT remote terminals shall be capable of being allocated the standby network management system terminal at the sub-network level. The network management system, allocated to the VSAT terminal that is assigned as the standby sub-network management system, shall be capable of managing and reporting on status information of all VSAT terminals on the sub-network (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Local NMS Terminal.** It shall be possible to allocate a network management system to the VSAT terminal at the network and sub-network level. Network management systems allocated to the terminal shall only be capable of managing and reporting on status and alarm information of that terminal only (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **NMS Protocols.** Extensive use of SNMP and/or CMIP protocols shall be used to manage, control and co-ordinate network management parameters and files on a client/server basis (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Modular Design.** The network management software shall be of a modular design, forward compatible in order to migrate to new hardware platforms as and when required (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Ease of Use.** The network management software shall be easy to use, with a graphic interface and online help incorporated (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Graphic User Interface.** The graphic user interface of the new network management software shall provide for:

11.1.11.1 Geographical maps showing the network and sub-network nodes and VSAT terminals (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

11.1.11.2 Status and alarm information of network nodes, sub-network terminals, per site systems, sub-systems and equipment (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

11.1.11.3 Graphic overview of equipment configuration and parameters on an individual site basis (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

11.1.11.4 Graphic circuit connection and equipment block diagrams (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Password Protection.** The network management software shall be provided with the necessary password protection mechanisms at different levels for authorised access restriction (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Terminal Reconfiguration.** The network management software shall allow for “Over the Air” automatic reconfiguration of the network-failed elements or configuration of new terminals and circuits from the network level main and standby terminal without affecting the operation of the network when new circuits are to be implemented or failed terminals are reconfigured (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Monitoring and Control Information.** The network management software shall provide performance monitoring, status monitoring and alarm information of individual equipment sets on a per remote VSAT terminal basis, grouped into logical networks and sub-networks (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Traffic Statistics.** The network management software shall provide voice and data traffic statistics between the VSAT terminals that comprise the overall network, the logical sub-networks and the individual VSAT terminals (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Voice Services**
   1. Regarding voice services (ATS/DS), the following statistics are required (M):
2. Number of calls per ATS circuit of the specified site.
3. Total call duration (duration of the conservation) per ATS circuit of the specified site. A call without response is not taken into account.
4. Percentage of successful calls per ATS circuit of the specified site. A busy tone is considered as a failure. A call is considered as successful in the following cases :
5. The communication is established; or
6. The remote phone rings, but the communication is not established because nobody answers.
7. Total number of calls for the specified site
8. Total call duration for the specified site
9. Total percentage of successful calls for the specified site.

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **AFTN/ATN Services**

Regarding AFTN/ATN services, the following statistics are provided in reports (M):

1. Number of data Bytes transmitted per AFTN/ATN circuit of the specified site.
2. Percentage of successful data Bytes transmitted per AFTN/ATN circuit of the specified site.
3. Total number of data Bytes transmitted for the specified site.

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Report Generation.** The network management software shall provide for report generators of all statistics, configuration parameters and other technical information for network and sub-network administration (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

11.1.17.1 Statistics Report Layout

The report page must be divided into two pages - a selection page which allows the user to specify the site, the year and the month of the report he wants to display, and a report display page (M).

1. The selection page must be divided into two zones:

* The “time settings” zone: select year and month of the desired report.
* The “impacted site(s)” zone: allows the user to select one or several sites which will be displayed on the report. Dedicated buttons allow quick selection i.e:
* Select all sites
* Unselect all the sites
* Select only NAFISAT sites
* Select only SADC2 sites

1. When time and site selections have been defined, the user can validate his choice with an “OK” button to open the “reports display page”.
2. The report display page must offer the possibility to export the generated reports to a Microsoft Excel file. The report page could be composed of several reports according to the number of selected sites
3. Diagram 11.1 below shows a typical statistics report dialogue page.

