



Technical Specification for the Primary/Secondary (Mode S) Radar System **MOLDATSA**

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1 SCOPE

1-1 PURPOSE

This tender document constitutes the technical specification for the procurement of co-mounted PSR/MSSR Mode S radar systems for MOLDATSA. It outlines all functional and non-functional requirements for the product requested by MOLDATSA, including necessary services e.g. installation, optimization and commissioning the PSR/MSSR Mode S radar systems for Republic of MOLDOVA **should** be installed at the location around 3 km from the Chişinău International Airport (LUKK). The system shall comply with ICAO and Eurocontrol requirements and provide reliable air traffic surveillance services.

The proposal **shall** incorporate the following:

- a) Supply equipment;
- b) Training for the maintenance engineers.
- c) FAT execution;
- d) Installation of equipment;
- e) SAT execution;
- f) Commissioning the PSR/MSSR Mode S radar systems;

1-2 REVISION HISTORY

Date	Version	Responsible	Comments/Status
10-02-2025	1.0	S. Sandu V. Stratan	Draft
27-02-2025	2.0	V. Stratan	Draft
07-03-2025	2.0	S. Sandu	Draft
26-10-2025	3.0	S. Sandu V. Stratan	Final

1-3 PROTECTIVE MARKING POLICY

Although the existence and purpose of the MOLDATSA radar system are publicly available information, the details of the system described in this specification are not. Therefore, the content of this document **shall** not be disclosed or otherwise made available to anyone other than MOLDATSA personnel, authorized MOLDATSA tender participants, and their potential subcontractors. In accordance with this policy, the document is marked as CONFIDENTIAL COMMERCIAL INFORMATION.



1-4 READING INSTRUCTIONS

A three or more-digit number to the left of a paragraph identifies number of requirements in this specification. Paragraphs without this number are for information only.

Conventions for denoting requirements are as follows:

- ‘**Shall**’ - indicates a statement of specification, the compliance with which is mandatory to achieve. It indicates a requirement that shall be satisfied by the offered systems claiming conformity to the specification. Such requirements are intended to be testable and their implementation auditable.
- ‘**Should**’ - indicates a recommendation or best practice, whose use is encouraged, but which **may** or **may not** be satisfied by the offered systems claiming conformity to the specification.
- ‘**May**’ – indicates an optional feature.
- ‘**Will**’ – is meant in its normal English usage to indicate a forward-looking statement or statement of intent.

1-5 REFERENCES

The following documents are referred to in this document, or have relevance for its content. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For non-dated references, latest or current versions **shall** apply.

Should, at the moment of tendering, newer versions of the document exist, these **shall** be taken into account. The Tenderer **shall** then also clearly state that other versions are used and **shall** declare non-compliance with the requirements.

ICAO	Annex 10, Aeronautical Telecommunications – Volume IV: Surveillance Radar and Collision Avoidance Systems
ICAO	Doc 9871, Technical Provisions for Mode S Services and Extended Squitter
ICAO	Doc 8071, Manual on Testing of Ground-Based Surveillance Systems
ICAO	Doc 9684, Manual on Secondary Surveillance Radar (SSR) Systems
EUROCONTROL,	Standard Document for Radar Surveillance in En-route Airspace and Major Terminal Areas
EUROCONTROL,	Specification for European Mode S Station (EMS)
EUROCONTROL	European Commission Regulation, (EU) 2017/373



EUROCONTROL	European Commission Regulation (EU) 2023/1768 and 1769
EUROCONTROL	Specification for ATM Surveillance System Performance (ESASSP)
SESAR	Final Technical Specifications for PJ.14- W2-84f TRL6 Surveillance Performance Monitoring - End-to-end
EUROCONTROL	Specification for Surveillance ASTERIX, Technical Specification for Surveillance Data Exchange, Part 1– 4, 12 https://www.eurocontrol.int/asterix
EUROCAE	ED-129C – Technical Specification for a 1090 MHz Extended Squitter ADS-B Surveillance System
ISO 9001:2015	Quality Management System
WMO N° 386	Manual on the Global Telecommunication System, WMO N° 386.
WMO N° 306	Manual on Codes, WMO N° 306
CENELEC	Standard EN55032 of European Committee for Electro technical Standardization
EC Standard	IEC 950, Safety of information technology equipment, including electrical business equipment

