ANNEX E - PROGRAM TECHNICAL REQUIREMENTS

1   DOCUMENT OVERVIEW

This document describes the technical requirements for the FFGH MLU & SEWACO OPV3S Program.

Throughout the document and the appendices, addition to the 6.2 Key Definitions in the main document of this SOW, the following definitions/naming convention will apply.

1.1   System and equipment integration levels

The levels of integration which can be applicable to the technical requirements for the FFGH MLU & SEWACO OPV3S Program, are defined as follows, ranging from the maximum integration, to the least integration levels, sequentially:

a) **Full Integration:** Full integration of a system is the system's full scope integration to the CMS, in accordance with the Integration Control Document (ICD) of the associated system. These usually includes; command, control and monitoring of all features of the system; command and control of movement and actions (e.g., zoom in/out, focus, move up, move down, fire, polarization change, pulse length change, TX power change, etc.), receive all relevant data for situational awareness; and receive the video (e.g., video stream for cameras and "raw" video regarding radars and sonars, etc.) and system status data (i.e., internal test, failures, action's needed, alignment process, firing corrections, etc.)

b) **Partial Integration:** It's the integration level that lies between a fully integrated and stand-alone functioning of the system. Within the scope of this SOW, it is generally referred to the exchange of relevant data required to achieve situational awareness, video, and system status.

c) **Stand-Alone:** A stand-alone system refers to a self-contained and independent system that operates and functions independently without any integration to the CMS.

Integration component definitions:

Video Integration: refers to the process of incorporating the video component from a source system to the destination system. The specific definition and characteristics of video can vary depending on the source system specifications. In the context of radar and sonar systems, video integration entails receiving data that represents objects in a distance versus direction graph, resembling a map representation. This data is generated by analysing the transmission signal reflections. On the other hand, when dealing with video cameras, video integration involves accessing the real-time video stream and display in the destination system.

Data Integration encompasses the process of integrating received data that significantly contributes, or has the potential to contribute, to the operational situational awareness. It involves transmitting information from the source system to the destination system, which can include critical parameters such as distance, speed, azimuth, position, closest point of approach of a target, frequency, altitude, and other relevant data available in the source system. The objective of data integration is to consolidate and harmonize the several information from various sources, enabling a comprehensive and accurate understanding of the operational environment within the destination system.

Command and Control Integration (hereafter also mentioned as "full control") allows the destination system's Graphical User Interface (GUI) to seamlessly control, modify, explore, and configure settings and features of the source system. It empowers users to efficiently manage various functionalities, at least, including changing operation modes, adjusting transmission power, controlling movement (e.g., camera positioning), and engaging weapon systems. This integration enhances user control and facilitates effective interaction between the destination and source systems.

Status integration involves the exchange of information related to the functional health of the source system. It encompasses the transmission of various critical details, warnings and failures, such as; internal temperature, fan speed, fault notifications, internal test results, hours or usage remaining until the next maintenance, heartbeat status, current workload, and other relevant parameters. The purpose of status integration is to enable the destination system to receive and monitor the operational status and condition of the source system, facilitating proactive maintenance, performance optimization, and effective decision-making.

2 GENERAL REQUIREMENTS

TECH_Req.1. The Contractor shall upgrade 2 (two) Vasco da Gama Class frigates with the new SEWACO systems, integrating the Legacy and the GFE systems, delivering a comprehensive solution. [Essential]

TECH_Req.2. The Contractor shall deliver a complete set of new SEWACO Systems for the 2 (two) VGAM FFGH and 6 (six) OPV3S. [Essential]

TECH_Req.3. The contractor should provide a complete set of new SEWACO Systems for up to 3 (three) additional ships, individually, following OPV3S configuration, including installation, integration and the ILS-OLM level package per ship. [Optional]

TECH_Req.4. The products to be delivered shall be developed and integrated by maximizing the use of: [Essential]

> a. Mission proven COTS/MOTS components and COTS/MOTS based solutions;
> b. Non-Developmental Items (NDI);
> c. Qualified items;
> d. Existing designs, documentation and processes.

TECH_Req.5. All the equipment delivered and installed as part of this contract shall be new at current production and not refurbished. [Essential]

TECH_Req.6. The Contractor is responsible for conducting complete design, integration, and engineering calculations for the delivery of fit-for-purpose Products and Services. [Essential] (FFGH Only)

Error! Reference source not found._Table 1_Table 1 summarizes the design of the New SEWACO comprehensive solution.

NATO SUPPORT AND PROCUREMENT AGENCY
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Table 1 - Scope of Supply

Systems	Product	Essential CMS Integration Level	Supply	Responsibility for execution				
				Systems Integration Design	Engineering	Modifications (touch labour)	Installation	Integration
CMS	-	-	By this Contract	Contractor	Contractor	End User	Contractor	Contractor
3D Radar	-	Full	By this Contract	Contractor	Contractor	End User	Contractor	Contractor
2D Radar	-	Full	Optional	Contractor	Contractor	End User	Contractor	Contractor
IFF	-	Full	By this Contract	Contractor	Contractor	End User	Contractor	Contractor
ESM	-	Partial	By this Contract	Contractor	Contractor	End User	Contractor	Contractor
IBS-NAVRAD	-	Full	By this Contract	Contractor	Contractor	End User	Contractor	Contractor
EOD	-	Full	By this Contract	Contractor	Contractor	End User	Contractor	Contractor
EOS	-	Full	Optional	Contractor	Contractor	End User	Contractor	Contractor
SONAR	AN/SQS-510	Partial	Legacy	Contractor	Contractor	End User	End User	Contractor
TAS	-	Partial	GFE	Contractor	Contractor	End User	End User	Contractor
Unnamed Vehicles	-	Partial (Provisions for)	GFE	Contractor	Contractor	End User	End User	Contractor
FCR	-	Full	By this Contract	Contractor	Contractor	End User	Contractor	Contractor
GUN	CADAM 100mm	Full	Legacy	Contractor	Contractor	End User	End User	Contractor
NSSM	RIM 7	Full	Legacy	Contractor	Contractor	End User	End User	Contractor
CIWS	Vulcan Phalanx Bl II Bl1	Partial	Legacy	Contractor	Contractor	End User	End User	Contractor
Additional CIWS	Vulcan Phalanx Bl II Bl1	Partial	GFE	Contractor	Contractor	End User	End User	Contractor
HWS	-	Partial	Legacy	Contractor	Contractor	End User	End User	Contractor
RWS 12,7MM	-	Partial~~Full~~	GFE	Contractor	Contractor	End User	End User	Contractor
OSD	-	Full	By this Contract	Contractor	Contractor	End User	Contractor	Contractor
IBMS	-	Partial	GFE	Contractor	Contractor	End User	End User	Contractor

Systems	Product	Essential CMS Integration Level	Supply	Systems Integration Design	Engineering	Modifications (touch labour)	Installation[2]	Integration
C4I	-	No integration	GFE	N/A	Contractor	End User	End User	N/A
ICCS	-	Partial	GFE	Contractor	Contractor	End User	End User	Contractor
Internal/External Comms	-	No integration	GFE	N/A	Contractor	End User	End User	N/A
SATCOM	-	No integration	GFE	N/A	Contractor	End User	End User	N/A
TDL	-	Full	GFE	Contractor	Contractor	End User	End User	Contractor
XBT/XSV	-	Partial	Legacy	Contractor	Contractor	End User	End User	Contractor
Radio Direction Finder[1]	-	Partial	GFE	Contractor	Contractor	End User	End User	Contractor
WAIS	WAIS R6	Full	By this Contract	Contractor	Contractor	End User	Contractor	Contractor
Scope of Supply - OPV3S								
Systems	Product	Essential CMS Integration Level	Supply	Responsibility for execution				
				Systems Integration Design	Engineering	Modifications (touch labour)	Installation[2]	Integration
CMS	-	-	By this Contract	Contractor	End User	End User	Contractor	Contractor
2D Radar	-	Full	By this Contract	Contractor	End User	End User	Contractor	Contractor
IFF	-	Full	By this Contract	Contractor	End User	End User	Contractor	Contractor
ESM	-	Partial	By this Contract	Contractor	End User	End User	Contractor	Contractor
~~IBS~~ NAVRAD	-	Full	~~By this Contract~~ GFE	Contractor	End User	End User	~~Contractor~~ End User	Contractor
EOS	-	Full	By this Contract	Contractor	End User	End User	Contractor	Contractor
TAS	-	Partial	GFE (Provisions for)	Contractor	End User	End User	End User	Contractor
Unnamed Vehicles	-	Partial (Provisions for)	GFE	Contractor	End User	End User	End User	Contractor
RWS 30/40MM	-	Partial	GFE	Contractor	End User	End User	End User	Contractor
RWS 12,7MM	-	~~Partial~~ Full	GFE	Contractor	End User	End User	End User	Contractor
OSD	-	Partial	By this Contract	Contractor	End User	End User	Contractor	Contractor

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[1] Only to consider as GFE in case Contractor in not compliant with TECH_ESM.Req.119 (Desirable Lvl1).

[2] For the OPV, regarding Installation, placing the systems on-board will be performed by NSPA/End-User, under Contractor´s supervision. Contractor will be responsible for performing the STW.

IBMS	-	Partial	GFE	Contractor	End User	End User	End User	Contractor
ICCS	-	Partial	GFE	Contractor	End User	End User	End User	Contractor
TDL	-	Full	GFE	Contractor	End User	End User	End User	Contractor
XBT/XSV	-	Partial	GFE	Contractor	End User	End User	End User	Contractor
Radio Direction Finder	-	Partial	GFE	Contractor	End User	End User	End User	Contractor
WAIS	WAIS R6	Full	GFE	Contractor	End User	End User	End User	Contractor

The main configuration for SEWACO system for FFGH is requested to be as follows (FFGH Only):
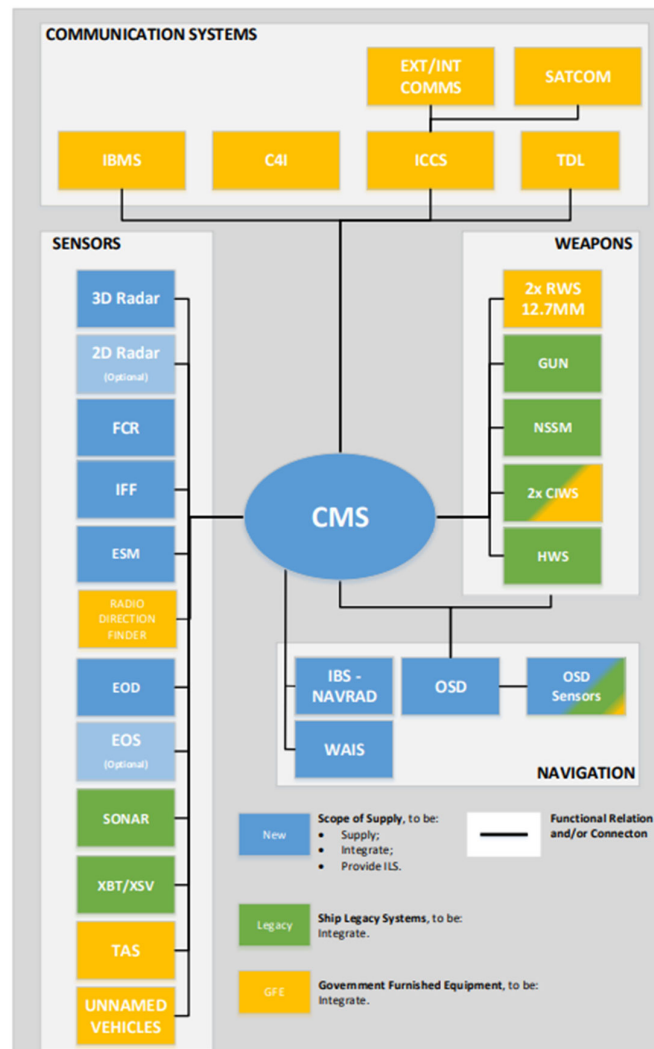
Figure 1 - Scope of Supply for FFGH

The main configuration for SEWACO system for OPV3S is requested to be as follows (OPV3S Only):
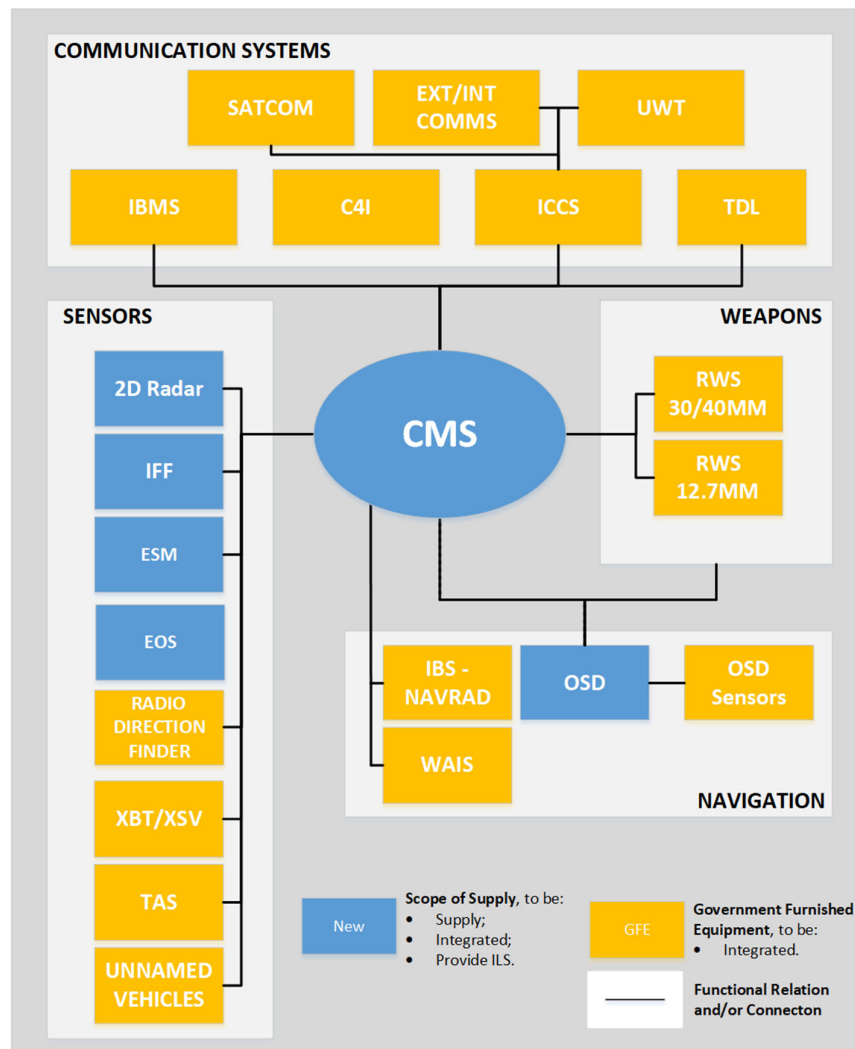
Figure 23 - Scope of Supply for OPV3S

TECH_Req.7. The Contractor shall design and develop the Engineering required for the production and implementation of necessary Modifications (to be performed by NSPA and End User), to install and integrate the new SEWACO systems, Legacy systems and GFE systems [Essential] (FFGH Only)

TECH_Req.8. All the Hardware to be installed on board shall comply with the specifications detailed in the General Design Requirements documents attached as Appendix A and Appendix B for each Programs, where applicable. [Essential]

Appendix C lists the systems and equipment which are;

    a. to be provided as GFE systems to the Contractor;

    b. the Legacy systems to be removed from the ship by the End User; and

    c. the Legacy systems to be reinstalled to the ship by the End User.

3   TECHNICAL REQUIREMENTS

3.1   General Design and Material Requirements

The General Design and Material Requirements documents describe the interface requirements for systems and electronic equipment which are to be integrated to the ships. These documents are organized in a comprehensive way and include, as much as possible, references to existing standards, and other guidelines defined by the End User.

The general design and material requirements for the VGAM FFGH upgrade are detailed in the Appendix A and shall be read as a complement to the existing Building Specifications for Portuguese Navy MEKO 200 Frigates which will be provided after the Effective Date of the Contract (EDC).

The general requirements for the OPV are detailed in Appendix B.

3.2   System Requirements

3.2.1   Combat Management System [Common]

The Combat Management System (CMS) shall support the user with presenting the necessary information for decision making during the operations, which are received from the systems to the extend given in *Table 1**Table 1*.

In general, the CMS shall perform the following main tasks:

    a. Integration of sensors systems, OSD systems, communication systems, and weapons systems information and/or control;

    b. Human Machine Interface;

    c. Filter, reduce and process the data considering constraints, such as, sensor quality, consistency, data recency, in order to improve the data quality to be processed in the next phase;

    d. Apply algorithms on the rough data, based on the NATO and/or National doctrine, in fields ranging from, navigation safety rules, weather conditions, position, weapon capabilities, mission goal (e.g., self-defence, defence of others, area surveillance), target capabilities and current status, own-ship system status, to aid and support the

operators for their mission;

e. Data transfer and management;

f. Provide indicators, warnings, cautions, advisories, information, assessments, and reports to the user as below:

  i. alarms to advise on change in the tactical picture;

  ii. own ship system readiness status changing;

  iii. course suggestions;

  iv. log and information for later use;

  v. weapon engagement; or

  vi. kill assessment.

The system shall contribute to the crew readiness allowing them to conduct tailored simulated scenarios from simpler to complex ones.

In terms of system functions the CMS could be divided into the following logical/functional sub-blocks:

CMS Hardware – Provide the necessary processing power to support the implementation of CMS function. The hardware includes rack enclosures, networks, storage, computers, operator consoles, radar / video distribution, data storage, and physical pieces mounted to comply with the standards given in the general requirements, Appendix A.

CMS Software

Core Systems – CMS core system which support all layers of software, includes the CMS management and control tools, CMS and subsystem monitoring, and database management.

Integration – Encompass all necessary aspects to integrate subsystems like the Sensors Systems, Navigation Systems, Communication Systems, Weapons Systems, Legacy Systems, External Networks, and third-party software in order to provide CMS, access to data, control, and monitoring over the integrated systems.

Situational Awareness – Managing sensor information, compilation and dissemination of a common and reasonable situational picture.

Threat Engagement – Performs engagement planning and deployment or allows manual execution of engagements on the compiled picture with the available efforts.

Operations Support and Execution – Provides tools to conduct maritime and military operations according the National and NATO procedures and doctrine (e.g., mission planning tools, tactical formation, custom area drawing, Heli approach pattern, etc.)

Human-Machine Interface (HMI) – Provides platform for the operator to interact with the CMS, allowing; information visualization (e.g., tracks, radar video, cameras video), operations execution, subsystem control and monitoring, overlaid in an electronic navigation chart. Additionally, provides flexibility for the user to customize the workspace to their needs and role.

Data Logging and Recording – Provides the means to view, record, replay CMS data, including, tactical, radar, video, and own ship sensor data and export all to an offline device to use as legal evidence or post analyses off-premises.

System Support and Maintenance – Provides the system and subsystem maintenance functionalities that will allow the system maintainers to perform their tasks.

On-board Embedded Training Tool – Provides on-board training facilities that emulate a design scenario of operation concurrently with Live Operations execution.