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| **COMPLIANCE (C/PC/NC/Noted)** |  |



**11.2 ATNS VSAT Network Traffic Calculation**

1. **Individual VSAT Network Traffic Tables.** Traffic tables shall be developed from the connectivity matrices as given in Volume 2, Part 1, paragraphs 1.0 to 9.0. A traffic table shall be developed for each type of connectivity required showing the total traffic generated per site for each type of connectivity (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Aggregate VSAT Network Traffic Tables.** An aggregate traffic table shall be developed from the individual per traffic type tables showing the total aggregate traffic generated per VSAT site (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **MCPC Traffic Tables.** For those sites where MCPC type traffic is generated such traffic shall be shown in separate tables (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Overhead Traffic.** The overhead traffic for each type of carrieras given in the developed tables under 11.2.1 to 11.2.3 shall be shown. Overhead traffic shall include but not be limited to, overhead for voice, overhead for modulation, overhead for FEC coding, etc. (M)

|  |  |
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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**11.3 Transmission Link Budget Calculation**

1. **Satellite and Satellite Transponder.** ATNS has 9 MHz of C-Band spectrum on East Hemi Transponder 23/23 of INTELSAT IS 10-02 at 359° East longitude (I).

|  |  |
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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **VSAT Network Link Budget Calculations.** A complete and detailed set of VSAT terminal transmission link budget calculations shall be developed for the satellite, transponder and ground segment equipment required (M).

|  |  |
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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Geographical Advantage.** Each detailed transmission link budget calculated for the site, shall be calculated in both directions from that specific site to the remote site with the worse geographic advantage, to which the specific site needs to establish a voice and/or data connection via the VSAT network

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **MCPC Link Budgets.** For those sites where MCPC traffic is generated (including the optional planned sites), a separate link budget shall be calculated for each SCPC link from and to the specific site and its reciprocal MCPC site. These MCPC link budgets shall be based on INTELSAT IS 10-02 at 359° east longitude, East Hemi Transponder 23/23.

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Detailed SCPC Bandwidth Required.** Tables shall be included showing the exact satellite bandwidth per carrier for the MCPC links (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**12. installation requirements**

**12.1 General Installation Requirements**

VSAT terminals shall be installed at the main Air Traffic Control Centres as indicated in Volume 2, Part 1, paragraphs 1.0 to 8.0. Each installation will be preceded with a “Site Survey” as given under paragraph 12.2 of this document (I).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Installation Specifications.** The information captured during the site survey shall be revised, reworked and compiled into a VSAT site specific "Installation Specification" (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Installation Specification Approval.** Each VSAT site specific "Installation Specification" shall be approved by the on-site user before commencement of any installation work (M).

|  |  |
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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**12.2 Individual Site Surveys**

1. **Site Survey Visits.**  Site survey visits shall be conducted for the Tripoli terminals. The Contractor's site survey team shall be accompanied by an engineer from ATNS (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Site Survey Report.** A detailed site survey report shall be drafted from the data collected during the physical site survey and submitted for approval. The detailed specific site installation specifications shall be developed and drafted from the site detail as recorded in the site survey reports (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Site Survey Information.** The site survey information gathered during the physical visit to the site shall include but not be limited to (M):
2. Senior civil aviation personnel contact detail.
3. On-site technical personnel detail
4. Site physical (delivery) and postal addresses.
5. Site geographical measured data.
6. Location of antenna position (present or new position (where it will be relocated)).
7. Status of antenna condition.
8. Status of RF transmit and receive switches (refer to paragraph 10.6.1.2 of this document)
9. Status of antenna earth (refer to paragraph 10.6.1.5 of this document)
10. Status of orbital arc clearance from antenna position
11. Equipment building location.
12. Location of equipment rooms.
13. Distances of antenna to equipment rooms,
14. Distances to MDF racks .
15. Distances to electrical distribution boxes.
16. New cable trays and ducts required.
17. Status of electrical feed to new cabinet.
18. Neutral-earth, live-earth, neutral-live, status of building earth.
19. Site and equipment building layout diagrams.
20. Any other details that the Contractor deem important to fully describe the site where a VSAT terminal will be installed.

|  |  |
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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Site Survey Form.** A functional draft site survey form shall be included in the response to Volume 3 (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Contractors Responsibility.** In terms of capturing data during the site surveys, the successful Contractor shall be responsible for the following on-site implementation items. Also refer to paragraph 10.6 “Standard Site Installation”. (M):

12.2.5.1 Installation of outdoor equipment.

12.2.5.2 Positioning of new indoor equipment racks.

12.2.5.3 New indoor cable ducting and cable trays required for the installation.

12.2.5.4 Installation of indoor equipment.

12.2.5.5 Preparation of cabling for connectivity of installed indoor equipment to user on-site ATS/DS, AFTN and ATN equipment.

