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TECHNICAL SPECIFICATION AND REQUIREMENTS FOR THE SUPPLY OF WAM SYSTEM

Prepared by CNS/ATM systems department

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CONTENTS

1.	GENERAL	5
1.1	INTRODUCTION	5
1.2	BASIC REQUIREMENTS	5
1.3	SLOVENIA CONTROL RESPONSIBILITIES	5
1.4	CONTRACTOR RESPONSIBILITIES REGARDING GROUND STATION INSTALATION	6
1.5	SCOPE OF THE DOCUMENT	6
1.6	REFERENCED DOCUMENTS AND STANDARDS	6
1.7	SPECIFICATIONS	6
1.8	STANDARDS	7
1.9	SLOVENIA CONTROL'S DOCUMENTS	7
2.	SLOVENIA CONTROL SYSTEM PERFORMANCE REQUIREMENTS	8
2.1	SLOVENIA CONTROL'S AIRSPACE ORGANIZATION	8
2.2	COVERAGE REQUIREMENTS	8
2.2.1	Coverage Specification (Services Specification)	10
3.	ED-142 "TECHNICAL SPECIFICATIONS FOR WIDE AREA MULTILATERATION (WAM) SYSTEM"	15
4.	SLOVENIA CONTROL ADDITIONAL REQUIREMENTS TO THE EXISTING STANDARDS AND SPECIFICATIONS	16
4.1	TARGET DETECTION	16
4.2	CODE DETECTION	16
4.3	POSITION ACCURACY	16
4.3.1	Horizontal Position Accuracy	16
4.3.2	Vertical Position Accuracy	16
4.4	DEGRADED MODE OF OPERATION	16
4.5	TARGET REPORTING REQUIREMENTS	17
4.5.1	Target Report Output Period	17
4.5.2	Data Output	17
4.5.2.1	Update of Changed Aircraft Information	17
4.5.3	Synchronization to external Systems	17
4.6	FUNCTIONAL REQUIREMENTS	17
4.7	SYSTEM STATES AND MODES OF THE CENTRAL PROCESS. SYSTEM (CPS)	18
4.7.1	Operational Mode	18
4.7.2	Maintenance Mode	18
4.8	SYSTEM SECURITY	18
4.9	INTERROGATION	19
4.9.1	1030 MHz Interrogation Transmission	19
4.9.2	Mode A/C Interrogation	19

4.10	TIME SYNCHRONIZATION.....	19
4.10.1	Time Synchronization	19
4.11	INTEGRITY	20
4.12	ADS-B PROCESSING.....	20
4.13	DATA OUTPUT MANAGEMENT	21
4.13.1	Data Output Modes	21
4.13.2	Data output formats	21
4.13.3	Number of outputs	22
4.14	DATA RECORDING	22
4.14.1	Data recording and replay capability	22
4.15	COMMUNICATIONS	22
4.16	TARGET CAPACITY	23
4.17	BITE	23
4.18	CONTROL AND MONITORING SYSTEM (CMS).....	23
4.18.1	CMS Functions	23
4.18.2	CMS requirements.....	24
4.18.3	LCMS requirements.....	24
4.18.4	Target Quality Evaluation Function	25
4.18.5	Display Function	25
4.19	WAM TEST AND EVALUATION SYSTEM (OFFLINE CPS).....	26
4.20	SYSTEM SERVICE CONDITIONS	26
4.20.1	Service life	26
4.20.2	Environmental Conditions	26
4.20.3	Susceptibility/Interference to other systems.....	26
4.20.4	Electrical environment	26
4.21	SYSTEM ARCHITECTURE	27
4.22	SOFTWARE AND HARDWARE DESIGNS.....	27
4.23	HARDWARE REQUIREMENTS	27
4.23.1	General.....	27
4.23.2	Remote Units (Ground Stations)	27
4.24	SOFTWARE REQUIREMENTS.....	28
4.25	SYSTEM EXPANDABILITY	28
4.26	SAFETY	28
4.27	RELIABILITY, AVAILABILITY, MAINTAINABILITY	29
4.27.1	Reliability analysis	29
5.	PROJECT MANAGEMENT.....	30
5.1	PROJECT MANAGER	30
5.2	PROGRESS MEETINGS.....	30
5.3	PROGRESS REPORTS REQUIREMENTS.....	30
6.	PROJECT TASKS	31
6.1	WAM COVERAGE ANALYSIS	31

6.2	ELEMENTS TO BE SUPPLIED BY THE CONTRACTOR.....	32
6.2.1	Equipment	32
6.2.2	Technical Infrastructure	32
6.3	PLANNING	32
6.4	VERIFICATION AND VALIDATION	33
6.4.1	Factory Acceptance Test (FAT)	33
6.4.1.1	FAT Documentation	33
6.4.1.2	FAT Execution	33
6.4.2	Site Acceptance Test (SAT)	34
6.4.2.1	SAT Documentation	34
6.4.2.2	SAT Execution	34
7.	LOGISTICS	36
7.1	DOCUMENTATION	36
7.2	TRAINING	36
7.2.1	WAM Technical training.....	36
7.2.2	Training documents	37
7.3	SPARES.....	37
7.4	WARRANTY PERIOD	37

1. GENERAL

1.1 INTRODUCTION

The overall purpose of this document is to specify requirements for the Slovenia Control Wide Area Multilateration - WAM system:

- Defined Slovenian WAM System Architecture
- Operational Requirements
- Technical Requirements

The SLOWAM System shall be composed of a Wide Area Multilateration (WAM) system covering Ljubljana FIR including Brnik (LJLJ), Maribor (LJMB), Portoroz (LJPZ) and Cerklje (LJCE) airports.

1.2 BASIC REQUIREMENTS

Gen-Basic- 01	To reduce the complexity regarding the installation and maintenance of the Wide Area Multilateration system, Slovenia Control shall define sites for WAM ground station locations with exact technical specifications for antenna characteristics, position, cable type and length, data transmission.
Gen-Basic- 02	To optimize selection of possible sites, Slovenia Control has made arrangements with local companies to select the most suitable locations for WAM equipment regarding line of sight, power, communications etc...
Gen-Basic- 03	<p>Slovenia Control defined the locations for the ground stations.</p> <p>Locations of site are specified in following files:</p> <ul style="list-style-type: none">• SLOWAM Sites.xlsx• SLOWAM Sites.kmz (Google Earth)
Gen-Basic- 04	The Wide Area Multilateration System shall comply with the performance requirements in EUROCAE Doc ED-142.
Gen-Basic- 05	<p>The Wide Area Multilateration System shall consist of, but not be limited to, the following principal items:</p> <ul style="list-style-type: none">• Sufficient Interrogators and Receivers to provide specified coverage, accuracy, availability in the required service areas as specified in this document.• Redundant WAM Central Processor System associated to the interrogators / receivers.• Offline WAM Central Processor System associated to the interrogators / receivers and to be used for testing and tuning purposes.• Synchronization system for the TDOA.• Control and Monitoring System (CMS).• Test transponder(s), if it is required by system design.
Gen-Basic- 06	The number and location of the receivers, interrogators, or combined interrogator/receivers, number of antennas required to satisfy the requirements of the WAM System, are specified in SLOWAM Sites.xlsx file.

1.3 SLOVENIA CONTROL RESPONSIBILITIES

Gen-Cust - 01	Slovenia Control shall be responsible to provide 220V/50 Hz AC mains power for elements of the Wide Area Multilateration system.
Gen-Cust - 02	Slovenia Control shall be responsible to provide infrastructure like shelters, buildings, masts, mounting racks for elements of the Wide Area Multilateration system.

Gen-Cust - 03	Slovenia Control shall be responsible to provide network equipment and communication between remote units and central processing station.
Gen-Cust - 04	Slovenia Control shall be responsible to provide all RF cables, power cables, communication cables, jumper cables.
Gen-Cust - 05	Slovenia Control shall be responsible to provide all civil works for successful installation of antennas and other equipment installation.

1.4 CONTRACTOR RESPONSIBILITIES REGARDING GROUND STATION INSTALATION

Gen-Contr - 01	Even though Contracting Authority is performing an installation Contractor shall be responsible for the inspection of proper installation and operation of Ground Station Remote units. In case some of Ground Stations are found not to be within specification, Contractor shall advise corrective activities.
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1.5 SCOPE OF THE DOCUMENT

Gen.Scope - 01	The purpose of this document is to define the functional, technical, system and all other requirements to be fulfilled to meet the Slovenia Control WAM specification.
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1.6 REFERENCED DOCUMENTS AND STANDARDS

All offered systems shall be compliant to the latest edition of the following documents. Slovenia Control can in some instances request better performances then specified in Specifications and Standards. In such cases Slovenia Control requirements take precedence over following documents and automatically become minimum specification requirements.

1.7 SPECIFICATIONS

Gen Spec - 01	RTCA, Minimum Operational Performance Standards for 1090-MHz Extended-Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information System-Broadcast (TIS-B) - DO-260.
Gen Spec - 02	RTCA, Minimum Operational Performance Standards for 1090-MHz Extended-Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information System-Broadcast (TIS-B) - DO-260A.
Gen Spec - 03	RTCA, Minimum Operational Performance Standards for 1090-MHz Extended-Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information System-Broadcast (TIS-B) - DO-260B.
Gen Spec - 04	EUROCAE, ED-73B, Minimum Operational Performance Specification for Secondary Surveillance Radar Mode S Transponders.
Gen Spec - 05	EUROCAE, ED-117, Minimum Operational Performance Specification for Mode S Multilateration systems for use in advanced surface movement guidance and control systems (A-SMGCS).
Gen Spec - 06	EUROCAE, ED-142, Technical Specification for Wide Area Multilateration (WAM) Systems.
Gen Spec - 07	EUROCAE, ED-129A, Technical Specification for a 1090 MHz Extended Squitter ADS-B Ground Station.
Gen Spec - 08	EUROCAE, ED126, Safety, Performance and Interoperability Requirements Document for ADS-B Airport Surface Surveillance Application (ADS-B-NRA).
Gen Spec - 09	EUROCAE, ED161, Safety, Performance and Interoperability Requirements Document for ADS-B Airport Surface Surveillance Application (ADS-B-RAD)
Gen Spec - 10	Slovenia Control additional requirements to the existing standards and specifications (Chapter 3).

1.8 STANDARDS

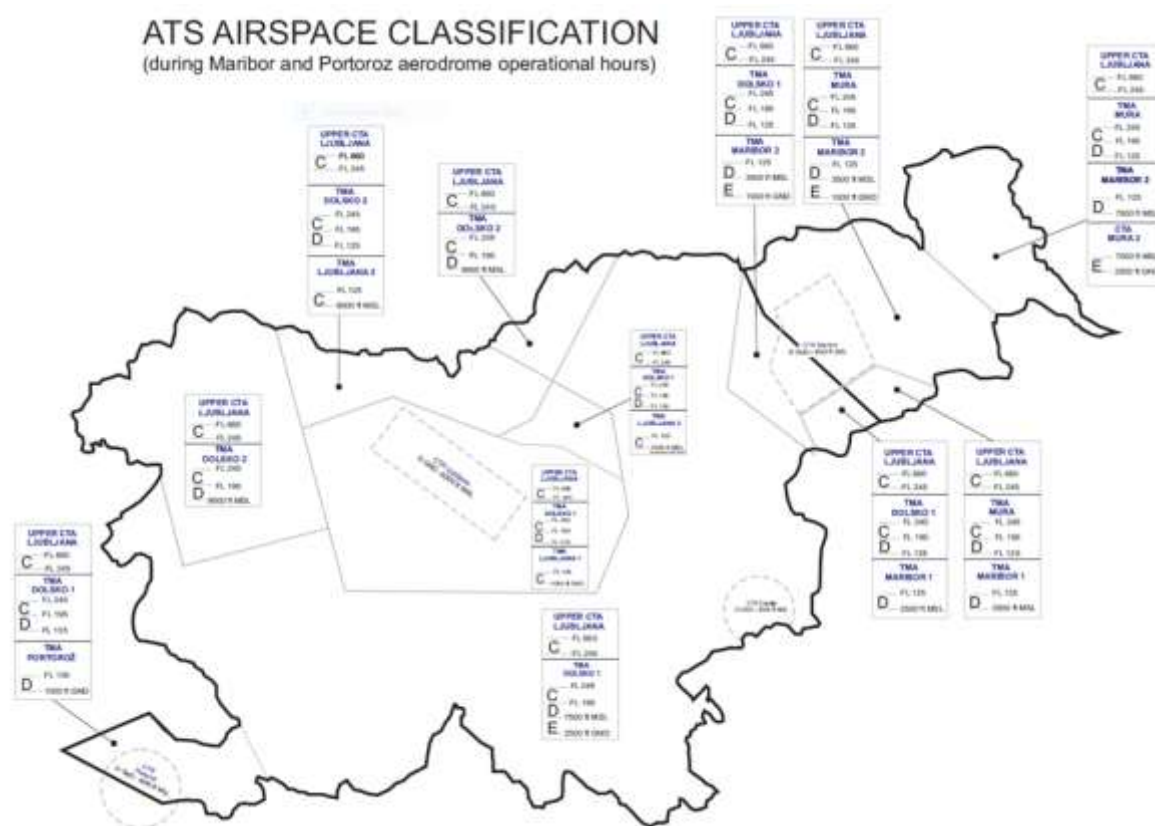
Gen Std - 01	ICAO Annex 10, Vol 4. Surveillance and Collision Avoidance Systems
Gen Std - 02	ICAO Doc. 9871 – Technical Provisions for Mode S Services and Extended Squitter
Gen Std - 03	ICAO Doc 9426-NA/924, Air Traffic Services Planning Manual
Gen Std - 04	ICAO Doc 4444-ATM/501, Air Traffic Management, Procedures for Air Navigation Services
Gen Std - 05	ICAO Doc 9924-AN/474, Aeronautical Surveillance Manual
Gen Std - 06	Asterix Category 019 – Eurocontrol Standard Document for Surveillance Data Exchange, Part 18, Multilateration System Status Messages, SUR.ET1.ST05.2000-STD-18-02
Gen Std - 07	Asterix Category 020 – Eurocontrol Standard Document for Surveillance Data Exchange, Part 14: Category 020, Multilateration Target Reports, SUR.ET1.ST05.2000-STD-14-02
Gen Std – 08	Asterix Category 21 – Eurocontrol Standard Document for Surveillance Data Exchange, Part 12: Category 021, ADS-B Messages, SUR.ET1.ST05.2000-STD-12-01
Gen Std – 09	Asterix Category 23 – Eurocontrol Standard Document for Surveillance Data Exchange, Part 16: Category 023, CNS/ATM Ground Station and Service Status Reports, SUR.ET1.ST05.2000-STD-16-01
Gen Std – 10	Asterix Category 010 – Eurocontrol Standard Document for Surveillance Data Exchange, Part 7: Category 010, Transmission of monosensor Surface Movement Data , SUR.ET1.ST05.2000-STD-07-01
Gen Std – 11	EUROCAE, ED-109A, Guidelines for Communication, Navigation, Surveillance and Air Traffic Management (CNS/ATM) Systems Software Integrity Assurance
Gen Std – 12	Asterix Category 247 – Eurocontrol Standard Document for Surveillance Data Exchange, Part 20: Category 247, Version Number Exchange, SUR.ET1.ST05.2000-STD20-01

1.9 SLOVENIA CONTROL'S DOCUMENTS

Gen Cref – 01	SLOWAM Sites.xlsx
Gen Cref - 02	SLOWAM Sites.kmz
Gen Cref - 03	Matrix of compliance

2. SLOVENIA CONTROL SYSTEM PERFORMANCE REQUIREMENTS

2.1 SLOVENIA CONTROL'S AIRSPACE ORGANIZATION

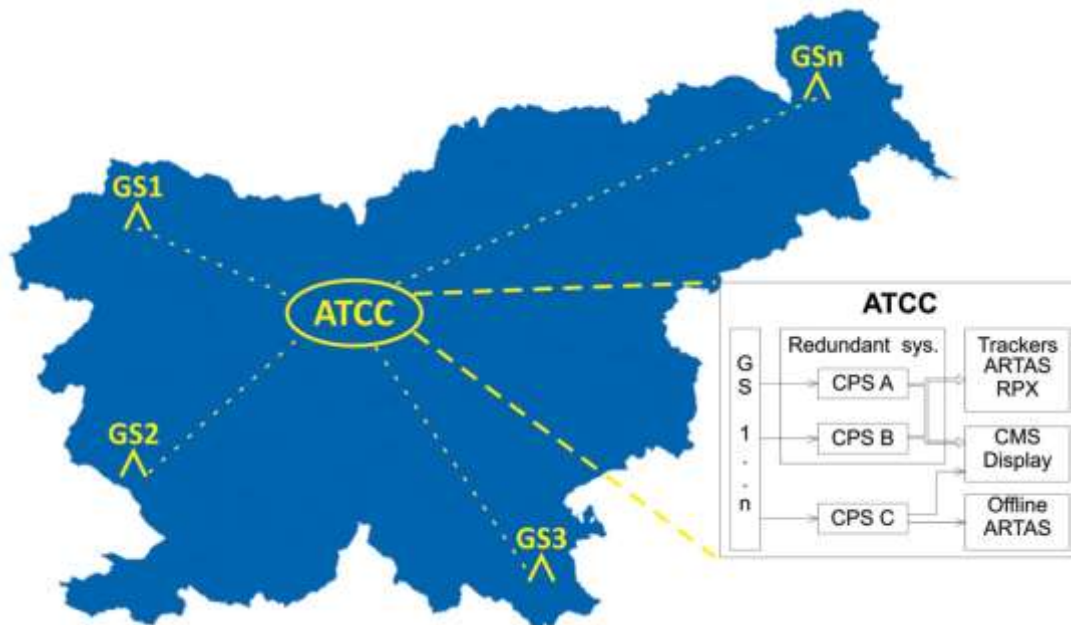


Picture 1 : Slovenia Control's Airspace Organization

2.2 COVERAGE REQUIREMENTS

Perf. Cov - 01	The WAM System should as a minimum provide coverage in the volumes presented below. Each Volume/Sector shall be independent output Service from Central Processor.
Perf. Cov - 02	In the tables Volume/Sectors are listed with coordinates and the associated requirements for coverage. Below each table a sketch of the Volume/Sector is presented.
Perf. Cov - 03	The WAM System should as a minimum provide coverage in the Sector A Service TOP (Ljubljana FIR + 40 NM) presented below.
Perf. Cov - 04	The WAM System should as a minimum provide coverage in the Sector B Service LOW (Ljubljana FIR + 10 NM) presented below.
Perf. Cov - 05	The WAM System should as a minimum provide coverage in the Sector C Service WEST presented below.
Perf. Cov - 06	The WAM System should as a minimum provide coverage in the Sector D Service EAST presented below.
Perf. Cov - 07	The WAM System should as a minimum provide coverage in the Sector E Service CTR presented below.
Perf. Cov - 08	The WAM system shall provide continuous coverage in the above defined sectors and be capable of detecting, identifying, tracking and processing targets equipped with SSR Mode-A/C, Mode S ELS and EHS transponders as well as ADS-B 1090 MHz Extended Squitter avionics and non-transponder devices.