1-6 INTRODUCTION AND GENERAL REMARKS

- 1-6.1. Moldavian Air Traffic Services Authority (hereafter referred to as "MoldATSA") is undertaking the procurement a new, modern, advanced the co-mounted PSR/MSSR Mode S Radar System for Republic of Moldova (entire Chisinau FIR), Chisinau TMA and Chisinau Airport area to support improved safety and situational awareness in its airspace in compliance with ICAO and EUROCONTROL regulations.
- 1-6.2. This initiative **will** support both civil and military operations in the airspace, ensuring seamless integration with neighboring air navigation systems and contributing to the safety of regional airspace.
- 1-6.3. Acceptance of the equipment and execution of documents **should** be in full conformity with the Regulation (EU) 2023/1768, Regulation (EU) 2023/1769 and Regulation (EU) 2023/1771.
- 1-6.4. This capability **shall** be operational 24/7, ensuring uninterrupted service for a minimum period of 15 years.
- 1-6.5. The UPS, the air conditioning, Radar Tower **will** be assured by MOLDATSA.



- 1-6.6. The product shall be designed to provide a service life of 15 years without paid upgrades.
- 1-6.7. The Radar functional parameters **shall** be no worse than specified requirements in the ESASSP.
- 1-6.8. The below specified requirements are the main ones, other requirements (not specified in the text) **shall** be fulfilled in accordance with the documents listed in 1-5.
- 1-6.9. If the requirements specified in this document (or specified in the documents listed in 1-5) are not met - the Offertant must state this separately.



2 SYSTEM REQUIREMENTS

2-1 MAIN REQUIREMENTS FOR PRIMARY RADAR (PSR)

Primary Surveillance Radar (PSR) is a surveillance system that operates without requiring a response from an aircraft (unlike Secondary Surveillance Radar, SSR). It is used for detecting non-cooperative targets, functioning in case of transponder failures, and supporting primary surveillance in high-density airspace areas.

- (1) PSR **shall** be integrated with a dual weather signal reception and processing channels.
- (2) It **shall** allow for display of effective weather data according to the US National Weather Service NMS standard, on the entire PSR range.

2-1.1. Main Functional Requirements

2-1.1.1. Detection Range and Coverage

- (1) Minimum detection range **shall** be: 60 NM (and as option – 80NM).
- (2) Altitude coverage **shall** ensure aircraft detection at both low (coverage 300 ft (or less) to 15NM) and high altitudes (660FL), including low-level flights near airport. Horizontal coverage - 360°,

at the following parameters:

2-1.1.1.1. Probability of detection Pd for targets **shall** fulfill the conditions:

- (1) $RCS = 1m^2$
- (2) Swerling type I
- (3) $0 < \text{velocity} < 2000$ knots
- (4) Acceleration/deceleration 0.01g-5g in direct antenna visibility
- (5) Pfalse alarms: 10^{-6}
- (6) Windfarms within 4km distance and 200m heights
- (7) No restriction about target direction(tangential , radial , etc)

shall be:

- (7.1) $Pd > 90\%$ for targets in 60NM
- (7.2) Tenderer **shall** provide theoretical coverage diagrams for different elevations considering previous constrains

(8) Pd = 80% for targets **shall** fulfill the conditions:

- (8.1) range <40NM
- (8.2) $RCS = 0.25m^2$
- (8.3) swerling type I
- (8.4) $0 < \text{velocity} < 2000$ knots
- (8.5) acceleration/deceleration 0.01g-5g in direct antenna visibility
- (8.6) Pfalse alarms: 10-6
- (9) RF and digital Sensitivity Time Control (STC): 32 sectors
- (10) System stability $\geq 63dB$
- (11) Systematic errors:



- (11.1) range bias <80m
- (11.2) azimuth bias < 0.1°
- (11.3) slant range gain error :<1m/NM
- (11.4) time stamp error <80ms
- (11.5) Random errors
- (11.6) slant range<100m rms
- (11.7) azimuth<0.1° rms
- (11.8) range resolution <45m
- (11.9) azimuth resolution <1.4° rms
- (12) Shall use windfarm effects mitigation technique
- (13) Dynamic range: >85dB
- (14) Minimum Detectable Signal: -128dBm
- (15) Radar target data capacity: 1000 aircrafts/scan
- (16) False reports generated by receiver noise, fix clutter, precipitation clutter: max.
3/scan
- (17) false reports including angels: max 15/scan

2-1.1.2. Accuracy and Resolution

2-1.1.2.1. Azimuth Accuracy

Should be no worse than 0.1–0.2 degrees, ensuring precise aircraft positioning.

2-1.1.2.2. Range and Radial Accuracy

- (1) The range determination error **should** not exceed 0.1–0.2 nautical miles.
- (2) The range resolution **should** allow distinguishing aircraft at a distance of at least 200–300 meters apart.

2-1.1.3. Target Detection and Signal Processing **shall** be:

- (1) Advanced clutter suppression techniques: Ground clutter suppression not less 45 dB
- (2) Doppler processing for improved target discrimination.
- (3) Doppler processing for improved target separation by velocity.
- (4) Support for ASTERIX (CAT 1, CAT 34, CAT 48, CAT 62).
- (5) Ethernet-based data transmission for integration with Air Traffic Control (ATC) systems.

2-1.1.3.1. Sensitivity and Detection Thresholds

- (1) Minimum Radar Cross Section (RCS):
 - (1.1) **Shall** detect objects with RCS of 1 m² at up to 60 nautical miles.

2-1.1.4. Clutter and Interference Suppression

2-1.1.4.1. Weather clutter suppression:

- (1) **shall** use of Doppler filtering to eliminate echoes from rain, snow, and hail.



- (2) **shall** use digital data processing algorithms to remove false detections.
- (3) **shall** be Precipitation suppression not less 35 dB.

2-1.1.4.2. Radar interference suppression **shall** use:

- (1) Filtering of moving ground objects (cars, trains).
- (2) Suppression of signals from fixed structures (buildings, hills).

2-1.1.4.3. False target suppression **shall**:

- (1) Use of adaptive detection threshold algorithms to minimize false alarms.

2-1.1.5. Antenna System **should** use:

- (1) Digital beamforming for precise azimuth determination.

2-1.1.5.1. Antenna Characteristics **shall** be:

- (1) Gain: at least 34 dBi.
- (2) Beamwidth $\leq 1.2^\circ$ to minimize side lobes.

2-1.1.5.2 Gearbox and motors:

- (1) The turning gear dual Assembly and sub-assemblies drive **shall** be designed in such a manner as to for facilitate easy access to corrective and preventive maintenance;
- (2) Fixed rotation rates **shall** be 15 rpm;
- (3) Continuous lubrication of all moving parts **shall** be ensured at all times;
- (4) Sub-assemblies **shall** be provided for continuous oil level monitoring and generation of the remotely alarms;
- (5) In case of an oil level anomaly, the antenna **shall** cease rotation;
- (6) Greasing of assemblies **shall** not be necessary more than once every six months;
- (7) Greasing points **shall** be easily accessible for maintenance personnel;
- (8) The Antenna system **shall** be driven by duplicated motors inverter controlled;
- (9) One motor **shall** be capable of driving antenna;
- (10) A clutch system (electrical or mechanical) **should** engage / disengage manually each motor from/to the reduction gearbox only when antenna is stopped;
- (11) Safety interlock system **shall** prevent access to the antenna platform unless RF outputs from the PSR and MSSR transmitters is disabled, the motor drive is inhibited and turning is mechanically locked;
- (12) RF output **shall** be enabled manually from radar control panel, on steady state of antenna only with safety interlocks in place;
- (13) A comprehensive BITE (built-in-test equipment) **shall** allow in depth detailed monitoring and control of the Turning Gear and the motors status (fault, oil status, pressure failure, engine temperature, etc.).