3.2.1.1   CMS System Requirements

3.2.1.1.1 CMS System General Requirements

TECH_CMS.Req.1   The Combat Management System (CMS) shall be able to command, control and monitor the systems integrated, to carry out the required missions as described within this SOW. [Essential]

TECH_CMS.Req.2   The control and display of the sensors, OSD, C2, communication, and weapon systems shall be integrated to the CMS to the level as defined **Error! Reference source not found.**Table 1   Scope of Supply. [Essential]

TECH_CMS.Req.3   CMS shall be able to conduct the missions in a multi-threat environment simultaneously. [Essential]

TECH_CMS.Req.4   The CMS shall be based on an open architecture to allow modules built to integrate new systems, or to replace the systems to eliminate the obsolescence. [Essential]

TECH_CMS.Req.5   The CMS shall be built in a modular concept and based on mission proven software and hardware technology that allows to adapt and evolve along with the technological evolution without compromising from the existing capabilities and performance. [Essential]

TECH_CMS.Req.6   The CMS shall reduce the effort required from the operator, optimizing the time factor, either in the mission planning and execution phases, from detection and

classification of contacts, especially potential threat contact, prioritizing by threat level to weapon usage recommendation. Shall have a high degree of process automation that enables tactical and operational advantage. [Desirable_Lvl1]

TECH_CMS.Req.7   The CMS shall have set of tools, based on hardware and software, that enable adequate information and operational knowledge management. [Essential]

TECH_CMS.Req.8   The CMS shall have an uninterruptable power supply to sustain its operation during a power failure, for at least 15 minutes. [Essential]

TECH_CMS.Req.9   The CMS should have an uninterruptable power supply to sustain its operation during a power failure for at least 45 minutes. [Desirable_Lvl1]

3.2.1.1.2   CMS Hardware Requirements

TECH_CMS.Req.10   The Contractor shall use in maximum extent the COTS hardware which are in accordance with the standards given in Annex F. [Essential]

TECH_CMS.Req.11   The CMS hardware configuration shall be redundant (e.g., redundant: data storage, network, processing, operation database, etc) with an availability rate that complies with the requirements of this Contract. [Essential]

TECH_CMS.Req.12   The CMS hardware should have up to 30 percent growth capacity in data storage and processing power. [Desirable_Lvl1]

3.2.1.1.2.1 CMS Consoles System Requirements

TECH_CMS.Req.13   Operator consoles shall be designed as a single operator multi-function console. [Essential]

**TECH_CMS.Req.14**   Operator consoles shall be modular configuration (i.e., allow scalable features depending on the operator functions) to fit to different operator roles and/or adaptable to space constraints. [Essential]

TECH_CMS.Req.15   Consoles shall allow the physical integration of the communication terminal developed by the company EID, the OEM (User Terminal UT), details will be provided upon EDC (e.g., 10" monitor with rugged case). [Essential]

TECH_CMS.Req.16   The Contractor shall design and implement a layout for the Combat Information Center (CIC), as well as the available space and Legacy/GFE constraints (representative layout is given in Figure 3Figure 3 below), taking into consideration the following criteria: [Essential] (FFGH only)

   a. Operator-Operator interaction;

   b. Ability to observe displays on adjacent consoles;

   c. Ability to observe shared visual displays for operational information or other (e.g. Presentations or CCTV Visualisation) (Cooperative Wall Displays);

d. Accessibility of console components;

e. Space for physical peripherals and storage;

f. Ability to observe and operate other equipment panels;

g. Efficiency of use of floor space and overall volume.
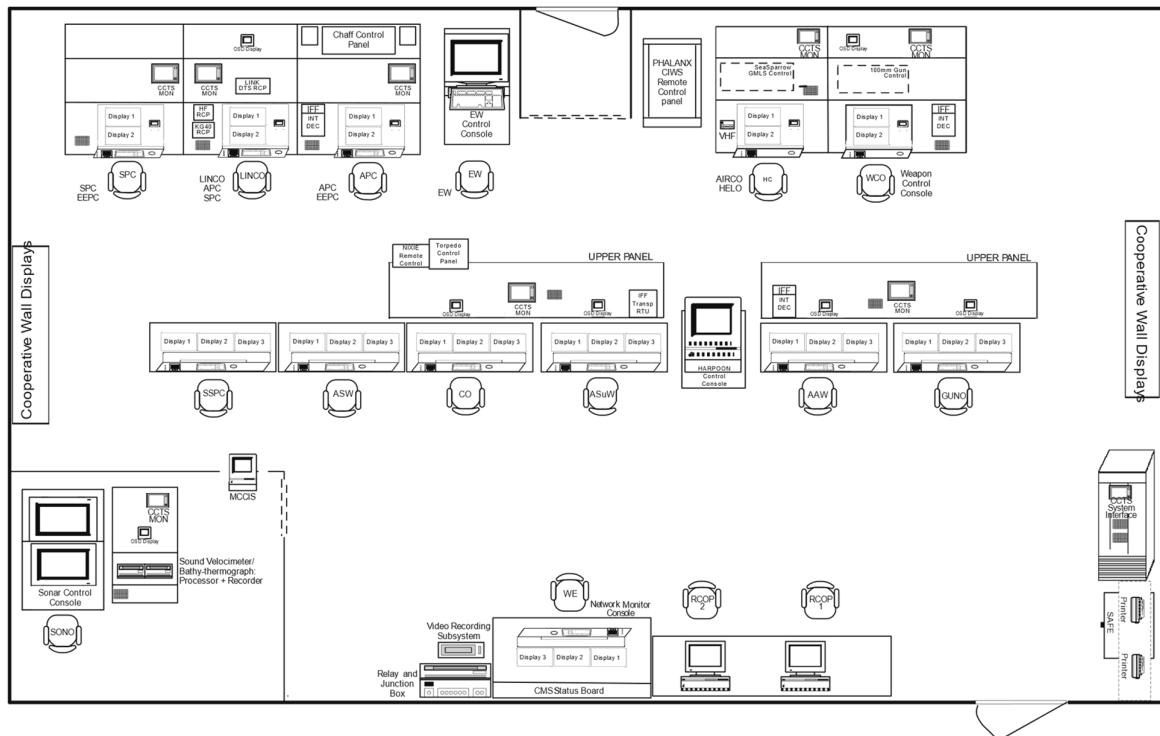
Figure 34 – FFGH CIC layout concept (representative)

TECH_CMS.Req.17 The Contractor shall propose a design for the Combat Information Center (CIC) (representative layout is given in Figure 4Figure 4 below), taking into consideration the following bullets: [Essential] (OPV only)

a. Operator-Operator interaction;

b. Ability to observe displays on adjacent consoles;

c. Ability to observe shared visual displays for operational information or other (e.g. Presentations or CCTV Visualisation) (Cooperative Wall Displays);

d. Accessibility of console components;

e. Space for physical peripherals and storage;

f. Ability to observe and operate other equipment panels;

g. Efficiency of use of floor space and overall volume.
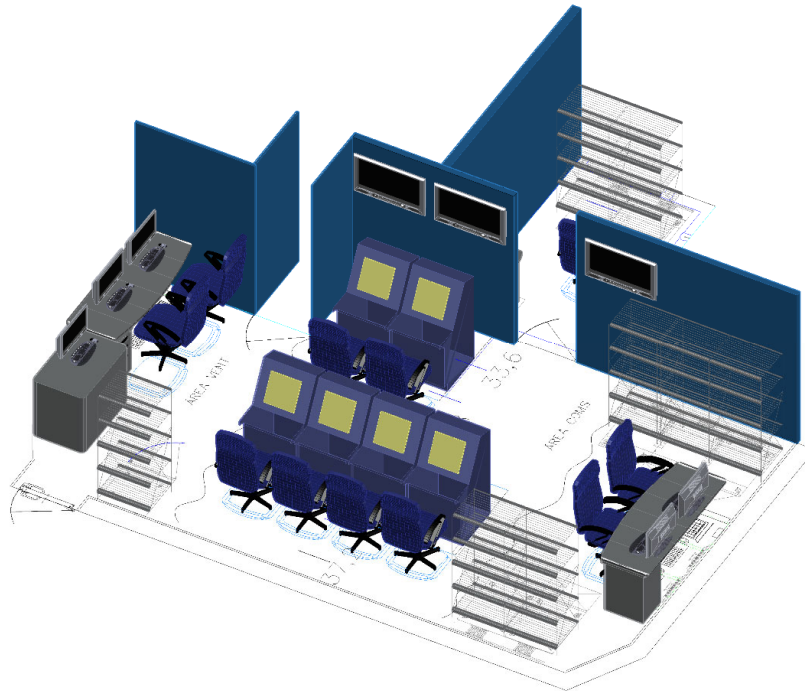
Figure 45 - OPV CIC concept layout (representative)

TECH_CMS.Req.18   CMS consoles ergonomics shall comply with the OSHA[3] or MIL-STD-1472 requirements with taking into account the long hours of operation (6 hours per watch, 2 shifts per day per person, 24h continuous operation) and continuous usage without significantly reducing comfort levels for the operators. The operator chairs are an integral part of the CMS consoles, and must therefore comply with the ergonomics, comfort, use profile, durability and robustness required for the envisaged type of operation. [Essential]

TECH_CMS.Req.19   CMS consoles shall be resistant to wear related to heavy and continuous usage. [Essential]

TECH_CMS.Req.20   The console physical design shall allow each operator to work from any console regardless of the console layouts (e.g., situational awareness operator console can be used by the Air Defence Officer, if needed). [Essential]

TECH_CMS.Req.21   CMS consoles quantity shall allow the ship to engage the full spectrum of its CONOPS i.e., each type of mission operator shall be able to use a console, simultaneously. (FFGH only)

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[3] Occupational Safety and Health Administration (OSHA) requirements for computer ergonomics (https://www.osha.gov/etools/computer-workstations)

  a. At least 10 in CIC; [Essential]

  b. More than 10 in CIC; [Desirable Lvl1]

  c. 1 smaller console (acceptable to have only 1 screen) on the bridge; [Essential]

  d. 1 smaller consoles on the Staff Room. [Essential]

  e. 1 smaller console on the weapons section base. [Essential]

TECH_CMS.Req.22 CMS consoles quantity shall allow the ship to engage the full spectrum of its CONOPS. (OPV3S Only).

  a. 7 consoles in the CIC, [Essential]

  b. 1 smaller console on the bridge. [Essential]

TECH_CMS.Req.23 CMS consoles should allow the replacement of any of its components in less than 15 minutes in case of failure. [Desirable Lvl1]

TECH_CMS.Req.24 CMS Consoles shall be able to accommodate at least two different computers to access administrative IT secure networks apart from CMS network (e.g., Portuguese National Secure WAN and NATO Secure WAN), using same input equipment's (example: secure KVM technology - same keyboard, video and mouse). All on-board administrative networks shall be available for these computers to connect to. [Essential]

TECH_CMS.Req.25 CMS Consoles shall simultaneously display the information from the CMS (tactical picture always visible) and from one of the other integrated computers based on the operator's choice. [Essential]

TECH_CMS.Req.26 CMS Consoles should provide alternatives in case of peripherals malfunctions (e.g., Existence of Protected and External USB in case of Primary Keyboard and Mouse failure, allowing the replacement by a Secondary USB Keyboard and Mouse). [Desirable Lvl1]

TECH_CMS.Req.27 The CMS shall have at least 2 cooperative wall displays, within the CIC, readable from 5 meters distance. [Essential]

3.2.1.1.3 CMS Software Requirements

3.2.1.1.3.1 Core Systems Requirements

TECH_CMS.Req.28 The CMS shall provide computing capability and network service according to systems and subsystem requirements. [Essential]

TECH_CMS.Req.29 The CMS shall have the capability to monitor and control it's computing and network resources. [Essential]

TECH_CMS.Req.30 The CMS shall be able to report the system status (visual and log) to the operator as well as through the output interface to IBMS. [Essential]

TECH_CMS.Req.31   The CMS shall have a 97% of operation availability (i.e., absence of critical failures during mission periods). [Essential]

TECH_CMS.Req.32   The CMS shall provide data security and system redundancy according to systems and subsystem requirements and Security Aspects Letter.

(i.e., security measures for protection of communication, information, and other electronic systems, and the information that is stored, processed or transmitted in these systems with respect to confidentiality, integrity, availability, authentication and non-repudiation.) [Essential]

TECH_CMS.Req.33   The CMS shall provide data replication through distributed systems. [Essential]

TECH_CMS.Req.34   In case of degraded mode, the CMS shall be able to access all its features from no more than 3 consoles and roles configuration (i.e., Decision, Compilation and Weapons). [Essential]

TECH_CMS.Req.35   Each individual CMS major subsystem or equipment (e.g. consoles or cabinets), shall have a maximum run up time of 5min. [Essential]

TECH_CMS.Req.36   The CMS shall have individual user accounts with assigned role/permission to it. [Essential]

TECH_CMS.Req.37   The user accounts, roles and permissions shall be proposed by the Contractor and approved by the End User until CDR. [Essential]

TECH_CMS.Req.38   The CMS shall keep the login history of each console and operator activity logs in the appropriate database. [Essential]

3.2.1.1.4 Requirements for Integration with external systems

TECH_CMS.Req.39   The CMS shall continuously evaluate the SEWACO systems' status to identify status changes, providing alarms and/or warnings to the operator. [Essential]

TECH_CMS.Req.40   The CMS shall present to the operator the necessary information to evaluate and monitor if the helicopter launch and recover are inside the Ship Helicopter Operating Limits. [Essential]

TECH_CMS.Req.41   The CMS shall be able to receive data from several unmanned vehicles' (UAV/USV and UUV, further referred to as UXV) own sensors or payload sensors. The integration of the UXV into the CMS is a one direction interface to feed the UXV own sensors data into a dedicated layer of the CMS, where the main information of the ongoing deployment are shown, such as position, course, speed, altitude (or depth, as applicable), vehicle ID, etc. The integration of the UXV payload sensors is to have a one directional integration as well into the CMS, and will, in principle, be integrated at a later stage, due to the potential payload variability. In principle, video, electromagnetic, acoustic, and radar data

is to be integrated into the applicable layers of the CMS. The Integrator must provide the ICD in order to enable the subsequent integration of these dimensions. There is no command & control integration from the CMS to the UXV. The UXV will be controlled from their dedicated consoles. [Essential]

TECH_CMS.Req.42   The system shall be able to perform link management and data forwarding. [Essential]

TECH_CMS.Req.43   The CMS shall allow the operators to perform transmission control of the different sensors, according to their level of integration, in a full and sectorial mode. [Essential]

3.2.1.1.4.1 Situational Awareness Requirements

TECH_CMS.Req.44   The CMS shall be able to receive and provide data to contribute to the operator's Operational Picture Development in different domains (e.g., AAW, ASuW, ASW, other). [Essential]

TECH_CMS.Req.45   The CMS shall allow the generation and maintenance of a coherent Common Operational Picture (COP). [Essential]

TECH_CMS.Req.46   The CMS input data shall be available by layers (e.g., the radar video from different radars shall be an information layer; the air, surface, and subsurface tracks from different sensors shall be available by layers) to allow the selection of the right data for the occasion. [Essential]

TECH_CMS.Req.47   The CMS shall have the capability to process minimum 300 air contacts, including highly manoeuvrable combat aircraft, UAVs and hypersonic missiles operating at low altitude. [Essential]

TECH_CMS.Req.48   The CMS shall have the capability to process minimum 100 surface contacts. [Essential]

TECH_CMS.Req.49   The CMS shall be able to autonomously search/detect objects, process the data, and perform transition to track targets. [Essential]

TECH_CMS.Req.50   The CMS should be able to automatically process information/data from Ownship and External Sensors and Weapon Systems (e.g., shared panorama, and capabilities between NATO warships to apply cooperative actions, potentiating combined capabilities and interoperability), for correlation and support the analysis, identification, and classification of contacts. [Desirable_Lvl1]

TECH_CMS.Req.51   The CMS shall be able to determine Track ID. [Essential]

TECH_CMS.Req.52   The CMS shall be able to resolve Track ID conflicts. [Essential]

TECH_CMS.Req.53   The CMS shall be able to integrate multiple track data sources. [Essential]

TECH_CMS.Req.54   The operator shall be able to access the Track/Target information (e.g., Track quality and source, Target Measurement, Track and Attribute Data). [Essential]

TECH_CMS.Req.55   The CMS shall allow the operator to deconflict air and water space management to maintain safety. [Essential]

TECH_CMS.Req.56   The CMS, depending on the integration level with SEWACO subsystems (i.e., SONAR's and Electronic Warfare System), should allow the operator to perform manual entries, into an existing or pre-defined database, with diverse information from various types of platforms, and log/archive/update the acoustic and electromagnetic effects of those platforms. [Desirable_Lvl1]

TECH_CMS.Req.57   The CMS, depending on the integration level with SEWACO subsystems (i.e., SONAR's and Electronic Warfare System), shall be able to automatically process information, based on the existing or pre-defined database, for correlation and support the analysis, classification, and identification of contacts. [Essential]

TECH_CMS.Req.58   The CMS, depending on the integration level with SEWACO subsystems (i.e., SONAR's and Electronic Warfare System), shall allow the import and export of the operational data from national or other programs/databases, such as the NATO Emitter Database (NEDB), acoustic databases, etc. [Essential]

TECH_CMS.Req.59   The CMS should have the capability to import different types of georeferenced information (e.g., Bathymetry, Additional Military Layers, Satellite Images, Routes, Air Corridors, Territorial Waters and Areas). [Desirable_Lvl1]

TECH_CMS.Req.60   The CMS should provide to the operator automatic or semi-automatic fused operational data sources. [Desirable_Lvl1]

TECH_CMS.Req.61   The CMS shall be able to use the operational data for post mission analysis and legal evidence. The information shall include the integrated own ship data (e.g. Ships Position and Time Tag) and Data Link Units' data. [Essential]

TECH_CMS.Req.62   Post Mission Analysis feature shall be proposed by the Contractor and approved by the End User until CDR. [Essential]

TECH_CMS.Req.63   The CMS shall display the data and video of electro-optical director/surveillance system, CCTV and other SEWACO video cameras. [Essential]

TECH_CMS.Req.64   The CMS, depending on the available data, should assess and optimize the detection probabilities for different target types for the selected sensor (e.g., should adapted search patterns, pulse length, modulation, transmission power, etc). [Desirable Lvl2]

TECH_CMS.Req.65　　The CMS should present the Predicted RADAR range to the operators. [Desirable Lvl2]

TECH_CMS.Req.66　　The CMS should compute, based on the integration level, the Predicted Sonar Range and other indicators, using the information sent by the Expendable Bathythermograph (XBT) and/ or Expendable Sound Velocimeter (XSV). [Desirable Lvl1]

TECH_CMS.Req.67　　The operator should be able to use as input for situational awareness different sources of external information (e.g., COI list, MMSI Database, NATO Emitter Database). [Desirable Lvl1]

3.2.1.1.4.2　Threat Engagement Requirements

TECH_CMS.Req.68　　The CMS shall be able to perform threat evaluation automatically, prioritize levels between threats, depending on speed, distance, heading, movement pattern, and other parameters defined by the operators, in the CMS software module. [Essential]

TECH_CMS.Req.69　　The CMS shall allow the operator to manually override the engagement priorities of the threats. [Essential]

TECH_CMS.Req.70　　The CMS shall allow the operator to add threats to the engagement priorities manually. [Essential]

TECH_CMS.Req.71　　The CMS shall be able to automatically perform weapon designation and employment. [Essential]

TECH_CMS.Req.72　　The CMS shall allow the operator to perform weapon designation and employment. [Essential]

TECH_CMS.Req.73　　The CMS shall be able to engage surface and air targets assigned from a radar and/or electro-optical track. [Essential]

TECH_CMS.Req.74　　Depending on the integration level, the operator shall be able to perform assignments and engagements of weapons and sensors in CMS. [Essential]

TECH_CMS.Req.75　　The operator shall be able to perform cease-fire, hold fire, or break engage orders. [Essential]

TECH_CMS.Req.76　　The CMS shall suspend an engagement upon receipt of a cease-fire or hold-fire command by the operator. [Essential]

TECH_CMS.Req.77　　The CMS shall calculate and provide to the operator, threat engageability, kill effectiveness, and probability of success. [Essential]

TECH_CMS.Req.78　　The CMS should provide a timeline recommendation for engaging order and fire solution for different threats priorities according to the national/NATO firing doctrine, which can be accepted by veto or automatically depending on the system mode configuration defined by the operator. [Desirable_Lvl1]

TECH_CMS.Req.79   The system shall recommend engagement orders, such as new engagements, and engagements priority change. [Desirable_Lvl1]

TECH_CMS.Req.80   The operator shall be able to select weapons and schedule engagement orders. [Essential]

TECH_CMS.Req.81   When defined by the operator, the CMS shall be able to perform weapon and schedule engagements autonomously. [Essential]

TECH_CMS.Req.82   The operator should be able to determine/manage the firing doctrine for different threats, such as sequence of weapon/effector employment, effector selection criteria and parameters, effector switch criteria, etc. [Desirable_Lvl1]

TECH_CMS.Req.83   Depending on the defined integration level, the operator shall be able to initialize/control weapons; and perform manual firing. [Essential]

TECH_CMS.Req.84   Depending on the defined integration level and if determined by the operator, the CMS shall be able to perform initialize/control weapons autonomously; the fire will be by: [Essential]

    a. operator veto (semi-automatic);

    b. automatic.

TECH_CMS.Req.85   The operator shall be able to monitor the engagement status. [Essential]

TECH_CMS.Req.86   The CMS should evaluate and recommend fire solution for the identified threat, at least for the following weapon type/deployment: [Desirable_Lvl1]

    a. IR and Chaff Decoy;

    b. Naval Gun Support (NGS);

    c. Anti-Air and Surface Gun Firing;

    d. Torpedo Firing;

    e. Surface-to-Surface Missile; and

    f. Point Defence Missile System.

TECH_CMS.Req.87   The CMS should support the coordination of defence for a Task Group (TG) using the available information, e.g., the status of units according to the 4S matrix (Speed, Stability, Steering, Sustainability) and Own Systems. [Desirable Lvl1]

TECH_CMS.Req.88   The CMS should support the Cooperative Engagement (i.e., the CMS shall allow the ship to participate and contribute to the joint war fighting domain with networked sensors and weapons capable of coordinated action and/or and cooperative engagement capabilities with other NATO assets, including anti-symmetric defence scenarios). [Desirable Lvl1]

TECH_CMS.Req.89   The CMS shall implement security and safety measures to guarantee the safe use of weapon systems. The security measures will assess that operators have deliberate intentions to make use of the weapon system, e.g., the system cannot fire under simulation mode or technical alignment conditions, fire inhibit switch deactivation, or emergency stop. [Essential]

TECH_CMS.Req.90   The CMS shall be capable of simultaneously engage at least, 2 (two) air and 10 (ten) surface tracks. [Essential]

TECH_CMS.Req.91   The CMS shall be capable, depending on subsystems availability, to automatic and/or manually correct the Gun in surface mode firing. [Essential]

TECH_CMS.Req.92   The CMS shall be able to apply spotter corrections during NGS firing. [Essential] (FFGH only)

3.2.1.1.4.3 Operations Support and Execution Requirements

TECH_CMS.Req.93   The CMS shall enable the employment of national tactical doctrine. [Essential]

TECH_CMS.Req.94   The CMS should be able to provide at least, but not limited to, the listed warnings and/or alarms. [Desirable_Lvl1]

  a.   Collision Alarm;

  b.   Unauthorized contact inside own ship defence zone;

  c.   Unauthorized contact inside protected zone;

  d.   Unauthorized contact inside Weapon safety sector;

  e.   Contact outside define patrol zone;

  f.   Contact above speed threshold;

  g.   System Hardware/Software fault not yet acknowledged;

  h.   Contact being tracked lost;

  i.   Navigation behind schedule, action needed;

  j.   Threat Detected, action needed;

  k.   Contact of Interest found;

  l.   Wind conditions above threshold;

  m. Rain conditions above threshold;

  n.   Platform movement (pitch, roll, weave) outside threshold;

  o.   GNSS lost;

  p.   GNSS in autonomous mode, time counter initiated;

  q.   System in simulation mode;

  r.   System in real mode;

s. Fire inhibit system ON/OFF;

t. Racket (Electromagnetic emission) received;

u. SONAR contact received;

v. Threat inside engaging range;

w. Recording [screen, video camera].