- Perf. Cov – 09 The WAM system shall be capable of detecting and tracking the targets outside the specified Sectors to increase situational awareness of adjacent FIR's air situation.
- Perf. Cov – 10 The WAM system shall be capable to increase or alter the operational coverage volumes or the system performance through the addition or redeployment of receiving units and/or transmitting units.
- Perf. Cov – 11 The WAM system shall be expandable to satisfy possible future coverage requirements. E.g. the processor in the offer shall be able to handle at least 100 ground stations.
- Perf. Cov – 12 The required minimum coverage altitudes for all Sectors are defined as feet AMSL. In areas where terrain height is higher than required minimum altitude coverage the minimum coverage is expected to be same as terrain height.
- Perf. Cov – 13 The used coordinate system shall be WGS-84.
- Perf. Cov – 14 The coverage for ADS-B shall be from the required minimum coverage altitude to ceiling of the respective sectors.



Picture 2 : Slovenia Control's WAM System Structure

2.2.1 Coverage Specification (Services Specification)

	Name	Coordinates	Height
Perf. Cov. Sp. – 1	Sector A	12.66054787970133, 45.45036199560955	At least from FL 245 to FL 660
	Service TOP	13.88929233742833, 44.76646291877133	
	(Ljubljana FIR + 40 NM)	16.06380302971598, 45.00327670204039	
		17.35163459805115, 46.04084762442886	
		17.00040026999729, 47.32218231156518	
		15.16362821076374, 47.32612563439292	
		14.56188378580413, 47.06222801947622	
		13.70238922374775, 47.17718822217183	
		12.44895831917737, 46.26765083523038	
		12.66054787970133, 45.45036199560955	



Picture 2 : Sector A (Service TOP - Ljubljana FIR + 40 NM)

Perf. Cov. Sp. – 2	Sector B	13.14418429666129, 46.28040490809989,	At least from FL 125 to FL 245
	Service LOW	13.39188683049582, 45.70119129489159,	
	(Ljubljana FIR + 10 NM)	13.36503987841518, 45.46916522093797,	
		13.4705833666772, 45.30454704802089,	
		14.5877877301881, 45.36245450471055,	
		15.21784792060114, 45.31339155170193,	
		15.57991118631227, 45.40129411098205,	
		15.53972111866059, 45.55005335458408,	
		15.91697194832582, 45.85912707249235,	
		16.47830030926583, 46.26709271253561,	
		16.82327729284996, 46.46853041107021,	
		16.58075883217115, 46.84950130289879,	
		15.94513384462353, 47.01142050543318,	
		14.71903202203073, 46.6564435122797,	
		14.45014903093024, 46.53192975235306,	
		13.55769060878325, 46.64357764354345,	
		13.14418429666129, 46.28040490809989	



Picture 3 : Sector B (Service LOW - Ljubljana FIR + 10 NM)

Perf. Cov. Sp. – 3	Sector C Service WEST	14.84881056692677, 46.58292172474236, 14.58165825631863, 46.4239370413771, 14.42988080226904, 46.44803360201074, 14.27941201877286, 46.44534973928801, 14.09202880170833, 46.48438983264304, 13.91856195061723, 46.52931685519523, 13.69975389155698, 46.52217117096368, 13.36462525830603, 46.31635747662785, 13.41155176815392, 46.19829099576778, 13.65413515266044, 46.17193143825812, 13.45954997251339, 46.03280086747198, 13.50376902694709, 45.95461632822939, 13.6413167584284, 45.96500093700613, 13.56630822394036, 45.85291832526434, 13.58526922342638, 45.79324297669914, 13.78873086039009, 45.73792279662627, 13.90432838051025, 45.63013575787776, 13.84207889615858, 45.5934085405599, 13.72295261477489, 45.60209654218119, 13.5588910606464, 45.59631498840815, 13.47044672016581, 45.50426858577293, 13.66660122019695, 45.44112212672098, 13.85749156714157, 45.42160275910507, 13.99113976076859, 45.45271627650049, 14.00862607081891, 45.49378974361488, 14.20152097253534, 45.46281258975435, 14.38377776954673, 45.48257766654677, 14.50603916504811, 45.52822967441692, 14.57561251189091, 45.66101601634977	At least from FL 50 to FL 125
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Picture 4 : Sector C (Service WEST)

Perf. Cov. Sp. – 4	Sector D Service EAST	15.71436015248894, 46.00957896040537, 15.72668676050951, 46.05091204195308, 15.61840648860551, 46.16239180375096, 16.03117897786939, 46.30953823085252, 16.29965640666021, 46.37129701177604, 16.31805553052825, 46.50146705260052, 16.61127616229736, 46.45369238034518, 16.35904692785953, 46.83791853154512, 16.28912878326487, 46.8801909702111, 16.09731325104568, 46.86973971099736, 15.98227884805591, 46.8287346060401, 15.99149899462051, 46.78974429219984, 15.98307610467425, 46.75178946988458, 16.00164592304934, 46.71591503222457, 16.02651948842315, 46.70381715365172, 16.0386902204336, 46.65646953171925, 15.99745961887766, 46.68514327297277, 15.85233382388197, 46.72944966488061, 15.74494920702015, 46.703123992963, 15.64975916455318, 46.71254290643223, 15.63791898806753, 46.69237259675374, 15.59574127030649, 46.69293829666546, 15.04443720721177, 46.6564179812048, 14.9840987050656, 46.6229804913031, 14.95438957568396, 46.6339621745246, 14.87016651381797, 46.61123289602734, 14.84866897937946, 46.58292738477633, 15.71436015248894, 46.00957896040537	At least from FL 50 to FL 125
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Picture 5 : Sector D (Service EAST)

Perf. Cov. Sp. – 5.1	Sector E Service CTR Ljubljana Airport	14.32695409607364, 46.22240225329669, 14.70900729772522, 46.02781924284347, 14.80504137640415, 46.12203423803629, 14.42305477248118, 46.31304706651077, 14.32695409607364, 46.22240225329669	At least from FL 35 to FL 50
Perf. Cov. Sp. – 5.2	Sector E Service CTR Maribor Airport	15.58234925217456, 46.52508618670548, 15.60949140024402, 46.49029589872068, 15.55744449294949, 46.40608524326406, 15.6615625447345, 46.29770065413506, 15.88721111250494, 46.40479038999709, 15.7492206960137, 46.60000016391765, 15.58234925217456, 46.52508618670548	At least from FL 35 to FL 50
Perf. Cov. Sp. – 5.3	Sector E Service CTR Portoroz Airport	13.61143099001574, 45.37612001406748, 13.78161470670461, 45.50320929886718, 13.59636868460219, 45.60572794576876, 13.43383207453283, 45.46277377950473, 13.61143099001574, 45.37612001406748	At least from FL 35 to FL 50
Perf. Cov. Sp. – 5.4	Sector E Service CTR Cerklje Airport	15.66956549064738, 45.84260616173796, 15.5656885926427, 45.97949050593628, 15.36496576847604, 45.90654027754491, 15.46851786460294, 45.79792980004782, 15.66956549064738, 45.84260616173796	At least from FL 35 to FL 50



Picture 6 : Sector E (Service CTR)

3. ED-142 “TECHNICAL SPECIFICATIONS FOR WIDE AREA MULTILATERATION (WAM) SYSTEM”

Perf. ED-142 - 01 The WAM system shall comply with ED-142: "Technical Specification for Wide Area Multilateration (WAM) Systems". Bidder shall precisely describe how is compliant with each requirement, option, recommendation described in document.

4. SLOVENIA CONTROL ADDITIONAL REQUIREMENTS TO THE EXISTING STANDARDS AND SPECIFICATIONS

4.1 TARGET DETECTION

Perf. Pod - 01 The Probability of detection for any target within update interval in the coverage volume shall be greater than or equal to 98%.

4.2 CODE DETECTION

Perf. Code - 01 The receiver(s) of the Ground stations shall implement algorithms features compliant or exceeding DO260B specifications thus allowing for ultimate performance even under high fruit conditions.

4.3 POSITION ACCURACY

4.3.1 Horizontal Position Accuracy

Perf. HPA - 01 Within the above specified Sector A (Service TOP - Ljubljana FIR + 40 NM), the horizontal position errors shall be 100 meters RMS or better.

Perf. HPA - 02 Within the above specified Sector B (Service LOW - Ljubljana FIR + 10 NM), the horizontal position errors shall be 70 meters RMS or better.

Perf. HPA - 03 Within the above specified Sector C and Sector D (Service WEST and Service EAST), the horizontal position errors shall be 50 meters RMS or better.

Perf. HPA - 04 Within the above specified Sector E (Service CTR), the horizontal position for CTR LJLJ, CTR LJMB and CTR LJCE errors shall be 30 meters RMS or better. For CTR LJPZ horizontal position errors shall be 60 meters or better.

Perf. HPA - 05 The horizontal WAM position shall be derived independently of latitude and longitude obtained from ADS-B message content.

4.3.2 Vertical Position Accuracy

Perf. VPA - 01 The reported vertical position information shall be based on barometrical altitude reported by targets within the specified coverage.

Perf. VPA - 02 Each target report shall contain a pressure altitude report acquired during the latest update interval. Coasting or extrapolation of previous pressure altitude data is not allowed.

4.4 DEGRADED MODE OF OPERATION

Perf. Degr – 01 The system shall include a tool which will continuously monitor status of different ground station units and in case of predefined failure combinations automatically announce unavailability of affected service.

Perf. Degr – 02 In case of one ground station unit is out of function (N-1) or out of system parameters, the WAM System shall continue to operate with the same performance as during normal operation.

Perf. Degr – 03 In case of more than one ground station unit is out of function or out of system parameters (N-2 or more), the WAM system shall only declare a fault if system minimum required performance is affected. Two or more remote units failing that do not cover the same part of airspace shall not cause the system to fail and not produce a system fault condition.

Perf. Degr – 04 In case of more than one ground station unit failing that have overlapping coverage the system shall calculate accuracy and only in case it is not within the minimum requirement announce a failure of the affected sector.

4.5 TARGET REPORTING REQUIREMENTS

Perf. Track – 01	As the WAM target output is fed into ARTAS and RPX tracker systems, the WAM system shall provide calculated plots without smoothing or extrapolation.
Perf. Track – 02	The target reports may contain, in addition to the information in the plot reports, track information like speed, heading, track number, etc.
Perf. Track – 03	As an alternative to the last calculated position (periodic delayed mode) the system shall be able to provide the position extrapolated to the time of the output of the track report (periodic predicted mode). It is noted that this output is not used in conjunction with tracker systems.
Perf. Track – 04	The update interval of the periodical target reports shall be selectable by the user.
Perf. Track – 05	The Bidder shall, as part of the proposal, provide detailed information on the track overload processing implemented within the system.

4.5.1 Target Report Output Period

Perf. Out – 01	The plot report and track report update interval shall be configurable for any intervals between 1 and 4 seconds by steps of 1 second.
Perf. Out – 02	The output period shall be configurable for each defined Service area separately.

4.5.2 Data Output

4.5.2.1 Update of Changed Aircraft Information

Perf. AC Up - 01	The WAM system shall output changes in the following aircraft information within 3 times the maximum update interval with a probability of 95%: <ul style="list-style-type: none">– ACID– Mode A code
Perf. AC Up – 02	The WAM system shall output changes in the following aircraft information within the maximum update interval with a probability of 95%: <ul style="list-style-type: none">– Emergency Codes– SPI

4.5.3 Synchronization to external Systems

Perf. Sync - 01	The WAM internal clock system used for time stamping of Asterix target reports shall be synchronized with UTC to sufficient accuracy which will guarantee requested Slovenia Control operation.
Perf. Sync - 02	In case of the primary synchronization source failing, the WAM system shall provide a backup source for Asterix time stamping that continues to ensure synchronization to UTC.

4.6 FUNCTIONAL REQUIREMENTS

Sys. Func - 01	The WAM system shall be designed in such way to minimize RF spectrum pollution, therefore reduce Interrogation to the minimum. The bidder shall as part of its offer provide software tool which will monitor, analyze and log transponder load generated by each multilateration system. Interrogation load shall be kept below 2% for any individual transponder.
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4.7 SYSTEM STATES AND MODES OF THE CENTRAL PROCESS. SYSTEM (CPS)

- Sys. Stat_M - 01 The WAM system shall be fully operational within 5 minutes of start-up or restart after power drop at the CPS and all the remote sites after proper shutdown.
- Sys. Stat_M - 02 It is noted that this does not apply for planned power-off, e.g. after a maintenance intervention where the system was in maintenance mode prior to power cycling and is then booted into operational mode.

4.7.1 Operational Mode

- Sys. OPSmod- 01 Within the operational mode the WAM system shall provide all main system functions to meet the required system performance as detailed in this specification.
- Sys. OPSmod - 02 Within the operational mode access to functions with impact on the operational performance shall be allowed only for users with adequate privileges.
- Sys. OPSmod - 03 It shall be possible to switch any unit of the WAM system from the operational mode to the maintenance mode.
- Sys. OPSmod - 04 Within the operational mode WAM ground station units set to maintenance shall not be used for target data processing.

4.7.2 Maintenance Mode

- Sys. Maimod - 01 Within the maintenance mode the WAM system shall provide all system functions as available within the operational mode.
- Sys. Maimod - 02 Within the maintenance mode the WAM system shall not transmit any plot or track reports.
- Sys. Maimod - 03 The WAM system shall transmit plot, track and status reports, only if required by the users.
- Sys. Maimod - 04 It shall be possible to switch any WAM system element from the operational mode to the maintenance mode.
- Sys. Maimod - 05 Within the maintenance mode the central processing unit in operation shall not be influenced by the central processing unit in maintenance mode.

4.8 SYSTEM SECURITY

- Sys. Securi - 01 The WAM system shall control the access to the system by users through password controlled login.
- Sys. Securi – 02 The WAM system shall allow defining individual user roles for groups of user with different individual access rights.
- Sys. Securi – 03 The WAM system shall have at least three different user roles as:
 - a monitoring user, able to retrieve status information
 - a supervisor **or maintenance** user, having the rights of a monitor user plus the ability to modify configuration parameters of the system and command system modes
 - an administrator user, able to configure user roles and administrate the system platform.
- Sys. Securi - 04 The WAM system shall be able to prevent concurrent access by multiple maintenance users to the same system element.
- Sys. Securi - 05 If system is locked by number of wrong login attempts the system administrator shall be able to unlock it.

4.9 INTERROGATION

4.9.1 1030 MHz Interrogation Transmission

Sys. Int – 01	The Bidder shall describe in detail the Interrogation Function.
Sys. Int – 02	The WAM system shall be able to operate on its own without interrogations from other systems.
Sys. Int - 03	<p>The WAM system shall be able to interrogate Mode-S and Mode-A/C transponders to obtain the following information to be included within the target reports:</p> <ul style="list-style-type: none">– Mode-A code– Mode-C code– Elementary Mode S information (Mode S Address, Mode S Aircraft Identification, Mode S Communication Capabilities and Flight Status, Mode A code and pressure altitude 25ft resolution).
Sys. Int - 04	The WAM System shall upon user request provide EHS information from equipped targets. (Any BDS register could be selected).
Sys. Int - 05	The WAM System shall extract the register BDS 3.0 for the duration that an ACAS RA is detected.
Sys. Int – 06	The average transponder occupancy time introduced by the WAM system shall be determined. This function is required for the operator of the WAM system to demonstrate compliance to the ICAO Annex 10 requirement that no transponder shall be kept busy processing replies or rejection interrogations by any interrogator of the WAM system for more than 2% of the transponder's time.
Sys. Int – 07	<p>The system shall provide interrogation log files detailing for each interrogation:</p> <ul style="list-style-type: none">– the time of interrogation– the interrogator used– the target interrogated– the message format used– the interrogation power used

4.9.2 Mode A/C Interrogation

Perf. ModA - 01	Where Mode A/C interrogations are required, the WAM system shall interrogate Mode A/C aircraft using Mode A/C only all call (i.e. Inter-mode with short P4 pulse).
Perf. ModA - 02	The system shall not use Mode A/C Whisper/Shout technology similar to ACAS as this would overload the spectrum. The bidder shall describe an alternative technology to detect and identity Mode A/C targets.

4.10 TIME SYNCHRONIZATION

4.10.1 Time Synchronization

Sys. TSync - 01	The WAM system shall have at least two independent time synchronization methods in order to provide a robust common timing reference for the system.
Sys. TSync - 02	The system shall be able to use the dual time synchronization methods simultaneously and in case of losing one source the system performance shall not degrade and the system shall continue to output the data without human actions.
Sys. TSync - 03	The WAM system shall be able to start up and operate within its required performance limits with only one of the two synchronization methods being available regardless of targets being present or not.

Sys. TSync - 04	Should the other time synchronization source (e.g. GNSS) be lost, the WAM system shall, without interruption of data, fulfill the performance requirements and continue to operate normally for at least one hour.
Sys. TSync - 05	The operator shall be informed about the status of the time synchronization system.
Sys. TSync - 06	The Bidders shall describe in detail the time synchronization method used within the WAM System.