2-1.1.6. Weather Resistance **shall** be:

- (1) Operating indoor temperature 0°C to $+40^\circ\text{C}$



- (2) Radar systems are designed for all-weather operation.
- (3) Wind resistance: up to 200 km/h.
- (4) Operating temperature range: -35°C to +55°C.
- (5) Water and dust protection: IP65 or higher.

2-1.1.7. Radar Tower will be provided by MOLDATSA
Height: 15 meters;

2-1.1.8. Diagnostic Capabilities

(1) Automated comprehensive Built-In Test Equipment (BITE) for real-time system diagnostics **should** be on modular parts.

2-1.1.9. Maintenance

- (1) **Shall** be automated comprehensive monitoring of Rx, Tx and AUX equipment.
- (2) **Shall** be modular design, Line Replaceable Unit (LRU), for quick component replacement.
- (3) **Shall** be remote performance evaluation, the Monitoring and Control system keep the number of maintenance actions and the maintenance time to a minimum.

2-2 MAIN REQUIREMENTS FOR SECONDARY SURVEILLANCE RADAR (SSR)

Secondary Surveillance Radar (SSR) Mode S is a surveillance system that enhances air traffic control (ATC) by providing aircraft identification, altitude and other additional information beyond what primary radar can detect. Unlike primary radar, which relies on reflected radio waves to determine an aircraft's position, SSR actively interrogates and retrieves aircraft transponders data, which respond with encoded data.

2-2.1. Main Functional Requirements to SSR

- (1) Instrumented range : 0.5 - 256 NM
- (2) Detection range : up to 256NM in Mode 3A/C and Mode S (EHS)
- (3) Overall probability of detection : > 99 % for the set of aircraft in measurement volume below zenithal gap and not in closer proximity (slant range > 2 NM, azimuth > 2 *nominal 3dB interrogation beamwidth).
- (4) Sectorial STC capability
- (5) II/SI capability
- (6) Tracking processing capacity at maximum range:
> 1 200 targets/scan
> 100 targets / 11.25°
- (7) Receiver dynamic range: >80 dB
- (8) Tangential sensitivity value: < -90 dBm
- (9) ADS-B receiver

2-2.1.1. Detection Range and Coverage

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(1) Minimum detection range **shall** be: 200 nautical miles.

(2) Altitude coverage **shall** ensure aircraft detection at both low (coverage 300 ft (or less) to 15NM) and high altitudes, including low-level flights near airport. Horizontal coverage - 360°.

2-2.1.2. Mode S Operating Modes **shall** be:

- (1) Mode S Elementary Surveillance (ELS): Transmission of a 24-bit ICAO address.
- (2) Mode S Enhanced Surveillance (EHS): Transmission of additional data, including angular velocity and vertical speed.

2-2.1.3. Antenna Specifications

Bandwidth and System Resolution **should** be:

- (1) Antenna beamwidth: 2.7° – 3.5° (at –3 dB level).
- (2) Minimum received signal level (P1): –77 dBm.
- (3) Maximum received signal level (P6): –49 dBm.

2-2.1.4. Gain **should** be:

- (1) Mode A/C: At least 28 dB
- (2) Mode S: At least 28 dB

2-2.1.5. Digital Signal Processing **shall** be:

- (1) Utilization of methods for reducing false replies and interference from other sources.
- (2) Application of digital methods to enhance detection accuracy and reliability.

2-2.1.6. Data Formats

SSR **shall** be compatible with existing ATC systems and support data transmission in standardized formats:

- (1) ASTERIX (CAT 1, CAT 8, CAT 21, CAT 23 / 25, CAT 34, CAT 48, CAT 62);
- (2) DF (Downlink Format): Various formats for transmitting data from an aircraft to a ground station;
- (3) UF (Uplink Format): Formats for transmitting data from a ground station to an aircraft.