TECH_CMS.Req.95 The alarms and warnings should be directed to the associated user profile. [Desirable Lvl1]

TECH_CMS.Req.96 The CMS should alert the operator with a visual warning that the EMCOMPLAN has been changed. [Desirable Lvl1]

TECH_CMS.Req.97 The systems status database (e.g., Operating mode, Activity, alarm, etc.) held by CMS shall be available to export, allowing external applications to query it in an automated manner, keeping adequate segregation between application and networks (e.g., IBMS system). [Essential]

TECH_CMS.Req.98 The CMS should allow execution of built-in tests for the integrated systems which have the status reporting capability. [Desirable_Lvl1]

3.2.1.1.4.4 Human-Machine Interface (HMI) Requirements

TECH_CMS.Req.99 The CMS shall provide an intuitive Graphical User Interface (GUI) where the operators will interact with the system and subsystems, according to the different NATO Warfare Domains doctrine (e.g., AAW, ASuW and ASW). [Essential]

TECH_CMS.Req.100 The CMS shall have user profiles with different access levels, [Essential], suggesting the following or equivelent:

a. Awareness Profiles - (i.e., only display the information available and have ability to apply filters on what is displayed; able to use the tools such as distance measure and bearing line between points, etc.);

b. Compilators, panorama constructors – (i.e., supervise CMS automated process of tracks generation; able to wipe, create, edit, contact. They upload, delete, create polynomial, formation, area, airlines routes, safety corridors, and similar figure. They are responsible to maintain the relevant information in the tactical picture to conduct the mission successfully and effectively.);

c. Sensors Controllers per domain areas (AAW, UWW) – (i.e., role authorized to operate the sensor, from operation to features configuration);

d. Weapon System Controller – (i.e., role authorized to control weapons moving, change settings, designate, engage, and fire, if fire veto is released);

e. Surface to Surface Missile Controller – (i.e., role authorized to control configuration and design the usage plan, change settings, designate, engage, and fire, if fire veto is released;

f. Tactical Data Link Controller – (i.e., role authorized to control the settings of TDL, responsible to transmit data to the network, and maintain a comprehensive TDL panorama and ensure its usability);

g. EW Controller – (i.e., role responsible to operate the EW sensor, adjust settings, maintain sensor alignment, and maintain a comprehensive EW panorama);

h. Decision Maker – FIRE authorization per domain– (i.e., responsible to authorize the fire action, the act as the last authorization step for the firing process);

i. Maintainer Administrator – (i.e., role responsible to maintain a wealthy CMS, it will have the right privileges to conduct monitoring and troubleshooting, initiate logs, extract information, access maintenance pages of sensors and weapon);

j. Information Security – (i.e., role responsible to assign roles into user accounts. This role will be performed in daily basis. The maintainer will also be able to perform this role as an administrator, although not as role/profile manager but as issue solver;

k. Helicopter Controller – (i.e., role responsible to control the helicopters, this role shall have the capacity to control radar settings and radar video; manipulate appropriate tools overruling the ones using it, if necessary.

TECH_CMS.Req.101   The interface should support displaying the system status by graphical representations (such as charts, graphs, and diagrams) and textual information. [Desirable Lvl1]

TECH_CMS.Req.102   The interface shall employ appropriate colour schemes, icons, and visual cues to enhance usability and improve user experience. [Essential]

TECH_CMS.Req.103   The CMS should present the status of connected systems and subsystems, highlighting system operational capability. [Desirable Lvl1]

TECH_CMS.Req.104   The operator should be able to select the information/data layers which better fit their need and mission. (e.g., Tracks, Tactical Situation, Operational Readiness, System and Subsystem Status). [Desirable Lvl1]

TECH_CMS.Req.105   The operators should be able to customize and save their display environment according to their needs and clearance. [Desirable Lvl2]

TECH_CMS.Req.106   The operator shall be able to receive system and operational environment alerts, warnings, alarms, and status information. [Essential]

TECH_CMS.Req.107   Regardless with the profile, each operator shall always visualize the ship's course, attitude, Local Time and UTC, alarms, and warnings information. [Essential]

TECH_CMS.Req.108   Regardless with the profile, the operator should always visualize a common set of information (e.g., Threat State Board, Commander Aim/Guidance, Rules of Engagement). [Desirable Lvl1]

TECH_CMS.Req.109   The CMS shall be able to compute and display the latest IHO-certified nautical chart format, selectable by the operator by object. [Desirable Lvl1]

TECH_CMS.Req.110   The CMS should present alerts, alarms, and all the relevant information for the execution of different warfare. [Desirable Lvl1]

TECH_CMS.Req.111   The HMI shall use **STANAG 2019 – APP-6 NATO Joint Military Symbology** or MIL-STD 2525. [Essential]

TECH_CMS.Req.112   The cooperative wall display shall present CMS information selected by the operator. [Essential]

TECH_CMS.Req.113   The CMS should have a cooperative wall configuration/management page. [Desirable Lvl1]

TECH_CMS.Req.114   The CMS shall display warning and alerts which requests important actions from the operator. [Essential]

TECH_CMS.Req.115   The active warning and alerts, mentioned in TECH_CMS.Req.114~~TECH_CMS.Req.133~~, shall always be visible until acknowledged. [Essential]

TECH_CMS.Req.116   The CMS tactical picture shall display, edit or draw, predefined, saved, upload, or new figures (areas, zones, safety zones, air and navigation routes, formations) using polylines, lines, sectors, circles, and other geometric figures, centred in a contact, georeferenced points, or own ship. [Essential]

TECH_CMS.Req.117   The CMS figures, drawing, zones mentioned on TECH_CMS.Req.116~~TECH_CMS.Req.147~~ shall be able to be seen locally and available for all CMS users. [Essential]

TECH_CMS.Req.118   The CMS tactical picture shall provide Ship Helicopter Limits (SHOL) layout giving the operators a real-time graphical display of relative wind, pitch and roll, outhouse, aircraft status, and cones of courses for Lynx MK 95 and most used NATO helicopters. [Essential]

TECH_CMS.Req.119   The CMS tactical picture shall have the capability to display pre-defined, if selected by the operator, weapons firing sectors, radar detections sectors, gun bearing line, and security areas. [Essential]

TECH_CMS.Req.120   The CMS tactical picture shall allow the operator to change the characteristics (e.g. azimuth, width, depth, height, others) of the sectors and areas required in the TECH_CMS.Req.119~~TECH_CMS.Req.150~~ and add new ones. [Essential]

TECH_CMS.Req.121   The CMS shall be able to display a layer of radar raw video (processed/emulated radar raw video), independently of the type of radar video inputs. [Essential]

3.2.1.1.4.5 Data Logging and Recording Requirements

TECH_CMS.Req.122   The CMS shall be able to record the tactical picture (e.g., geodic registration, tracks, emissions, action performed, alerts and warnings received). [Essential]

TECH_CMS.Req.123   The CMS shall be able to record the actions performed by the different operators. [Essential]

TECH_CMS.Req.124   The CMS shall have continuous recording capability, for a minimum of 21 days of the following: [Essential]

    a.   all events in the tactical picture;

    b.   video from system and subsystem;

    c.   data and status from system and subsystem mission events.

TECH_CMS.Req.125   The CMS shall allow the export, in a common format, of the recorded data for legal evidence and future use (e.g., mission debrief, training, lessons learned, mission analysis). [Essential]

3.2.1.1.4.6 System Support and Maintenance Requirements

TECH_CMS.Req.126   The maintainer support software should continuously monitor and display the status of the system in real-time, providing detailed information about both software and hardware components. [Desirable Lvl1]

Software status indicators may include, but are not limited to:

- Running processes and services;
- Memory and CPU usage;
- Network connectivity and data transfer rates;
- Software version and configuration details;

Hardware status indications may include, but are not limited to:

- Temperature, voltage, and power consumption;
- Device connectivity and communication status;
- Different interface's connection status;
- Sensor status, reading and environment conditions;
- Weapon status.

TECH_CMS.Req.127   The interface shall provide visual feedback, such as color-coded indicators or status icons, to highlight normal, warning, and error states of the CMS, its subsystems and the systems that interface with it. [Essential]

TECH_CMS.Req.128   The CMS shall support maintenance activities to ensure the smooth operation of both the software and hardware components. [Essential]

Maintenance actions may include, but are not limited to:

    a. Software reset: Restarting the software component of the system without affecting the hardware.

    b. Hardware reset: Power cycling or rebooting the dedicated hardware component of the system.

    c. Maintenance mode activation: Initiating a mode that allows access to advanced maintenance functions.

    d. Software updates and patches: Allowing the operator to apply software updates to fix bugs or security vulnerabilities (e.g. Firmware update).

    e. Hardware diagnostics: Providing tools to perform diagnostics on hardware components and identify potential issues.

    f. System configuration: Allowing the operator to modify system settings and parameters.

TECH_CMS.Req.129   The CMS software application should be equipped with robust error handling mechanisms to handle unexpected situations. Should display and provide clear and informative error messages that describe the issue encountered, suggesting possible solutions, and guide the maintainer through the troubleshooting process. [Desirable Lvl1]

TECH_CMS.Req.130   The CMS should include error recovery mechanisms, such as automatic error detection and correction, system rollback, or fallback mechanisms, to minimize the impact of errors on system availability and functionality. [Desirable Lvl2]

TECH_CMS.Req.131   The CMS should provide a mechanism for maintainers to manage system logs effectively (e.g., viewing, searching, filtering, and exporting of log data for troubleshooting, auditing, or analysis purposes). [Desirable Lvl1]

TECH_CMS.Req.132   The CMS shall generate log entries for critical events, errors, warnings, and important system activities, capturing relevant information such as timestamps, error codes, and detailed descriptions. [Essential]

TECH_CMS.Req.133   The CMS shall include features for maintainers to manage the underlying database (i.e., provide tools to perform database backups, restoration, and optimization). [Essential]

TECH_CMS.Req.134   The CMS Database management functionality should allow creating, modifying, or deleting database schemas, tables, and indexes as needed. [Desirable Lvl1]

TECH_CMS.Req.135   Maintainers should have the ability to execute database queries and scripts for data retrieval, modification, or analysis. [Desirable Lvl2]

TECH_CMS.Req.136   The CMS software and hardware components shall implement security measures to protect against unauthorized system access, unauthorized data management (i.e., data breaches and tampering) and unauthorized user accounts management. [Essential] The security measures may include, but are not limited to:

   a. User authentication mechanisms shall be in place, such as username/password authentication, to ensure that only authorized personnel can access the system.

   b. Access control shall be enforced based on user roles and privileges, allowing different levels of access to different system functionalities.

TECH_CMS.Req.137   The CMS shall include functionality for maintainers to manage user accounts and their permissions (i.e., create new user accounts, modify existing accounts, or deactivate/disable accounts if necessary). [Essential]

TECH_CMS.Req.138   The CMS User account management features shall include options to assign roles, permissions, and access levels to different user accounts. [Essential]

TECH_CMS.Req.139   The CMS maintainer shall be capable of managing the user profile login system. [Essential]

3.2.1.1.4.7 On-board Embedded Training Tool Requirements

TECH_CMS.Req.140   The CMS shall be able to provide simulated environment for operator training. [Essential]

TECH_CMS.Req.141   The CMS should be able to provide hybrid training environments (i.e., fusion of simulated and real-world data). [Desirable Lvl1]

TECH_CMS.Req.142   The CMS shall allow the development of training scenarios scripts that can be subsequently executed. [Essential]

TECH_CMS.Req.143   The CMS should allow a full or partial simulation of the ships' systems and subsystems inputs in accordance with the scenario, including the ships' position, attitude, and speed. [Desirable Lvl1]

TECH_CMS.Req.144   The CMS shall be able to introduce and control different air, surface, and undersea platforms as tactical player to the simulation. [Essential]

TECH_CMS.Req.145   The CMS should create, edit existing tactical players, and save platforms and equipment's to the associated database to be used in simulated scripts. [Desirable Lvl1]

TECH_CMS.Req.146   The CMS should allow equipment's assignment to the desired platform. [Desirable Lvl2]

TECH_CMS.Req.147   The CMS shall allow the capture, recording, and playback of the training results for crew debriefing. [Essential]

TECH_CMS.Req.148   The CMS should allow failure simulation of ships' systems (e.g., Radar systems, Propulsion systems, Weapon systems). [Desirable Lvl1]

TECH_CMS.Req.149   The CMS should allow emergency simulation (e.g., fly operations emergency, emergency management, other). [Desirable Lvl2]

TECH_CMS.Req.150   The CMS should have an additional working space/console that operates as a gamemaster and supporting role. This will enable all other consoles' introduction to the training sessions. [Desirable Lvl1]

TECH_CMS.Req.151   The CMS simulation module should allow onboard simulation but also training with external units, either on land or dynamic, i.e., simulated data should be available to be transmitted through secure communication networks. [Desirable Lvl1]

TECH_CMS.Req.152   The CMS should allow training of the following domains: [Desirable Lvl2]

a.   Ship/Force Protection;

b.   Command, Control, Communications and Computers;

c.   Threat / Weapons engagement;

d.   Sonar Training;

e.   EW training.

TECH_CMS.Req.153   A CMS training module should be supplied and assembled at dedicated on shore facilities to allow Operation and Maintenance training. [Desirable Lvl1]

3.2.2 Sensor Systems

3.2.2.1   New Sensor Systems

The New Sensor Systems are composed of the following systems:

    a. 3D Radar System; (FFGH Only)

    b. 2D Radar System; (OPV3S Essential) [FFGH Optional]

    c. EOD System; (FFGH Only)

    d. FCR System; (FFGH Only)

    e. IBS – NAV RAD System; (FFGH Only)

    f. EOS System; [OPV3S Essential] [FFGH Optional]

    g. IFF System;

    h. ESM System.

TECH_Req.9. The following new sensor systems transmission shall be inhibited individually and collectively with a mechanic switch located at CIC: [Essential]

    a. 3D Radar;

    b. 2D Radar

    c. IFF;

    d. EOD;

    e. FCR;

    f. NAVRAD.

3.2.2.1.1 3D Radar System (FFGH Only)

3.2.2.1.1.1   3D Radar System Requirements

The system requirements for 3D Radar are described in Appendix D-I.

3.2.2.1.1.2   3D Radar-CMS Integration Requirements

TECH_SNR. Req.1   The 3D radar shall be fully integrated into CMS. [Essential]

TECH_SNR. Req.2   The CMS shall have full control over the 3D Radar, in accordance with Appendix D-I requirements. [Essential]

3.2.2.1.2 2D Radar System [OPV3S Essential] [FFGH Optional]

3.2.2.1.2.1 2D Radar System Requirements

The system requirements for 2D Radar are described in Appendix D-II.

3.2.2.1.2.2 2D Radar-CMS Integration Requirements

TECH_SNR. Req.3   The 2D radar shall be fully integrated into CMS. [Essential]

TECH_SNR. Req.4   The CMS shall have full control over the 2D radar, in accordance with Appendix D-II requirements. [Essential]

3.2.2.1.3 EOD System (FFGH Only)

3.2.2.1.3.1 EOD System requirements

The system requirements for a new EOD are described in Appendix D-III.

3.2.2.1.3.2 EOD-CMS Integration Requirements

TECH_SNR. Req.5   The EOD shall be fully integrated into CMS. [Essential]

TECH_SNR. Req.6   The CMS shall have full control over the EOD, in accordance with Appendix D-III requirements. [Essential]

3.2.2.1.4 FCR System (FFGH Only)

3.2.2.1.4.1 FCR System requirements

The system requirements for a new FCR are described in Appendix D-IV.

3.2.2.1.4.2 FCR-CMS Integration Requirements

TECH_SNR. Req.7   The FCR shall be fully integrated into CMS. [Essential]

TECH_SNR. Req.8   The CMS shall have full control over the FCR, in accordance with Appendix D-IV requirements. [Essential]

3.2.2.1.5 EOS System [OPV Essential] [FFGH Optional]

3.2.2.1.5.1 EOS System requirements

The system requirements for a new EOS are described in Appendix D-V.

3.2.2.1.5.2 EOS-CMS Integration Requirements

TECH_SNR. Req.9   The EOS shall be fully integrated into CMS. [Essential]

TECH_SNR. Req.10 The CMS shall have full control over the EOS, in accordance with Appendix D-V requirements. [Essential]

3.2.2.1.6 IFF System

3.2.2.1.6.1 IFF System requirements

The system requirements for the IFF system are described in Appendix D-VI.

3.2.2.1.6.2 IFF-CMS Integration Requirements

TECH_SNR. Req.11 The IFF shall be fully integrated into CMS. [Essential]

TECH_SNR. Req.12 The CMS shall have full control over the IFF, in accordance with Appendix D-VI requirements. [Essential]

3.2.2.1.7 ESM System

3.2.2.1.7.1 ESM System requirements

The system requirements for a new ESM are described in Appendix D-VII.

3.2.2.1.7.2 ESM-CMS Integration Requirements

TECH_SNR. Req.13 The ESM system shall send, at least, track information to CMS to conduct further investigation, or engage with weapon systems. [Essential]

TECH_SNR. Req.14 The CMS shall receive system status and diagnostic information from ESM system. [Essential]

TECH_SNR. Req.15 The ESM system shall be operated from its dedicated console, or through remote access from the CMS console. [Essential]

NOTE: This requirement shall be in the scope this Contract only if TECH_SNR. Req.16TECH_SNR. Req.34 and TECH_SNR. Req.17TECH_SNR. Req.35 are not in effect.

TECH_SNR. Req.16 The ESM should be fully integrated to CMS. [Desirable Lvl2]

TECH_SNR. Req.17 The CMS should have full control over the ESM, according to Appendix D-VII requirements. [Desirable Lvl2]

3.2.2.2 Legacy Sensor Systems (FFGH Only)

The following are the list of Legacy Systems will remain in VGAM FFGH.

 a. Sonar System;

 b. XBT/XSV System.

3.2.2.2.1 CMS Integration Requirements for the Legacy Sensor Systems

TECH_SNR. Req.18 The XBT / XSV system should be integrated with the CMS as given below:

  a. allowing the data exchange which will be used to assess sonar detection ranges and effectiveness on the measured conditions. [Desirable Lvl1]

  b. send the system status and diagnostic information to the CMS [Desirable Lvl2]

TECH_SNR. Req.19 The CMS shall be able to receive and display track information (e.g., direction, speed, distance, etc) from the Hull Mounted Sonar to allow further investigation or to engage with weapon systems. [Essential]

TECH_SNR. Req.20 The Hull Mounted Sonar shall provide system status to the CMS. [Essential]

NOTE: The Hull Mounted Sonar will use the existing dedicated console in the CIC.

3.2.2.3   GFE Sensor Systems

The following are the list of GFE Systems:

  a. Active Towed Array Sonar (ATAS);

  b. Unmanned vehicles, namely aerial (UAV), surface (USV) and underwater (UUV);

  c. XBT/XSV System; (OPV Only)

  d. Radio Direction Finder.

3.2.2.3.1 TAS – CMS Integration Requirements

TECH_SNR. Req.21 The Active Towed Array Sonar (ATAS) shall send, at least, track information (e.g., direction, speed if available, frequency, other) and system status to CMS. [Essential]

TECH_SNR. Req.22 From the CMS console there should be a remote access to the ATAS. [Essential]

NOTE: The ATAS will use a dedicated console in the CIC.

TECH_SNR. Req.23 The ATAS may be fully integrated in the CMS; [Optional]

TECH_SNR. Req.24 The CMS may have full control over the ATAS. [Optional]

3.2.2.3.2 CMS Integration Requirements for the Unmanned Vehicles

TECH_SNR. Req.25 UXV System will adapt to comply with the level of integration specified in TECH_CMS.Req.41. For that an CMS Interface Control Document shall be delivered by the contractor. [Essential]

3.2.2.3.3 Error! Reference source not found.Error! Reference source not found.Error! Reference source not found.**CMS Integration Requirements for the XBT / XSV system (OPV Only)**

TECH_SNR. Req.26 The XBT / XSV system should be integrated with the CMS, allowing the data exchange which will be used to assess sonar detection ranges and effectiveness on the measured conditions. [Essential]

3.2.2.3.4 CMS Integration Requirements for the Radio Direction Finder

TECH_SNR. Req.27 The Radio Direction Finder system shall send, at least, track information to CMS to conduct further investigation, or engage with weapon systems. [Essential]

TECH_SNR. Req.28 The CMS shall receive system status and diagnostic information from Radio Direction Finder system. [Essential]

TECH_SNR. Req.29 The Radio Direction Finder system shall be operated from its dedicated console, or through remote access from the CMS console. [Essential]

NOTE: This requirement shall be in the scope this Contract only if TECH_SNR.30TECH_SNR. Req.30 is not in effect.

TECH_SNR. Req.30 If a COMINT will be supplied, it shall be fully integrated into CMS. [Desirable Lvl2]

3.2.3 Weapon Systems

3.2.3.1   Legacy Weapon Systems (FFGH Only)

The following are the list of legacy systems for the Weapons Systems

    a. 100 MM Creusot-Loire Gun System;

    b. NSSM System:

        i. NSSM – MK29 Launcher System;

        ii. NSSM – CWI Mk73 System;

    c. Phalanx CIWS System;

    d. Harpoon SSM System.