4.11 INTEGRITY

Sys. Integ - 01	The WAM system shall have the ability to provide continuous validation of data and timely alerts to the operator when the system must not be safely used in operation as intended.
Sys. Integ – 02	The WAM system shall include field-mounted test targets for performance and integrity monitoring allowing for end-to-end performance test of the system.
Sys. Integ – 03	Reference and Monitoring Transponders (RMTR) may be used for the end-to-end test of the WAM system.

4.12 ADS-B PROCESSING

Sys. ADS-B - 01	The system shall receive and process 1090 MHz Extended Squitter (1090 ES) ADS-B Messages as defined by ICAO Annex 10 and Eurocae ED102/RTCA DO260, DO260A, and ED102A/DO-260B.
Sys. ADS-B – 02	The system shall apply a global CPR reasonableness test in order to validate the position decoding.
Sys. ADS-B – 03	The ADS-B function shall output a Figure of Merit / Position Accuracy Value (FOM/PA) for ADS-B according to the Navigation Uncertainty Category contained in messages complying with MOPS DO260 and output a FOM/PA mapped according to a configurable mapping table out of Navigation Integrity Category (NIC), Navigation Accuracy Category (NAC) and Software Integrity Level (SIL) contained in messages complying with MOPS DO260A and DO260B.
Sys. ADS-B – 04	The system shall output an ADS-B report within 50ms of receiving the specified triggering message.
Sys. ADS-B – 05	The system shall output ADS-B target reports in a configured interval or continuously as the ADS-B messages are received.
Sys. ADS-B – 06	The system shall be able to adjust the actual ADS-B target report update rate to adapt to the available network capacity.
Sys. ADS-B – 07	The system shall be able to ensure the following processes: <ul style="list-style-type: none"> – eliminate duplicate target reports – validate data consistency
Sys. ADS-B – 08	The system shall be capable of receiving and decoding ADS-B messages from at least 250 targets/second.
Sys. ADS-B – 09	The system shall output ADS-B plots (no coasting of ADS-B targets is allowed).
Sys. ADS-B – 10	The ADS-B system shall output target and status reports on multiple outputs, which are individually configurable.
Sys. ADS-B – 11	The ADS-B system shall be able to provide the data to other systems with the following ASTERIX formats: ASTERIX Category 021 with user selectable Editions.
Sys. ADS-B – 12	The System shall allow filtering of ADS-B targets according to the following criteria: <ul style="list-style-type: none"> – Airborne/ground targets – geographical area/polygon

	<ul style="list-style-type: none"> – altitude band – figure of merit – Mode S Address – Call Sign – Squawk – Etc...
Sys. ADS-B – 13	For each target resulting in the generation of an ADS-B target reports, ADS-B shall compare the position information within the ADS-B target data against the position information calculated by WAM for that target.
Sys. ADS-B – 14	The comparison of ADS-B and WAM position information shall be enabled or disabled via configuration parameter.
Sys. ADS-B – 15	For each target undergoing ADS-B/WAM position comparison, if the absolute distance between the ADS-B position and calculated WAM position is less than or equal to a pre-defined threshold, the ADS-B target report shall indicate that the ADS-B reported position is potentially accurate, by setting bit 3 in Data Item I021/040 (Target report descriptor) to "1".
Sys. ADS-B – 16	The distance threshold used for ADS-B/WAM position comparison shall be a configurable parameter in the unit meters.
Sys. ADS-B – 17	The system shall provide additional means to identify false ADS-B targets that may be created by either transponder malfunctions or by intentional transmission of false information (spoofing).
Sys. ADS-B – 18	The system shall verify the received ADS-B data and mark target reports that fail integrity verification as potentially erroneous.
Sys. ADS-B – 19	The Bidders shall describe in detail the ADS-B integrity verification methods applied to ensure for the protection of reported target integrity.

4.13 DATA OUTPUT MANAGEMENT

4.13.1 Data Output Modes

Sys. OutMd - 01	<p>The WAM system shall be able to output data operating in one or more, but not limited to, of the following output modes:</p> <ul style="list-style-type: none"> – Data Driven Mode – Periodic Delayed Mode – Periodic Predicted Mode
Sys. OutMd - 02	The default output mode shall be periodic delayed mode.

4.13.2 Data output formats

Sys. OutF - 01	<p>The WAM system shall be able to provide the data to any other system(s) with the following ASTERIX formats:</p> <p>ASTERIX Category 010, part 7, Transmission of monosensor Surface Movement Data , SUR.ET1.ST05.2000-STD-07-01</p> <p>ASTERIX Category 019, part 18, Multilateration System Status Messages, SUR.ET1.ST05.2000-STD-18-02</p> <p>ASTERIX Category 020, part 14, Multilateration Target Reports SUR.ET1.ST05.2000-STD-14-02</p> <p>ASTERIX Category 021, part 12, ADS-B Reports, SUR.ET1.ST05.2000-STD-12-01, Edition 2.1</p> <p>ASTERIX Category 023, part 16, CNS/ATM Ground Station and Service Status Reports, SUR.ET1.ST05.2000-STD-16-01</p> <p>ASTERIX Category 247, part 20: Category 247, Version Number Exchange, SUR.ET1.ST05.2000-STD20-01</p>
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4.13.3 Number of outputs

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| Sys. Output - 01 | The WAM system shall, as a minimum, provide 16 independent logical output channels for the submission of target reports and status information. |
| Sys. Output - 02 | Each of the output channels shall be configurable to at least 2 simultaneous addresses of destination. |
| Sys. Output - 03 | For each of these output channels at least the following parameters shall be definable by the WAM system administrator: <ul style="list-style-type: none">– Addresses and ports (broadcast-, multicast- or unicast-addresses)– Transmission protocol (UDP, TCP)– Status of the output (either active, non-active or test)– User definable geographical maps to filter target reports– ASTERIX category– Update interval |

4.14 DATA RECORDING

4.14.1 Data recording and replay capability

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| Sys. Rec – 01 | The system shall record and replay all internal and external data, but at least the following data: <ul style="list-style-type: none">– Plot reports– Track reports– Target information after the several internal steps of data processing (including quality information if available)– Interrogation activity including which interrogator transmitted at what power to which target with which interrogation format and an interrogation success statistics correlating interrogations sent with successfully received replies. |
| Sys. Rec – 02 | The system shall be able to record and replay all output formats with a single tool into the same file so that the context is preserved. |
| Sys. Rec – 03 | The system shall provide the functionality to export and import recorded data. |
| Sys. Rec – 04 | The system shall provide the functionality to filter the data on target specific data items. |
| Sys. Rec – 05 | The system shall provide the functionality to have a listing of all data in a readable format. |
| Sys. Rec – 06 | The system shall provide the functionality to have a screen shot of the displayed data. |
| Sys. Rec – 07 | The Bidder shall, as part of the proposal, describe the human machine interface as realized for the data recording and replay function. |
| Sys. Rec – 08 | The system shall maintain a time stamped record of the operating status, states and modes of the equipment. |
| Sys. Rec – 09 | The system shall be able to log any user interaction on configuration including: <ul style="list-style-type: none">– Access attempts– Control actions– Configuration changes |

4.15 COMMUNICATIONS

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| Sys. Com – 01 | Communication part between ground stations and Central Processing Station is responsibility of Slovenia Control. |
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Sys. Com – 02 Contracting Authority shall provide communication bandwidth with at least 1Mbit/s.

4.16 TARGET CAPACITY

Sys. TgtCap – 01 As a minimum, the WAM system shall be able to simultaneously acquire and maintain tracking of 400 targets within its stated operational coverage volume while meeting all the specified surveillance performance requirements.

Sys. TgtCap - 02 An overload mechanism shall be provided to detect when the number of targets exceeds a configurable capacity threshold. In case of overload targets that are outside of specified Volume/Sectors are first to be discarded.

Sys. TgtCap - 03 In addition and separate to multilateration calculation the WAM system shall provide the capability to process all information included within Mode-S and ADS-B messages (e.g. enhanced surveillance).

4.17 BITE

Sys. BITE - 01 The Bidder shall describe in detail the Built In Test Equipment (BITE).

Sys. BITE - 02 The Bidder shall describe which system unit parameters and functions are monitored by the BITE.

4.18 CONTROL AND MONITORING SYSTEM (CMS)

4.18.1 CMS Functions

Sys.CmsFun - 01 The CMS function shall provide the following sub-functions:

- System units status monitoring and control
- System configuration
- Target report quality evaluation
- Display

Sys.CmsFun - 02 User access to the system monitoring and control function shall be protected by password providing the following different authorization levels:

- Operator (lowest level; access to system units status monitoring functions)
- Maintenance Engineer (medium level; access to system units status monitoring and control functions)
- System Administrator (highest level; access to configuration functions and system units status monitoring and control functions)

Sys.CmsFun – 03 To allow remote login the RMCS shall provide a remote access via telecommunication lines.

Sys.CmsFun – 04 The remote access shall provide security functions to prevent unauthorized access to the system (eg. password, encryption, access logging).

Sys.CmsFun – 05 The system shall prevent remote control or configuration access to any element by more than one authorized user at a time (subject of authorization level). The access mechanism shall be centrally managed.

Sys.CmsFun – 06 The system shall notify the Centralized Monitoring and Control System when an authorized or unauthorized connection to an element is established.

Sys.CmsFun – 07 The system shall provide real time performance statistics at least on:

- remote unit synchronization drift and offset per remote unit
- ground network link usage per remote unit
- target numbers for total targets, Mode S, Mode A/C and ADS-B
- Interrogation type, used interrogator, power, success rate of interrogations
- Probability of detection per target

4.18.2 CMS requirements

Sys.CMS- 01	<p>The CMS shall include the collection, evaluation, graphical presentation and recording of at least the following status items and status reports:</p> <ul style="list-style-type: none">– WAM system units status– Status of all processes performed within the different WAM system units– WAM system units status and failure reports– WAM system units access
Sys.CMS– 02	<p>Each of the status items and status reports of the WAM units shall be marked with at least the following identification data:</p> <ul style="list-style-type: none">– Source identifier– Time stamp– Criticality
Sys.CMS– 03	<p>The CMS shall be designed in such a way that when more than one CMS is installed within the System all CMS's can monitor the System.</p>
Sys.CMS– 04	<p>The CMS shall be designed in such a way that when more than one CMS is installed within the System that only one CMS can control the System at any given time.</p>
Sys.CMS– 05	<p>The WAM system elements status reports shall be submitted periodically and on event.</p>
Sys.CMS– 06	<p>The CMS shall include manual change of the WAM system elements status, manual changeover to standby channels and manual reset of system units.</p>
Sys.CMS– 07	<p>The Bidder shall, as part of the proposal, describe which status items of the different CMS system units can be monitored and/or controlled locally.</p>
Sys.CMS– 08	<p>The CMS should be able to update software on the remote units remotely.</p>
Sys.CMS– 09	<p>The CMS system shall use the SNMP protocol to exchange control and monitoring data with an external system.</p>
Sys.CMS– 10	<p>The transmission protocol for the interface to an external system shall be able to use different transmission protocols (UDP, TCP) which must be selectable by the system administrator.</p>
Sys.CMS– 11	<p>The system configuration function shall provide the possibility to change at least the following system configuration items:</p> <ul style="list-style-type: none">– Number of sensor units– Number of WAM time synchronization units (if required)– Mode of operation of WAM system units / system unit channels (Operational Mode / Maintenance Mode)– Test transponders if any
Sys.CMS– 12	<p>The Bidder shall describe which system configuration items can be modified as part of the system configuration function.</p>
Sys.CMS– 13	<p>The Bidder shall describe the human machine interface as used within the system configuration function.</p>

4.18.3 LCMS requirements

Sys. LCMS - 01	<p>The LCMS shall be able to support all maintenance activities necessary to perform on each Ground Station and CPS's, these activities consists of fault detection to Line Replaceable Unit (LRU) level, configuration and access to error logs.</p>
Sys. LCMS - 02	<p>The LCMS shall be able to support all configuration capabilities of the System.</p>
Sys. LCMS – 03	<p>The LCMS System shall have a Technical Situation Display to display in real time the WAM and ADS-B traffic situation.</p>

Sys. LMCS – 04	The LCMS shall be able to update software on the Ground Stations and CPS's locally.
Sys. LMCS – 05	The software for the Local Control and Monitoring System shall be installed on the provided laptop.

4.18.4 Target Quality Evaluation Function

Sys.TgtEva - 01	At least the following data items, describing the quality of the reported target, shall be calculated and included within the target reports: Number and identification of sensor units used for target position calculation: <ul style="list-style-type: none"> – Horizontal dilution of precision. – Vertical dilution of precision. – Estimated position accuracy (2-dimensional position, height)
Sys.TgtEva - 02	The Bidder shall, as part of the proposal, describe which additional items describing the quality of the reported target data are calculated and included within target position reports and target track reports.

4.18.5 Display Function

Sys. Disp - 01	The CMS System shall have a Technical Situation Display to display in real time the WAM and ADS-B traffic situation based on ASTERIX CAT020 (WAM), and CAT021 (ADS-B) target reports.
Sys. Disp - 02	The CMS shall be able to use all of the fields within the ASTERIX CAT019 (WAM status) and CAT023 (ADS-B status) and display them to the user.
Sys. Disp – 03	The Bidder shall, as part of the proposal, describe the human machine interface as realized within the CMS.
Sys. Disp - 04	The system shall provide the functionality to display target reports under laid by area maps, system configuration maps and filtering maps.
Sys. Disp – 05	The system shall provide the functionality to display target report quality evaluation data.
Sys. Disp – 06	The system shall provide the functionality to display all data items of an individual target report by selecting the corresponding target on the display screen.
Sys. Disp – 07	The system shall provide the functionality to display the data provided by a selectable output channel of the WAM system.
Sys. Disp – 08	The system shall provide the functionality to define geographical maps to filter target reports (defining 3-dimensional position).
Sys. Disp – 09	The system shall provide the functionality to define target filters depending on available target information.
Sys. Disp – 10	The display function shall provide a target search function.
Sys. Disp – 11	The display function shall provide panning and zooming techniques to allow any part of the coverage volume to be selected for display.
Sys. Disp - 12	The language used for the display function shall be English.
Sys. Disp – 13	The system shall provide the functionality to load and present pictures (JPEG or other formats).
Sys. Disp – 14	The system shall provide the functionality to align the pictures to the WAM system maps.
Sys. Disp - 15	The Bidder shall, as part of the proposal, describe the display functions that are available within the Bidder's system and provide representative screenshots.

4.19 WAM TEST AND EVALUATION SYSTEM (OFFLINE CPS)

Sys. TES - 01	Offline WAM is system that operates autonomously from the operational system. It shall be used for the system testing, validation and verification of any change of the operational system, training, replaying recorded data for analysis, etc.
Sys. TES - 02	Test and Evaluation System shall provide the same functions as the Central Processing System.
Sys. TES - 03	Test and Evaluation System shall allow system testing and evaluation without influencing the operational system.
Sys. TES - 04	Test and Evaluation System shall be able to be installed remote and independent from (but parallel to) the Central Processing System.
Sys. TES - 05	It shall be possible to select any subset of WAM system units, including units in operational and in maintenance mode, to be used by the Test System.

4.20 SYSTEM SERVICE CONDITIONS

4.20.1 Service life

Sys.Life - 01	The WAM system shall meet all system service conditions as detailed in this paragraph on a 24 hours per day, 7 days per week basis of continuous operation.
Sys.Life - 02	The WAM system supplied in accordance with this specification shall have a usable life of at least 15 years.
Sys.Life - 03	The system service conditions as detailed in this paragraph shall be allocated to each unit of the system.

4.20.2 Environmental Conditions

Sys. Eenv - 01	The contractor shall specify heat dissipation in terms of electrical power from all individual equipment. Operator's work stations, free-standing terminals, printers, etc. are defined as individual equipment.
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4.20.3 Susceptibility/Interference to other systems

Sys. Interf - 01	The WAM system shall be immune to adverse effects such as radio interference, including that produced by standard radio navigation, telecommunication and radar facilities.
Sys. Interf - 02	The Bidder shall describe how electromagnetic compatibility will be assured to allow for co-existence with the above mentioned telecommunication systems.
Sys. Interf - 03	The WAM system shall not cause interference to standard radio navigation, telecommunication and radar facilities.
Sys. Interf - 04	The Bidder shall, as part of his proposal, provide detailed information about radio frequency parameters and techniques (e.g. bandwidth, modulation, power, etc).

4.20.4 Electrical environment

Sys. Elec - 01	<p>The equipment should be designed for connection to AC main and it should be designed for and, without showing any malfunction, resist the following tolerances on the AC power supply:</p> <ul style="list-style-type: none">– Mains voltage: 230V ± 10%, 1 ph, N, E– Frequency: 50 Hz ± 6%– Frequency change: ≤ 0.25 Hz/s– Harmonic content: ≤ 6%
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- Power factor: ≤ 0.8
- Interruption mains voltage: ≤ 10 ms.

Sys. Elec – 02	Should the equipment not be connected to AC main, it shall also be designed for DC voltage supply.
Sys. Elec – 03	In case of a power outage or a power interruption all software processes shall be terminated correctly.

4.21 SYSTEM ARCHITECTURE

Sys. Archi - 01	The central data processor shall be in dual configuration so that if one processor fails, the standby processor can immediately take over and continue to output data without human actions (HOT standby).
Sys. Archi - 02	The time for switchover from primary to backup shall be less than 3 seconds with no loss of target data.
Sys. Archi - 03	The Bidder shall describe in detail all redundant parts of the system providing dual channel functionality and the impact to the system during a switch- or failover (period of data loss).

4.22 SOFTWARE AND HARDWARE DESIGNS

Sys. Dsgn - 01	The equipment shall be designed and developed according to good engineering practice.
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4.23 HARDWARE REQUIREMENTS

4.23.1 General

Sys. HW - 01	The WAM system processing and display units shall use standard commercial hardware platforms (commercial off the shelf equipment).
Sys. HW - 02	The Bidder shall, as part of the proposal, deliver detailed information on the hardware platforms delivered as part of the WAM system units, including information on replacement capabilities.
Sys. HW - 03	All displays (except LCMS) shall be at least 21" flat screens with a screen resolution of 1600x1200 pixels as a minimum
Sys. HW - 04	All CPS's, Ground stations and other possible components shall be designed for 19" inch rack mount.