The MSSR Mode S radar systems **shall** have the following components:

- (1) Dual channel MSSR equipment
- (2) Antenna (co-mounted with PSR antenna) with 2 motors and 2 APG (Azimuth Pulse Generator)
- (3) RMD (Radar Maintenance Display) for synthetic and processed raw video
- (4) Far Field Monitor — FFM dual test transponder)
- (5) LCMS and RCMS



(6) Dual GPS clock for time stamping of the data

2-3 REQUIREMENTS FOR SOFTWARE OF THE PSR/MSSR MODE S RADAR

2-3.1. Software Compatibility and Integration

2-3.1.1. The software **should** be fully compatible with the radar hardware and the associated systems (PSR and MSSR);

2-3.1.2. It **shall** support seamless integration with external systems, such as air traffic control systems, surveillance networks, and data management platforms.

2-3.2. Mode S Functionality

2-3.2.1. The software **should** support all the functionalities required for Mode S radar operations, including the ability to detect, decode, and track Mode S transponder signals;

2-3.2.2. It **shall** enable the radar to operate in both primary and secondary surveillance modes (PSR and MSSR);

2-3.2.3. The software **should** handle interrogation and reply processing for Mode S targets, ensuring accurate identification and tracking.

2-3.3. Surveillance Data Processing and Display

2-3.3.1. The software **should** process radar data in real-time and provide clear, detailed displays for operators;

2-3.3.2. It **should** have capabilities to filter and classify targets, distinguishing between aircraft, weather phenomena, and other objects;

2-3.3.3. The software **should** allow for both manual and automated data filtering, ensuring a clear and concise operational picture.

2-3.4. Signal Processing and Reflection Suppression

2-3.4.1. The software **shall** include advanced signal processing capabilities to minimize interference and suppress unwanted reflections, ensuring accurate target detection even in challenging environments;

2-3.4.2. It **should** support algorithms for suppression of ground clutter and false targets.

2-3.5. Monitoring and Diagnostics

2-3.5.1. The software **should** include monitoring tools for real-time performance analysis, system health diagnostics, and error detection;

2-3.5.2. It **shall** provide detailed logs for fault tracing and system performance reports.

2-3.6. User Interface

2-3.6.1. The software **should** feature an intuitive user interface (UI) that allows operators to easily access and manage radar settings, modes, and system performance data;

2-3.7. Automation and Control

2-3.7.1. The software **should** support automated tracking, alarm generation, and report creation;



2-3.7.2. It **shall** allow for automated mode switching and configuration based on predefined operational conditions.

2-3.8. Security and Data Integrity

2-3.8.1. The software **shall** include robust cybersecurity measures to protect against unauthorized access, data breaches, and cyberattacks;

2-3.8.2. It **should** ensure data integrity and non-repudiation of radar information, including encrypted communications.

2-3.9. Software Upgrades and Support

2-3.9.1. The supplier **should** provide a plan for future software upgrades and updates to ensure ongoing compatibility and performance improvements;

2-3.9.2. Support services **should** be included, with clear guidelines for software troubleshooting, updates, and training.

2-3.10. Compliance with Standards

2-3.10.1. The software **shall** comply with international standards for radar systems and air traffic control, including ICAO and Eurocontrol specifications, see 1-5 REFERENCES;

2-3.10.2. It **should** meet safety and operational standards as per the applicable regulations in the country of installation.



3 TIME SYNCHRONIZATION

- 3-1. Radar time synchronization is crucial for accurate operation. For time synchronization and indication, the NTP time Server with multiple (minimum 3) GNSS constellation connection **shall** be provided;
- 3-2. All computer nodes and network equipment **shall** be synchronized with the existing GNSS -clock using NTP;



4 INTERFACES

- 4-1. It **shall** be provided TCP/IP connection to be readably for the MAATS ATM System;
- 4-2. It **shall** be provided double independent connections to ATM System;



5 CONTROL AND MONITORING SYSTEM (CMS)

5-1 GENERAL REQUIREMENTS

5-1.1. The Control and Monitoring System (CMS) **shall** provide centralized management, configuration, monitoring, and diagnostics of the radar system;

5-1.2. The CMS **shall** support both local and remote access for system operation and maintenance;

5-1.3. CMS **shall** come with an easy to use, intuitive module based Graphical User Interface (GUI);