3.2.3.1.1 CMS Integration Requirements for the Gun System (FFGH Only)

TECH_WPN. Req.1   The Main Gun system shall be fully integrated with CMS. [Essential]

TECH_WPN. Req.2   The CMS shall have full control over the Main Gun System. [Essential]

TECH_WPN. Req.3   The CMS shall be able to conduct maintenance activities, such as but not limited to using the gun bore camera. [Essential]

3.2.3.1.2 CMS Integration Requirements for the NSSM – MK29 Launcher System (FFGH Only)

TECH_WPN. Req.4   The GLM Mk29 Launcher system shall be fully integrated with CMS. [Essential]

TECH_WPN. Req.5   The CMS shall have full control over the MK29 Launcher System. [Essential]

TECH_WPN. Req.6   The CMS shall be able to conduct maintenance activities, such as but not limited to the missiles firing test. [Essential]

3.2.3.1.3 CMS Integration Requirements for the NSSM – CWI Mk73 System (FFGH Only)

TECH_WPN. Req.7   The CWI Mk73 system shall be fully integrated with CMS. [Essential]

TECH_WPN. Req.8   The CMS shall have full control over CWI Mk73 System. [Essential]

TECH_WPN. Req.9   The CMS shall be able to conduct maintenance activities, such as but not limited to the missiles firing test. [Essential]

3.2.3.1.4   CMS Integration Requirements for the Phalanx CIWS System (FFGH Only)

TECH_WPN. Req.10 The Close in Weapon System (Phalanx) should be fully integrated with CMS. [Desirable Lvl2]

TECH_WPN. Req.11 The CMS should have full control (e.g., control the weapon system from CMS, features configuration, receive tracks from Phalanx radar and cameras) over the Phalanx system. [Desirable Lvl2]

TECH_WPN. Req.12 The CMS shall receive video from the Phalanx system. [Essential]

TECH_WPN. Req.13 The CMS should receive data from the Phalanx system. [Desirable Lvl1]

TECH_WPN. Req.14 The CMS shall receive system status and diagnostic information from the Phalanx system. [Essential]

TECH_WPN. Req.15 The CMS should be able to conduct maintenance activities, such as but not limited to the gun Pre-Action Calibration (PAC) firing. [Desirable Lvl2]

3.2.3.1.5   CMS Integration Requirements for the HARPOON System (FFGH Only)

TECH_WPN. Req.16 The HARPOON System should be fully integrated with CMS. [Desirable Lvl2]

TECH_WPN. Req.17 The CMS shall receive the Harpoon missile firing plan. [Essential]

TECH_WPN. Req.18 The CMS should receive data from the HARPOON System. [Desirable Lvl1]

TECH_WPN. Req.19 The CMS shall receive system status and diagnostic information from the HARPOON System. [Essential]

TECH_WPN. Req.20 The CMS should be able to conduct maintenance activities, such as but not limited to the HARPOON Missile BIT Test. [Desirable Lvl2]

3.2.3.2   GFE Weapon Systems

The following are the list of GFE Systems for the Weapon Systems:

    a.   RWS 30 MM;

    b.   RWS 12.7 MM.

3.2.3.2.1   CMS Integration Requirements for RWS 30 MM (OPV Only)

TECH_WPN. Req.21 RWS 30 MM should be fully integrated with CMS. [Desirable Lvl2]

TECH_WPN. Req.22 The CMS shall receive data from RWS 30MM. [Essential]

TECH_WPN. Req.23 The CMS shall receive video from RWS 30MM. [Essential]

TECH_WPN. Req.24 The CMS shall system status and diagnostic information from RWS 30MM. [Essential]

TECH_WPN. Req.25 The RWS 30MM shall be operated from its own dedicated console. [Essential]

3.2.3.2.2 CMS Integration Requirements for RWS 12.7 MM

TECH_WPN. Req.26 The RWS 12.7 MM should be fully integrated with CMS. [Desirable Lvl2]

TECH_WPN. Req.27 The CMS shall receive data from RWS 12.7 MM. [Essential]

TECH_WPN. Req.28 The CMS shall receive video from RWS 12.7 MM. [Essential]

TECH_WPN. Req.29 The CMS shall receive system status and diagnostic information from RWS 12.7 MM. [Essential]

TECH_WPN. Req.30 The RWS 12,7 MM shall be operated from its own dedicated console. [Essential]

3.2.4 Navigation Systems The following are the list of Navigation Systems.

a. Navigation Radars;

b. WAIS;

c. Own Ship Data

3.2.4.1 Navigation Radars (NAVRAD)

3.2.4.1.1 NAVRAD System Requirements

The system requirements for the Navigation Radars (NAVRAD) system are described in Appendix E-I.

3.2.4.1.2 NAVRAD – CMS Integration Requirements

TECH_SNR. Req.31 The NAVRAD shall be fully integrated into CMS. [Essential]

TECH_SNR. Req.32 The CMS shall have full control over the NAVRAD. [Essential]

3.2.4.2 WAIS System

3.2.4.2.1 WAIS System Requirements

TECH_SNR. Req.33 To maintain the standardization of material in this area on all ships and to facilitate the fluidity of the existing logistic chain, a W-AIS duly licensed, equivalent, and compatible with the models in use in the Navy (128bit encryption), namely the W-AIS SAAB R4 and R5 SUPREME SECURE, shall be supplied. [Essential]

3.2.4.2.2 WAIS – CMS Integration Requirements

TECH_SNR. Req.34 The WAIS shall be fully integrated into CMS. [Essential]

TECH_SNR. Req.35 The CMS shall have full control over the WAIS system. [Essential]

3.2.4.3 Own Ship Data (OSD) System

3.2.4.3.1 OSD System Requirements

The system requirements are specified in Appendix E. The figure below represents the box level schematic are relation between the Own Ship Data and its subsystems (i.e., sensor) and its clients.
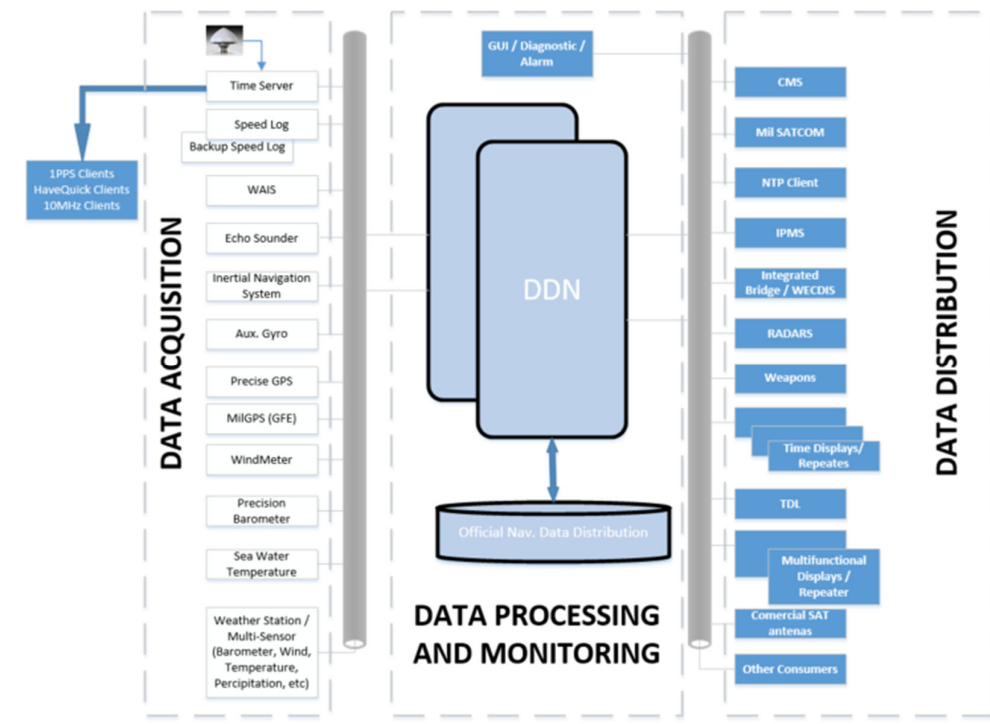
Figure 56 Conceptual Solution for New Own Ship Data System

3.2.4.3.2 OSD-CMS Integration Requirements

TECH_SNR. Req.36 The OSD system shall send the available and required data regarding Positioning, Navigation, Time and Environmental Data to the CMS in adequate format, and without significant delay. [Essential]

TECH_SNR. Req.37 The CMS shall receive system status and diagnostic information from the OSD system. [Essential]

TECH_SNR. Req.38 The interface shall ensure isolation between OSD network and the CMS network. [Essential]

3.2.5 Communication System

The following are the list Communication Systems which are all GFE Systems:

    a. TDL;

    b. ICCS;

    c. IBMS.

3.2.5.1 Tactical Data Link (TDL)

3.2.5.1.1 TDL-CMS Integration Requirements

TECH_COM. Req.1 The CMS interface with Data Link Processor (LINPRO produced by Technobit) shall provide a fully integrated solution based at **STANAG 5516 for Link 16, STANAG 5522 for Link 22,** and **STANAG 5616 for Data Forwarding**, according the Table 2 – TDL topic setsTable 2 – TDL topic sets. [Essential]

TECH_COM. Req.2 The CMS shall have control on the configurations and features of the Data Link Terminals (DTS, MIDS, and NCE) which will allow e.g.: [Essential]

    a. Network configuration;

    b. System monitoring;

    c. Control over the Quality of service;

    d. Issues Troubleshooting;

    e. Multi-Link Network configuration;

    f. Input Data checks;

    g. Configuration files download/upload.

TECH_COM. Req.3 The CMS shall exchange tactical information across CMS and TDL regarding the Table 2 – TDL topic setsTable 2 – TDL topic sets [Essential]

Table 2 – TDL topic sets

Tactical Set	Status Set	System Management Set
Navigation	Link Status Message	Add IU Message
Track Message	IU List Message	Drop IU Message
Special Point Message	Openlink Manually Initiated BIT Message	Inhibit IU Message
ASW Point Message	Alert Message	Drop Track Request Message
ASW Bearing Message	IFF/SIF Conflict Notification Message	Init/Stop Link/Dataforwarding Message
Intelligence Message	Cat/Id Conflict Message	Listen Mode Message

Tactical Set	Status Set	System Management Set
Platform Status Message	Command Received Message	Define TN Pool Message
EW Message	Compliance Received Message	Set Max LTQ Message
Pointer Message	Coordination Engagement Received Message	Information Request Message
IFF Data Message	Automatic Correlation Status Message	Filter Message
Association/Pairing Message	Text Message	Start/End Track Control Message
Link Data Message	Image Message	Command Message
Engagement Status Message	-	Compliance Message
Drop Track Message	-	Drop Tracks of inactive IU Message
Own Unit Info Message	-	Data Update Request Message
Category/Identity Change Message	-	Terminate Exercise Message
ASW Information Message	-	Display Message
Strength Change Message	-	Contact XMIT message
Threat Warning Message	-	Pointer Request Message
-	-	HUR/VUR/SLURP Request Message
-	-	Corr/Decorr Message
-	-	Emergency/Force Tell Message
-	-	Update/Clear IFF Message
	-	Confirm Local Cat/Id Message
	-	Change TN Message
-	-	Change Data Order Message
-	-	Command Monitoring Message
-	-	Coordination Engagement Message
-	-	Response Message
-	-	Ping Message
-	-	Automatic Correlation Message
-	-	Link Automatic Transmission Message
-	-	Remote Contacts Purge

Tactical Set	Status Set	System Management Set
-	-	Text Request Message
-	-	Image Request Message

TECH_COM. Req.4   The CMS shall receive system status and diagnostic information from the TDL. [Essential]

3.2.5.2   ICCS System

3.2.5.2.1   ICCS - CMS Integration Requirements

TECH_COM. Req.5   The Communication (ICCS 6.0) has a user interface designated as User Terminal (UT). The UT shall be physically integrated with the CMS consoles, in order to allow the CMS operator to use/access the ICCS UT from the console sitting place. [Essential]

TECH_COM. Req.6   The ICCS UT should be configured according to the user role profile which assigned to each CMS console. [Desirable Lvl1]

TECH_COM. Req.7   The CMS should receive system status and diagnostic information from the ICCS System. [Desirable Lvl1]

TECH_COM. Req.8   The SATCOM shall have an emission control button (i.e., Transmission ON / OFF), in the CIC. [Essential]

3.2.5.3   Internal Battle Management System (IBMS)

TECH_COM. Req.9   IBMS System will adapt and comply with the level of integration specified in TECH_CMS.Req.98TECH_CMS.Req.97, namely, data and interface system status. For that an Interface Control Document shall be delivered. [Essential]

4   ENGINEERING REQUIREMENTS

The purpose of this chapter is to describe the engineering requirements regarding the VGAM FFGH MLU Program as well as the OPV 3S Program, to be detailed in the following paragraphs.

TECH_Req.10. The design shall comply with the specifications detailed in the General Design Requirements documents attached as Appendix A and Appendix B for each Programs, where applicable. [Essential]

4.1   INTEGRATION ENGINEERING REQUIREMENTS (FFGH Only)

The purpose of this paragraph is to describe the integration engineering requirements regarding the VGAM FFGH MLU Program. These integration engineering deliverables shall demonstrate the integration of the new, updated or upgraded equipment and/or systems to the ship. The major integration engineering areas are:

a.   The electromagnetic compatibility for antennas;

b.   The general cabling;

c.   The mechanical/physical interfaces;

d.   The Ship Helicopter Operational Limits (SHOL);

e.   The Ship Electromagnetic Radiation (EMR) and Radiation Hazard (RADHAZ) Areas;

f.   The cooling and air balance;

g.   The ship stability and displacement;

h.   The "as built" drawings;

i.   The power balance;

j.   On-board CIS Security

4.1.1   General Requirements

TECH_Req.11. All the Engineering Requirements deliverables shall be handed over to NSPA and End User in accordance with the Annex C. [Essential]

TECH_Req.12. The integrated operation efficiency of the new systems´ and GFE systems´ shall remain the same as their standalone functioning. [Essential]

TECH_Req.13. The impact of replacing an essential safety component with a non-identical "equivalent" component shall be fully assessed and demonstrated in accordance with **ANEP-77 PART3 chapter IV**. [Essential]

TECH_Req.14. The contractor shall be responsible for the integration of Legacy equipment to the New Systems (like Torpedo Firing Panel, SRBOC panel, etc.). [Essential]

TECH_Req.15. The Contractor, as a risk mitigation, shall participate in the Quality Control inspections performed during the modifications execution. [Essential]

4.1.2 Electromagnetic Compatibility (EMC) for Antennas

TECH_Req.16. The Contractor shall perform an EMC study to define the precise location of the antennas to be installed to the platform and ensure that electromagnetic compatibility is preserved on the platform with taking into consideration the following: [Essential]

  a. The final configuration of the ship's top deck structures;
  b. GFE system antennas listed in **Appendix C**;
  c. The legacy antennas remaining on the ship;
  d. The original construction layout of antennas document "**120/DE-401/881629 Arrangement of Antennas**".

TECH_Req.17. While considering the location of the new antennas, the location of the existing antennas should not be impacted. [DesirableLvl1]

TECH_Req.18. The contractor shall provide the Antenna Layout on the VGAM FFGH with considering the EMC Study and in accordance with Appendix A. [Essential]

4.1.3 General Cabling

TECH_Req.19. The contractor shall provide the following Engineering Documents necessary for the cabling Modifications scope in accordance with Appendix A and Annex C: [Essential]

  a. **Cable Routing List**;
  b. **Wiring Diagram per System**;
  c. **Core Lists for Each Cable (new or legacy)**;
  d. **Internal Layout of Each New Cabinet**;

Note: These documents will be used for proper installation of the new systems and the GFE equipment. For a better understanding of the requirements for the Paragraph 4.1.34.3, *"from the side"* means one end of the correspondent cable while *"to the side"* means the other end of the correspondent cable.

TECH_Req.20. The **Cable Routing** list shall have at least the following information for each new cable: [Essential]

  a. Cable number in accordance with "**120/MA-321/901908 – Cable Plant**" taking into account that:

      i. a new letter in position 7 shall be added in order to identify the new cables;

      ii. an "X" shall be used for a copper cable;

      iii. a "Z" shall be used for a fiber optic cable.

b. Cable type;

c. Cable separation in accordance with "**120/DE321/88 – Fitting Instructions for Cable Installation**";

d. Cable diameter;

e. Equipment number from the side;

f. Equipment name from the side;

g. Connector type from the side;

h. From the side room;

i. From the side deck;

j. Equipment number to the side;

k. Equipment name to the side;

l. Connector type to the side;

m. To the side room;

n. To the side deck;

o. Cable routing, with the identification of all the cable tray numbers in accordance with "**120/MA-321/901908 – Cable Plant**";

p. Cable transit, with the identification of every transit number in accordance with "**120/MA-321/901908 – Cable Plant**";

q. Bulkhead and cable penetration changes and cabling stuffing boxes specification;

r. Estimated cable length;

s. Estimated cable weight;

t. Wiring diagram number where this cable is mentioned.

TECH_Req.21. Each system shall have a dedicated wiring diagram which illustrates the cable interconnections between the blocks of the complete system. [Essential]

TECH_Req.22. Each cable shall be represented by only one line and shall comply with the following requirements: [Essential]

a. Each system cabling shall be represented only in one drawing;

b. A cable that interconnects two different systems shall be represented in both system's wiring diagram and refer to the other system diagram number;

c. The cable number and cable type for each cable shall be indicated next to it;

d. The system number and equipment number for each new system block shall be indicated;

e. When a new system cable interconnects with a Legacy System block, this block must be marked with a symbol in the new diagram in a way that it is easy to understand that is a block from a Legacy System;

f. The wiring diagram shall indicate the following information:

   i. Construction layout of the ship, decks and bulkheads;

   ii. Deck number and bulkhead number;

   iii. Room number/name.

TECH_Req.23. The Contractor shall provide a Core List for each new cable, as well as legacy cables decided to maintain, which indicates where end of each cable shall be connected exactly and shall indicate at least the following information: [Essential]

a. Cable number;
b. Cable type;
c. Cable separation in accordance with "**120/DE321/88 – Fitting Instructions for Cable Installation**";
d. Equipment number from the side;
e. Equipment name from the side;
f. Equipment number to the side;
g. Equipment name to the side;
h. Connector type from the side;
i. Connector type to the side;
j. From the side room;
k. To the side room;
l. Where to connect from the side;
m. Where to connect to the side;
n. brief description of the type of signal in each wire.

TECH_Req.24. The Contractor shall provide the internal detailed layout of each new cabinet. [Essential]

4.1.4 Mechanical Interfaces

TECH_Req.25. The Contractor shall develop and provide the detailed Mechanical Interface Drawings, illustrating the required physical integration with the ship structure for the new system and the GFE equipment in accordance with Annex C. These drawings shall facilitate production for the execution of the Modifications. [Essential]

TECH_Req.26. These mechanical interface drawings shall include the detailed information and specifications necessary for production purposes (such as new foundations, piping, structural adaptions drawings) in order to facilitate the execution of the Modifications. [Essential]

TECH_Req.27. These drawings shall provide sufficient technical detail to produce the new foundations and adaptations to the existing foundations which shall serve to the production of the necessary Modifications to install the new equipment in the ship. [Essential]

TECH_Req.28. The Contractor shall develop and provide a concept **Room Layout Drawing,** for the end user approval, identifying recommended locations for equipment installation (such as cable trays, piping, ducts, foundations) in accordance with Annex C. [Essential]

TECH_Req.29. The new and/or refurbished Functional Units (FU), which may also include the potential New Mast solution, must feature fully functional spaces equipped with all necessary provisions, including but not limited to lighting, power plugs, ventilation, smoke detection and firefighting. [Essential]

TECH_Req.30. In the event of a new mast being necessary, for its design the contractor shall consider the following: [Essential]

a) Legacy, GFE and New systems EMC specific requirements;

b) Re-installation of legacy systems (located on the old mast);

c) Legacy and GFE systems/equipment specific requirements (as an example: navigation lights).

TECH_Req.31. In the case that a new Mast is required as a solution for the installation of new SEWACO systems, the contractor shall provide the following engineering documents in accordance with Annex C: [Essential]

a. **Detailed Removal Instructions Document for the Original Mast(s)** including mechanical, cabling and piping;

b. Basic and detailed **Construction Drawings** considering the installation of the necessary legacy systems or equipment;

c. Detailed **Piping Arrangement Drawings Inside and Outside the New Mast** including firefighting, pre-wetting, cooling and heating, control air and others considered necessary;

d. Detailed **Drawings of the Cable Trays, Cable Ducts and Cable Transits Inside and Outside of the New Mast**;

e. Detailed **Drawings for the Ventilation Ducts**;

f. **Ship´s Radar Cross Section (RCS) Study**.

TECH_Req.32. During the upgrade, the layout of some SEWACO Functional Unit (FU) may require some changes due to the required modifications e.g. cabling, cooling/ventilation, equipment location, water and gas tightness and weight. The contractor shall keep the existing FU philosophy while applying modifications and adaptations to the FUs. [Essential]

TECH_Req.33. The contractor shall provide the following engineering deliverables for each of the modified SEWACO FU taking into account the GFE included to the relevant FU: [Essential]

      a. **Mechanical drawings with new cable routing**;

      b. **Mechanical drawings with new piping and ventilation ducts;**

      c. **Mechanical drawings with the new equipment location including structural drawings with the new physical integration**;

      d. **Water and Gas Tight as per Construction Report** for each FU after the necessary changes applied;

      e. **Shock and Vibration Compliance Certificate**.