12.2.5.6 Installation and connecting of UPS equipment, where required (refer to paragraphs 10.6.3 and 10.11.1 of this document.

12.2.5.7 Connection of the new equipment rack and installed indoor equipment to the user 220/240 VAC mains feed distribution equipment.

12.2.5.7 Commissioning, setting to work of installed equipment, on-site training and transition of operation from existing to installed equipment.

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **On-Site Users Responsibility.** During the site survey the responsibilities of the on-site user shall be established. These responsibilities could typically include the following depending on the site condition and local circumstances (M):
   1. Ensure that the existing antenna has a clear line-of-site to the satellite and remove any obstacles identified during the site survey.
   2. Identification of any new RF interference sources, if any.
   3. Moving of on-site user equipment for positioning of the new VSAT indoor equipment racks.
   4. Removal of cable trays or ducts, if required.
   5. Access to 220/240 VAC distribution equipment.
   6. Equipment room climate control and air conditioning.
   7. Access to user ATS/DS, AFTN and ATN equipment.
   8. User Support and personnel during commissioning, setting to work and on-site training.

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**12.3 Equipment Distribution and Clearance**

12.3.1 Although this terminal installation is regarded as a new installation, various maintenance support options shall form part of the existing Logistic Support (LS) System that is in place, for the total support of the installation project for the economic life of the equipment. The Bidder shall deliver a draft Integrated Logistic Support Plan for their supplied equipment (M):

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**13. VSAT terminal maintenance requirements**

**13.1 General Maintenance Requirements**

1. The existing Logistic Support System shall continue to be utilised for the support of the terminal installation, (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Maintenance and maintenance management of VSAT remote sites during the installation, commissioning and "setting-to-work" phases shall be provided (M)

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**13.2 Network and Terminal Availability**

VSAT terminal availability shall be included based on the following;

1. **Remote Terminal Reliability Diagram.** A VSAT terminal reliability block diagram shall be provided. The reliability block diagram shall at least show all main equipment components as per the offered configurations (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Individual Equipment Failure Rates.** For each of the sites, a table showing equipment/component "Mean Time between Failures (MTBF)", failure rate/hour and reliability/operational hour shall be provided. Bidders shall show how the MTBF figures have been calculated (theoretical) or measured (practical) (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **VSAT Remote Site Reliability.** For each of the sites in question, a site reliability figure shall be calculated and shown (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **VSAT Remote Site Availability.** Inherent site availability figure shall be calculated and shown, assuming a typical three (3) hour "Mean Time to Repair (MTTR)" from start of corrective maintenance to end of corrective maintenance, excluding logistic and administrative delay (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **VSAT Network Availability.** Using the reliability and availability figures for each of the sites as calculated, extrapolate the calculation and suggest a VSAT network "inherent availability" for a typical one year operational period. All assumptions made shall be provided and motivated (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**13.3 On-Site Maintenance Requirement**

The "on-site" maintenance is essentially physical repair activities to ensure the network operability and performance (I).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. The "on-site" personnel using the "on-site" local NMS client terminal will perform "O" and "I"-level maintenance. "On-site" maintenance activities will include, but not be limited to the following (M):
   1. First line maintenance via on-site NMS.
   2. Preventative activities and management thereof.
   3. Fault reporting.
   4. Completion of failure reports.
   5. LRU fault diagnosis.
   6. LRU replacement.
   7. Software reboots and software configurations.
   8. Re-alignment.
   9. Routine servicing.
   10. Completion of failure reports.
   11. Failure reports.
   12. Miscellaneous corrective and preventative tasks.
   13. Engineering support.

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**13.4 Service Provider Maintenance Support**

ATNS as the Service Provider shall provide a maintenance management and support function to Tripoli during any maintenance action undertaken by the "on-site" maintenance personnel. This maintenance management and support function shall include but not be limited to:

1. Off-air measurements of carriers and timeslots and data streams of the failed site on request by the "on-site" maintenance personnel (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Reconfiguration of terminal parameters that could affect the overall network performance on request by the "on-site" maintenance personnel (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Other technical support and co-ordination between centres during “difficult-to-clear” failure occurrences (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Configuration and final commissioning of new terminals added to the network (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Spares repair and replenishment of failed spares and LRU’s after final VSAT network acceptance (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**14. training requirements**

**14.1 Pre-installation Comprehensive Supplier Training**

Pre-installation detailed technical training shall be provided to the local Company Engineering Technicians. The pre-installation training shall consist of in-depth and specific technical, operational and maintenance training pertaining to the VSAT terminal installation.