5-2 SYSTEM ARCHITECTURE

5-2.1. The CMS **shall** be designed with a redundant and fault-tolerant architecture to ensure high availability;

5-2.2. The system **shall** support multi-user access, with different levels of privileges (e.g., administrator, operator, maintenance staff);

5-2.3. Control and Monitoring System (CMS) **shall** consist of:

5-2.3.1. Local and remote control and monitoring console;

5-2.3.2. Radar Technical Display (RTD) in radar technical room;

5-2.4. CMS **shall** present:

5-2.4.1. Extracted plots as specific digital symbols with associated label;

5-2.4.2. Geographical map background;

5-2.4.3. Selectable extracted targets (primary, MSSR, Mode S, combined), Mode S video signal NORMAL and PROCESSED, and WEATHER presentation;

5-2.4.4. CMS **shall** be able to record real time video, extracted data fed in output to ATC system in ASTERIX format for at least 3 days in heavy traffic condition in contiguous files of 30 minutes file length and store them for minimum 14 days;

5-2.4.5. CMS **shall** provide easy access to download / copy recorded files;

5-2.4.6. CMS **shall** provide extracted ASTERIX data in an associated window for any selected target from live or recorded traffic ;

5-2.5. CMS working positions **shall** to have monitors (not less than 24"), keyboards and mouse;

5-2.6. CMS **shall** be possible to install on two separate working positions;

5-2.7. Degradation change of the status **shall** be provided by audio signal;

5-2.8. Logical interfaces **shall** be possible to open and close;



5-2.9. The system engineer **shall** have full access to the system.

5-3 FUNCTIONAL REQUIREMENTS

5-3.1. CMS **shall** has real-time status monitoring of all radar subsystems, including PSR and MSSR Mode S;

5-3.2. CMS **shall** has logging and event recording of all system activities, failures, and maintenance actions;

5-3.3. CMS **shall** has automated fault detection and diagnostics with detailed error messages and recommended corrective actions;

5-3.4. CMS **shall** has configuration management for radar parameters, allowing authorized personnel to adjust system settings as needed;

5-3.5. CMS **shall** has control functions for starting, stopping, and resetting radar components remotely;

5-3.6. CMS **shall** has performance monitoring with real-time and historical data visualization, record all status modifications of the radar system for minimum 30 days;

5-3.7. CMS **shall** has alarm system with visual and audible alerts for critical system failures;

5-3.8. CMS **shall** monitor ancillaries included in the system: anti-intrusion, fire alarm, air conditioning, power distribution, UPS, power generator;

5-3.9. Different colors **shall** be used for normal /nonfunctional / degraded / missing information status;

5-3.10. Degraded / nonfunctional status of radar hardware and software elements shall be presented in orange / red color accompanied by written explanation of malfunction and troubleshooting suggestions.

5-4 COMMUNICATION & INTERFACES

5-4.1. The CMS **shall** support standard SNMP (Simple Network Management Protocol) for remote monitoring and management;

5-4.2. The system **shall** be capable of integrating with external Air Traffic Management (ATM) systems through appropriate data interfaces;

5-4.3. The CMS **shall** have secure web-based access for remote monitoring and troubleshooting;



5-4.4. The CMS **shall** support data export in CSV, XML, or other common formats for reporting and analysis.

5-4.5. The CMS **shall** be provided on separate technical supervision workstation;

5-5 SECURITY REQUIREMENTS

5-5.1. The system **shall** have multi-level user authentication and access control;

5-5.2. All remote access **shall** be encrypted (SSL/TLS, VPN, or equivalent) to prevent unauthorized access;

5-5.3. The CMS **shall** maintain detailed access logs for security auditing purposes.

5-6 MAINTENANCE & SUPPORT

5-6.1. The CMS **shall** support automated system updates and patches;

5-6.2. The CMS **shall** include System self-test and diagnostic capabilities for predictive maintenance;

5-6.3. The system **shall** provide remote troubleshooting and firmware upgrade capabilities;

5-6.4. The Supplier **shall** provide full technical documentation and training for operating personnel.