4.1.5 Ship Helicopter Operational Limits (SHOL)

TECH_Req.34. With the upgrade of the SEWACO radars and sensors, the ship's upper decks modifications may have an impact on the wind discharge to the helideck and consequently change the Ship Helicopter Operational Limits which will lead to the recertification of the ships. The contractor shall perform the **Ship Helicopter Operational Limits Study** with the impact study of the airwake aerodynamics over the ships deck, with a recommendation if a new SHOL certification is required. [Essential]

TECH_Req.35. Perform the **SHOL Certification** for the operation with the *helicopter LYNX MK95A*. [Optional]

TECH_Req.36. This certificate should be operationally verified during the Sea Acceptance Test (SAT) of the first VGAM FFGH. [Optional]

4.1.6 EMR and RADHAZ Areas

TECH_Req.37. The contractor shall provide the **EMR and RADHAZ Areas Study** based on STANAG 1380 and the respective **EMR and RADHAZ Areas drawing** which identifies the new area limits. [Essential]

TECH_Req.38. The topside integration shall guarantee that field intensity levels, and power densities on vessel topside, do not exceed the permissible exposure limits (PEL) of radiation hazards for personnel (HERP) at manned locations designated for equipment handling activities, hazards of electromagnetic radiation to ordnance (HERO) at designated ordnance storage and handling areas, and hazards of electromagnetic radiation to fuel (HERF) at the ship´s fuelling operating areas. In order to meet the previously mentioned RADHAZ analysis (HERP, HERO, HERF), the contractor will consider the PELs established in the applicable standards (documents that should be provided by the contractor). Concurrent to the EMC analysis process (described in the WP-2), the potential for violations of RADHAZ standards shall be simulated at a set of established test points (TPs) or testing zones (TZs) on the topside/weather deck that will be provided by the contractor. These TPs and TZs shall be designated as HERP, HERO, and/or HERF for each topside location according to the activity that is expected to take place there. During the RADHAZ analysis the predicted EM field strengths and power densities due to all topside emitters shall be compared to the appropriate radiation permissible exposure limit (PEL) at each TP/TZ location according to the TP/TZ designation (personnel, ordnance, and fuel). Not only static results will be provided, but an interactive/dynamic computer application will be provided as well, in which the user can visualize/compare RADHAZs due to any topside emitter configuration at different TPs and TZs. Because topside EMI and EM safety violations often cannot be completely resolved through the design process, the attainment of an EM operable topside often requires the establishment of suitable operational procedures whose purpose is to mitigate the residual EMI and RADHAZ threats. [Essential]

4.1.7 Cooling and Air Balance

TECH_Req.39. The existing cooling system will be upgraded with a new Chilled Water Plant (CWP) to accommodate the modified demands resulting from the upgrade of the SEWACO systems. The contractor shall conduct and provide a **Cooling Balance Study**, with recommendations and actions to the End user, to ensure that adequate cooling can be supplied to the systems under this scope. This study shall include the following systems, but not limited to: [Essential]

    a. All cooling detailed information, such as piping specs and routing; seating, support and outfitting; cooling load for the several consumers, for the new SEWACO and GFE systems;

b. All cooling detailed information, such as piping specs and routing; seating, support and outfitting; cooling load for the several consumers, for the potential changes on the cooling of the Legacy systems as a result of the Upgrade;

c. All cooling detailed information, such as piping specs and routing; seating, support and outfitting; cooling load for the several consumers, for new and/or refurbished FU, which may also include the potential New Mast solution;

d. All cooling detailed information, such as piping specs and routing; seating, support and outfitting; cooling load, for the Operations Room;

e. Relevant engineering information for the installation of new air cooling units (ACU) in the FU that will replace the existing ones.

TECH_Req.40. The contractor shall conduct and provide an **Air Balance Study**, with recommendations and actions to the End user, to ensure that adequate air ventilation demanding's can be supplied. The study shall primarily address the new SEWACO and GFE systems, while also considering their impact on the legacy systems and the overall ventilation requirements of the ship. [Essential]

TECH_Req.41. The detailed engineering shall include, but not limited to, the necessary changes to the chilled water makers and distribution system, as well as cooling air makers and distribution system, to provide the provision of sufficient cooling load to the several consumers. [Essential]

TECH_Req.42. The Cooling and Air Balance study shall be handed over by the Contractor to the End User during the Preliminary Design Review, in accordance with Annex C. [Essential]

4.1.8 Stability and Displacement Reduction

TECH_Req.43. The contractor shall perform the weight balance between the existing condition (to be provided by the End User as GFI) and modified/upgrade configuration, including the position of the new Centre of Gravity, and the Longitudinal Weight Distribution (with repositioning of weight if deemed necessary for stability, or strength purposes, considering, if necessary, the utilization of the growth margins defined in the Building Specifications for Portuguese Navy MEKO 200 Frigates or the **ITDINAV 802(A)**, whatever is more adequate for the execution of the SOW). [Essential]

TECH_Req.44. The contractor shall perform and deliver an **Evaluation of Intact and Damaged Stability Report**, on the modified/upgraded configuration of the ship using as criteria the limits established in accordance with the PoN Intact and Damage Stability Criteria, as specified in **ITDINAV 802(A)**, considering, if necessary, the utilization of the growth margins defined in the mentioned criteria [Essential]

TECH_Req.45. The contractor shall be responsible for the evaluation of primary structure hull strength, in order to prove that the new ship structural arrangement is within the limits in accordance with the Building Specifications for Portuguese Navy MEKO 200 Frigates. The resulting reports shall be in accordance with Annex C and with the following information: [Essential]

a. **Longitudinal Bending Moment Absolute and Relative/Comparison (with respect to the Non-Upgraded Configuration) Assessment Report;**

b. **Global Primary Structure Strength Assessment and Validation Report, including stress "hot spot" characterization and location, if any;**

c. **Longitudinal Shear Force distribution report with the identification of the critical locations, if any.**

TECH_Req.46. The contractor shall guarantee, with respect to the New SEWACO and GFE systems, that the hull's Secondary Structure Strength, regarding stress level evaluation and structural performance of the main stress hot spots, are within the limits of the Building Specifications for Portuguese Navy MEKO 200 Frigates, or IACS structural rules for details and fatigue design for the estimated remaining ship life. [Essential]

TECH_Req.47. In the event that a New Mast is required to accommodate new SEWACO, Legacy and GFE systems, the Contractor shall ensure that the following: [Essential]

a. Ship's Stability and Displacement remain within the limits established in the Building Specifications for Portuguese Navy MEKO 200 Frigates considering, if necessary, the utilization of the growth margins defined in those

Specifications or the **ITDINAV 802(A),** whatever is more adequate for the execution of the SOW;

b. Evaluation of the structural impact locally and globally, proposing the necessary engineering solutions, if necessary for implementation;

c. Static and Dynamic analysis in order to avoid that the natural frequencies of the new mast and the global ships' structure are out of the range of the propulsion plant and expected sea spectrum exciting frequencies.

TECH_Req.48. An Inclining Test shall be performed after the execution of the HAT and prior to the SAT. [Essential]

TECH_Req.49. The Inclining Test Report, with recommendations, shall be handed over to the End User before the SAT. [Essential]

TECH_Req.50.A new Stability Manual will be produced and handed over to the End User (using the existing Stability Manual as reference) if the Displacement, VCG, and LCG are outside of the limits with growth margins foreseen in the Building Specifications for Portuguese Navy MEKO 200 Frigates or **ITDINAV 802(A)** whatever is more adequate for the execution of the SOW. [Essential]

4.1.9 "As Built" Drawings

TECH_Req.51. Resulting from the upgrade and associated impacts – either electrical or mechanical - the contractor shall provide the "as built" drawings based/referenced to the original documents, identifying the changes occurred. [Essential]

4.1.10 Power Balance

TECH_Req.52.A **Power Balance Study** shall be provided in accordance with Annex C to ensure that adequate power can be supplied to all the required systems (like. G. HVAC, SEWACO, and other systems). [Essential]

TECH_Req.53. The Power Balance Study will define the new power distribution system configuration, namely the connection of systems per switchboard, its protection devices, the redundancy power supplies, etc. [Essential]

TECH_Req.54. The Contractor shall issue a **Power Balance Report** for the first ship. The report shall list all values per switchboard. [Essential]

4.1.11 On-board CIS Security

TECH_Req.55. In case of interconnection of CIS on-board, the Contractor shall implement a CIS Security to the interface element in accordance with the **NATO Guidelines AC/35-D/1019-REV1** and **AC/35-D/1021-REV3** as well as the applicable requirements in the Annex C Program Technical Requirements. [Essential]

4.2 SYSTEMS INTEGRATION ENGINEERING REQUIREMENTS (OPV Only)

The OPV3S Construction Program is an ongoing program whose engineering design is still in process.

The systems integration engineering requirements for the OPV 3S program are divided into two stages:

a. **the Basic Engineering Design (BD);** and
b. **the Detailed Engineering Design (DD)**.

To conclude either stage, it is necessary to gather information about all systems which are part of the configuration of the OPV3S, including electronic and electrical equipment and systems. In conclusion, for the installation of equipment and systems on board, complementary technical documentation is required by OPV3S Construction Program.

In this context, after the Effective Date of Contract (EDC), some of the information mentioned above, on a need to know basis and only when necessary for the design and construction of the OPVs, may have to be disclosed to the engineering designer and to the shipbuilder under the supervision of the End User. Any information disclosure shall be duly informed.

TECH_Req.56. The information required for the platform construction design and subsequent installation of the equipment on-board, which are listed in this section, shall be provided to the NSPA in accordance with the delivery timeline described below: [Essential]

a) Information requirements labelled with BD letters shall be provided with the proposals of this Contract in order to verify each equipment/ systems maturity and compliance with the platform requirements. The same information shall be formally provided as a deliverable 2 (two) weeks after the Kick-Off Meeting,

b) information requirements labelled with DD1 letters shall be provided as soon as possible, not later than 6 (six) months after the contract signature,

c) information requirements labelled with DD2 letters shall be provided as soon as possible, not later than 10 (ten) months after the contract signature, and

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d) information labelled INST shall be available on completion of the Factory Acceptance Tests, at least three months before the date planned for system installation.

4.2.1 Performance related specifications and special requirements

TECH_Req.57. The information related to performance which are listed below in *Table 3**Table 4* shall be provided to the NSPA as per the Stage indicated in the table. [Essential]

Table 34 – Information requirement related to performance

Information Required	Stage
Minimum mast height	BD
Alignment and accuracy requirements (including lines and marks)	BD
Weapons and sensors coverage arcs (vertical and horizontal) and safety margins on blind arcs (structural dependent), if applicable	DD1

4.2.2 Composition and Dimensional characteristics

The weight of each equipment/ major component is going to be used in the preliminary stability calculations, design bending moment determination, primary structure calculations, and hydrodynamic calculations (see respective section in appendix B) of the OPV3S Construction design.

The dimensions of the equipment/ systems are going to be used in the general arrangement drawing, equipment/ systems distribution inside the ship, maintenance accesses arrangement and each compartment internal layout (see respective section in appendix B).

TECH_Req.58. In this respect, the information related to composition and dimensions which are listed in *Table 4**Table 5* shall be provided to the NSPA as per the Stage indicated in the table. [Essential]

Table 45 – Information requirement related to composition and dimensions

Information Required	Stage
Composition of the equipment – identification of major components	BD
Dimensions for each equipment/ major component	BD
Weight for each equipment/ major component	BD
Survivability relation between major components (redundant/ dependent)	DD1
Dimensional drawings (installation drawings)	DD1
Space required for maintenance for each component (maintenance envelope)	DD1
Regular Maintenance free spaces required	DD1
Maximum allowable cable length between components	DD1

4.2.3 Structural requirements

Specific structural requirements to install any weapon or sensor, including structural rigidity, weapon induced forces and alignments, is required by the OPV3S Construction Program.

Similarly, mounts for each component shall be identified, if available, to enable foundation design (see respective section in appendix B).

TECH_Req.59. In this respect, the information related to structures which are listed in *Table 5Table 6* shall be provided to the NSPA as per the Stage indicated in the table. [Essential]

Table 56 – Information requirement related to structures

Information Required	Stage
Specific structural requirements (e.g. rigidity)	BD
Specific weapon induced forces (if applicable)	BD
Mounts characteristics for each equipment/ major component	DD1
Dynamic characteristics of the equipment (e.g. rotation speed)	DD1
Shock characteristics for each equipment/ component	DD1
Center of gravity for each equipment/ major component	DD1
Natural vibration frequencies (if applicable)	DD1

4.2.4 Radiated noise

TECH_Req.60. The characteristics of the radiated noise from each equipment/ component shall be identified, if applicable, in order to identify the mitigation strategies for the airborne noise and to reduce underwater acoustic signature (see respective section in appendix B). [Essential]

TECH_Req.61. In this respect, the information related to radiated noise which are listed in *Table 6*Table 7 shall be provided to the NSPA as per the Stage indicated in the table. [Essential]

Table 67 – Information requirement related to radiated noise

Information Required	Stage
Maximum sound pressure dB(A) for each equipment	DD1

4.2.5 Vibrations

TECH_Req.62. The vibrations produced per equipment/ component (including vibrations induced by rates of fire), shall be identified, if available and applicable, in order to verify the eventual need for structural reinforcements, as well as to identify the mitigation strategies to reduce underwater acoustic signature and mounts selection, unless they have not been identified or supplied by the Original Equipment Manufacturer (OEM) (see respective section in appendix B). [Essential]

TECH_Req.63. In this respect, the information related to radiated noise which are listed in *Table 7Table 8* shall be provided to the NSPA as per the Stage indicated in the table. [Essential]

Table 78 – Information requirement related to vibrations

Information Required	Stage
Rates of fire (if applicable)	BD
Vibration values in mm/ s RMS (if available)	DD1

4.2.6 Electromagnetic Environment (EME)

The shipboard electromagnetic environment shall be characterized to define the upper deck layout of the antennas and other emission/ receiving sources, as well as to guarantee electromagnetic compatibility (EMC), reduce electromagnetic interference (EMI), define

RADAHZ areas, and detect where shielding is required (see respective section in appendix B).

In this respect, the information related to EME which are listed in

TECH_Req.64. *Table 8Table 9* shall be provided to the NSPA as per the Stage indicated in the table. [Essential]

Table 89 – Information requirement related to EME

Information Required	Stage
Equipment frequency operation range	BD
Equipment electromagnetic field characteristics	BD
Antenna/ sensor dimensions	BD
Earthing EMC requirements	DD1
RADAHZ areas	DD1

4.2.7 Heating, ventilation and air conditioning (HVAC)

TECH_Req.65. The heat generated per each equipment/ component and any temperature restrictions for the operation of each equipment/ component shall be identified in order to determine the HVAC system specifications on-board (see respective section in Appendix B). [Essential]

TECH_Req.66. If no statement is made the following ambient characteristics for normal operation shall be followed: [Essential]

   a. Maximum temperature 35 ºC;
   b. Minimum temperature 15 ºC;
   c. Relative humidity 35 to 65%.

TECH_Req.67. In this respect, the information related to HVAC which are listed in *Table 9Table 10* shall be provided to the NSPA as per the Stage indicated in the table. [Essential]

Table 910 – Information requirement related to HVAC

Information Required	Stage
Temperature restrictions for the operation of each equipment	BD
Heat generated per each equipment	BD
Type of refrigeration (e.g. air/ fresh water/ sea water)	BD
Detailed specification for connecting the equipment to the platform auxiliary systems (type of connections, flow requirements, pressure drops), if applicable	DD1

4.2.8 Compressed air requirements

TECH_Req.68. Compressed air requirements for the equipment shall be identified in order to determine the air compressors capacity, adequate air treatment and reserve air bottles, if necessary (see respective section in Appendix B). In this respect, the information related to compressed air which are listed in Table 10Table 11 shall be provided to the NSPA as per the Stage indicated in the table. [Essential]

Table 1011 – Information requirement related to compressed air

Information Required	Stage
Compressed air pressure and air flow required (if applicable)	BD
Air quality requirements (air drying and filtration requirements)	BD
Detailed specification for connecting the equipment to the platform auxiliary systems (type of connections)	DD1

4.2.9 Fire-extinguishment requirements

TECH_Req.69. Requirements for fire-extinguishing systems from the ship to be applied to the equipment, or any impossibility to use any extinguishing agent to the equipment shall be identified (see respective section in appendix B). In this respect, the information related to fire-extinguishment which are listed in Table 11Table 12 shall be provided to the NSPA as per the Stage indicated in the table. [Essential]

Table 11~~12~~ – Information requirement related to fire-extinguishment

Information Required	Stage
Specific fire-extinguishing system identification (if necessary)	BD
Identification of extinguishing agents not to use	BD
Detailed specification for connecting the equipment to the platform fire-extinguishing system (type of connections), if applicable	DD1

4.2.10 Electric power and signalling characteristics

TECH_Req.70. Electric power consumptions and electric network supply requirements shall be specified to enable electrical load calculation (see respective section in appendix B). [Essential]

TECH_Req.71. Electric characteristics and requirements for each equipment/ component shall be identified to enable electrical installation design. [Essential]

TECH_Req.72. In this respect, the information related to electric power and signalling which are listed in *Table 12*~~Table 13~~ shall be provided to the NSPA as per the Stage indicated in the table. [Essential]

Table 12~~13~~ – Information requirement related to electric power

Information Required	Stage
Power consumption for each equipment	BD
Electric network supply requirements for each equipment	BD
Detailed electric characteristics specification for each equipment	DD1
Power cabling characteristics	DD1
Cabling characteristics and limitations within each SEWACO system/ equipment	DD1
Cabling characteristics and limitations between SEWACO equipment/ systems	DD2

4.2.11 Material specifications

TECH_Req.73. The identification of dangerous materials and different material characteristics to verify materials compatibility shall be identified (see respective section in appendix B). In this respect, the information related to general material which are listed in *Table 13Table 14* shall be provided to the NSPA as per the Stage indicated in the table. [Essential]

Table 13~~14~~ – Information requirement related to general material

Information Required	Stage
Declaration of non-dangerous materials usage	BD
Equipment safety sheets (if applicable)	DD1
Lubrication sheets (if applicable)	DD1

4.2.12 Technical documentation required for Installation

The following documentation shall be provided to the NSPA, in order to provide to the OPV3S Construction Program. In this respect, the information related to the installation which are listed in

TECH_Req.74.*Table 14Table 15* shall be provided to the NSPA as per the Stage indicated in the table. [Essential]

Table 14~~15~~ – Information requirement related to installation

Documentation	Stage
Drilling plans (foundation drawings)	DD1
Detail drawings of all parts not attached to equipment	DD1
Lubrication oil chart (if applicable)	DD1
Piping diagrams (if applicable)	DD2
Information of all nominal bores, flange dimensions and materials (if applicable)	DD2
Circuit diagrams, block diagrams terminal diagrams and cable core list (if the work is to be done by the shipyard)	DD2

Certificates	DD1
Storage preservation and pre-installation maintenance instructions	INST
Physical installation manual (if available for disclosure and unclassified)	DD2
Handling instructions	DD2

5   INTEGRATED LOGISTICS SUPPORT (ILS)

The system requirements are described in Appendix F Integrated Logistic Support section.

APPENDICES:

APPENDIX A FFGH General Design and Material Requirements

APPENDIX B OPV General Design and Material Requirements

APPENDIX C Lists of GFE and Legacy Systems and Equipment

APPENDIX D Sensors New System Requirements – Common

APPENDIX E Navigation Radars System Requirements – FFGH

APPENDIX F Integrated Logistic Support

APPENDIX A   VGAM FFGH General Design and Material Requirements

See the separate document.

APPENDIX B   OPV3S General Design and Material Requirements

*See the separate document.*

APPENDIX C   Lists of GFE/GFI and Legacy Systems Equipment
## (FFGH Only)

1. List of GFE

The following systems and equipment will be provided to the Contractor as GFE which are to be consider *by the Contractor* for the System Integration Design, Engineering and to be integrated with the CMS, when applicable. *:*

1. MILGPS from DIGINEXT;
2. TDL 16 & 22 via DLP LINPRO produced by TECHNOBIT;
3. ICCS from EID (including V/U/HF radios, antennas, modems and crypto devices),
    i. Engineering inside Communication Center and transmitters FU will be managed by the end-user;
    ii. Contractor is responsible for Design and Engineering outside the FU.
        1. Placing 60 UT
        2. Manage the following antennas:
            a. HF

                i. 3x Active Antenna Rx HF (STA-10);
                ii. 2x Passive Antenna Rx HF (STA-40);
                iii. 4x Antenna HF (AS 3772) – Narrowband;
                iv. 2x Antennas HF (R&S) – Wideband;
                v. 1x Antenna HF for Tactical Radio PRC525.
            b. V/UHF
                i. 2x Antennas HK-014
                ii. 4x Antennas HK-001
                iii. 3x Antennas CX-4
                iv. 2x Antennas for L16
4. Internal Comms;
    i. Placing 92 IPT (internal voice terminals) distributed all around the ship.
    ii. 12 X POE 400 switch (8 ports)
    iii. 6x DC UPS
5. MILSATCOM produced by EM Solutions; the Engineering solution shall allow install a cobra system or a king cobra system.
6. IT network (Secure and administrative network, CCTV system);
    i. All HW and Cabinets are GFE

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 ii. 4 Networks

 iii. Around 160 drops fibre (total)

 iv. Around 160 drops coper (total)

 v. Cables length estimation (mts):

  1. Backbone (24 lines OM3 50/125): 1000

  2. Fiber cable (4 lines OM3 50/125): 3000

  3. Ethernet cable SSTP Cat.7: 3000
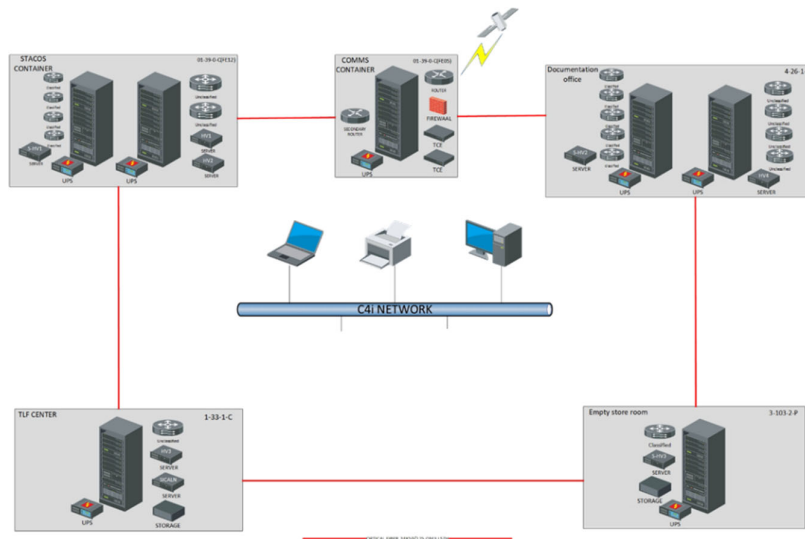
7. Radio Direction Finder;

8. IBMS (Internal Battle Management System) all the hardware will be managed under the IT Networks;

9. 2xRemote Weapon Systems 12.7mm; to be installed in the existing's foundation as in picture xx.
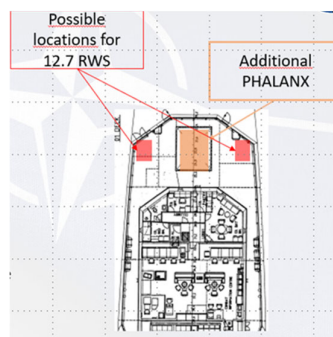
10. Active Towed Array Sonar; will be a system with an active and passive mode, the maximum expected weight is 10 tons.