4.23.2 Remote Units (Ground Stations)

Sys. RemUn – 01	The Remote Units shall be housed in self-contained units, which can be installed at indoor or outdoor locations (in case of outdoor unit).
Sys. RemUn – 02	Each Remote Unit shall be equipped with a temperature sensor, which shall be monitored by the system monitoring and control function.
Sys. RemUn – 03	Each Remote Unit shall be equipped with a power socket.
Sys. RemUn – 04	The Remote Unit RF antenna(s) shall be compliant to the environmental conditions as stipulated in ETS 300 019-1-4.
Sys. RemUn – 05	The Remote Unit shall have adequate protection against over-voltage, over-current and lightning strikes.
Sys. RemUn – 06	No active elements such as antenna amplifier units shall be installed at the main antenna cable outside of the lightning-protected enclosure of the Remote Unit, unless it has sufficient additional lightning protection.
Sys. RemUn – 07	The Remote Unit shall provide degarbling capability compliant with a performance level of A3 as defined by RTCA DO260A.
Sys. RemUn – 08	The Bidder shall, as part of the proposal, deliver the following information on the indoor and outdoor Remote Units:

- Dimension
- Weight
- Power consumption
- Heat dissipation

Sys. RemUn – 09 The Remote Unit shall be designed for minimum maintenance and minimum system downtime.

Sys. RemUn – 10 There shall be no preventive maintenance activity that requires more than a half year site visit.

4.24 SOFTWARE REQUIREMENTS

Sys. SWdsg - 01 Software design shall follow the guidelines for the assurance of software contained in ED-109A.

Sys. SWdsg - 02 The Assurance Level shall be minimum AL4 as defined in ED-109 (AL4 corresponds to Software Assurance level SWAL3 as defined in ED153) or, as an alternative, for systems or system elements developed before the issue of this standard, a safety argument for the software based on in-service evidence should be used for assurance.

Sys. SWdsg – 03 The Bidder shall identify parts in AL4 not covered by the Bidder's implementation of ED-109 and other processes and provide the result.

Sys. SWdsg – 04 The Bidder shall identify compliance to AL4 for parts not implemented through ED-109 and provide the result.

Sys. SWdsg – 05 The Contractor shall use ED-109 and provide to Slovenia Control information from previous applications, used development procedures and methods of verifications, about the pre-developed software if used in the equipment.

Sys. SWdsg - 06 Well-established and international accepted programming language should be used.

Sys. SWdsg - 07 The Contractor shall demonstrate that software build process is without compile warnings and errors.

Sys. SWdsg - 08 Contractor shall during warranty period free of charge provide any new software or firmware upgrade to the equipment.

4.25 SYSTEM EXPANDABILITY

Sys. Expnd - 01 The WAM system shall provide the ability to increase or alter the Operational Coverage Volume or the System Performance through the addition or redeployment of Receiving Unit and/or Transmitting Unit.

Sys. Expnd – 02 The central data processor(s) shall have room for expansion to cover future requirements.

Sys. Expnd - 03 Bidder shall state the maximum number of ground stations that can be used within the proposed configuration and how upgrades can be carried out to expand the capacity of the system.

Sys. Expnd - 04 Adding an additional ground stations shall be done without Supplier intervention.

4.26 SAFETY

Sys. Sfty - 01 The Contractor shall have an established and documented Safety Management System and a Software Safety Assurance System.

Sys. Sfty - 02 The Contractor shall use the Generic Safety Assessment for ATC Surveillance using WAM produced by Eurocontrol as input to the Contractor's safety work.

Sys. Sfty – 03	The Contractor shall implement relevant recommended Safety Requirements from the Eurocontrol generic Safety Assessment and provide evidence that implementation has been completed.
Sys. Sfty – 04	The Contractor shall meet Safety Objectives for hazards identified in Eurocontrol's generic Safety Assessment.
Sys. Sfty – 05	The Contractor shall perform an FHA activity to identify hazards not identified in Eurocontrol's Generic Safety Assessment.
Sys. Sfty – 06	The Contractor shall meet Safety Objectives for hazards identified as a result of the FHA.
Sys. Sfty – 07	The Contractor shall perform PSSA and SSA phases in accordance with Eurocontrol Safety assessment Methodology (SAM).
Sys. Sfty – 08	The Contractor shall identify weaknesses in the system using techniques like for instance FMECA or Common Cause Analysis (CCA), and implement mitigations.
Sys. Sfty – 09	The Contractor shall support CONTRACTING AUTHORITY for the generation of safety case by proving the documents mentioned above and further product related safety documentation.

4.27 RELIABILITY, AVAILABILITY, MAINTAINABILITY

4.27.1 Reliability analysis

Sys. Reliab – 01	<p>The offer shall include description of the reliability of the system in terms of:</p> <ul style="list-style-type: none"> – MTBF (Mean Time Between Failures) – MTBCF (Mean Time Between Critical Failures) – MTTR (Mean Time To Repair) – Risk analysis for whole system
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5. PROJECT MANAGEMENT

5.1 PROJECT MANAGER

PM. Pmngr - 01 The Bidder shall be responsible for appointing a Project Manager which shall coordinate all activities related to this project until end of warranty period.

5.2 PROGRESS MEETINGS

PM. Meet - 01 The Contractor shall arrange progress meetings for monitoring progress of project activities.

PM. Meet - 02 The progress meetings shall be the formal contact forum between the Contractor and the Contracting authority.

PM. Meet - 03 Progress meetings shall be held regularly after the award of contract signing at the request of the Contracting authority.

PM. Meet - 04 It is anticipated that progress meetings will be held at 3-month interval initially or at the request of the Contracting authority.

PM. Meet - 05 The progress meeting shall take place either at the Contractor's facilities or at the Contracting authority's facilities.

PM. Meet - 06 The progress meetings shall, inter alia, cover:

- Product specification approval
- Acceptance test documentation and approval (Factory and Site)
- Approval of delivery
- Contract fulfillment
- Progress of Project activities

5.3 PROGRESS REPORTS REQUIREMENTS

PM. Rep - 01 The Contractor shall keep records of all work done in the engineering and construction phases of the work and make an activity and progress report, monthly and annually as follows:

- two copies of the monthly Progress Report,
- two copies of the annual Progress Report and,
- two copies of the Final Report.

PM. Rep - 02 The regular monthly report will be made as of the end of each calendar month and will include comments for each month as the project accelerates or falls behind schedule.

6. PROJECT TASKS

6.1 WAM COVERAGE ANALYSIS

- Proj. Sim – 01 The Bidder shall submit a coverage analysis showing at least the horizontal performance accuracy (HPA) as well as the DOP of the proposed system using sites defined in SLOWAM Sites.xlsx file. The analysis shall be submitted on a USB stick or similar media.
- Proj. Sim – 02 The results of the coverage analysis as detailed in this paragraph shall be provided for visualization in Google Earth application.
- Proj. Sim – 03 The analysis shall use digital terrain elevation data DTED Level 1 or equivalent.
- Proj. Sim – 04 The Bidder shall for analysis use following assumptions :
- Transponder Output Power is 200W
 - Transponder sensitivity is -75 dBm
 - Cable losses shall be used as specified in SLOWAM Sites.xlsx
 - Antenna gain shall be used as proposed by the Bidder however not less than specified in SLOWAM Sites.xlsx
- Proj. Sim – 05 The Bidder shall provide HPA coverage showing WAM system performances ;
- For Sector A – Service TOP, at FL 245 from 10 meters to 250 meters by 20 meter increments.
 - For Sector B – Service LOW, at FL 125 from 10 meters to 150 meters by 10 meter increments.
 - For Sector C and D – Service West and East, at FL 50 from 10 meters to 100 meters by 10 meter increments.
 - For Sector E – Service CTR, at FL 35 from 10 meters to 100 meters by 10 meter increments.
- Proj. Sim – 06 The coverage analysis shall include information on reduction of system performance parameters in case of failures of Sensor Units, (Worst case scenario). Separate coverage analyses shall be provided for the following cases:
- All Sensor Units operational
 - N-1 operational
- Proj. Sim – 07 The results of the coverage analysis shall be presented on a separate area layout maps which shall be compatible for visualization in Google Earth application. The Bidder shall provide every HPA coverage analysis not just for visualization in Google earth, but also with percentage value number (rounded on 2 decimal points). This percentage value number shall be calculated with respect to the volume of sector A – service TOP (Perf.Cov.Sp.–1).
- Proj. Sim – 08 The analysis shall also include:
- the coverage diagram for ADS-B
 - the coverage diagrams of the interrogators
- Proj. Sim – 09 Performance values presented in the coverage analysis of the Bidder shall be met completely by the operational system which is offered to the Contracting Authority. Potential performance or coverage gaps compared to the performance values presented in the coverage analysis shall be corrected during Execution of the Contract at the Bidder's costs.
- Proj. Sim – 10 The bidder shall submit on a USB stick or similar media data of a real traffic recording of an existing typical WAM installation in order that Contracting authority could run SASS-C analysis and assess performance. Recording shall be in Asterix Cat 20 and CAT21 for duration of 4-6 hours during peak traffic hours.

6.2 ELEMENTS TO BE SUPPLIED BY THE CONTRACTOR

6.2.1 Equipment

Proj. Sup - 01	<p>The following system units shall be supplied as part of the WAM system:</p> <ul style="list-style-type: none">– Receive Only Units,– Combined Receive / Transmit Units (depending on the Bidder WAM system architecture),– 3 Central Processing Systems (CPS),– WAM Reference Transponder Units (if required by the Bidder WAM system architecture),– WAM Time Synchronization Units ,– Control & Monitoring System,– Proper Antenna system with at least 6 dB gain (achieved by antenna design or RF amplifier),– Other components depending on the Bidder WAM system architecture
Proj. Sup - 02	<p>The WAM system shall be complete in accordance with all functional and performance requirements defined within this specification. The Bidder shall describe in details their proposed solution such as number of units and their proposed configuration for each site defined in SLOWAM Sites.xlsx.</p>
Proj. Sup - 03	<p>Item or part necessary for proper operation and adjustment in accordance with the requirements of this specification shall be incorporated even though that item or part may not be specifically provided or described herein.</p>
Proj. Sup - 04	<p>All features required to meet the functional and performance requirements shall be incorporated even though the features may not be specifically provided for or described herein.</p>
Proj. Sup - 05	<p>All necessary facilities, parts and hardware, including receptacles, connectors, cables, cabling (wiring), and outlets shall be incorporated to enable the components of the system to be properly assembled, interconnected, installed and maintained as required herein.</p>

6.2.2 Technical Infrastructure

Proj. Inf - 01	<p>Contracting authority will provide equipment shelters if needed and all mains source cabling unless otherwise agreed.</p>
Proj. Inf – 02	<p>Contracting Authority will provide telecommunication network between the ground stations and central processor(s) and between the central processor(s) and the ATM Surveillance Data Processors (SDP) or any other system.</p>
Proj. Inf – 03	<p>The Contractor shall supply lightning protection as part of Omni directional antenna and overvoltage protection for all Remote Ground Stations.</p>
Proj. Inf – 04	<p>The Contractor shall supply all power cables required for connecting the WAM system units to the nearest power distribution equipment.</p>
Proj. Inf – 05	<p>The Contractor shall supply mounting equipment required for the antenna installation.</p>

6.3 PLANNING

Proj. InsPlan - 01	<p>The Contractor shall be responsible for the required detailed planning of installation and commissioning.</p>
Proj. InsPlan - 02	<p>All plans shall be approved by the Contracting authority</p>
Proj. InsPlan - 03	<p>The Contractor shall prepare a preliminary version of the installation plans and deliver that to Contracting Authority for review no later than two (2) months prior to start of installations.</p>

- | | |
|--------------------|--|
| Proj. InsPlan - 04 | After receiving the order, the Contractor shall in coordination with Contracting authority within one (1) month after contract award, prepare the required main time schedule with regards to the installation and commissioning activities on site. |
| Proj. InsPlan - 05 | The time schedule shall indicate start date, realization period and completion date of installation and commissioning on site. |

6.4 VERIFICATION AND VALIDATION

6.4.1 Factory Acceptance Test (FAT)

6.4.1.1 FAT Documentation

- | | |
|------------------|---|
| Proj.FATDoc - 01 | Upon approval by Contracting authority the following documents shall be binding on both parties: <ul style="list-style-type: none"> – Test Plan – Test Specification – Test Procedure – Test Record – List of Delivery |
| Proj.FATDoc - 02 | The Test Plan (identification of test specifications, procedures and schedule) shall be worked out by the Contractor and shall be made available for Contracting Authority for review and approval latest four (4) weeks prior to the expected start of the SAT. |
| Proj.FATDoc - 03 | The Test Plan shall mutually be approved at the latest two (2) weeks before the actual start of the SAT. |

6.4.1.2 FAT Execution

- | | |
|------------------|--|
| Proj.FATexe - 01 | Twenty (20) working days prior to the expected start of the FAT Contracting Authority and the Contractor shall mutually agree upon a fixed starting date for the FAT to be carried out in the Contractor's premises. |
| Proj.FATexe - 02 | Before starting the formal FAT, the Contractor shall present to Contracting Authority the complete Pre-test Report. |
| Proj.FATexe - 03 | The Contractor shall provide all instruments, equipment, materials, facilities and services required for appropriate execution of the FAT. |
| Proj.FATexe - 04 | Equipment under FAT shall consist of the complete system in accordance with the Contract. |
| Proj.FATexe - 05 | The FAT shall be performed following the Test Plan and the Test Procedure, successively checking the items for compliance with the Test Specification. |
| Proj.FATexe - 06 | The Contractor shall provide the evaluation tool(s) to support the FAT. |
| Proj.FATexe - 07 | During the FAT a Test Record shall be completed. Every recording, listing, print-out etc. created during the FAT shall be added to the test report as evidence. |
| Proj.FATexe - 08 | Should problems occur during the FAT or should the FAT test results be unsuccessful the problems shall be corrected. |
| Proj.FATexe - 09 | The following set of documentation shall be handed over to Contracting Authority as evidence of successfully completed FAT: <ul style="list-style-type: none"> – Certification Record, signed by Contracting Authority or his representatives upon completion of the FAT – Set of completed Test Records – All recordings – List of Delivery – Certification Record, signed by Contracting Authority confirming successful finish of training |

6.4.2 Site Acceptance Test (SAT)

6.4.2.1 SAT Documentation

Proj.SATDoc - 01	Upon approval by Contracting Authority the following documents shall be binding on both parties: <ul style="list-style-type: none">– Test Plan– Test Specification– Test Procedure– Test Record– List of Delivery
Proj.SATDoc - 02	The Test Plan (identification of test specifications, procedures and schedule) shall be worked out by the Contractor and shall be made available for Contracting Authority for review and approval latest four (4) weeks prior to the expected start of the SAT.
Proj.SATDoc - 03	The Test Plan shall mutually be approved at the latest two (2) weeks before the actual start of the SAT.

6.4.2.2 SAT Execution

Proj.SATexe - 01	Ten (10) working days prior to the expected start of the SAT Contracting Authority and the Contractor shall mutually agree upon a starting date for the SAT to be carried out in Contracting Authority's facilities.
Proj.SATexe - 02	The Site Acceptance Test shall include verification of all items delivered in accordance with the Contract, including training, documentation and quality of workmanship.
Proj.SATexe - 03	The Contractor shall provide the evaluation tool(s) to support the SAT.
Proj.SATexe - 04	Before starting the formal SAT, the Contractor shall present to Contracting Authority the complete Pre-test Report. This documentation shall contain full details of the Contractor's evaluation of the test results achieved during Setting Up.
Proj.SATexe – 05	Equipment under SAT shall consist of the complete system in accordance with the Contract.
Proj.SATexe – 06	The final phase of the SAT shall include a long term Stability Test, lasting for minimum 1 week, during which the system shall run under continuous relevant operation without any signs of anomalous function.
Proj.SATexe - 07	As WAM System will be part of Slovenia Control operational environment, SAT can only be successfully finished after it passes SAT procedure including SASS-C analysis as well as flight check provided by Contracting Authority. With the SASS-C analysis the Contracting Authority will also assess the accuracy and coverage values provided by Contractor in WAM coverage Analysis in order to verify if the delivered WAM system complies with the results provided by the Contractor in the WAM coverage Analysis. In case the delivered WAM System will not comply with the results provided by the Contractor in the WAM coverage Analysis and other technical requirements SAT will be considered as failed. Analysis shall be based on Traffic of opportunity and Flight check. SASS-C analysis shall be conducted by contracting authority experts.
Proj.SATexe – 08	During the SAT a Test Record shall be completed. Every recording, listing, print-out etc. created during the SAT shall be added to the test report as evidence.
Proj.SATexe – 09	If problem/s occur during the FAT or SAT test results are unsuccessful the problems shall be corrected by Contractor within deadline set by contracting Authority.

- Proj.SATexe – 10 The following set of documentation shall be handed over Contracting Authority as evidence of successfully completed SAT:
- Certification Record, signed by Contracting Authority or his representatives upon completion of the test
 - Set of completed Test Records
 - All recordings
 - List of all documents that contribute to SAT.