5-7 COMPLIANCE AND STANDARDS

5-7.1. The CMS **shall** comply with ICAO (International Civil Aviation Organization) standards for radar control and monitoring;

5-7.2. It **shall** meet the EUROCONTROL specifications for surveillance systems;

5-7.3. The system **shall** be tested and certified to meet reliability and safety requirements.



6 RELIABILITY, AVAILABILITY, MAINTAINABILITY

6-1. These reliability requirements define a highly available and fault-tolerant PSR/MSSR Mode_S radar system, ensuring continuous air traffic surveillance. Here's a breakdown of the key metrics:

- (1) Mean time between failures (MTBF) **shall** exceed 10.000 hours;
- (2) Mean Time Before Critical Failures (MTBCF) **shall** exceed 60.000 hours;
- (3) The availability of the system, not counting planned downtime, **shall** be not less than 99.95%. Supplier **shall** provide the calculation.

6-2. Field LRUs and interconnections **shall** be designed in such a way that replacement, setup and test can be carried out safely by a single maintenance technician;

6-3. Provider **shall** present an evaluation of spare parts needed for five years and include them in offer, according reliability parameters, availability and time for supply of each individual part or LRU;

6-4. The hardware used **shall** be mature and reliable of high performance;

6-5. The PSR/MSSR Mode_S radar systems **shall** have a minimum service life of at least 15 years;

6-6. COTS software and hardware **shall** be supported by its respective supplier/developer. License and support agreements shall be transferred to the customer;

6-7. The maintainability of the application software, corrections, modifications and enhancements **shall** be provided by supplier without any regressions;

6-8. The system **should** have a UNIX operational system, preferably Linux;

6-9. The application software **shall** be documented and structured in a way that makes it easy to maintain.



7 HARDWARE AND DESIGN REQUIREMENTS

7-1 SYSTEM ENVIRONMENT REQUIREMENTS

7-1.1. PSR/MSSR Mode S radar, UPS and power distribution, antifire and HVAC system **shall** be installed in separate suitable rooms;

7-1.2. The equipment **shall** be possible to connect to AC 380 – 400V, three phase, 45-63 Hz;

7-1.3. External diesel generator, three phase, 60kVA, with automation for start and load transfer in case of mains power failure, **shall** be provided by MOLDATSA;

7-1.4. Dual UPS, three phase, **shall** be provided by MOLDATSA on basis of the presented by radar manufacturer specifications of radar power consumption and power supply requirements.

7-1.4.1. **Shall** be online, double conversion;

7-1.4.1. Batteries **shall** be for minimum one hour radar autonomy;

7-1.5. Automatic/Manual power selector: grid/generator and power distribution unit **shall** be provided by MOLDATSA;

7-1.6. Power distribution system with overvoltage and overload protections for essential users **shall** be included;

7-1.7. All power supplies **should** have protection against both over current and overvoltage in case of any occurring fault, e.g., short circuit of the voltage, short circuit in some component or thunderstorm impact;

7-1.8. The equipment **shall** be designed in compliance with Standard EN55032 of European Committee for Electro technical Standardization (CENELEC): "Limits and methods of measurement of radio interference characteristics of information technology equipment";

7-1.9. Antifire system (detection, extinguish end exhaustion) with local and remote alarming;

7-1.10. On the Radar Tower **shall** be Obstruction lights, conform the (ICAO) Annex 14 - Aerodromes.

7-2 SAFETY RELATED REQUIREMENTS

7-2.1. The equipment **shall** comply with the requirements as stated in applicable IEC Publications (950);

7-2.2. All materials **should** be antistatic and they shall not be dangerous for users;



7-2.3. All equipment **shall** be connected to the protective earth for safety reasons. Only exception is equipment with double insulation, which shall be indicated with a sign on the equipment;

7-2.4. Testing of potential free level in protective earth grounding **shall** be done at installation;

7-2.5. No loops in earthing circuits are allowed, but structure of circuits **shall** be of "tree" type.