11. CIWS Phalanx (Additional for the forward section of the ship IAW picture xx), is expected to install a local Control Panel in the Hangar area .

The Setting-to-work (STW) of the GFE systems and equipment falls under the responsibility of the NSPA/End User.

The table 15 define boundaries for the more complex GFE system.

Table 15 - GFE definition

GFE definition			
Equipment	Power consumption (W)	Cabling (nrº of cables)	Cooling necessity (W)
Integrated Communication system (internal/ external and management)	9000	700	14000
TACTAS (MAX weight 10 tons)	18000	20	3000
C4I	2000	400	2000
MilSatcom	350	20	2000
TDL	2000	20	1000
RWS	2850	10	1000
Radio Direction Finder	250	6	NA
Totals	34450	1176	23000

The following equipment and systems will *be considered as GFE to have provisions for assembling and integration on board:*

1. Unmanned Aerial Vehicles;
2. Unmanned Surface Vehicles;
3. Unmanned Underwater Vehicles.

2. List of GFI

All Legacy/GFE systems documentation which are mentioned throughout this SOW and its Annexes will be provided to the Contractor immediately after the Contract Award. Equipment's under Export Control might need to require authorization before providing the information.

3. List of Legacy systems which to be overhauled and reinstalled

The following legacy equipment and systems will be overhauled and reinstalled by PoN on board:

1. CREUSOT-LOIRE 100MM MOD.68 CADAM Gun;
2. CIWS RAYTHEON PHALANX Block1B;
3. GMLS MK29 RIM-7 SEA SPARROW;
4. CWI MK73-MOD0;
5. HSCLCS V6/7 Harpoon;
6. AN-SQS 510 Sonar;
7. XBT/XSV.

4. List of Legacy systems and equipment which to be disassembled from the ship

The following legacy equipment and systems will be completely disassembled from the ship, and will not be part of the configuration:

1. Thales DA 08 radar;
2. Thales MW 08 radar
3. Thales STACOS Combat Management System;
4. Thales STIR I and STIR II;
5. EID ICCS 5 (Integrated Communications Control System);
6. PABX and Announcement system (Internal Comms);
7. Combat Information Centers (CIC);
8. Chilled Water Units;
9. SEWACO Containers Air Condition Units (14 units).
10.

5. List of GFS provided by NSPA/End User

The End User will provide the Contractor with a set of Yard Facilities to be used during the execution of the modernization activities. Each facility has been assigned a predetermined limit, establishing the contracted amount. Any additional requirements beyond this limit will be the responsibility of the Contractor and subject to negotiation with the End User and/or Yard. The commencement of facility usage will be initiated upon the arrival of the first equipment delivered by the Contractor at the Yard, or upon the establishment of the Contractor Staff at the Yard premises.

Category	Facility	Ceiling per Ship (D - Days; H - Hours)
MLU activities	Open Drydock	90 D
MLU activities	Pier	275 D
MLU activities	Scaffolding	240 H
Transport & Handling	Main cranes (40 Ton), along quay, incl. operator (TBC)	600 H
Transport & Handling	Forklift (1.5 and 4 Ton), incl. operator	600 H
Transport & Handling	Chariot (2 Ton), incl. Operator	600 H
Transport & Handling	Up to 120 Ton rental crane (based on request)	250 H
Transport & Handling	Cargo transport: a) 2 towed tire dray with 40 ton capacity (6m X 2,5m). b) 1 towed tire dray with 15 ton capacity (4,5m X 2,35m).	100 H
Storage	Storage capacity in DAS (Weapons and Sensors Division) The facilities are *available as is*: c) Space on the right wing of the 4th floor – 575 sqm (divided in several rooms).	Duration of modernization works in the yard.
Storage	Storage loading/unloading capacity: a) In the building there are 1 elevator, and 2 load lifts. b) Regarding means of lifting loads (overhead Crane), there are: Hangar: 2 x 5 Ton and 2 x 35 Ton Park antennas: 1 x 3 Ton.	Duration of modernization works in the yard.
Support Activities	Electrical power.	Duration of modernization

		works in the yard.
Support Activities	Compressed air.	Duration of modernization works in the yard.
Support Activities	Industrial Residue disposal (hazardous and non-hazardous).	Duration of modernization works in the yard.
Support Activities	Garbage disposal (all types).	Duration of modernization works in the yard.
Support Activities	Water.	Duration of modernization works in the yard.
Security	Access to AASA: Access control for all workers, entities and companies. RFID card assigned (exceptions, "short" visits, registered at the reception but without a card).	Duration of modernization works in the yard.

Security	FACILITIES a. Access Control (people): 1. In DAS building, perimeter access control (right now all cards assigned by the concierge and HR will allow entrance on all access points in the building). 2. Specific access control can be adjusted to specific persons and areas. b. Alarmist and video surveillance: 1. Video alarm system at the entrance, DAS, Logistics Hub and Academy. During non-working hours, alarms report to the shipyard concierge with movement detection and automatic recording of the event (approx. 10 seconds). There is no permanent recording. Ordinance with permanent access to online video. c. SHIP Access: Both access control (people) and a doorman at the entrance to the dock.	Duration of modernization works in the yard.
Office facilities	3 available spaces as is. The rooms can be converted in: meeting room and/or offices.	Duration of modernization works in the yard.
Medical support (first aid)	Permanent medical support (nurse) and first aid.	Duration of modernization works in the yard.

APPENDIX D   New Sensors Systems Technical Requirements

I.   3D Radar System Requirements Specification (FFGH Only)

Requirement Number	Requirement	Requirement Type
Operating modes and processing capabilities		
SR Operating Frequency Selection Modes (FSM)		
TECH_3DRADAR.Req.1	The radar shall have the possibility to select different FSM, having one of them being "Fixed Frequency" mode.	Essential
TECH_3DRADAR.Req.2	The radar should have the following random FSM: • "Pulse-To-Pulse Frequency Agility" mode • "Burst-To-Burst Frequency Agility" mode • "Least Jammed Frequency Agility" mode	Desirable Lvl1
SR Operation Waveform Scanning Modes (WSM)		
TECH_3DRADAR.Req.3	The radar should have "Normal Mode".	Desirable Lvl1
TECH_3DRADAR.Req.4	The radar should have "Anaprop Mode" (Anomalous propagation).	Desirable Lvl1
SR Operating Clutter Filtering Modes (CFM)		
TECH_3DRADAR.Req.5	The radar shall have "Moving Target Indicator" (MTI) or equivalent.	Essential
TECH_3DRADAR.Req.6	The radar should have "Adaptive Moving Target Indicator" (AMTI).	Desirable Lvl1
TECH_3DRADAR.Req.7	The radar shall have a Threshold (Fixed, Adaptive and Automatic) control in order to obtain a "Constant False-Alarm Rate" (CFAR) in clutter and multiple target situations.	Essential
Sillent Mode / Emission Control Available		
TECH_3DRADAR.Req.8	The radar shall include a transmission blanking function (emission control) based on sectorization.	Essential
TECH_3DRADAR.Req.9	The radar shall support multiple simultaneous sectors.	Essential
TECH_3DRADAR.Req.10	The transmission sectorization shall be available independently for RADAR and IFF.	Essential
TECH_3DRADAR.Req.11	The radar shall provide a functionality by the operator to turn off all radiation immediately (radar silence).	Essential
Clutter Automatic Processing (CAP)		
TECH_3DRADAR.Req.12	The radar should have Low Doppler Maps (LDM)	Desirable Lvl1

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Requirement Number	Requirement	Requirement Type
TECH_3DRADAR.Req.13	The radar should have MTI selection maps	Desirable Lvl1
TECH_3DRADAR.Req.14	The radar should have an automatic selection of the most efficient channel for the detection, which is the channel that has the best Signal/Noise ratio and the lowest percentage of false alarms.	Desirable Lvl1
TECH_3DRADAR.Req.15	The radar should have (built-in) the "Clutter Intensity Maps" to elimination of clutter from land.	Desirable Lvl2
General Requirements for the Main System		
TECH_3DRADAR.Req.16	The antenna group should have an IFF antenna, with three channel solution (sum, delta and omni), and capable of operating at 1030MHz and 1090MHz. OMNI channel solution can be implemented separately from the antenna. Note: if flat planar radar will be proposed a dedicated antenna for IFF is acceptable.	Desirable Lvl1
TECH_3DRADAR.Req.17	The system should have a Radar Performance Evaluation System (RPES) according to TECH_3DRADAR.Req.52, TECH_3DRADAR.Req.53, TECH_3DRADAR.Req.54 and TECH_3DRADAR.Req.55.	Desirable Lvl2
TECH_3DRADAR.Req.18	The radar configuration to be delivered should be based on the currently market available baseline, and fitted with the last available proven and recent technology.	Desirable Lvl1
TECH_3DRADAR.Req.19	The radar should provide long-range surveillance coverage of Jammers.	Desirable Lvl1
TECH_3DRADAR.Req.20	The radar should have an efficient signal data processing and an effective anti-jammer management to counter new generation threats in different kinds of ECM (Electronic Counter Measures) and severe clutter environments.	Essential
TECH_3DRADAR.Req.21	The radar should have provision of gunnery (splash spotting) support for engaged surface targets.	Essential
TECH_3DRADAR.Req.22	The radar should have a Lightning Protection System.	Desirable Lvl2
TECH_3DRADAR.Req.23	The system should have the possibility to reduce start-up time in case of contingency or emergency.	Desirable Lvl1
System Requirement Specification		
Frequencies		
TECH_3DRADAR.Req.24	The radar shall have a minimum bandwidth of 10% of the centre frequency (frequency agility of 10% of the centre frequency).	Essential
TECH_3DRADAR.Req.25	The radar shall have the narrowest bandwidth to the centre frequency (frequency agility of the centre frequency).	Desirable Lvl1

Requirement Number	Requirement	Requirement Type
TECH_3DRADAR.Req.26	The radar shall comply with **ECC Decision ECC/DEC/ (11)01** provided the band from 1400-1427MHz is in the spurious domain for the selected operating mode.	Essential
Detection Area		
TECH_3DRADAR.Req.27	The radar should have a multi-beam solution, which is a combination of Multiple, Simultaneous and Independent Pencil Beams operating at different frequencies that can be steered in elevation independently from the others.	Desirable Lvl1
TECH_3DRADAR.Req.28	The radar transmission shall have a uniform radiation coverage throughout the 360 degrees.	Essential
TECH_3DRADAR.Req.29	The radar shall have a minimum calculated range coverage of 0,3NM. Shall have a maximum calculated range of 64NM for the detection of aerial targets and 32NM for surface targets (not considering Earth curvature).	Essential
TECH_3DRADAR.Req.30	The radar should have a maximum calculated range of 120NM for the detection of aerial targets.	Desirable Lvl1
TECH_3DRADAR.Req.31	The radar should have a minimum calculated range coverage of 0,05NM for the detection of Surface targets.	Desirable Lvl1
TECH_3DRADAR.Req.32	The radar should be capable of detecting aerial targets at an elevation angle of at least -2 deg, or lower, up to at least 60 deg, relative to the horizon.	Desirable Lvl2
TECH_3DRADAR.Req.33	The radar should be capable of detecting aerial targets in the detection area from the lowest possible Line-of-Sight at least up to the altitude of 30.000ft.	Desirable Lvl1
Detection Performance		
TECH_3DRADAR.Req.34	In ICAO standard atmosphere, the radar should detect aerial targets with a RCS of 0.1 m² up to a range of at least 20 NM.	Desirable Lvl1
TECH_3DRADAR.Req.35	In ICAO standard atmosphere, the radar should detect aerial targets with a RCS of 1 m² up to a range of at least 35 NM.	Desirable Lvl1
TECH_3DRADAR.Req.36	The radar shall be capable of detecting and tracking flight targets with an acceleration and manoeuvring capability from 0 g up to 3 g.	Essential
Accuracy and Resolution		
TECH_3DRADAR.Req.37	The precision of the distance measurement of the radar should be less than or equal to 70 m (standard deviation) over the entire detection range.	Desirable Lvl1
TECH_3DRADAR.Req.38	The azimuth resolution of the radar should be less than or equal to 5 deg over the entire range.	Desirable Lvl1
TECH_3DRADAR.Req.39	The radar shall ensure an azimuth accuracy of less than or equal to 0.3 deg. (standard deviation).	Essential
TECH_3DRADAR.Req.40	The range resolution of the radar should be less than or equal to 150m.	Desirable Lvl1

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Requirement Number	Requirement	Requirement Type
Data Processing		
TECH_3DRADAR.Req.41	The processing time shall be less than 2 seconds from signal input at the antenna to data output for plots.	Essential
TECH_3DRADAR.Req.42	The radar shall update the plot information at least once per scan.	Essential
TECH_3DRADAR.Req.43	The radar shall be capable of processing and reporting at least 300 aerial plots.	Essential
TECH_3DRADAR.Req.44	The radar shall be capable of processing and reporting at least 100 surface plots.	Essential
TECH_3DRADAR.Req.45	The radar should be capable of processing and reporting at least 2000 plots per scan.	Desirable Lvl2
TECH_3DRADAR.Req.46	The radar should be capable of processing and reporting jamming strobes.	Desirable Lvl2
TECH_3DRADAR.Req.47	Non-Automatic Initiation (NAI) • The radar should be able to disable automatic track initialization.	Desirable Lvl2
TECH_3DRADAR.Req.48	The radar should balance the amplitude of the received pulse (step-modulated) attenuating the very strong signals returned from nearby ground clutter targets in the first few range gates applying Sensitivity Time Control (STC) Laws.	Desirable Lvl1
Radar Performance Evaluation System (RPES)		
TECH_3DRADAR.Req.49	The contractor should provide the RPES SW (Radar Performance Evaluation System Software) tools, including SMR (System Manager Report).	Desirable Lvl2
TECH_3DRADAR.Req.50	The RPES SW tools should provide the capability for off-line analysis of radar data recordings for short and long-term performance evaluation and monitoring.	Desirable Lvl2
TECH_3DRADAR.Req.51	The RPES SW tools should be capable of loading all radar recording file formats.	Desirable Lvl2
TECH_3DRADAR.Req.52	The RPES should support the following detection data selection criteria: • Start date-time and end date-time; • Plots; • Jamming Strobes; • ARM Alerts; • Minimum and maximum slant range; • Start and end azimuth.	Desirable Lvl2
Radar control		
TECH_3DRADAR.Req.53	The radar shall be operated, monitored and maintained, locally via a radar control panel (could be a laptop).	Essential
User interfaces		

Requirement Number	Requirement	Requirement Type
TECH_3DRADAR.Req.54	The radar shall be equipped with HMI (Human Machine Interface) HW (Hardware) and SW (Software) elements to ensure efficient radar operation and maintenance activities.	Essential
TECH_3DRADAR.Req.55	The radar should have a training mode support to operational and technical personnel.	Desirable Lvl2
Synchronization		
TECH_3DRADAR.Req.56	The RADAR shall include a time synchronization mechanism in order to be able to be synchronized with external systems.	Essential
External Interface Media		
TECH_3DRADAR.Req.57	The radar shall provide the Blanking signal for ESM systems, include Pre-Sync pulse and transmission pulse envelop.	Essential
Communication Protocols		
TECH_3DRADAR.Req.58	The System should provide all Data Outputs, including device – system status, error messages, directed interrogations and plot data in the following data formats/ protocols: ASTERIX and Mil-ASTERIX, for the integration into the MilRADNET. ASTERIX Categories 007, 021, 034, 048, 155, 156, 157, 158, 159 and 240.	Desirable Lvl1
System Performance Check (SPC)		
TECH_3DRADAR.Req.59	Perform the following radar tests and provide correspondent analysis report: detection range/surveillance volume, clutter rejection, range resolution and accuracy, angular resolution and accuracy, height accuracy, frequency and bandwidth, site adaptation validation, site alignment, multi radar correlation aspects and SR/SSR transmit and receive patterns.	Desirable Lvl2
Automatic Feature Disabling		
TECH_3DRADAR.Req.60	For the purpose of SPC evaluation of receiver and antenna performance a method should be provided that can disable to the maximum extent possible any automatic control feature in the receiver chain such as, but not limited to, STC and AGC.	Desirable Lvl2
Beam Steering		
TECH_3DRADAR.Req.61	If the radar has one or more electronically steered beams, then beam steering should be accomplished from the LMCC.	Desirable Lvl2
Elevation Increment Selection		
TECH_3DRADAR.Req.62	The elevation increment for the complete SR elevation coverage should be selectable.	Desirable Lvl2
Radiation with Locked Azimuth		

Requirement Number	Requirement	Requirement Type
TECH_3DRADAR.Req.63	In maintenance mode it should be possible to lock the antenna in a defined azimuth position with a precision error of less than 1 degree, and turn on transmission.	Desirable Lvl2
SPC Measurement Points		
TECH_3DRADAR.Req.64	The connection points that are listed should be provided to permit the connection of external measurement equipment to the radar sub-system: - SSR P1-P3 trigger; - SSR unprocessed & unquantized log video from SUM, Difference and Omni-directional channels simultaneously or IF outputs from all SSR receiver channels; - Radar timing signals (ACP, ARP/NRP); - Forward RF sample (transmit pulse at fixed PRF); - IF signal at the pulse compression line output (if analogue pulse compression is used); - IF signal accounting for the entire Array's final receiver function or if the radar uses digital beam forming, an IF signal shall be derived by modulating the I and Q signals onto an IF carrier frequency; - Primary radar transmit trigger; - Receiver Life time gate.	Desirable Lvl2
TECH_3DRADAR.Req.65	The connection points and the levels for all signal types should be specified in the technical documentation.	Desirable Lvl2
System Loss Measurement		
TECH_3DRADAR.Req.66	The radar sub-system should measure and display system losses at various points from the array through the entire receive chain.	Desirable Lvl2
Noise Figure Measurement		
TECH_3DRADAR.Req.67	The radar sub-system should measure and display the system noise figure.	Desirable Lvl2
MTI Stability Measurement		
TECH_3DRADAR.Req.68	The radar sub-system should measure and display the system's MTI stability.	Desirable Lvl2
TECH_3DRADAR.Req.69	The radar sub-system should provide measurements for the transmit chain, the receive chain and combined.	Desirable Lvl2

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II. 2D Radar System Requirements Specification (OPV Only) (FFGH Optional)

Requirement Number	Requirement	Requirement Type
General Requirements for the Main System		
TECH_2DRADAR.Req.1	The radar system shall provide, at least, two-dimensional long-range surveillance coverage of AIR and SURFACE targets.	Essential
TECH_2DRADAR.Req.2	The radar system should provide, three-dimensional long-range surveillance coverage of AIR and SURFACE targets, as a replacement of the 2D Radar.	Desirable Lvl1
TECH_2DRADAR.Req.3	The antenna group should have an IFF antenna, with three channel solution (sum, delta and omni), and capable of operating at 1030MHz and 1090MHz. OMNI channel solution can be implemented separately from the antenna. Note: if flat planar radar will be proposed a dedicated antenna for IFF is acceptable.	Desirable Lvl1
TECH_2DRADAR.Req.4	The radar configuration to be delivered shall be based on the currently market available baseline, and fitted with the last available proven and recent technology.	Essential
TECH_2DRADAR.Req.5	The radar shall have an efficient signal data processing and an effective jammer suppression to counter new generation threats in different kinds of ECM (Electronic Counter Measures) and severe clutter environments.	Essential
TECH_2DRADAR.Req.6	The radar shall have frequency and time diversity.	Essential
TECH_2DRADAR.Req.7	The radar shall implement pulse compression.	Essential
TECH_2DRADAR.Req.8	The radar shall be support up to multiple simultaneous sectors.	Essential
TECH_2DRADAR.Req.9	The transmission sectorization shall be available independently for RADAR and IFF.	Essential
TECH_2DRADAR.Req.10	The System shall include a transmission blanking function (emission control) based on sectorization.	Essential
TECH_2DRADAR.Req.11	The System shall be able to turn off all radiation of all components immediately (radar silence).	Essential
TECH_2DRADAR.Req.12	The system should use Solid State Power Amplifier technology for transmission.	Desirable Lvl1
TECH_2DRADAR.Req.13	The radar shall have "Moving Target Indicator" (MTI) or equivalent.	Essential

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Requirement Number	Requirement	Requirement Type
TECH_2DRADAR.Req.14	The bidder may supply a system with the same exact configuration as the solution presented for the OPV (FFGH ONLY).	Optional
System Requirement Specification		
Detection Performance		
TECH_2DRADAR.Req.16	The radar should have a minimum calculated range coverage not greater than 0,3NM and at least 50NM for the detection of aerial targets.	Desirable Lvl1
TECH_2DRADAR.Req.17	In ICAO standard atmosphere, the radar shall detect targets with an RCS of 3 m² up to a range of at least 50 NM with a detection probability of at least 80% combined with a false alarm rate of no more than 10^-6 for each scan.	Essential
Surface Targets		
TECH_2DRADAR.Req.18	The radar should be able to plot at least 500 surface tracks	Desirable Lvl1
TECH_2DRADAR.Req.19	The radar should track surface targets to speeds up to 70 kts.	Desirable Lvl1
TECH_2DRADAR.Req.20	Range accuracy should be at least of 10 meters	Desirable Lvl1
TECH_2DRADAR.Req.21	Azimuth accuracy should be at least of 0.2 degrees	Desirable Lvl1
Air Targets		
TECH_2DRADAR.Req.22	The radar should be able to plot at least 500 air tracks	Desirable Lvl1
TECH_2DRADAR.Req.23	The radar should track air targets to speeds up to at least 450 kts.	Desirable Lvl1
User interfaces		
TECH_2DRADAR.Req.24	The System shall be equipped with Human Machine Interface (HMI) HW and SW elements to ensure efficient Radar Operation and maintenance activities.	Essential
Radar control		
TECH_2DRADAR.Req.25	The radar shall be operated, monitored and maintained, locally via a radar control panel (could be a laptop).	Essential