7. LOGISTICS

7.1 DOCUMENTATION

Proj. Doc – 01	<p>The system documentation shall include complete technical and operational manuals for each equipment and part of the WAM system consisting at least:</p> <ul style="list-style-type: none">– System description– Technical data– Circuit diagrams and parts list– Complete instructions for operation, maintenance and fault diagnostic– Detailed descriptions and instructions for WAM system parameters and tuning
Proj. Doc – 02	<p>The documentation shall be up to date with the system accepted by the Contracting Authority.</p>
Proj. Doc – 03	<p>Contractor shall free of charge provide revisions and upgrades to above mentioned documents in case of changes, upgrades, etc.</p>
Proj. Doc – 04	<p>The documentation shall be provided in Slovenian or English language.</p>
Proj. Doc – 05	<p>To assist any further modification and use, the documentation should also be available in electronic format.</p>

7.2 TRAINING

7.2.1 WAM Technical training

Proj. Trng - 01	<p>Contractor shall provide training for technical personnel, which shall last at least ten (10) working days. The training shall be divided in two separate consecutive time periods for two groups of students (each lasting at least ten working days).</p>
Proj. Trng - 02	<p>The training course(s) shall be held at Contractor's premises. The maximum numbers of participants are five (5) at each training.</p>
Proj. Trng - 03	<p>The Bidder shall include description of the training course offered. The training shall include theoretical and practical training for the whole WAM system covering installation and maintenance and the coverage analysis and planning tool including detailed training for the system parameters and tuning.</p>
Proj. Trng - 04	<p>Upon contract signing the Contractor shall present a schedule for the training including start and stop and present milestones for the total training.</p>
Proj. Trng – 05	<p>The technical training course shall:</p> <ul style="list-style-type: none">– involve theoretical and practical training;– include fault diagnosis/recovery;– use of documentation, handbooks and instruments delivered by the Contractor for the contracted system.
Proj. Trng – 06	<p>After each training the Contractor shall test the knowledge of the students and evaluate the results.</p>
Proj. Trng – 07	<p>Training course and training documentation shall be provided in Slovenian or English language.</p>
Proj. Trng – 08	<p>The successful completion of training shall be performed before FAT. After completion of the training course, hardware and software specialists shall be able to monitor/evaluate the performance, maintain, operate and configure the system, within the frame of the maintenance concept. After successful completion of the training course Contracting Authority issues Certification Record, confirming successful finish of training.</p>

7.2.2 Training documents

Proj. TrDoc - 01	The training material consisting of the documentation to be delivered with the final supply shall be of the format specified in the Requirement.
Proj. TrDoc- 02	Each participant shall obtain a complete set of documentation when the training courses start. Those handbooks shall be each student's personal belonging.
Proj. Trdoc - 03	A copy of the document including material to be used by the Instructor during training shall be available to Contracting Authority at least four (4) weeks before the beginning of the training course.

7.3 SPARES

Proj. Spares - 01	<p>The Contractor shall deliver following spare parts:</p> <ul style="list-style-type: none">- 5 pcs omnidirectional antennas- 2 pcs sector antennas- 4 pcs standalone Ground Station Receivers Units- 1 pc outdoor standalone Ground Station Receiver Unit- 3 pcs Transmitter/Receiver standalone Units- 4 pcs GPS antennas- 1 pc CPS- 1 pc RCMS
Proj. Spares - 02	The spare parts and modules shall be of the same quality and have same characteristics as in the installed system.
Proj. Spares - 03	Bidder shall include the price list for all spare parts, which shall be valid at least twenty four (24) months after SAT.

7.4 WARRANTY PERIOD

Proj. Wrtty - 01	The Warranty Period shall be at least seven (7) years after successfully completed SAT.
Proj. Wrtty - 02	During the Warranty Period Contracting Authority will report all the failures and malfunctions to the Contractor. Malfunction shall be rectify by Contractor in agreed time period defined in contract.
Proj. Wrtty – 03	<p>Contractor shall provide documentation which shall be used for the reporting problems and include at least the following information:</p> <ul style="list-style-type: none">– date of failure or malfunction reported– description of the failure or malfunction– status of the item (investigation, solved, implemented)– all correspondence concerning the item– special, mutually agreed information
Proj. Wrtty - 04	To enable the investigation of warranty claims, the Contractor will be provided with all information and material deemed necessary.
Proj. Wrtty - 05	Spare parts shall be available fifteen (15) years after the end of warranty period.

APPENDIX A: TERMS, DEFINITIONS, ABBREVIATIONS

ACID	Aircraft Identification
ADS-B	Automatic Dependent Surveillance - Broadcast
AGL	Above Ground Level
AL	Assurance Level
AMSL	Above Mean Sea Level
ANSP	Air Navigation Services Provider
ASTERIX	All purpose STructured EuRocontrol surveillance Information eXchange
ATC	Air Traffic Control
ATM	Air Traffic Management
BITE	Built In Test Equipment
CE	European CE mark
CMS	Control and Monitoring System
CNS	Communication, Navigation and Surveillance
CPS	Central Processing System
CTR	Control Zone
DF	Downlink Format
DTED	Digital Terrain Elevation Data
EEC	European Economic Community
ELS	Elementary Surveillance
FAT	Factory Acceptance Test
FL	Flight level
FS	Flight Status
ICAO	International Civil Aviation Organization
LCMS	Remote Control and Monitoring/Maintenance System
LRU	Line Replaceable Unit
MLAT	Multilateration
MOPS	Minimum Operational Performance Specification
MTBF	Mean Time Between Failures
MTBCF	Mean Time Between Critical Failures
MTTR	Mean Time To Repair
NM	Nautical Miles
PCD	Probability of Code Detection
PD	Probability of Position Detection
PFCD	Probability of False Code Detection
PFD	Probability of False Detection
PLG	Probability of Long position Gap

RA	Resolution Advisory
RCMS	Remote Control and Monitoring/Maintenance System
RF	Radio Frequency
RMS	Root Mean Square
RTCA	Radio Technical Commission for Aeronautics
RVSM	Reduced Vertical Separation Minima
SAT	Site Acceptance Test
SDP	Standard Deviation of Position
SNMP	Simple Network Management Protocol
SPI	Special Position Identification
SSR	Secondary Surveillance Radar
SWAL	Software Assurance Level
TDOA	Time difference of arrival
The Contractor	The successful Bidder to be chosen to supply Equipment and perform work
The Contracting Authority	The party that issued request for the tender
The Tender	The formal offer to supply goods and perform work
The Bidder	The party that submits Tender
TMA	Terminal Maneuvering Area
TOA	Time of Arrival
TP	TP Test Procedure
WAM	Wide Area Multilateration
WGS	World Geodetic System

NOTE: The Matrix of compliance is an integral part of the bid.

MATRIX OF COMPLIANCE TECHNICAL SPECIFICATION AND REQUIREMENTS FOR THE SUPPLY OF WAM SYSTEM

Prepared by CNS/ATM systems department

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Bidders shall fill-in COMPLIANCE column field using YES or NO words (YES for compliant and NO for non-compliant). If the Bidder fills-in the word “NO” or any other word not being “YES” in the COMPLIANCE column field, or leaves the COMPLIANCE column field empty, such a bidder will be excluded from the public procurement procedure. Please note, that where COMPLIANCE column field is greyed and have “–” sign, the bidder shall NOTE and accept the statement provided by Contracting Authority and shall not insert anything in that part of the COMPLIANCE column (the greyed one).

Bidders shall submit its own documentation – bidder documentation in order to prove the compliance of the offered WAM System with the requirements set below by the Contracting Authority. The bidders shall also fill-in the “Reference in Bidder Documentation” column with the exact reference/identification (e.g. by number, precise title, page etc.) of the submitted bidder documentation in order that the Contracting Authority can identify the compliance with the requirements in the bidder documentation. Please note, that where in the “Reference in Bidder Documentation” column is stated “*Provided with Tender Documentation - defined in SLOWAM Sites. Xlsx and SLOWAM Sites. Kmz*”, “*Slovenia Control Responsibility*”, “*Provided with Tender Documentation*” and is greyed, the bidder shall not insert anything in that part of the “Reference in Bidder Documentation” column (the greyed one).

Bidders are not allowed to change any part of the text in other fields! If bidder change/amend/delete or insert anything in other fields of the table, such a bidder will be excluded from the public procurement procedure.

In order to proceed with filling in the Table of Compliance the Bidder must agree to first carefully read the tender documentation. The Bidder by filling-in the following table accepts also the responsibility to get fully acquainted with the terms and conditions set in the tender documentation.

TABLE OF COMPLIANCE

BASIC REQUIREMENTS

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Gen-Basic- 01	To reduce the complexity regarding the installation and maintenance of the Wide Area Multilateration system, Slovenia Control shall define sites for WAM ground station locations with exact technical specifications for antenna characteristics, position, cable type and length, data transmission.	–	<i>Provided with Tender Documentation - defined in SLOWAM Sites. Xlsx and SLOWAM Sites. kmz</i>
Gen-Basic- 02	To optimize selection of possible sites, Slovenia Control has made arrangements with local companies to select the most suitable locations for WAM equipment regarding line of sight, power, communications etc...	–	<i>Slovenia Control Responsibility</i>
Gen-Basic- 03	Slovenia Control defined the locations for the ground stations. Locations of site are specified in following files: <ul style="list-style-type: none"> • SLOWAM Sites.xlsx • SLOWAM Sites.kmz (Google Earth) 	–	<i>Provided with Tender Documentation</i>
Gen-Basic- 04	The Wide Area Multilateration System shall comply with the performance requirements in EUROCAE Doc ED-142.		

Gen-Basic- 05	<p>The Wide Area Multilateration System shall consist of, but not be limited to, the following principal items:</p> <ul style="list-style-type: none"> • Sufficient Interrogators and Receivers to provide specified coverage, accuracy, availability in the required service areas as specified in this document. • Redundant WAM Central Processor System associated to the interrogators / receivers. • Offline WAM Central Processor System associated to the interrogators / receivers and to be used for testing and tuning purposes. • Synchronization system for the TDOA. • Control and Monitoring System (CMS). • Test transponder(s), if it is required by system design. 		
Gen-Basic- 06	The number and location of the receivers, interrogators, or combined interrogator/receivers, number of antennas required to satisfy the requirements of the WAM System, are specified in SLOWAM Sites.xlsx file.	–	<i>Provided with Tender Documentation</i>

SLOVENIA CONTROL RESPONSIBILITIES

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Gen-Cust - 01	Slovenia Control shall be responsible to provide 220V/50 Hz AC mains power for elements of the Wide Area Multilateration system.	–	<i>Slovenia Control Responsibility</i>
Gen-Cust - 02	Slovenia Control shall be responsible to provide infrastructure like shelters, buildings, masts, mounting racks for elements of the Wide Area Multilateration system.	–	<i>Slovenia Control Responsibility</i>
Gen-Cust - 03	Slovenia Control shall be responsible to provide network equipment and communication between remote units and central processing station.	–	<i>Slovenia Control Responsibility</i>
Gen-Cust - 04	Slovenia Control shall be responsible to provide all RF cables, power cables, communication cables, jumper cables.	–	<i>Slovenia Control Responsibility</i>
Gen-Cust - 05	Slovenia Control shall be responsible to provide all civil works for successful installation of antennas and other equipment installation.	–	<i>Slovenia Control Responsibility</i>

CONTRACTOR RESPONSIBILITIES REGARDING GROUND STATION INSTALATION

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Gen-Contr - 01	Even though Contracting Authority is performing an installation Contractor shall be responsible for the inspection of proper installation and operation of Ground Station Remote units. In case some of Ground Stations are found not to be within specification, Contractor shall advise corrective activities.		

SCOPE OF THE DOCUMENT

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Gen.Scope - 01	The purpose of this document is to define the functional, technical, system and all other requirements to be fulfilled to meet the Slovenia Control WAM specification.	–	<i>Provided with Tender Documentation</i>

SPECIFICATIONS

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Gen Spec - 01	RTCA, Minimum Operational Performance Standards for 1090-MHz Extended-Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information System-Broadcast (TIS-B) - DO-260.		
Gen Spec - 02	RTCA, Minimum Operational Performance Standards for 1090-MHz Extended-Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information System-Broadcast (TIS-B) - DO-260A.		
Gen Spec - 03	RTCA, Minimum Operational Performance Standards for 1090-MHz Extended-Squitter Automatic Dependent Surveillance-Broadcast (ADS-B) and Traffic Information System-Broadcast (TIS-B) - DO-260B.		
Gen Spec - 04	EUROCAE, ED-73B, Minimum Operational Performance Specification for Secondary Surveillance Radar Mode S Transponders.		
Gen Spec - 05	EUROCAE, ED-117, Minimum Operational Performance Specification for Mode S Multilateration systems for use in advanced surface movement guidance and control systems (A-SMGCS).		
Gen Spec - 06	EUROCAE, ED-142, Technical Specification for Wide Area Multilateration (WAM) Systems.		
Gen Spec - 07	EUROCAE, ED-129A, Technical Specification for a 1090 MHz Extended Squitter ADS-B Ground Station.		
Gen Spec - 08	EUROCAE, ED126, Safety, Performance and Interoperability Requirements Document for ADS-B Airport Surface Surveillance Application (ADS-B-NRA).		
Gen Spec - 09	EUROCAE, ED161, Safety, Performance and Interoperability Requirements Document for ADS-B Airport Surface Surveillance Application (ADS-B-RAD)		
Gen Spec - 10	Slovenia Control additional requirements to the existing standards and specifications (Chapter 3).		

STANDARDS

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Gen Std - 01	ICAO Annex 10, Vol 4. Surveillance and Collision Avoidance Systems		
Gen Std - 02	ICAO Doc. 9871 – Technical Provisions for Mode S Services and Extended Squitter		
Gen Std - 03	ICAO Doc 9426-NA/924, Air Traffic Services Planning Manual		
Gen Std - 04	ICAO Doc 4444-ATM/501, Air Traffic Management, Procedures for Air Navigation Services		
Gen Std - 05	ICAO Doc 9924-AN/474, Aeronautical Surveillance Manual		
Gen Std - 06	Asterix Category 019 – Eurocontrol Standard Document for Surveillance Data Exchange, Part 18, Multilateration System Status Messages, SUR.ET1.ST05.2000-STD-18-02		
Gen Std - 07	Asterix Category 020 – Eurocontrol Standard Document for Surveillance Data Exchange, Part 14: Category 020, Multilateration Target Reports, SUR.ET1.ST05.2000-STD-14-02		
Gen Std – 08	Asterix Category 21 – Eurocontrol Standard Document for Surveillance Data Exchange, Part 12: Category 021, ADS-B Messages, SUR.ET1.ST05.2000-STD-12-01		
Gen Std – 09	Asterix Category 23 – Eurocontrol Standard Document for Surveillance Data Exchange, Part 16: Category 023, CNS/ATM Ground Station and Service Status Reports, SUR.ET1.ST05.2000-STD-16-01		
Gen Std – 10	Asterix Category 010 – Eurocontrol Standard Document for Surveillance Data Exchange, Part 7: Category 010, Transmission of monosensor Surface Movement Data , SUR.ET1.ST05.2000-STD-07-01		

Gen Std – 11	EUROCAE, ED-109A, Guidelines for Communication, Navigation, Surveillance and Air Traffic Management (CNS/ATM) Systems Software Integrity Assurance		
Gen Std – 12	Asterix Category 247 – Eurocontrol Standard Document for Surveillance Data Exchange, Part 20: Category 247, Version Number Exchange, SUR.ET1.ST05.2000-STD20-01		

SLOVENIA CONTROL'S DOCUMENTS

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Gen Cref – 01	SLOWAM Sites.xlsx	–	<i>Provided with Tender Documentation</i>
Gen Cref - 02	SLOWAM Sites.kmz	–	<i>Provided with Tender Documentation</i>
Gen Cref - 03	Matrix of compliance	–	<i>Provided with Tender Documentation</i>

COVERAGE REQUIREMENTS

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Perf. Cov - 01	The WAM System should as a minimum provide coverage in the volumes presented below. Each Volume/Sector shall be independent output Service from Central Processor.		
Perf. Cov - 02	In the tables Volume/Sectors are listed with coordinates and the associated requirements for coverage. Below each table a sketch of the Volume/Sector is presented.	–	<i>Provided with Tender Documentation</i>

Perf. Cov - 03	The WAM System should as a minimum provide coverage in the Sector A Service TOP (Ljubljana FIR + 40 NM) presented below.		
Perf. Cov - 04	The WAM System should as a minimum provide coverage in the Sector B Service LOW (Ljubljana FIR + 10 NM) presented below.		
Perf. Cov - 05	The WAM System should as a minimum provide coverage in the Sector C Service WEST presented below.		
Perf. Cov - 06	The WAM System should as a minimum provide coverage in the Sector D Service EAST presented below.		
Perf. Cov - 07	The WAM System should as a minimum provide coverage in the Sector E Service CTR presented below.		
Perf. Cov - 08	The WAM system shall provide continuous coverage in the above defined sectors and be capable of detecting, identifying, tracking and processing targets equipped with SSR Mode-A/C, Mode S ELS and EHS transponders as well as ADS-B 1090 MHz Extended Squitter avionics and non-transponder devices.		
Perf. Cov – 09	The WAM system shall be capable of detecting and tracking the targets outside the specified Sectors to increase situational awareness of adjacent FIR`s air situation.		
Perf. Cov – 10	The WAM system shall be capable to increase or alter the operational coverage volumes or the system performance through the addition or redeployment of receiving units and/or transmitting units.		
Perf. Cov – 11	The WAM system shall be expandable to satisfy possible future coverage requirements. E.g. the processor in the offer shall be able to handle at least 100 ground stations.		
Perf. Cov – 12	The required minimum coverage altitudes for all Sectors are defined as feet AMSL. In areas where terrain height is higher than required minimum altitude coverage the minimum coverage is expected to be same as terrain height.		
Perf. Cov – 13	The used coordinate system shall be WGS-84.		
Perf. Cov – 14	The coverage for ADS-B shall be from the required minimum coverage altitude to ceiling of the respective sectors.		