1. **Satellite Communications and VSAT Technology Platform.** Satellite communication in general and specific aspects related to the VSAT installation offered, such as bandwidth control, network sizing, traffic sizing, satellite access protocols used, circuit establishment, circuit interfaces (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **VSAT Site Construction and Configuration.** Indoor and outdoor site construction inclusive of outdoor terminal line-up and indoor terminal configurations (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **VSAT Network Management.** The planning, configuration control and operation of the sub-network and local level of the VSAT network management system (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **VSAT Terminal Operation and Maintenance.** All operational and maintenance items as included under the training that will be conducted "on-site" during the installation of the individual remote terminals (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**14.2 On-Site Operation and Maintenance Training**

"On-site" operation and maintenance training shall be provided to at least 4 operation and maintenance personnel staff members of the individual State at the time of the installation VSAT sites by the Contractor. The individual site-training program shall include but not be limited to:

1. **Basic Knowledge.** Overview and basic operational aspects of the VSAT (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Handbooks.** Handling and use of the different operational and maintenance handbooks and manuals (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Basic Installation and Configuration.** The installation, dismantling and configuration of the different equipment sets and LRU’s (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **VSAT Terminal Operation.** Physical operation of the VSAT remote terminal (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Failure Identification.** The identification and localisation of hardware and software problems and failures at sub-system and LRU level through the use of the local network management terminal (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Maintenance.** Hardware and software maintenance procedures and actions including Preventative maintenance (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**15.1 Acceptance Testing**

15.1.1 The contractor shall participate in the Factory Acceptance Testing (FAT) of the equipment with ATNS and the original equipment manufacturer and ATNS (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

15.1.2 Site Acceptance testing of the installed equipment shall be the responsibility of the contractor (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**15.2 Terminal Equipment**

15.2.1 All training shall be of identical technology to the IDU7000 and SKYWAN FAD 9220 equipment used for the operational sites, including the Network Management System (M).

**16. Aeronautical Telecommunication Network (ATN)**

The ATN Backbone network for NAFISAT as it relates to Tripoli, as described in Volume 2, Part 1, paragraphs 6 and 8.4 is based on the AFI ATN Plan developed by ICAO. The eventual plan is to interconnect the NAFISAT sub-networks with AFISNET and the REDDIG VSAT network in South America to establish the backbone of the planned AFI ATN (I).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**16.1 AFI ATN Requirements**

16.1.1 The ATN requirements as included in the RFQ complies with the planned AFI network in respect of the satellite access method and the use of INTELSAT IS10-02 space segment to ensure seamless operation with the neighbouring VSAT networks (I).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

16.1.2 A further requirement of the AFI ATN is that operation must be based on IPv6 and it is therefore important for ATNS to ensure that the VSAT terminals that will be part of the NAFISAT ATN backbone infrastructure will both IPv4 and IPv6 compliant (I).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

16.1.3 It will also be required that the backbone terminals for the AFI ATN will be fully redundant in respect of the outdoor and indoor equipment (I).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**17. spare parts, tools and test equipment**

A complement of recommended spare parts, special tools and test equipment are required at each individual remote VSAT site and at the central VSAT Network Support Centres in Entebbe and Johannesburg (I).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**17.1 Spare Part Calculation**

1. **Probability of Failure.** A table shall be included showing the detailed calculation of the "Probability of Failure" for each of the equipment sets/components identified in the VSAT remote terminal reliability block diagrams as given under paragraph 13.2 above. The table shall be divided to show the three sub-network equipment sets and be calculated for a one year operational time period (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Summary Spare Part.** The "Probability of Failure" table shall be revised to show the expected annual spares part pool required for each of the sub-networks (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**17.2 "On-Site" Spare Parts and Spares Pool**

It shall be possible for the individual sites to select either a centralised or decentralised maintenance option. In the case of decentralised maintenance, the individual "on-site" personnel shall be responsible for conducting corrective maintenance from the "on-site" spares pool (I). The "on-site" spares pool shall be based on but not be limited to:

1. The "Probability of Failure" annual spares pool per equipment set/component as calculated above (M)

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. The equipment sets/components spares pool per individual sites may be divided into specific Line Replaceable Units (LRU’s) such as, line interface cards, processor boards, power supplies, backplane boards and chassis (D).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Consumables such as fuses, connectors, dust filters, and cables (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Back-up software such as operating systems, configuration routines and maintenance software utilities (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. A table shall be included showing the annual spares required per site assuming that all sites shall choose the decentralised maintenance option (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**17.3 Service Provider Spare Parts and Spares Pool**

In the case where none of the sites choose decentralised maintenance, centralised maintenance shall be conducted from two maintenance Support Centres, one at Entebbe and one at Johannesburg (I). The service provider spares pool per maintenance centre shall be based on, but not be limited to:

1. The "Probability of Failure" annual spares pool per equipment set/component as calculated above (M)

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. The equipment sets/components spares pool per individual sites may be divided into specific Line Replaceable Units (LRU’s) such as, line interface cards, processor boards, power supplies, backplane boards and chassis (D).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Consumables such as fuses, connectors, dust filters, and cables (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Back-up software such as operating systems, configuration routines and maintenance software utilities (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. A table shall be included showing the annual spares required per maintenance centre assuming that all sites shall choose the centralised maintenance option (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**18. verification and Qualification REQUIREMENTS**

**18.1 General Network Verification and Qualification**

1. The successful Bidder shall be responsible for all equipment configurations, commissioning and verification of the operational status of the VSAT terminals in accordance with the requirements and standards of the VSAT Technology Supplier and INTELSAT as the Satellite Resource Supplier (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. All network and VSAT terminal verification and qualification tests conducted shall be in accordance with the approved Test and Evaluation Master Plan as required and stipulated in Volume 3 of this RFQ document (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**18.2 Responsibility for Network and Site Parameter Configuration**

1. **Network Configuration Database.** A Microsoft Excel/Access® database shall be developed and delivered that shall be used to store, manage and co-ordinate, all network and VSAT site parameters for the ATNS VSAT network (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Database Independency.** The database shall be independent from any operational

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. database that may be provided as part of the VSAT Network Management System (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Network Configuration Parameters.** The configuration database shall be based on a user selectable menu structure providing access to configuration parameters that are linked to each other from the highest menu, being the network communications circuit connectivity down to the individual port parameters (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Equipment Configuration Parameters.** The configuration database shall also provide for storing, managing and co-ordinating general equipment set-up parameters as may be required by the individual equipment manufacturers (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**18.3 Responsibility for INTELSAT Carrier Line-up and Terminal Verification**

1. **Co-ordination of Test Parameters.** The successful Bidder shall be responsible to co-ordinate the requirement for terminal verification testing against INTELSAT requirements (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **Verification Testing.** The successful Bidder shall include in the Test and Evaluation Master Plan any tests that may be required by INTELSAT (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. **INTELSAT Test Result Submission.** The successful Bidder shall be responsible for compiling the final Verification Test Report for submission to INTELSAT (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**18.4 Installation and Site Commissioning Testing**

VSAT Terminal shall be individually tested and commissioned to show conformance to the network design and VSAT installation as offered. Installation and Commissioning tests shall include, but not be limited to:

1. Physical inspection of the indoor and outdoor installations (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Station verification testing and registration as required by the satellite operator (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Technical and operational network performance testing (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. AFTN, ATS/DS, ATN, and Remote Control and Monitoring interconnectivity testing from and between a particular site and the adjacent sites (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. Software testing of the network management terminal functionality (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**18.5 Site Acceptance Documentation**

On completion of the installation and commissioning tests and as part of the hand-over of the site, a set of site acceptance documentation shall be delivered. This site acceptance documentation shall include, but not be limited to:

1. An Operation and Maintenance handbook of the individual equipment sets (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. A completed and updated site “As Built” document showing final equipment layouts, site layouts, cabling diagrams and equipment configuration parameters (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

1. A Test and Evaluation document showing all the detail and results of the acceptance and commissioning tests completed (M).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |

**18.6 Responsibility for Individual Station-to-Station Testing**

**End-to-End User Tests.** ATNS and the "on-site" user shall be responsible for conducting end-to-end user tests.These tests shall be conducted over a 7-14 day period and shall only take place after commissioning (I).

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| **COMPLIANCE (C/PC/NC/Noted)** |  |