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Requirement Number	Requirement	Requirement Type
Communication Protocols		
TECH_2DRADAR.Req.26	The System (SOW001/D) should provide all Data Outputs, including device– system status, error messages, directed interrogations and plot data in the following data formats/ protocols: ASTERIX and Mil-ASTERIX, for the integration into the MilRADNET ASTERIX Categories 007, 021, 034, 048, 155, 156, 157, 158, 159 and 240.	Desirable Lvl1
Synchronization		
TECH_2DRADAR.Req.27	The RADAR shall include a time synchronization mechanism in order to be able to be synchronized with external systems.	Essential
External Interface Media		
TECH_2DRADAR.Req.28	The radar shall provide the Blanking signal for ESM systems, include Pre-Sync pulse and transmission pulse envelop.	Essential

III. Electro-Optic Director (EOD System) (FFGH Only)

Functional Requirements		
TECH_EOD.Req.1	The system shall be able to operate as a standalone system or integrated with a Combat Management System	Essential
TECH_EOD.Req.2	The director shall be able to be aligned with the main gun CADAM 100MM, in order to be compliant with NATO standards for AAW and NGS purpose, and 12.7 RWS.	Essential
TECH_EOD.Req.3	The sensor pod shall have at least two cameras, a colour TV camera and a MWIR camera (3-5 μm band) and a Laser Range Finder;	Essential
TECH_EOD.Req.4	The sensor pod shall be trainable in both elevation as well as azimuth;	Essential
TECH_EOD.Req.5	The sensor pod should have a coverage of 360 degrees in azimuth;	Desirable Lvl2
TECH_EOD.Req.6	The elevation limits shall be equal or greater than 80º and -20º	Essential
TECH_EOD.Req.7	The vertical elevation of the colour TV and MWIR camera should be at least from -35 up to +80 degrees in WFOV (wide field of view);	Desirable Lvl1
TECH_EOD.Req.8	The system should use only optical zoom.	Desirable Lvl2
TECH_EOD.Req.9	The sensor pod shall be horizon/vector stabilized as well as geo/target fixed stabilized.	Essential
TECH_EOD.Req.10	The sensor pod shall have a stabilization error of: • ≤15% of the smallest IFOV (instantaneous field of view) of the sensor package during 2 image frames; • ≤15% of the NFOV (narrow field of view) during 1 minute.	Essential
TECH_EOD.Req.11	The system shall have an auto-video tracker;	Essential
TECH_EOD.Req.12	The frame rate of all video streams shall be ≥25Hz;	Essential
TECH_EOD.Req.13	Both colour TV camera and the MWIR camera should have optical zoom capability with at least 3 different fields of view (FOV) or continuous zoom;	Desirable Lvl1
TECH_EOD.Req.14	WFOV (wide field of view) should be ≥ 10°;	Desirable Lvl1
TECH_EOD.Req.15	NFOV (narrow field of view) should be ≤ 3°;	Desirable Lvl1
TECH_EOD.Req.16	The cameras shall have a switch time ≤2 sec between two FOV's in case of no continuous zoom;	Essential

TECH_EOD.Req.17	All cameras shall stay within focus when switching from NFOV to WFOV and back in one sequence, without focus adjustment;	Essential
TECH_EOD.Req.18	All cameras shall have manual focus;	Essential
TECH_EOD.Req.19	All cameras shall have a focus setting that is environmental temperature compensated;	Essential
TECH_EOD.Req.20	All sensors shall remain undamaged while looking directly into the sun;	Essential
TECH_EOD.Req.21	All cameras should meet **STANAG 4451 Protection Against Fixed Wavelength (Battlefield) Dazzling Lasers**;	Desirable Lvl1
TECH_EOD.Req.22	All cameras shall have auto focus which can be switched back to manual;	Essential
TECH_EOD.Req.23	The director shall be able to engage surface targets at 3NM	Essential
TECH_EOD.Req.24	The director shall be able to engage air targets at 1,5NM	Essential
Colour TV Camera		
TECH_EOD.Req.25	The colour TV camera should have, at least, a staring array with HD resolution of 1920 x 1080 pixels (progressive);	Desirable Lvl1
TECH_EOD.Req.26	The performance of the colour TV camera shall be: • Detection range: 6 NM; For the following scenario: - Applicable procedures/terminology: **STANAG 4348** - Background temperature: 20°C - Weather conditions: Daylight 1.000 lux - Target dimensions: 2.3 x 2.3 m - Contrast target-background: 20%	Essential
TECH_EOD.Req.27	The performance of the colour TV camera should be: • Detection range: 8NM; For the following scenario: - Applicable procedures/terminology: **STANAG 4348** - Background temperature: 20°C - Weather conditions: Daylight 1.000 lux - Target dimensions: 2.3 x 2.3 m - Contrast target-background: 20%	Desirable Lvl2
IR Camera		
TECH_EOD.Req.28	The MWIR camera shall have a staring array with a resolution of at least 640 x 480 pixels;	Essential

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TECH_EOD.Req.29	The MWIR camera shall have a detector cooling time of ≤10min.	Essential
TECH_EOD.Req.30	The MWIR camera should have a sun glint filter if the sensor is sensitive beneath 3.6 µm	Desirable Lvl1
TECH_EOD.Req.31	The bidder shall provide the measured MRTD curve and the performance calculations of the MWIR camera.	Essential
TECH_EOD.Req.32	The range performance of the MWIR camera shall be: • Detection range: 8NM; For the following scenario: - Applicable procedures/terminology: **STANAG 4347, 4349 and 4350** - Background temperature: 20°C - Weather conditions σ (sigma): 0.2 - Target dimensions: 2.3 x 2.3 m - ∆T target-background: 3.2°C	Essential
TECH_EOD.Req.33	The range performance of the MWIR camera should be: • Detection range: 15NM; For the following scenario: - Applicable procedures/terminology: **STANAG 4347, 4349 and 4350** - Background temperature: 20°C - Weather conditions σ (sigma): 0.2 - Target dimensions: 2.3 x 2.3 m - ∆T target-background: 3.2°C	Desirable Lvl2
LASER		
TECH_EOD.Req.34	The LRF shall have a beam with a wavelength of 1.54mm, a repetition rate of at least 1pps, and it's performance shall in accordance with its MWIR .	Essential
TECH_EOD.Req.35	The system should include a Laser Range Designator with a 10NM range and comply with **STANAG 3733.**	Desirable Lvl1
TECH_EOD.Req.36	It shall be possible to switch all image and LRF enhancement/processing possibilities on/off individually;	Essential
TECH_EOD.Req.37	The performance of the LRF should: • Maximal range (at least): 8NM; • Minimum range (not longer): 250 m For scenarios in requirements TECH_EOD.Req.25 and TECH_EOD.Req.31	Desirable Lvl1

IV. Fire Control Radar (FCR) System (FFGH Only)

Requirement Number	Requirements	Requirement Type
General Requirements		
TECH_FCR.Req.1	The director, for a designated target, shall have the ability to launch NSSM RIM7 in all its modes, and for the same target, simultaneously shoot with the main gun.	Essential
TECH_FCR.Req.2	The bidder should supply a new CW illuminator.	Desirable Lvl1
TECH_FCR.Req.3	In case the bidder does not supply CW illuminator, the director shall be integrated with MK73 MOD 1 CW Illuminator.	Essential
TECH_FCR.Req.4	The director shall not hamper NSSM tactical employment.	Essential
TECH_FCR.Req.5	The system, itself or in combination with CMS, shall have Kinematic Based Engageability algorithm to assess whether a given target is Engageable or Will Be Engageable by NSSM. Two contours shall be embedded in this algorithm: one for Manoeuvring Targets (also referred to as the Inner Contour), and one for Non-Manoeuvring targets (also referred to as the Outer Contour).	Essential
TECH_FCR.Req.6	The director shall have a TV camera aligned with the main radiation beam.	Essential
TECH_FCR.Req.7	The director shall have an IR camera aligned with the main radiation beam.	Essential
TECH_FCR.Req.8	The director shall be able to be aligned with the main gun CADAM 100MM in order to be compliant with NATO standards.	Essential
TECH_FCR.Req.9	The system shall include a Man-Aloft switch to cut power for the director as well as inhibit radiation.	Essential
TECH_FCR.Req.10	The system shall use frequency agility.	Essential
TECH_FCR.Req.11	The systems transmitter should use SSPA (solid state power amplifier) technology.	Desirable Lvl1
Pedestal		
TECH_FCR.Req.12	The director shall be stabilized on both axes.	Essential
TECH_FCR.Req.13	The director shall move 360º in direction.	Essential
TECH_FCR.Req.14	The elevation limits shall be equal or greater than 80º and -20º.	Essential
TECH_FCR.Req.15	Angular speed shall be equal or higher than 2rad/s on elevation and direction	Essential
TECH_FCR.Req.16	Angular acceleration shall be equal or higher than 2rad/s2 on elevation and direction	Essential

Requirement Number	Requirements	Requirement Type
	Threat Response requirements	
TECH_FCR.Req.17	The system shall allow for full weapons capabilities employment (CADAM 100MM and NSSM RIM7) for the following scenario: Threat characteristics: RCS: 1 m^2 Speed: Mach 1 Flight altitude: 3000 m For this scenario, the system shall allow for a minimum range for detection of 30NM.	Essential
TECH_FCR.Req.18	For the scenario described in TECH_FCR.Req.17, the system should allow for a minimum range for detection of 60NM.	Desirable Lv1
TECH_FCR.Req.19	The system shall allow for full weapons capabilities employment (CADAM 100MM and NSSM RIM7) for the following scenario: Threat characteristics: RCS: 0.1 m^2 Speed: Mach 1 Flight altitude: 10 m For this scenario, the system shall allow for a minimum range for detection of 10NM.	Essential
TECH_FCR.Req.20	For the scenario described in TECH_FCR.Req.19, the system should allow for a minimum range for detection of 25NM.	Desirable Lv1
TECH_FCR.Req.21	The system shall allow for full weapons capabilities employment (CADAM 100MM and NSSM RIM7) for the following scenario: Threat characteristics: RCS: 0.5 m^2 Speed: Mach 2 Flight altitude: 10 m For this scenario, the system shall allow for a minimum range for detection of 10NM.	Essential
TECH_FCR.Req.22	For the scenario described in TECH_FCR.Req.21, the system should allow for a minimum range for detection of 35NM.	Desirable Lv1
TECH_FCR.Req.23	The FCR shall have been previously integrated into a naval semi-active surface to air missile system and proven in operational environment.	Essential

Requirement Number	Requirements	Requirement Type
TECH_FCR.Req.24	The system shall allow the CMS to comply with the requirements TECH_CMS.Req.68TECH_CMS.Req.70 to TECH_CMS.Req.92TECH_CMS.Req.94	Essential

V. Electro-Optic System (EOS) System (OPV3S Only; FFGH Optional)

Requirement Number	Requirements	Requirement Type
Functional Requirements		
TECH_EOS.Req.1	The system shall be able to operate as a standalone system or integrated with a Combat Management System	Essential
TECH_EOS.Req.2	The sensor pod shall have at least two cameras, a colour TV camera and a MWIR camera (3-5 µm band) and a Laser Range Finder;	Essential
TECH_EOS.Req.3	The sensor pod shall be trainable in both elevation as well as azimuth;	Essential
TECH_EOS.Req.4	The sensor pod should have a coverage of 360 degrees in azimuth;	Desirable Lvl2
TECH_EOS.Req.5	The vertical elevation of the colour TV and MWIR camera should be at least from -35 up to +80 degrees in WFOV (wide field of view);	Desirable Lvl1
TECH_EOS.Req.6	It shall be possible to receive a colour TV video stream and MWIR video stream on the CMS consoles simultaneously;	Essential
TECH_EOS.Req.7	The sensor pod shall be horizon/vector stabilized as well as geo/target fixed stabilized.	Essential
TECH_EOS.Req.8	The sensor pod shall have stabilization error of: • ≤15% of the smallest IFOV (instantaneous field of view) of the sensor package during 2 image frames; • ≤15% of the NFOV (narrow field of view) during 1 minute.	Essential
TECH_EOS.Req.9	The system should have an auto-video tracker;	Essential
TECH_EOS.Req.10	The frame rate of all video streams shall be ≥25Hz;	Essential
TECH_EOS.Req.11	Both colour TV camera and the MWIR camera shall have optical zoom capability with at least 3 different fields of view (FOV) or continuous zoom;	Essential
TECH_EOS.Req.12	WFOV (wide field of view) should be ≥ 15° (both horizontal as vertical);	Desirable Lvl1
TECH_EOS.Req.13	NFOV (narrow field of view) should be ≤ 1° (both horizontal as vertical);	Desirable Lvl1
TECH_EOS.Req.14	The cameras shall have a switch time ≤2 sec between two FOV's in case of no continuous zoom;	Essential
TECH_EOS.Req.15	All cameras shall stay within focus when switching from NFOV to WFOV and back in one sequence, without focus adjustment;	Essential
TECH_EOS.Req.16	All cameras shall have manual focus;	Essential
TECH_EOS.Req.17	All cameras shall have a focus setting that is temperature compensated;	Essential
TECH_EOS.Req.18	All sensors shall remain undamaged while looking directly into the sun;	Essential

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Requirement Number	Requirements	Requirement Type
TECH_EOS.Req.19	All cameras should meet **STANAG 4451 Protection Against Fixed Wavelength (Battlefield) Dazzling Lasers**;	Desirable Lvl1
TECH_EOS.Req.20	All cameras shall have autofocus which can be switched back to manual;	Essential
TECH_EOS.Req.21	Apart from a processed digital video stream, the system should be able to send a raw video stream. Raw means: direct after analogue-digital converter of the image sensor, without any further processing.	Desirable Lvl1
TECH_EOS.Req.22	The EOS shall be able to be aligned with the main gun 30MM in order to be compliant with NATO standards for AAW and ASuW purpose, as well as the 12.7 RWS..	Essential
TECH_EOS.Req.23	The bidder may supply a system with the same exact configuration as the solution presented for the OPV (FFGH ONLY);	Optional
Colour TV Camera		
TECH_EOS.Req.24	The colour TV camera shall have, at least, a staring array with HD resolution of 1920 x 1080 pixels (progressive);	Essential
TECH_EOS.Req.25	The performance of the colour TV camera shall be: • Detection range: 6NM; • Classification/recognition range: 4NM. For the following scenario: - Applicable procedures/terminology: **STANAG 4348** - Background temperature: 20°C - Weather conditions: Daylight 1.000 lux - Target dimensions: 2.3 x 2.3 m - Contrast target-background: 20%	Essential
IR Camera		
TECH_EOS.Req.26	The MWIR camera shall have a staring array with a resolution of at least 640 x 480 pixels;	Essential
TECH_EOS.Req.27	The MWIR camera shall have a detector cooling time of ≤10min.	Essential
TECH_EOS.Req.28	The MWIR camera shall have a sun glint filter if the sensor is sensitive beneath 3.6 µm	Desirable Lvl1
TECH_EOS.Req.29	The bidder shall provide the measured MRTD curve and calculations the performance of the MWIR camera is based on.	Essential
TECH_EOS.Req.30	The range performance of the MWIR camera shall be: • Detection range: 8NM; • Classification/recognition range: 4NM. For the following scenario:	Essential

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Requirement Number	Requirements	Requirement Type
	- Applicable procedures/terminology: **STANAG 4347, 4349 and 4350** - Background temperature: 20°C - Weather conditions σ (sigma): 0.2 - Target dimensions: 2.3 x 2.3 m - ΔT target-background: 3.2°C	
LASER		
TECH_EOS.Req.31	The system should include a Laser Range Designator with a 10NM range and comply with STANAG 3733.	Desirable Lvl1
TECH_EOS.Req.32	The LRF shall have a beam with a divergence of 0.7mrad, wave length of 1.54mm and reception rate of at least 1pps, and its performance shall in accordance with its MWIR.	Essential
TECH_EOS.Req.33	The laser to be used by the LRF shall be an eye safe laser.	Essential
TECH_EOS.Req.34	It shall be possible to switch all image and LRF enhancement/processing possibilities on/off individually;	Essential
TECH_EOS.Req.35	The performance of the LRF shall: • Maximal range (at least): 15NM • Minimum range (not longer): 250 m For scenarios in requirements TECH_EOS.Req.25 and TECH_EOS.Req.30	Desirable Lvl1

VI. Identification Friend-or-Foe (IFF) System

Requirement Number	Requirements	Classification
System Requirements		
States or Modes Requirements		
TECH_IFF.Req.1	The system shall be able to operate as a standalone system or integrated with a Combat Management System	Essential
Functional Requirements		
TECH_IFF.Req.2	The IFF system shall be able to use interrogation management and shall implement the IFF Modes 1, 2, 3/A, C, 5 and S as per **STANAG 4193 Ed.3**	Essential
TECH_IFF.Req.3	The antenna group should have an IFF antenna, with three channel solution (sum, delta and omni), and capable of operating at 1030MHz and 1090MHz. OMNI channel solution can be implemented separately from the antenna.	Desirable Lvl1
TECH_IFF.Req.4	The system shall have implemented both Mode 5 Level 1 and Level 2.	Essential
TECH_IFF.Req.5	The system should implement M5L2-B.	Desirable Lvl1
TECH_IFF.Req.6	Interrogators shall have implemented the lethal interrogation formats and transponders shall be able to reply/report at the lethal interrogations on both Mode 5 Level 1 and Level 2.	Essential
TECH_IFF.Req.7	Interrogators shall be able to interrogate CAT007 ASTERIX protocol	Essential
TECH_IFF.Req.8	Mode S shall support the interrogation, detection and acquisition of mode S, 3/A and C to comply with ICAO Annex 10: mode 3/A, C, S All-Call interrogation; mode A/C only All-Call; mode S only All-Call.	Essential
TECH_IFF.Req.9	The Mode S implementation shall include: a. addressed surveillance and standard-length communication transactions; b. standard length communication protocols; c. extended length communication transactions; d. data link functions.	Essential
TECH_IFF.Req.10	The Mode S implementation shall implement: a. Stochastic Lockout Override (SLO) object interrogation; b. Enhanced Surveillance (EHS); c. Extended Squitter (ES); d. ADS-B data reception;	Essential
TECH_IFF.Req.11	The transponder part shall have the following three system states controlled from the data interface: a. Off: system is off;	Essential

Requirement Number	Requirements	Classification
	b. Standby: system will only reply to lethal interrogations; c. On: system will reply/report at all the selected modes.	
TECH_IFF.Req.12	The interrogator part shall be able to implement at least have the following system modes for interrogation controlled from the data interface: d. Interrogation management including MIP selection; e. Supermode interrogations; f. Intermode interrogations; g. Sector differentiated interrogation schemes, up to a sector of 360°. Multiple sectors, ships oriented and earth fixed, shall be possible in combination with non-interrogation sectors; together at least 4 sectors; h. Direct interrogation capability. Accurate designation in range and azimuth as well as interrogation using a window in range and sector are both allowed; i. Combination of d and e.	Essential
TECH_IFF.Req.13	The IFF system shall be able to receive a secure PNT source, compatible with M Codes	Essential
TECH_IFF.Req.14	The IFF system shall be able to use a KIV-77 crypto machine (KIV-77 is GFE), or any other Crypto Machine capable pf operating with Mod.5 Level1 and 2 (ex: QRTKxNG) as long as delivered by Contractor.	Essential
TECH_IFF.Req.15	The maximum range of the IFF system shall be in accordance with the maximum standard range of the main radar delivered under this contract (3D Radar for the FFGH and 2D Radar for the OPV).	Essential
Performance Requirements		
TECH_IFF.Req.16	The IFF systems performance shall be compliant with the methods and specifications in STANAG 4193.	Essential
Certification Requirements		
TECH_IFF.Req.17	The contractor shall deliver a certified lockable rack/BOX in order to allow platform (ship) level certification in compliance with STANAG 4193.	Essential

VII. Electronic Support Measures (ESM) System

Requirement Number	Requirements	Requirement Type
System Requirements		
Frequency coverage		
TECH_ESM.Req.1	The ESM system shall have a frequency coverage of 2 - 18 GHz.	Essential
TECH_ESM.Req.2	The ESM system should be able to grow to frequency coverage of 0.5 - 2 GHz. (FFGH Only)	Desirable Lvl2
Probability of Interception (POI)		
TECH_ESM.Req.3	The ESM system shall have a POI >= 80% in the frequency band between 2 - 18 GHz.	Essential
TECH_ESM.Req.4	In case the ESM system is able to receive in the 0.5 - 2 GHz band, the system should have a POI >= 99% in this band. (FFGH Only)	Desirable Lvl2
Digital Receiver		
TECH_ESM.Req.5	The ESM system shall have a digital receiver covering the 2 - 18 GHz band.	Essential
TECH_ESM.Req.6	In case the ESM system is able to receive in the 0.5 - 2 GHz band, the system should have a digital receiver covering this band. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.7	The Bidder should provide information on the channel bandwidth of the digital receiver. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.8	The digital receiver of the ESM system shall have the capability of analysing multiple simultaneous signals with a minimum frequency separation <= 10 MHz.	Essential
TECH_ESM.Req.9	The digital receiver of the ESM system shall have the capability of measuring at least 8 simultaneous signals.	Essential
TECH_ESM.Req.10	The digital receiver of the ESM system should have the capability of measuring ≥ 16 simultaneous signals. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.11	The ESM system shall be capable to measure simultaneous signals, which may be pulsed, continuous wave (CW) or any mixture of pulsed and CW signals.	Essential
TECH_ESM.Req.12	The Bidder should provide information on the sampling rate of the I/Q data. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.13	The Bidder should provide information on the number of bits of the I/Q data. (FFGH Only)	Desirable Lvl2
System Coverage		