Coverage Specification (Services Specification)

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Perf. Cov. Sp.– 1	Sector A Service TOP (Ljubljana FIR + 40 NM) 12.66054787970133, 45.45036199560955 13.88929233742833, 44.76646291877133 16.06380302971598, 45.00327670204039 17.35163459805115, 46.04084762442886 17.00040026999729, 47.32218231156518 15.16362821076374, 47.32612563439292 14.56188378580413, 47.06222801947622 13.70238922374775, 47.17718822217183 12.44895831917737, 46.26765083523038 12.66054787970133, 45.45036199560955	At least from FL 245 to FL 660	
Perf. Cov. Sp.– 2	Sector B Service LOW (Ljubljana FIR + 10 NM) 13.14418429666129, 46.28040490809989, 13.39188683049582, 45.70119129489159, 13.36503987841518, 45.46916522093797, 13.4705833666772, 45.30454704802089, 14.5877877301881, 45.36245450471055, 15.21784792060114, 45.31339155170193, 15.57991118631227, 45.40129411098205, 15.53972111866059, 45.55005335458408, 15.91697194832582, 45.85912707249235, 16.47830030926583, 46.26709271253561, 16.82327729284996, 46.46853041107021, 16.58075883217115, 46.84950130289879, 15.94513384462353, 47.01142050543318, 14.71903202203073, 46.6564435122797, 14.45014903093024, 46.53192975235306, 13.55769060878325, 46.64357764354345, 13.14418429666129, 46.28040490809989	At least from FL 125 to FL 245	
Perf. Cov. Sp.–3	Sector C Service WEST 14.84881056692677, 46.58292172474236, 14.58165825631863, 46.4239370413771, 14.42988080226904, 46.44803360201074, 14.27941201877286, 46.44534973928801, 14.09202880170833, 46.48438983264304, 13.91856195061723, 46.52931685519523, 13.69975389155698, 46.52217117096368, 13.36462525830603, 46.31635747662785, 13.41155176815392, 46.19829099576778, 13.65413515266044, 46.17193143825812, 13.45954997251339, 46.03280086747198, 13.50376902694709, 45.95461632822939, 13.6413167584284, 45.96500093700613, 13.56630822394036, 45.85291832526434, 13.58526922342638, 45.79324297669914,	At least from FL 50 to FL 125	

		13.78873086039009, 45.73792279662627, 13.90432838051025, 45.63013575787776, 13.84207889615858, 45.5934085405599, 13.72295261477489, 45.60209654218119, 13.5588910606464, 45.59631498840815, 13.47044672016581, 45.50426858577293, 13.66660122019695, 45.44112212672098, 13.85749156714157, 45.42160275910507, 13.99113976076859, 45.45271627650049, 14.00862607081891, 45.49378974361488, 14.20152097253534, 45.46281258975435, 14.38377776954673, 45.48257766654677, 14.50603916504811, 45.52822967441692, 14.57561251189091, 45.66101601634977		
Perf. Cov. Sp.– 4	Sector D Service EAST	15.71436015248894, 46.00957896040537, 15.72668676050951, 46.05091204195308, 15.61840648860551, 46.16239180375096, 16.03117897786939, 46.30953823085252, 16.29965640666021, 46.37129701177604, 16.31805553052825, 46.50146705260052, 16.61127616229736, 46.45369238034518, 16.35904692785953, 46.83791853154512, 16.28912878326487, 46.8801909702111, 16.09731325104568, 46.86973971099736, 15.98227884805591, 46.8287346060401, 15.99149899462051, 46.78974429219984, 15.98307610467425, 46.75178946988458, 16.00164592304934, 46.71591503222457, 16.02651948842315, 46.70381715365172, 16.0386902204336, 46.65646953171925, 15.99745961887766, 46.68514327297277, 15.85233382388197, 46.72944966488061, 15.74494920702015, 46.703123992963, 15.64975916455318, 46.71254290643223, 15.63791898806753, 46.69237259675374, 15.59574127030649, 46.69293829666546, 15.04443720721177, 46.6564179812048, 14.9840987050656, 46.6229804913031, 14.95438957568396, 46.6339621745246, 14.87016651381797, 46.61123289602734, 14.84866897937946, 46.58292738477633, 15.71436015248894, 46.00957896040537	At least from FL 50 to FL 125	
Perf. Cov. Sp.- 5.1	Sector E Service CTR Ljubljana Airport	14.32695409607364, 46.22240225329669, 14.70900729772522, 46.02781924284347, 14.80504137640415, 46.12203423803629, 14.42305477248118, 46.31304706651077, 14.32695409607364, 46.22240225329669	At least from FL 35 to FL 50	

Perf. Cov. Sp. – 5.2	Sector E Service CTR Maribor Airport	15.58234925217456, 46.52508618670548, 15.60949140024402, 46.49029589872068, 15.55744449294949, 46.40608524326406, 15.6615625447345, 46.29770065413506, 15.88721111250494, 46.40479038999709, 15.7492206960137, 46.60000016391765, 15.58234925217456, 46.52508618670548	At least from FL 35 to FL 50		
Perf. Cov. Sp. – 5.3	Sector E Service CTR Portoroz Airport	13.61143099001574, 45.37612001406748, 13.78161470670461, 45.50320929886718, 13.59636868460219, 45.60572794576876, 13.43383207453283, 45.46277377950473, 13.61143099001574, 45.37612001406748	At least from FL 35 to FL 50		
Perf. Cov. Sp. – 5.4	Sector E Service CTR Cerklje Airport	15.66956549064738, 45.84260616173796, 15.5656885926427, 45.97949050593628, 15.36496576847604, 45.90654027754491, 15.46851786460294, 45.79792980004782, 15.66956549064738, 45.84260616173796	At least from FL 35 to FL 50		

ED-142 “TECHNICAL SPECIFICATIONS FOR WIDE AREA MULTILATERATION (WAM) SYSTEM”

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Perf. ED-142 - 01	The WAM system shall comply with ED-142: "Technical Specification for Wide Area Multilateration (WAM) Systems". Bidder shall precisely describe how is compliant with each requirement, option, recommendation described in document.		

TARGET DETECTION

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Perf. Pod - 01	The Probability of detection for any target within update interval in the coverage volume shall be greater than or equal to 98%.		

CODE DETECTION

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Perf. Code - 01	The receiver(s) of the Ground stations shall implement algorithms features compliant or exceeding DO260B specifications thus allowing for ultimate performance even under high fruit conditions.		

POSITION ACCURACY

Horizontal Position Accuracy

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Perf. HPA - 01	Within the above specified Sector A (Service TOP - Ljubljana FIR + 40 NM), the horizontal position errors shall be 100 meters RMS or better.		
Perf. HPA - 02	Within the above specified Sector B (Service LOW - Ljubljana FIR + 10 NM), the horizontal position errors shall be 70 meters RMS or better.		
Perf. HPA - 03	Within the above specified Sector C and Sector D (Service WEST and Service EAST), the horizontal position errors shall be 50 meters RMS or better.		
Perf. HPA - 04	Within the above specified Sector E (Service CTR), the horizontal position for CTR LJLJ, CTR LJMB and CTR LJCE errors shall be 30 meters RMS or better. For CTR LJPZ horizontal position errors shall be 60 meters or better.		
Perf. HPA - 05	The horizontal WAM position shall be derived independently of latitude and longitude obtained from ADS-B message content.		

Vertical Position Accuracy

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Perf. VPA - 01	The reported vertical position information shall be based on barometrical altitude reported by targets within the specified coverage.		
Perf. VPA - 02	Each target report shall contain a pressure altitude report acquired during the latest update interval. Coasting or extrapolation of previous pressure altitude data is not allowed.		

DEGRADED MODE OF OPERATION

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Perf. Degr – 01	The system shall include a tool which will continuously monitor status of different ground station units and in case of predefined failure combinations automatically announce unavailability of affected service.		
Perf. Degr – 02	In case of one ground station unit is out of function (N-1) or out of system parameters, the WAM System shall continue to operate with the same performance as during normal operation.		
Perf. Degr – 03	In case of more than one ground station unit is out of function or out of system parameters (N-2 or more), the WAM system shall only declare a fault if system minimum required performance is affected. Two or more remote units failing that do not cover the same part of airspace shall not cause the system to fail and not produce a system fault condition.		
Perf. Degr – 04	In case of more than one ground station unit failing that have overlapping coverage the system shall calculate accuracy and only in case it is not within the minimum requirement announce a failure of the affected sector.		

TARGET REPORTING REQUIREMENTS

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Perf. Track – 01	As the WAM target output is fed into ARTAS and RPX tracker systems, the WAM system shall provide calculated plots without smoothing or extrapolation.		
Perf. Track – 02	The target reports may contain, in addition to the information in the plot reports, track information like speed, heading, track number, etc.		
Perf. Track – 03	As an alternative to the last calculated position (periodic delayed mode) the system shall be able to provide the position extrapolated to the time of the output of the track report (periodic predicted mode). It is noted that this output is not used in conjunction with tracker systems.		
Perf. Track – 04	The update interval of the periodical target reports shall be selectable by the user.		
Perf. Track – 05	The Bidder shall, as part of the proposal, provide detailed information on the track overload processing implemented within the system.		

Target Report Output Period

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Perf. Out – 01	The plot report and track report update interval shall be configurable for any intervals between 1 and 4 seconds by steps of 1 second.		
Perf. Out – 02	The output period shall be configurable for each defined Service area separately.		

Data Output

Update of Changed Aircraft Information

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Perf. AC Up - 01	The WAM system shall output changes in the following aircraft information within 3 times the maximum update interval with a probability of 95%: <ul style="list-style-type: none">– ACID– Mode A code		
Perf. AC Up – 02	The WAM system shall output changes in the following aircraft information within the maximum update interval with a probability of 95%: <ul style="list-style-type: none">– Emergency Codes– SPI		

Synchronization to external Systems

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Perf. Sync - 01	The WAM internal clock system used for time stamping of Asterix target reports shall be synchronized with UTC to sufficient accuracy which will guarantee requested Slovenia Control operation.		
Perf. Sync - 02	In case of the primary synchronization source failing, the WAM system shall provide a backup source for Asterix time stamping that continues to ensure synchronization to UTC.		

FUNCTIONAL REQUIREMENTS

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Func - 01	The WAM system shall be designed in such way to minimize RF spectrum pollution, therefore reduce Interrogation to the minimum. The bidder shall as part of its offer provide software tool which will monitor, analyze and log transponder load generated by each multilateration system. Interrogation load shall be kept below 2% for any individual transponder.		

SYSTEM STATES AND MODES OF THE CENTRAL PROCESS. SYSTEM (CPS)

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Stat_M - 01	The WAM system shall be fully operational within 5 minutes of start-up or restart after power drop at the CPS and all the remote sites after proper shutdown.		
Sys. Stat_M - 02	It is noted that this does not apply for planned power-off, e.g. after a maintenance intervention where the system was in maintenance mode prior to power cycling and is then booted into operational mode.		

Operational Mode

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys.OPSm0d- 01	Within the operational mode the WAM system shall provide all main system functions to meet the required system performance as detailed in this specification.		
Sys.OPSm0d -02	Within the operational mode access to functions with impact on the operational performance shall be allowed only for users with adequate privileges.		

Sys.OPSm0d -03	It shall be possible to switch any unit of the WAM system from the operational mode to the maintenance mode.		
Sys.OPSm0d -04	Within the operational mode WAM ground station units set to maintenance shall not be used for target data processing.		

Maintenance Mode

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys.Maimod - 01	Within the maintenance mode the WAM system shall provide all system functions as available within the operational mode.		
Sys.Maimod - 02	Within the maintenance mode the WAM system shall not transmit any plot or track reports.		
Sys.Maimod - 03	The WAM system shall transmit plot, track and status reports, only if required by the users.		
Sys.Maimod - 04	It shall be possible to switch any WAM system element from the operational mode to the maintenance mode.		
Sys.Maimod - 05	Within the maintenance mode the central processing unit in operation shall not be influenced by the central processing unit in maintenance mode.		

SYSTEM SECURITY

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Securi - 01	The WAM system shall control the access to the system by users through password controlled login.		
Sys. Securi – 02	The WAM system shall allow defining individual user roles for groups of user with different individual access rights.		
Sys. Securi – 03	The WAM system shall have at least three different user roles as: <ul style="list-style-type: none">- a monitoring user, able to retrieve status information- a supervisor or maintenance user, having the rights of a monitor user plus the ability to modify configuration parameters of the system and command system modes- an administrator user, able to configure user roles and administrate the system platform.		
Sys. Securi - 04	The WAM system shall be able to prevent concurrent access by multiple maintenance users to the same system element.		
Sys. Securi - 05	If system is locked by number of wrong login attempts the system administrator shall be able to unlock it.		

INTERROGATION

1030 MHz Interrogation Transmission

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Int – 01	The Bidder shall describe in detail the Interrogation Function.		

Sys. Int – 02	The WAM system shall be able to operate on its own without interrogations from other systems.		
Sys. Int - 03	<p>The WAM system shall be able to interrogate Mode-S and Mode-A/C transponders to obtain the following information to be included within the target reports:</p> <ul style="list-style-type: none"> – Mode-A code – Mode-C code – Elementary Mode S information (Mode S Address, Mode S Aircraft Identification, Mode S Communication Capabilities and Flight Status, Mode A code and pressure altitude 25ft resolution). 		
Sys. Int - 04	The WAM System shall upon user request provide EHS information from equipped targets. (Any BDS register could be selected).		
Sys. Int - 05	The WAM System shall extract the register BDS 3.0 for the duration that an ACAS RA is detected.		
Sys. Int – 06	The average transponder occupancy time introduced by the WAM system shall be determined. This function is required for the operator of the WAM system to demonstrate compliance to the ICAO Annex 10 requirement that no transponder shall be kept busy processing replies or rejection interrogations by any interrogator of the WAM system for more than 2% of the transponder's time.		
Sys. Int – 07	<p>The system shall provide interrogation log files detailing for each interrogation:</p> <ul style="list-style-type: none"> – the time of interrogation – the interrogator used – the target interrogated – the message format used – the interrogation power used 		

Mode A/C Interrogation

Requirement	Description	Compliance	Reference in Bidder Documentation
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		(YES / NO)	
Perf. ModA - 01	Where Mode A/C interrogations are required, the WAM system shall interrogate Mode A/C aircraft using Mode A/C only all call (i.e. Inter-mode with short P4 pulse).		
Perf. ModA - 02	The system shall not use Mode A/C Whisper/Shout technology similar to ACAS as this would overload the spectrum. The bidder shall describe an alternative technology to detect and identity Mode A/C targets.		

TIME SYNCHRONIZATION

Time Synchronization

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. TSync - 01	The WAM system shall have at least two independent time synchronization methods in order to provide a robust common timing reference for the system.		
Sys. TSync - 02	The system shall be able to use the dual time synchronization methods simultaneously and in case of losing one source the system performance shall not degrade and the system shall continue to output the data without human actions.		
Sys. TSync - 03	The WAM system shall be able to start up and operate within its required performance limits with only one of the two synchronization methods being available regardless of targets being present or not.		
Sys. TSync - 04	Should the other time synchronization source (e.g. GNSS) be lost, the WAM system shall, without interruption of data, fulfill the performance requirements and continue to operate normally for at least one hour.		
Sys. TSync - 05	The operator shall be informed about the status of the time synchronization system.		
Sys. TSync - 06	The Bidders shall describe in detail the time synchronization method used within the WAM System.		

INTEGRITY

Requirement	Description	Compliance	Reference in Bidder Documentation
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		(YES / NO)	
Sys. Integ - 01	The WAM system shall have the ability to provide continuous validation of data and timely alerts to the operator when the system must not be safely used in operation as intended.		
Sys. Integ – 02	The WAM system shall include field-mounted test targets for performance and integrity monitoring allowing for end-to-end performance test of the system.		
Sys. Integ – 03	Reference and Monitoring Transponders (RMTR) may be used for the end-to-end test of the WAM system.		

ADS-B PROCESSING

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. ADS-B - 01	The system shall receive and process 1090 MHz Extended Squitter (1090 ES) ADS-B Messages as defined by ICAO Annex 10 and Eurocae ED102/RTCA DO260, DO260A, and ED102A/DO-260B.		
Sys. ADS-B – 02	The system shall apply a global CPR reasonableness test in order to validate the position decoding.		
Sys. ADS-B – 03	The ADS-B function shall output a Figure of Merit / Position Accuracy Value (FOM/PA) for ADS-B according to the Navigation Uncertainty Category contained in messages complying with MOPS DO260 and output a FOM/PA mapped according to a configurable mapping table out of Navigation Integrity Category (NIC), Navigation Accuracy Category (NAC) and Software Integrity Level (SIL) contained in messages complying with MOPS DO260A and DO260B.		
Sys. ADS-B – 04	The system shall output an ADS-B report within 50ms of receiving the specified triggering message.		
Sys. ADS-B – 05	The system shall output ADS-B target reports in a configured interval or continuously as the ADS-B messages are received.		
Sys. ADS-B – 06	The system shall be able to adjust the actual ADS-B target report update rate to adapt to the available network capacity.		

Sys. ADS-B – 07	<p>The system shall be able to ensure the following processes:</p> <ul style="list-style-type: none"> – eliminate duplicate target reports – validate data consistency 		
Sys. ADS-B – 08	The system shall be capable of receiving and decoding ADS-B messages from at least 250 targets/second.		
Sys. ADS-B – 09	The system shall output ADS-B plots (no coasting of ADS-B targets is allowed).		
Sys. ADS-B – 10	The ADS-B system shall output target and status reports on multiple outputs, which are individually configurable.		
Sys. ADS-B – 11	The ADS-B system shall be able to provide the data to other systems with the following ASTERIX formats: ASTERIX Category 021 with user selectable Editions.		
Sys. ADS-B – 12	<p>The System shall allow filtering of ADS-B targets according to the following criteria:</p> <ul style="list-style-type: none"> – Airborne/ground targets – geographical area/polygon – altitude band – figure of merit – Mode S Address – Call Sign – Squawk – Etc... 		
Sys. ADS-B – 13	For each target resulting in the generation of an ADS-B target reports, ADS-B shall compare the position information within the ADS-B target data against the position information calculated by WAM for that target.		
Sys. ADS-B – 14	The comparison of ADS-B and WAM position information shall be enabled or disabled via configuration parameter.		
Sys. ADS-B – 15	For each target undergoing ADS-B/WAM position comparison, if the absolute distance between the ADS-B position and calculated WAM position is less than or equal to a pre-defined threshold, the ADS-B target report shall indicate that the ADS-B reported position is potentially accurate, by setting bit 3 in Data Item I021/040 (Target report descriptor) to "1".		