7-3 HARDWARE INSTALLATION

7-3.1. The equipment **shall** be designed so that it can be easily installed, removed, and reinstalled with a minimum of special tools and without extensive disassembly;

7-3.2. All equipment pullout drawers (if such exist) **should** be of a full-suspension roller type with latching stops. Friction-slide construction is not preferred. Slides **shall** be of sufficient rigidity to prevent bowing and having rollers jump off their track;

7-3.3. The cabinets **shall** be provided with doors;

7-4 LABELING

7-4.1. Labeling **shall** be unified. The supplier shall propose the type of labeling system to be used;

7-4.2. Labels **shall** be made for the following items:

- a) Cabling;
- b) Cabinets and units;
- c) Cable vaults and conduits;
- d) Equipment.

7-4.3. Labeling **shall** include equipment labels, cable labels and cable addresses and color marking of cable vaults and conduits according to their disturbance group.

7-4.4. Markings **shall** be made in a permanent way to a lasting wear that can be mounted reliably.

7-4.5. Labels **shall** be fixed regularly and flexibly. If the label is hidden, then it shall be doubled or there shall be a pointer for it.

7-4.6. Labeling and corresponding documents **shall** be consistent.



7-5 CABLING

7-5.1. All cables and/or wiring **shall** be provided with at reasonable spare routings;

7-5.2. Cables **shall** have identification at both ends according to cabling documents and every 5 meters along the length.



8 NOTES

8-1 ABBREVIATIONS

ACC	Area Control Centre
ACP	Azimuth Count Pulse
ANSP	Air Navigation Service Provider
APG	Azimuth Pulse Generator
APP	Approach Control Centre
ASTERIX	All-purpose Structured Eurocontrol Radar Information Exchange
ATC	Air Traffic Control
ATCC	Air Traffic Control Centre
ATM	Air Traffic Management
BITE	Built-In Test equipment
CFAR	Constant False Alarm Regulation
COTS	Commercial Off-the-Shelf
CAM	Control and Monitoring System
DRF	Data Recording Facility
EATMP	European Air Traffic Management Program
FFM	Far Field Monitor
FRUIT	False Replies Unsynchronized In Time
FTS	Functional and Technical Specification
GPS	Global Positioning System
HVAC	Heating, Ventilation, and Air Conditioning
ICAO	International Civil Aviation Organization
IISLS	I ² SLS Improved Interrogation SLS
LCIPD	Local Convergence and Implementation Plan Document
LRU	Lowest Replaceable Unit
LVA	Large Vertical Aperture
MDS	Minimum Detectable Signal
MSSR	Monopulse Secondary Surveillance Radar
MTAC	Multiple Time Around Clutter
MTAT	Multiple Time Around Targets
MTBF	Mean Time Between Failures
MTBCF	Mean Time Between Critical Failures
MTD	Moving Target Detection
MTTR	Mean Time To Repair
NF	Noise Figure
NM	Nautical Mile
PCB	Printed Circuit Board
PAF	Plot Assignor Function



Pd	Probability of Detection
Pfa	Probability of False Alarm(s), False Alarm Probability
PROM	Programmable Memory
PSR	Primary Surveillance Radar
PTE	POEMS Test Equipment
RAM	Random Access Memory
RCS	Radar Cross Section
RF	Radio Frequency
RHD	Radar Horizon Distance
RMCS	Remote Monitoring and Control System
RMD	Radar Maintenance Display
RPM	Revolution per Minute
RTQC	Real Time Quality Control
S/C	Signal to Clutter Ratio
SASS-S	Surveillance Analysis Support System - Sensor
SCV	Sub Clutter Visibility
SDFC	Surveillance Data Filter and Combiner
SDP	Site Dependent Parameter
SLS	Sidelobe Suppression
SMF	System Management Function
SRU	Shop Replaceable Unit
SSR	Secondary Surveillance Radar
STC	Sensitivity Time Control
TAR	Terminal Approach Radar
TCP/IP	Transmission Control Protocol/Internet Protocol
TOD	Time Of Detection
TRS	Time Reference System
TWR	Tower Control
TTG	Test Target Generator
UPS	Uninterruptible Power Supply
UTC	Co-ordinated Universal Time
VSWR	Voltage Standing Wave Ratio