Sys. ADS-B – 16	The distance threshold used for ADS-B/WAM position comparison shall be a configurable parameter in the unit meters.		
Sys. ADS-B – 17	The system shall provide additional means to identify false ADS-B targets that may be created by either transponder malfunctions or by intentional transmission of false information (spoofing).		
Sys. ADS-B – 18	The system shall verify the received ADS-B data and mark target reports that fail integrity verification as potentially erroneous.		
Sys. ADS-B – 19	The Bidders shall describe in detail the ADS-B integrity verification methods applied to ensure for the protection of reported target integrity.		

DATA OUTPUT MANAGEMENT

Data Output Modes

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. OutMd - 01	The WAM system shall be able to output data operating in one or more, but not limited to, of the following output modes: <ul style="list-style-type: none"> – Data Driven Mode – Periodic Delayed Mode – Periodic Predicted Mode 		
Sys. OutMd - 02	The default output mode shall be periodic delayed mode.		

Data output formats

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. OutF - 01	The WAM system shall be able to provide the data to any other system(s) with the following ASTERIX formats:		

	<p>ASTERIX Category 010, part 7, Transmission of monosensor Surface Movement Data , SUR.ET1.ST05.2000-STD-07-01</p> <p>ASTERIX Category 019, part 18, Multilateration System Status Messages, SUR.ET1.ST05.2000-STD-18-02</p> <p>ASTERIX Category 020, part 14, Multilateration Target Reports SUR.ET1.ST05.2000-STD-14-02</p> <p>ASTERIX Category 021, part 12, ADS-B Reports, SUR.ET1.ST05.2000-STD-12-01, Edition 2.1</p> <p>ASTERIX Category 023, part 16, CNS/ATM Ground Station and Service Status Reports, SUR.ET1.ST05.2000-STD-16-01</p> <p>ASTERIX Category 247, part 20: Category 247, Version Number Exchange, SUR.ET1.ST05.2000-STD20-01</p>		
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Number of outputs

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Output - 01	The WAM system shall, as a minimum, provide 16 independent logical output channels for the submission of target reports and status information.		
Sys. Output - 02	Each of the output channels shall be configurable to at least 2 simultaneous addresses of destination.		
Sys. Output - 03	<p>For each of these output channels at least the following parameters shall be definable by the WAM system administrator:</p> <ul style="list-style-type: none"> – Addresses and ports (broadcast-, multicast- or unicast-addresses) – Transmission protocol (UDP, TCP) – Status of the output (either active, non-active or test) – User definable geographical maps to filter target reports – ASTERIX category – Update interval 		

DATA RECORDING

Data recording and replay capability

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Rec – 01	The system shall record and replay all internal and external data, but at least the following data: <ul style="list-style-type: none">– Plot reports– Track reports– Target information after the several internal steps of data processing (including quality information if available)– Interrogation activity including which interrogator transmitted at what power to which target with which interrogation format and an interrogation success statistics correlating interrogations sent with successfully received replies.		
Sys. Rec – 02	The system shall be able to record and replay all output formats with a single tool into the same file so that the context is preserved.		
Sys. Rec – 03	The system shall provide the functionality to export and import recorded data.		
Sys. Rec – 04	The system shall provide the functionality to filter the data on target specific data items.		
Sys. Rec – 05	The system shall provide the functionality to have a listing of all data in a readable format.		
Sys. Rec – 06	The system shall provide the functionality to have a screen shot of the displayed data.		
Sys. Rec – 07	The Bidder shall, as part of the proposal, describe the human machine interface as realized for the data recording and replay function.		
Sys. Rec – 08	The system shall maintain a time stamped record of the operating status, states and modes of the equipment.		
Sys. Rec – 09	The system shall be able to log any user interaction on configuration including: <ul style="list-style-type: none">– Access attempts		

	<ul style="list-style-type: none"> – Control actions – Configuration changes 		
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COMMUNICATIONS

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Com – 01	Communication part between ground stations and Central Processing Station is responsibility of Slovenia Control.	–	<i>Slovenia Control Responsibility</i>
Sys. Com – 02	Contracting Authority shall provide communication bandwidth with at least 1Mbit/s.	–	<i>Slovenia Control Responsibility</i>

TARGET CAPACITY

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. TgtCap – 01	As a minimum, the WAM system shall be able to simultaneously acquire and maintain tracking of 400 targets within its stated operational coverage volume while meeting all the specified surveillance performance requirements.		
Sys. TgtCap - 02	An overload mechanism shall be provided to detect when the number of targets exceeds a configurable capacity threshold. In case of overload targets that are outside of specified Volume/Sectors are first to be discarded.		
Sys. TgtCap - 03	In addition and separate to multilateration calculation the WAM system shall provide the capability to process all information included within Mode-S and ADS-B messages (e.g. enhanced surveillance).		

BITE

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. BITE - 01	The Bidder shall describe in detail the Built In Test Equipment (BITE).		
Sys. BITE - 02	The Bidder shall describe which system unit parameters and functions are monitored by the BITE.		

CONTROL AND MONITORING SYSTEM (CMS)

CMS Functions

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys.CmsFun - 01	The CMS function shall provide the following sub-functions: <ul style="list-style-type: none">– System units status monitoring and control– System configuration– Target report quality evaluation– Display		
Sys.CmsFun - 02	User access to the system monitoring and control function shall be protected by password providing the following different authorization levels: <ul style="list-style-type: none">– Operator (lowest level; access to system units status monitoring functions)– Maintenance Engineer (medium level; access to system units status monitoring and control functions)– System Administrator (highest level; access to configuration functions and system units status monitoring and control functions)		
Sys.CmsFun –03	To allow remote login the RMCS shall provide a remote access via telecommunication lines.		
Sys.CmsFun –04	The remote access shall provide security functions to prevent unauthorized access to the system (eg. password, encryption, access logging).		

Sys.CmsFun –05	The system shall prevent remote control or configuration access to any element by more than one authorized user at a time (subject of authorization level). The access mechanism shall be centrally managed.		
Sys.CmsFun –06	The system shall notify the Centralized Monitoring and Control System when an authorized or unauthorized connection to an element is established.		
Sys.CmsFun –07	<p>The system shall provide real time performance statistics at least on:</p> <ul style="list-style-type: none"> • remote unit synchronization drift and offset per remote unit • ground network link usage per remote unit • target numbers for total targets, Mode S, Mode A/C and ADS-B • Interrogation type, used interrogator, power, success rate of interrogations • Probability of detection per target 		

CMS requirements

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys.CMS- 01	<p>The CMS shall include the collection, evaluation, graphical presentation and recording of at least the following status items and status reports:</p> <ul style="list-style-type: none"> – WAM system units status – Status of all processes performed within the different WAM system units – WAM system units status and failure reports – WAM system units access 		
Sys.CMS– 02	<p>Each of the status items and status reports of the WAM units shall be marked with at least the following identification data:</p> <ul style="list-style-type: none"> – Source identifier – Time stamp – Criticality 		

Sys.CMS– 03	The CMS shall be designed in such a way that when more than one CMS is installed within the System all CMS's can monitor the System.		
Sys.CMS– 04	The CMS shall be designed in such a way that when more than one CMS is installed within the System that only one CMS can control the System at any given time.		
Sys.CMS– 05	The WAM system elements status reports shall be submitted periodically and on event.		
Sys.CMS– 06	The CMS shall include manual change of the WAM system elements status, manual changeover to standby channels and manual reset of system units.		
Sys.CMS– 07	The Bidder shall, as part of the proposal, describe which status items of the different CMS system units can be monitored and/or controlled locally.		
Sys.CMS– 08	The CMS should be able to update software on the remote units remotely.		
Sys.CMS– 09	The CMS system shall use the SNMP protocol to exchange control and monitoring data with an external system.		
Sys.CMS– 10	The transmission protocol for the interface to an external system shall be able to use different transmission protocols (UDP, TCP) which must be selectable by the system administrator.		
Sys.CMS– 11	<p>The system configuration function shall provide the possibility to change at least the following system configuration items:</p> <ul style="list-style-type: none"> – Number of sensor units – Number of WAM time synchronization units (if required) – Mode of operation of WAM system units / system unit channels (Operational Mode / Maintenance Mode) – Test transponders if any 		
Sys.CMS– 12	The Bidder shall describe which system configuration items can be modified as part of the system configuration function.		
Sys.CMS– 13	The Bidder shall describe the human machine interface as used within the system configuration function.		

LCMS requirements

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. LCMS - 01	The LCMS shall be able to support all maintenance activities necessary to perform on each Ground Station and CPS's, these activities consists of fault detection to Line Replaceable Unit (LRU) level, configuration and access to error logs.		
Sys. LCMS - 02	The LCMS shall be able to support all configuration capabilities of the System.		
Sys. LCMS – 03	The LCMS System shall have a Technical Situation Display to display in real time the WAM and ADS-B traffic situation.		
Sys. LMCS – 04	The LCMS shall be able to update software on the Ground Stations and CPS's locally.		
Sys. LMCS – 05	The software for the Local Control and Monitoring System shall be installed on the provided laptop.		

Target Quality Evaluation Function

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys.TgtEva - 01	At least the following data items, describing the quality of the reported target, shall be calculated and included within the target reports: Number and identification of sensor units used for target position calculation: <ul style="list-style-type: none"> – Horizontal dilution of precision. – Vertical dilution of precision. – Estimated position accuracy (2-dimensional position, height) 		
Sys.TgtEva - 02	The Bidder shall, as part of the proposal, describe which additional items describing the quality of the reported target data are calculated and included within target position reports and target track reports.		

Display Function

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Disp - 01	The CMS System shall have a Technical Situation Display to display in real time the WAM and ADS-B traffic situation based on ASTERIX CAT020 (WAM), and CAT021 (ADS-B) target reports.		
Sys. Disp - 02	The CMS shall be able to use all of the fields within the ASTERIX CAT019 (WAM status) and CAT023 (ADS-B status) and display them to the user.		
Sys. Disp – 03	The Bidder shall, as part of the proposal, describe the human machine interface as realized within the CMS.		
Sys. Disp - 04	The system shall provide the functionality to display target reports under laid by area maps, system configuration maps and filtering maps.		
Sys. Disp – 05	The system shall provide the functionality to display target report quality evaluation data.		
Sys. Disp – 06	The system shall provide the functionality to display all data items of an individual target report by selecting the corresponding target on the display screen.		
Sys. Disp – 07	The system shall provide the functionality to display the data provided by a selectable output channel of the WAM system.		
Sys. Disp – 08	The system shall provide the functionality to define geographical maps to filter target reports (defining 3-dimensional position).		
Sys. Disp – 09	The system shall provide the functionality to define target filters depending on available target information.		
Sys. Disp – 10	The display function shall provide a target search function.		
Sys. Disp – 11	The display function shall provide panning and zooming techniques to allow any part of the coverage volume to be selected for display.		
Sys. Disp - 12	The language used for the display function shall be English.		
Sys. Disp – 13	The system shall provide the functionality to load and present pictures (JPEG or other formats).		

Sys. Disp – 14	The system shall provide the functionality to align the pictures to the WAM system maps.		
Sys. Disp - 15	The Bidder shall, as part of the proposal, describe the display functions that are available within the Bidder's system and provide representative screenshots.		

WAM TEST AND EVALUATION SYSTEM (OFFLINE CPS)

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. TES - 01	Offline WAM is system that operates autonomously from the operational system. It shall be used for the system testing, validation and verification of any change of the operational system, training, replaying recorded data for analysis, etc.		
Sys. TES - 02	Test and Evaluation System shall provide the same functions as the Central Processing System.		
Sys. TES - 03	Test and Evaluation System shall allow system testing and evaluation without influencing the operational system.		
Sys. TES – 04	Test and Evaluation System shall be able to be installed remote and independent from (but parallel to) the Central Processing System.		
Sys. TES - 05	It shall be possible to select any subset of WAM system units, including units in operational and in maintenance mode, to be used by the Test System.		

SYSTEM SERVICE CONDITIONS

Service life

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
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Sys.Life - 01	The WAM system shall meet all system service conditions as detailed in this paragraph on a 24 hours per day, 7 days per week basis of continuous operation.		
Sys.Life - 02	The WAM system supplied in accordance with this specification shall have a usable life of at least 15 years.		
Sys.Life - 03	The system service conditions as detailed in this paragraph shall be allocated to each unit of the system.		

Environmental Conditions

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Eenvt - 01	The contractor shall specify heat dissipation in terms of electrical power from all individual equipment. Operator's work stations, free-standing terminals, printers, etc. are defined as individual equipment.		

Susceptibility/Interference to other systems

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Interf - 01	The WAM system shall be immune to adverse effects such as radio interference, including that produced by standard radio navigation, telecommunication and radar facilities.		
Sys. Interf - 02	The Bidder shall describe how electromagnetic compatibility will be assured to allow for co-existence with the above mentioned telecommunication systems.		
Sys. Interf - 03	The WAM system shall not cause interference to standard radio navigation, telecommunication and radar facilities.		

Sys. Interf - 04	The Bidder shall, as part of his proposal, provide detailed information about radio frequency parameters and techniques (e.g. bandwidth, modulation, power, etc).		
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Electrical environment

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Elec - 01	<p>The equipment should be designed for connection to AC main and it should be designed for and, without showing any malfunction, resist the following tolerances on the AC power supply:</p> <ul style="list-style-type: none"> – Mains voltage: 230V \pm 10%, 1 ph, N, E – Frequency: 50 Hz \pm 6% – Frequency change: \leq 0.25 Hz/s – Harmonic content: \leq 6% – Power factor: \leq 0.8 – Interruption mains voltage: \leq 10 ms. 		
Sys. Elec – 02	Should the equipment not be connected to AC main, it shall also be designed for DC voltage supply.		
Sys. Elec – 03	In case of a power outage or a power interruption all software processes shall be terminated correctly.		

SYSTEM ARCHITECTURE

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Archi - 01	The central data processor shall be in dual configuration so that if one processor fails, the standby processor can immediately take over and continue to output data without human actions (HOT standby).		

Sys. Archi - 02	The time for switchover from primary to backup shall be less than 3 seconds with no loss of target data.		
Sys. Archi - 03	The Bidder shall describe in detail all redundant parts of the system providing dual channel functionality and the impact to the system during a switch- or failover (period of data loss).		

SOFTWARE AND HARDWARE DESIGNS

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Dsgn - 01	The equipment shall be designed and developed according to good engineering practice.		

HARDWARE REQUIREMENTS

General

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. HW - 01	The WAM system processing and display units shall use standard commercial hardware platforms (commercial off the shelf equipment).		
Sys. HW - 02	The Bidder shall, as part of the proposal, deliver detailed information on the hardware platforms delivered as part of the WAM system units, including information on replacement capabilities.		
Sys. HW - 03	All displays (except LCMS) shall be at least 21" flat screens with a screen resolution of 1600x1200 pixels as a minimum		
Sys. HW - 04	All CPS's, Ground stations and other possible components shall be designed for 19" inch rack mount.		

Remote Units (Ground Stations)

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. RemUn – 01	The Remote Units shall be housed in self-contained units, which can be installed at indoor or outdoor locations (in case of outdoor unit).		
Sys. RemUn – 02	Each Remote Unit shall be equipped with a temperature sensor, which shall be monitored by the system monitoring and control function.		
Sys. RemUn – 03	Each Remote Unit shall be equipped with a power socket.		
Sys. RemUn – 04	The Remote Unit RF antenna(s) shall be compliant to the environmental conditions as stipulated in ETS 300 019-1-4.		
Sys. RemUn – 05	The Remote Unit shall have adequate protection against over-voltage, over-current and lightning strikes.		
Sys. RemUn – 06	No active elements such as antenna amplifier units shall be installed at the main antenna cable outside of the lightning-protected enclosure of the Remote Unit, unless it has sufficient additional lightning protection.		
Sys. RemUn – 07	The Remote Unit shall provide degarbling capability compliant with a performance level of A3 as defined by RTCA DO260A.		
Sys. RemUn – 08	<p>The Bidder shall, as part of the proposal, deliver the following information on the indoor and outdoor Remote Units:</p> <ul style="list-style-type: none"> – Dimension – Weight – Power consumption – Heat dissipation 		
Sys. RemUn – 09	The Remote Unit shall be designed for minimum maintenance and minimum system downtime.		

Sys. RemUn – 10	There shall be no preventive maintenance activity that requires more than a half year site visit.		
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SOFTWARE REQUIREMENTS

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. SWdsg - 01	Software design shall follow the guidelines for the assurance of software contained in ED-109A.		
Sys. SWdsg - 02	The Assurance Level shall be minimum AL4 as defined in ED-109 (AL4 corresponds to Software Assurance level SWAL3 as defined in ED153) or, as an alternative, for systems or system elements developed before the issue of this standard, a safety argument for the software based on in-service evidence should be used for assurance.		
Sys. SWdsg – 03	The Bidder shall identify parts in AL4 not covered by the Bidder's implementation of ED-109 and other processes and provide the result.		
Sys. SWdsg – 04	The Bidder shall identify compliance to AL4 for parts not implemented through ED-109 and provide the result.		
Sys. SWdsg – 05	The Contractor shall use ED-109 and provide to Slovenia Control information from previous applications, used development procedures and methods of verifications, about the pre-developed software if used in the equipment.		
Sys. SWdsg - 06	Well-established and international accepted programming language should be used.		
Sys. SWdsg - 07	The Contractor shall demonstrate that software build process is without compile warnings and errors.		
Sys. SWdsg - 08	Contractor shall during warranty period free of charge provide any new software or firmware upgrade to the equipment.		

SYSTEM EXPANDABILITY

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Expnd - 01	The WAM system shall provide the ability to increase or alter the Operational Coverage Volume or the System Performance through the addition or redeployment of Receiving Unit and/or Transmitting Unit.		
Sys. Expnd – 02	The central data processor(s) shall have room for expansion to cover future requirements.		
Sys. Expnd - 03	Bidder shall state the maximum number of ground stations that can be used within the proposed configuration and how upgrades can be carried out to expand the capacity of the system.		
Sys. Expnd - 04	Adding an additional ground stations shall be done without Supplier intervention.		

SAFETY

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Sfty - 01	The Contractor shall have an established and documented Safety Management System and a Software Safety Assurance System.		
Sys. Sfty - 02	The Contractor shall use the Generic Safety Assessment for ATC Surveillance using WAM produced by Eurocontrol as input to the Contractor's safety work.		
Sys. Sfty – 03	The Contractor shall implement relevant recommended Safety Requirements from the Eurocontrol generic Safety Assessment and provide evidence that implementation has been completed.		

Sys. Sfty – 04	The Contractor shall meet Safety Objectives for hazards identified in Eurocontrol's generic Safety Assessment.		
Sys. Sfty – 05	The Contractor shall perform an FHA activity to identify hazards not identified in Eurocontrol's Generic Safety Assessment.		
Sys. Sfty – 06	The Contractor shall meet Safety Objectives for hazards identified as a result of the FHA.		
Sys. Sfty – 07	The Contractor shall perform PSSA and SSA phases in accordance with Eurocontrol Safety assessment Methodology (SAM).		
Sys. Sfty – 08	The Contractor shall identify weaknesses in the system using techniques like for instance FMECA or Common Cause Analysis (CCA), and implement mitigations.		
Sys. Sfty – 09	The Contractor shall support CONTRACTING AUTHORITY for the generation of safety case by proving the documents mentioned above and further product related safety documentation.		

RELIABILITY, AVAILABILITY, MAINTAINABILITY

Reliability analysis

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Sys. Reliab – 01	<p>The offer shall include description of the reliability of the system in terms of:</p> <ul style="list-style-type: none"> – MTBF (Mean Time Between Failures) – MTBCF (Mean Time Between Critical Failures) – MTTR (Mean Time To Repair) – Risk analysis for whole system 		

PROJECT MANAGEMENT

PROJECT MANAGER

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
PM. Pmgr - 01	The Bidder shall be responsible for appointing a Project Manager which shall coordinate all activities related to this project until end of warranty period.		

PROGRESS MEETINGS

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
PM. Meet - 01	The Contractor shall arrange progress meetings for monitoring progress of project activities.		
PM. Meet - 02	The progress meetings shall be the formal contact forum between the Contractor and the Contracting authority.		
PM. Meet - 03	Progress meetings shall be held regularly after the award of contract signing at the request of the Contracting authority.		
PM. Meet - 04	It is anticipated that progress meetings will be held at 3-month interval initially or at the request of the Contracting authority.		
PM. Meet - 05	The progress meeting shall take place either at the Contractor's facilities or at the Contracting authority's facilities.		
PM. Meet - 06	The progress meetings shall, inter alia, cover: <ul style="list-style-type: none">– Product specification approval– Acceptance test documentation and approval (Factory and Site)– Approval of delivery		

	<ul style="list-style-type: none"> – Contract fulfillment – Progress of Project activities 		
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PROGRESS REPORTS REQUIREMENTS

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
PM. Rep - 01	<p>The Contractor shall keep records of all work done in the engineering and construction phases of the work and make an activity and progress report, monthly and annually as follows:</p> <ul style="list-style-type: none"> – two copies of the monthly Progress Report, – two copies of the annual Progress Report and, – two copies of the Final Report. 		
PM. Rep - 02	The regular monthly report will be made as of the end of each calendar month and will include comments for each month as the project accelerates or falls behind schedule.		

PROJECT TASKS

WAM COVERAGE SIMULATIONS

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Proj. Sim – 01	The Bidder shall submit a coverage analysis showing at least the horizontal performance accuracy (HPA) as well as the DOP of the proposed system using sites defined in SLOWAM Sites.xlsx file. The analysis shall be submitted on a USB stick or similar media.		
Proj. Sim – 02	The results of the coverage analysis as detailed in this paragraph shall be provided for visualization in Google Earth application.		
Proj. Sim – 03	The simulation shall use digital terrain elevation data DTED Level 1 or equivalent.		
Proj. Sim – 04	<p>The Bidder shall for simulation use following assumptions :</p> <ul style="list-style-type: none"> - Transponder Output Power is 200W - Transponder sensitivity is -75 dBm - Cable losses shall be used as specified in SLOWAM Sites.xlsx - Antenna gain shall be used as proposed by the Bidder however not less than specified in SLOWAM Sites.xlsx 		
Proj. Sim – 05	<p>The Bidder shall provide HPA coverage showing WAM system performances ;</p> <ul style="list-style-type: none"> – For Sector A – Service TOP, at FL 245 from 10 meters to 250 meters by 20 meter increments. – For Sector B – Service LOW, at FL 125 from 10 meters to 150 meters by 10 meter increments. – For Sector C and D – Service West and East, at FL 50 from 10 meters to 100 meters by 10 meter increments. – For Sector E – Service CTR, at FL 35 from 10 meters to 100 meters by 10 meter increments. 		
Proj. Sim – 06	The coverage analysis shall include information on reduction of system performance parameters in case of failures of Sensor Units, (Worst case scenario). Separate coverage analyses shall be provided for the following cases:		

	<ul style="list-style-type: none"> – All Sensor Units operational – N-1 operational 		
Proj. Sim – 07	The results of the coverage analysis shall be presented on a separate area layout maps which shall be compatible for visualization in Google Earth application. The Bidder shall provide every HPA coverage analysis not just for visualization in Google earth, but also with percentage value number (rounded on 2 decimal points). This percentage value number shall be calculated with respect to the volume of sector A – service TOP (Perf.Cov.Sp.–1).		
Proj. Sim – 08	<p>The simulation shall also include:</p> <ul style="list-style-type: none"> – the coverage diagram for ADS-B – the coverage diagrams of the interrogators 		
Proj. Sim – 09	Performance values presented in the coverage analysis of the Bidder shall be met completely by the operational system. Potential performance or coverage gaps compared to the Bidder's data in the final offer shall be corrected at the Bidder's costs.		
Proj. Sim – 10	The bidder shall submit on a USB stick or similar media data of a real traffic recording of an existing typical WAM installation in order that Contracting authority could run SASS-C analysis and assess performance. Recording shall be in Asterix Cat 20 and CAT21 for duration of 4-6 hours during peak traffic hours.		

ELEMENTS TO BE SUPPLIED BY THE CONTRACTOR

Equipment

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Proj. Sup - 01	<p>The following system units shall be supplied as part of the WAM system:</p> <ul style="list-style-type: none"> – Receive Only Units, – Combined Receive / Transmit Units (depending on the Bidder WAM system architecture), 		

	<ul style="list-style-type: none"> – 3 Central Processing Systems (CPS), – WAM Reference Transponder Units (if required by the Bidder WAM system architecture), – WAM Time Synchronization Units , – Control & Monitoring System, – Proper Antenna system with at least 6 dB gain (achieved by antenna design or RF amplifier), – Other components depending on the Bidder WAM system architecture 		
Proj. Sup - 02	The WAM system shall be complete in accordance with all functional and performance requirements defined within this specification. The Bidder shall describe in details their proposed solution such as number of units and their proposed configuration for each site defined in SLOWAM Sites.xlsx.		
Proj. Sup - 03	Item or part necessary for proper operation and adjustment in accordance with the requirements of this specification shall be incorporated even though that item or part may not be specifically provided or described herein.		
Proj. Sup - 04	All features required to meet the functional and performance requirements shall be incorporated even though the features may not be specifically provided for or described herein.		
Proj. Sup - 05	All necessary facilities, parts and hardware, including receptacles, connectors, cables, cabling (wiring), and outlets shall be incorporated to enable the components of the system to be properly assembled, interconnected, installed and maintained as required herein.		

Technical Infrastructure

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Proj. Inf - 01	Contracting authority will provide equipment shelters if needed and all mains source cabling unless otherwise agreed.	–	<i>Slovenia Control Responsibility</i>
Proj. Inf – 02	Contracting Authority will provide telecommunication network between the ground stations and central processor(s) and between the central processor(s) and the ATM Surveillance Data Processors (SDP) or any other system.	–	<i>Slovenia Control Responsibility</i>
Proj. Inf – 03	The Contractor shall supply lightning protection as part of Omni directional antenna and overvoltage protection for all Remote Ground Stations.		
Proj. Inf – 04	The Contractor shall supply all power cables required for connecting the WAM system units to the nearest power distribution equipment.		
Proj. Inf – 05	The Contractor shall supply mounting equipment required for the antenna installation.		

PLANNING

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Proj. InsPlan - 01	The Contractor shall be responsible for the required detailed planning of installation and commissioning.		
Proj. InsPlan - 02	All plans shall be approved by the Contracting authority		
Proj. InsPlan - 03	The Contractor shall prepare a preliminary version of the installation plans and deliver that to Contracting Authority for review no later than two (2) months prior to start of installations.		
Proj. InsPlan - 04	After receiving the order, the Contractor shall in coordination with Contracting authority within one (1) month after contract award, prepare the required main time schedule with regards to the installation and commissioning activities on site.		

Proj. InsPlan - 05	The time schedule shall indicate start date, realization period and completion date of installation and commissioning on site.		
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VERIFICATION AND VALIDATION

Factory Acceptance Test (FAT)

FAT Documentation

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Proj.FATDoc - 01	<p>Upon approval by Contracting authority the following documents shall be binding on both parties:</p> <ul style="list-style-type: none"> – Test Plan – Test Specification – Test Procedure – Test Record – List of Delivery 		
Proj.FATDoc - 02	The Test Plan (identification of test specifications, procedures and schedule) shall be worked out by the Contractor and shall be made available for Contracting Authority for review and approval latest four (4) weeks prior to the expected start of the SAT.		
Proj.FATDoc - 03	The Test Plan shall mutually be approved at the latest two (2) weeks before the actual start of the SAT.		

FAT Execution

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Proj.FATexe - 01	Twenty (20) working days prior to the expected start of the FAT Contracting Authority and the Contractor shall mutually agree upon a fixed starting date for the FAT to be carried out in the Contractor's premises.		
Proj.FATexe - 02	Before starting the formal FAT, the Contractor shall present to Contracting Authority the complete Pre-test Report.		
Proj.FATexe - 03	The Contractor shall provide all instruments, equipment, materials, facilities and services required for appropriate execution of the FAT.		
Proj.FATexe - 04	Equipment under FAT shall consist of the complete system in accordance with the Agreement.		
Proj.FATexe - 05	The FAT shall be performed following the Test Plan and the Test Procedure, successively checking the items for compliance with the Test Specification.		
Proj.FATexe - 06	The Contractor shall provide the evaluation tool(s) to support the FAT.		
Proj.FATexe - 07	During the FAT a Test Record shall be completed. Every recording, listing, print-out etc. created during the FAT shall be added to the test report as evidence.		
Proj.FATexe - 08	Should problems occur during the FAT or should the FAT test results be unsuccessful the problems shall be corrected.		
Proj.FATexe - 09	<p>The following set of documentation shall be handed over to Contracting Authority as evidence of successfully completed FAT:</p> <ul style="list-style-type: none"> – Certification Record, signed by Contracting Authority or his representatives upon completion of the FAT – Set of completed Test Records – All recordings – List of Delivery – Certification Record, signed by Contracting Authority confirming successful finish of training 		

Site Acceptance Test (SAT)

SAT Documentation

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Proj.SATDoc - 01	Upon approval by Contracting Authority the following documents shall be binding on both parties: <ul style="list-style-type: none">– Test Plan– Test Specification– Test Procedure– Test Record– List of Delivery		
Proj.SATDoc - 02	The Test Plan (identification of test specifications, procedures and schedule) shall be worked out by the Contractor and shall be made available for Contracting Authority for review and approval latest four (4) weeks prior to the expected start of the SAT		
Proj.SATDoc - 03	The Test Plan shall mutually be approved at the latest two (2) weeks before the actual start of the SAT.		

SAT Execution

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Proj.SATexe - 01	Ten (10) working days prior to the expected start of the SAT Contracting Authority and the Contractor shall mutually agree upon a starting date for the SAT to be carried out in Contracting Authority's facilities.		
Proj.SATexe - 02	The Site Acceptance Test shall include verification of all items delivered in accordance with the Agreement, including training, documentation and quality of workmanship.		
Proj.SATexe - 03	The Contractor shall provide the evaluation tool(s) to support the SAT.		

Proj.SATexe - 04	Before starting the formal SAT, the Contractor shall present to Contracting Authority the complete Pre-test Report. This documentation shall contain full details of the Contractor's evaluation of the test results achieved during Setting Up.		
Proj.SATexe – 05	Equipment under SAT shall consist of the complete system in accordance with the Contract.		
Proj.SATexe – 06	The final phase of the SAT shall include a long term Stability Test, lasting for minimum 1 week, during which the system shall run under continuous relevant operation without any signs of anomalous function.		
Proj.SATexe - 07	As WAM System will be part of Slovenia Control operational environment, SAT can only be successfully finished after it passes SAT procedure including SASS-C analysis as well as flight check provided by Contracting Authority. With the SASS-C analysis the Contracting Authority will also assess the accuracy and coverage values provided by Contractor in WAM coverage Analysis in order to verify if the delivered WAM system complies with the results provided by the Contractor in the WAM coverage Analysis. In case the delivered WAM System will not comply with the results provided by the Contractor in the WAM coverage Analysis and other technical requirements SAT will be considered as failed. Analysis shall be based on Traffic of opportunity and Flight check. SASS-C analysis shall be conducted by contracting authority experts.		
Proj.SATexe - 08	During the SAT a Test Record shall be completed. Every recording, listing, print-out etc. created during the SAT shall be added to the test report as evidence.		
Proj.SATexe - 09	If problem/s occur during the FAT or SAT test results are unsuccessful the problems shall be corrected by Contractor within deadline set by contracting Authority		
Proj.SATexe - 10	The following set of documentation shall be handed over Contracting Authority as evidence of successfully completed SAT: <ul style="list-style-type: none"> – Certification Record, signed by Contracting Authority or his representatives upon completion of the test – Set of completed Test Records – All recordings 		

	– List of all documents that contribute to SAT.		
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LOGISTICS

Documentation

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Proj. Doc – 01	The system documentation shall include complete technical and operational manuals for each equipment and part of the WAM system consisting at least: <ul style="list-style-type: none"> – System description – Technical data – Circuit diagrams and parts list – Complete instructions for operation, maintenance and fault diagnostic – Detailed descriptions and instructions for WAM system parameters and tuning 		
Proj. Doc – 02	The documentation shall be up to date with the system accepted by the Contracting Authority.		
Proj. Doc – 03	Contractor shall free of charge provide revisions and upgrades to above mentioned documents in case of changes, upgrades, etc.		
Proj. Doc – 04	The documentation shall be provided in Slovenian or English language.		
Proj. Doc – 05	To assist any further modification and use, the documentation should also be available in electronic format.		

TRAINING

WAM Technical training

Requirement	Description	Compliance	Reference in Bidder Documentation
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		(YES / NO)	
Proj. Trng - 01	Contractor shall provide training for technical personnel, which shall last at least ten (10) working days. The training shall be divided in two separate consecutive time periods for two groups of students (each lasting at least ten working days).		
Proj. Trng - 02	The training course(s) shall be held at Contractor's premises. The maximum numbers of participants are five (5) at each training.		
Proj. Trng - 03	The Bidder shall include description of the training course offered. The training shall include theoretical and practical training for the whole WAM system covering installation and maintenance and the coverage analysis and planning tool including detailed training for the system parameters and tuning.		
Proj. Trng – 04	Upon contract signing the Contractor shall present a schedule for the training including start and stop and present milestones for the total training.		
Proj. Trng – 05	The technical training course shall: <ul style="list-style-type: none"> – involve theoretical and practical training; – include fault diagnosis/recovery; – use of documentation, handbooks and instruments delivered by the Contractor for the contracted system. 		
Proj. Trng - 06	After each training the Contractor shall test the knowledge of the students and evaluate the results.		
Proj. Trng – 07	Training course and training documentation shall be provided in Slovenian or English language.		
Proj. Trng – 08	The successful completion of training shall be performed before FAT. After completion of the training course, hardware and software specialists shall be able to monitor/evaluate the performance, maintain, operate and configure the system, within the frame of the maintenance concept. After successful completion of the training course Contracting Authority issues Certification Record, confirming successful finish of training.		

Training documents

Requirement	Description	Compliance	Reference in Bidder Documentation
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		(YES / NO)	
Proj. TrDoc - 01	The training material consisting of the documentation to be delivered with the final supply shall be of the format specified in the Requirement.		
Proj. TrDoc- 02	Each participant shall obtain a complete set of documentation when the training courses start. Those handbooks shall be each student's personal belonging.		
Proj. Trdoc - 03	A copy of the document including material to be used by the Instructor during training shall be available to Contracting Authority at least four (4) weeks before the beginning of the training course.		

SPARES

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Proj. Spares - 01	<p>The Contractor shall include following spare parts:</p> <ul style="list-style-type: none"> - 5 pcs omnidirectional antennas - 2 pcs sector antennas - 4 pcs standalone Ground Station Receivers Units - 1 pc outdoor standalone Ground Station Receiver Unit - 3 pcs Transmitter/Receiver standalone Units - 4 pcs GPS antennas - 1 pc CPS - 1 pc RCMS 		
Proj. Spares - 02	The spare parts and modules shall be of the same quality and have same characteristics as in the installed system.		
Proj. Spares - 03	Bidder shall include the price list for all spare parts, which shall be valid at least twenty four (24) months after SAT.		

WARRANTY PERIOD

Requirement	Description	Compliance (YES / NO)	Reference in Bidder Documentation
Proj. Wrtty - 01	The Warranty Period shall be at least seven (7) years after successfully completed SAT.		
Proj. Wrtty - 02	During the Warranty Period Contracting Authority will report all the failures and malfunctions to the Contractor. Malfunction shall be rectify by Contractor in agreed time period defined in contract.		
Proj. Wrtty – 03	Contractor shall provide documentation which shall be used for the reporting problems and include at least the following information: <ul style="list-style-type: none"> – date of failure or malfunction reported – description of the failure or malfunction – status of the item (investigation, solved, implemented) – all correspondence concerning the item – special, mutually agreed information 		
Proj. Wrtty - 04	To enable the investigation of warranty claims, the Contractor will be provided with all information and material deemed necessary.		
Proj. Wrtty - 05	Spare parts shall be available fifteen (15) years after the end of warranty period.		