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Requirement Number	Requirements	Requirement Type
TECH_ESM.Req.14	The ESM system shall have an azimuth coverage of 360°	Essential
TECH_ESM.Req.15	The ESM system shall have an elevation coverage of 0° to ≥ 30° (-3 dB point) relative to the earth's surface.	Essential
TECH_ESM.Req.16	The ESM system should have an elevation coverage of 0° to ≥ 60° (-3 dB point) relative to the earth's surface. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.17	The Bidder shall deliver the antenna azimuth and elevation patterns for both individual elements and installed.	Essential
TECH_ESM.Req.18	The ESM system shall have the capability to detect emitters with H, V, LH circular and RH circular polarisation modes.	Essential
TECH_ESM.Req.19	The ESM system should have the capability to detect emitters within slant 45 and slant 135. (FFGH Only)	Desirable Lvl2
System Sensitivity		
TECH_ESM.Req.20	The ESM system shall have a sensitivity of ≤ -65 dBmi	Essential
ESM Automatic Processing		
TECH_ESM.Req.21	The ESM system shall have the capability to process ≥ 500.000 pulses / sec	Essential
TECH_ESM.Req.22	The ESM system should have the capability to process ≥ 1000.000 pulses / sec. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.23	The ESM system shall have a reaction time < 1s.	Essential
TECH_ESM.Req.24	The Bidder shall provide a detailed description of the scan measurement process, including its capacities for automatic scan measurements and manual initiated scan measurements.	Essential
TECH_ESM.Req.25	The probability that the measured, processed and presented parameters of the ESM system (particular centre frequency and bearing) match those of the transmitted emitter shall be >95% with regards to TECH_ESM.Req. 5, 63, 66, 67 and 68.	Essential
TECH_ESM.Req.26	The ESM system shall have the capability to track ≥ 200 signals simultaneously	Essential
TECH_ESM.Req.27	The ESM system should have the capability to track ≥ 500 signals simultaneously. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.28	The ESM system shall have the capability to process, detect and intercept CW signals, fixed and varying RF/PRI/PW emissions, with or without intrapulse modulation, transmitted by non-scanning and scanning emitters	Essential
TECH_ESM.Req.29	The ESM system shall have the capability of processing multimode signals and merge/fuse those signals into one signal report. Multimode signals are signals emitted by multifunction radars with varying frequency, PRI, and/or PW (pulse group emissions with group to group and pulse to pulse frequency, PRI, and/or PW variation)	Essential

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Requirement Number	Requirements	Requirement Type
TECH_ESM.Req.30	The ESM system shall have the capability to recognize any combination of RF, PRI, PW, scan type and intrapulse modulation.	Essential
TECH_ESM.Req.31	The ESM system shall have the capability to recognize at least the following RF type variations: Fixed Agile Agile continuous Agile continuous random Agile continuous periodic Agile continuous slide/drift Agile discrete Agile discrete regular pulse to pulse Agile discrete irregular pulse to pulse Agile discrete regular batch Agile discrete irregular batch	Essential
TECH_ESM.Req.32	The ESM system shall have the capability to recognise at least the following PRI type variations: Fixed AgileAgile continuous Agile discrete Agile complex Agile continuous random (jitter) Agile continuous periodic Agile continuous slide/drift Agile discrete regular pulse to pulse (stagger) Agile discrete regular batch (dwell and switch) Agile discrete irregular pulse to pulse (discrete jitter) Agile discrete irregular batch Agile discrete pulse group fixed Agile discrete pulse group variable Agile discrete pulse group complex.	Essential
TECH_ESM.Req.33	The ESM system shall have the capability to recognize at least the following PW type variations: Fixed Agile Agile discrete pulse to pulse Agile discrete batch	Essential
TECH_ESM.Req.34	The ESM system shall have the capability to recognise at least the following scan type variations: Non-scanning Irregular dwell Regular dwell Circular Conical Spiral Helical Raster	Essential

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Requirement Number	Requirements	Requirement Type
	Complex Horizontal uni-directional sector Horizontal bi-directional sector Vertical uni-directional sector Vertical bi-directional sector	
TECH_ESM.Req.35	The ESM system shall have the capability to recognise at least the following intrapulse modulation variations: FMOP linear up FMOP linear down FMOP non-linear up FMOP non-linear down FMOP triangular PMOP bi phase shift keying PMOP quad phase shift keying PMOP poly phase shift keying	Essential
TECH_ESM.Req.36	The ESM system should have the capability to recognise at least the following intrapulse modulation variations: (FFGH Only) FMOP linear up stepped, FMOP linear up ramp, FMOP linear up sawtooth, FMOP linear down stepped, FMOP linear down ramp, FMOP linear down sawtooth, FMOP non-linear sinusoidal, FMOP non-linear square/rectangular, FMOP frequency shift keying, PMOP bi phase shift keying regular, PMOP bi phase shift keying pseudo random, PMOP quad phase shift keying regular, PMOP quad phase shift keying pseudo random, PMOP poly phase shift keying regular, PMOP poly phase shift keying pseudo random.	Desirable Lvl2
TECH_ESM.Req.37	The Bidder shall provide a written detailed description of the processing of signal type behaviours.	Essential

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Requirement Number	Requirements	Requirement Type
TECH_ESM.Req.38	This description should describe all criteria used to discriminate for a particular signal behaviour type. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.39	This should include the definitions for transitions between signal behaviour types. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.40	The ESM system shall have the capability to initiate identification for all initial and updated interceptions.	Essential
TECH_ESM.Req.41	The Bidder should provide a detailed description (algorithms are preferable) of the identification process, including how and which measured parameters and library parameters are involved in this process. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.42	The ESM system should have the capability to base the identification results on platform environment variables air, ground, surface and subsurface. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.43	The ESM system shall have the capability to correlate scan type data in the identification process.	Essential
TECH_ESM.Req.44	The Bidder shall supply information about the criteria to initiate a re-identification.	Essential
TECH_ESM.Req.45	The ESM system shall automatically detect a mode change of a signal.	Essential
TECH_ESM.Req.46	The ESM system shall report the mode change of a signal.	Essential
Parameters Reported		
TECH_ESM.Req.47	The Bidder shall provide a detailed description of all parameters being reported in the standalone ESM system.	Essential
TECH_ESM.Req.48	For time dependent summary reports of emitter track data (e.g., minimum, maximum, average etc.) the Bidder should provide a full description of the algorithm applied to derive these data from earlier measurement. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.49	The ESM system shall have the capability to report RF variations, together with additional measured parameters.	Essential
TECH_ESM.Req.50	The ESM system shall have the capability to report PRI variations, together with additional measured parameters.	Essential
TECH_ESM.Req.51	The ESM system shall have the capability to report PW variations, together with additional measured parameters.	Essential
TECH_ESM.Req.52	The ESM system shall have the capability to report intrapulse modulation variations, together with additional measured parameters.	Essential
TECH_ESM.Req.53	The ESM system shall have the capability to report scan type variations, together with additional measured parameters.	Essential
TECH_ESM.Req.54	The ESM system shall have the capability to report the identification results.	Essential

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Requirement Number	Requirements	Requirement Type
TECH_ESM.Req.55	The ESM system shall have the capability to report time first seen.	Essential
TECH_ESM.Req.56	The ESM system shall have the capability to report time last seen.	Essential
TECH_ESM.Req.57	The ESM system shall have the capability to report the number of pulses of a track.	Essential
TECH_ESM.Req.58	The ESM system shall have the capability to report the reason for re-identification of a track.	Essential
TECH_ESM.Req.59	The ESM system should have the capability to report the reason for deletion of a track.	Desirable Lvl2
TECH_ESM.Req.60	The Bidder shall give a detailed description of the criteria when a new update of the track will be generated.	Essential
Signal Parameter Measurement		
TECH_ESM.Req.61	The ESM system shall have the capability to measure RF from 2 - 18 GHz.	Essential
TECH_ESM.Req.62	The ESM system shall have the capability to measure RF with a resolution ≤ 1 MHz.	Essential
TECH_ESM.Req.63	The ESM system shall have the capability to measure RF with an accuracy ≤ 3 MHz RMS.	Essential
TECH_ESM.Req.64	The ESM system should have the capability to measure the number of discrete RF's in a batch. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.65	The ESM system shall have the capability to measure bearing from 0 - 360 degrees	Essential
TECH_ESM.Req.66	In case the ESM system is able to receive in the 0.5 - 2 GHz band, it should have the capability to measure bearing with an accuracy error ≤ 5 degrees RMS in the frequency range from 0.5 - 2 GHz. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.67	The ESM system shall have the capability to measure bearing with an accuracy error ≤ 3 degrees RMS in the frequency range from 2.0 - 18 GHz (FFGH Only).	Essential
TECH_ESM.Req.68	The ESM system shall have the capability to measure bearing with an accuracy error ≤ 5 degrees RMS in the frequency range from 2.0 - 18 GHz (OPV Only).	Essential
TECH_ESM.Req.69	As part of the quotation the Bidder should deliver information and data on the bearing measurements performance, including information how this was measured. Bidder should supply information [%] on peak errors greater than 2 degrees and greater than 5 degrees in 2-18 GHz range. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.70	The ESM system shall have the capability to measure from a minimum PRI ≤ 2 µs to a maximum PRI ≥ 20000 µs.	Essential
TECH_ESM.Req.71	The ESM system shall have the capability to measure PRI with a deviation ≥ 20 % .	Essential
TECH_ESM.Req.72	The ESM system shall have the capability to measure PRI with a resolution ≤ 0.025 µs	Essential
TECH_ESM.Req.73	The ESM system shall have the capability to measure PRI with an accuracy ≤ 0.1 µs.	Essential
TECH_ESM.Req.74	The ESM system should have the capability to measure PRI with an accuracy ≤ 0.05 µs. (FFGH Only)	Desirable Lvl2

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Requirement Number	Requirements	Requirement Type
TECH_ESM.Req.75	The ESM system shall have the capability to measure PRI stagger/discrete positions.	Essential
TECH_ESM.Req.76	The ESM system should have the capability to measure ≥ 72 PRI stagger positions. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.77	The ESM system should have the capability to measure ≥ 72 PRI discrete values. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.78	The ESM system shall have the capability to measure stagger frame time ≥ 20 ms .	Essential
TECH_ESM.Req.79	The ESM system shall have the capability to measure the number of discrete PRI's in a batch.	Essential
TECH_ESM.Req.80	The ESM system shall have the capability to measure from a minimum PW ≤ 0.05 µs to a maximum PW ≥ 200 µs.	Essential
TECH_ESM.Req.81	The ESM system shall have the capability to measure PW with a resolution ≤ 25 ns.	Essential
TECH_ESM.Req.82	The ESM system shall have the capability to measure PW with an accuracy ≤ 50 ns or 1% whichever is greater.	Essential
TECH_ESM.Req.83	The ESM system shall declare CW when the measured PW > upper PW range limit.	Essential
TECH_ESM.Req.84	The ESM system shall report the minimum PW value when the measured PW < minimum PW AND the pulse train is valid.	Essential
TECH_ESM.Req.85	The ESM system shall have the capability to measure the number of discrete PW's in a batch.	Essential
TECH_ESM.Req.86	The ESM system shall have the capability to measure scan period better or equal than 0.1 - 20 s.	Essential
TECH_ESM.Req.87	The ESM system shall have the capability to measure scan period with a resolution ≤ 0.01 s.	Essential
TECH_ESM.Req.88	The Bidder shall specify the accuracy of the scan period measurement.	Essential
ESM Library		
TECH_ESM.Req.89	The ESM system shall be capable to import and export data through XML.	Essential
TECH_ESM.Req.90	The ESM system shall be compatible with STANAG 6009.	Essential
Audio / Video / RF-Output		
TECH_ESM.Req.91	The ESM system should have a single audio line including gain control. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.92	The operator should be able to select single threat signal capability. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.93	The selected audio should be free of interfering signals. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.94	The ESM system should have the capability to superimpose audio alarm indications. (FFGH Only)	Desirable Lvl2

Requirement Number	Requirements	Requirement Type
TECH_ESM.Req.95	The ESM system should have the capability to generate an audible alarm in case detected signals match, or signals that are stronger than a pre-determined amplitude level. Levels are to be specified separately for CW emissions and for pulsed emissions. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.96	The ESM system should have the capability to generate an audible alarm in case signals are steady illumination / tracking. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.97	The ESM system should have the capability to generate an audible alarm in case signals are CW/FMCW. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.98	The ESM system should have the capability to generate an audible alarm in case signals match a predefined library entry (library alarm). (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.99	The ESM system should have the capability to generate an audible alarm for the remote control facility in case of an overload of the available trackers in the system. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.100	The ESM system should have the capability to generate an audible alarm in case signals match a library entry with a priority level greater than or equal to predefined priority level. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.101	The ESM system should have the capability to generate a different tone for each alarm condition by the Remote Control Facility. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.102	The ESM system should have the capability to define each alarm condition for each type of alarm by the Remote Control Facility. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.103	All system alarms of the ESM system should be controllable by and be conducted by a report to a remote station with an indication of the system alarm initiated. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.104	All system alarms of the ESM system should be controllable by and be conducted by a report to a remote station with an indication of the system alarm stopped. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.105	The ESM system should have the capability to generate selectable track audio with a number of tracks being selected up to a minimum of four, simultaneously. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.106	The ESM system should have the capability to generate selectable strobe audio based on parameter frequency, pulse width, bearing and amplitude. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.107	The generated track audio and strobe audio of the ESM system should not be mutually exclusive. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.108	The remote station should be able to control the audio of the ESM system. (FFGH Only)	Desirable Lvl2
TECH_ESM.Req.109	The ESM system should have a digital video interface. (FFGH Only)	Desirable Lvl2
Blanking / Filtering		
TECH_ESM.Req.110	The ESM system shall have the capability to issue and receive a blanking to and from all sensors on-board.	Essential

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Requirement Number	Requirements	Requirement Type
TECH_ESM.Req.111	The ESM system shall inform whenever blanking occurs.	Essential
Calibration		
TECH_ESM.Req.112	If on-line calibration exists, the ESM system shall not disturb the operational mode AND the operational mode shall not disturb the calibration results.	Essential
TECH_ESM.Req.113	In case the ESM system uses off-line calibration, the Bidder shall indicate the frequency, duration and the conditions under which this calibration has to be performed	Essential
ESM General Requirements		
TECH_ESM.Req.114	The Supplier shall list the steps taken to minimize degrading operational performance of the system during operations in coastal waters. Issues of importance are for instance: TV interference, GSM, UMTS, GPS, GLONASS, Wireless LAN, IMT, WiMAX, DECT, EDGE, HSPA/HSPA+, LTE/LTE Advanced, C2000, high signal density, short distance to high power RF sources and reflecting objects on the coast	Essential
TECH_ESM.Req.115	If the ESM system has an internal algorithm to automatically blank or reduce interference the algorithm/protocol shall be described.	Essential
TECH_ESM.Req.116	The ESM system shall have the capability to be controlled from a standalone station	Essential
TECH_ESM.Req.117	The ESM system shall be able to withstand without any damage input power up to 25 dbm CW	Essential
TECH_ESM.Req.118	The ESM system shall be able to withstand without any damage input power up to 50 dbm pulsed wave.	Essential
COMINT		
	In case requirement 119 is met, requirements from 120 until 128 will became mandatory.	
TECH_ESM.Req.119	A Digital COMINT system should be supplied.	Desirable Lvl1
TECH_ESM.Req.120	The COMINT should operate in the frequency range from 1,6MHz to 3GHz.	Desirable Lvl1
TECH_ESM.Req.121	The COMINT should allow scan speed of at least 2Ghz/s throughout the whole bandwidth.	Desirable Lvl1
TECH_ESM.Req.122	The COMINT antenna should be integrated with an ESM antenna.	Desirable Lvl1
TECH_ESM.Req.123	The COMINT should enable operating in the HF/SKYFIX Cellular VHF/UHF/HUHF frequency bands.	Desirable Lvl1
TECH_ESM.Req.124	The COMINT should be capable of handling hopping, burst, and other agile transmissions.	Desirable Lvl1
TECH_ESM.Req.125	The COMINT should have an operational Direction Finder Accuracy: - HF band: 5° RMS - V/UHF band: 2° RMS	Desirable Lvl1
TECH_ESM.Req.126	The COMINT should be compliant with IMO Resolution A.665(16), of October 19, 1989.	Desirable Lvl1

Requirement Number	Requirements	Requirement Type
TECH_ESM.Req.127	The COMINT should allow permanent listening on the following frequencies: 121.5MHz, 156.525MHz (CH70), 156.800MHz (CH16), 243MHz and 2182KHz.	Desirable Lvl1
TECH_ESM.Req.128	The COMINT should allow decoding COSPAS-SARSAT signals, allowing indication of mode, country and GPS position.	Desirable Lvl1

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APPENDIX E   Navigation System Requirements – FFGH Only

I.   IBS – NAV RAD System (FFGH Only)

Requirement Number	Requirement	Requirement Type
IBS Requirements		
TECH_IBS_NAVRAD.Req.1	The contractor shall provide a solution to replace the old I band radar, supply a new E/F Band Navigation radar, and a Warship Electronic Chart Display and Information System (WECDIS) that remotely control the two radars. Therefore this solution will be named IBS Note: Solution can keep the existing consoles	Essential
TECH_IBS_NAVRAD.Req.2	The IBS shall be considered as a segregated network.	Essential
TECH_IBS_NAVRAD.Req.3	The IBS should integrate information from IPMS (SIEMENS SISHIP IMAC).	Desirable Lvl1

TECH_IBS_NAVRAD.Req.4	The IBS shall be able to receive/exchange data directly from the following sensors:
	    W-AIS
	    DGPS
	    MILGPS
	    INS
	    Echo Sounder
	    Speed Log
	    Wind meter
		Essential

TECH_IBS_NAVRAD.Req.5	The IBS shall be supplied with WECDIS 3.0 installed. In order to maintain the uniformity of material in this area and the commonality of this equipment in the Navy and to promote the efficiency of the existing logistic and training chain, similar or equivalent equipment shall be provided and compatible with those found in use in the Navy (OSI WECPINS 7.0).	Essential
TECH_IBS_NAVRAD.Req.6	Complementing the TECH_IBS_NAVRAD.Req.4, the IBS shall allow centralized access to sensor information provided via the Own Ship Data network.	Essential
TECH_IBS_NAVRAD.Req.7	The IBS shall allow for paperless navigation.	Essential

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Requirement Number	Requirement	Requirement Type
TECH_IBS_NAVRAD.Req.8	At least 4 fixed stations (1 station in the CIC) and 1 portable (laptop)shall be supplied.	Essential
TECH_IBS_NAVRAD.Req.9	The operating consoles should be redundant and interoperable, through the KVM digital matrix concept. In order to maintain the uniformity of material in this area and the commonality of this equipment in the Navy and to promote the efficiency of the existing logistic and training chain, similar or equivalent equipment shall be provided and compatible with those found in use in the Navy.	Desirable Lvl1
TECH_IBS_NAVRAD.Req.10	Additional network access points locations (outside the bridge) should be considered in at least the following locations: emergency bridge; Commanding Officer cabin; Navigations Officer cabin; CIC, to be defined in the design review phase.	Desirable Lvl1
TECH_IBS_NAVRAD.Req.11	The system should comply with IMO type approval certification for Integrated Navigation System.	Desirable Lvl2
Subsystem Requirements		
Conning		
TECH_IBS_NAVRAD.Req.12	The ship should have an centralized data display integrated.	Desirable Lvl1
TECH_IBS_NAVRAD.Req.13	The centralized data display should integrate in the IBS system.	Desirable Lvl1
TECH_IBS_NAVRAD.Req.14	The system should integrate with IPMS integration.	Desirable Lvl1
Voyage Data Recorder (VDR)		
TECH_IBS_NAVRAD.Req.15	The ship shall have a VDR system that complies with **IMO Resolution A.861(20), dated 27NOV97**, which introduced the Adoption of amendments to the performance standards for shipborne voyage data recorders (VDRs) (**Resolution A.861(20)**) and performance standards for shipborne simplified voyage data recorders (S-VDRs) (**Resolution MSC.163(78)**).	Desirable Lvl1
TECH_IBS_NAVRAD.Req.16	The VDR System should record operations on the Bridge by installing fixed video cameras on the Bridge.	Desirable Lvl1
TECH_IBS_NAVRAD.Req.17	The VDR System shall record the sound (audio) of the Bridge, enabling the recording of command orders through the installation of 4 microphones on the Bridge.	Desirable Lvl1
TECH_IBS_NAVRAD.Req.18	The VDR System shall record the sound (audio) of the VHF DSC equipment, enabling the recording of transmitted and received external communications.	Desirable Lvl1
Warship Electronic Chart Display and Information System (WECDIS)		

Requirement Number	Requirement	Requirement Type
TECH_IBS_NAVRAD.Req.19	The navigation system shall include a WECDIS which complies with **NATO STANAG 4564 edition 3 (2017)**.	Essential
TECH_IBS_NAVRAD.Req.20	Evidence of compliance to **STANAG 4564** shall be included with the proposal response. If compliant to a prior version, provide proof of compliance and a plan to achieve compliance to edition 3 (2017).	Essential
TECH_IBS_NAVRAD.Req.21	The WECDIS shall include the ability to transform positions from other geodetic datums to WGS84	Essential
TECH_IBS_NAVRAD.Req.22	The WECDIS shall include the ability to calculate and display a Limiting Danger Line at an operator-specified depth, regardless of whether that depth matches charted depth contours	Essential
TECH_IBS_NAVRAD.Req.23	The WECDIS shall include the ability to display Clearing Bearings	Essential
TECH_IBS_NAVRAD.Req.24	The WECDIS shall include the ability to display Additional Military Layers in accordance with **STANAG 7170 and product specification 3.0 using AML Portrayal 3.0**.	Essential
TECH_IBS_NAVRAD.Req.25	The WECDIS shall include the ability to 4W Grids	Essential
TECH_IBS_NAVRAD.Req.26	The WECDIS shall include the ability to Furthest on Circles (FoC)	Essential
TECH_IBS_NAVRAD.Req.27	The WECDIS shall include the ability to construct and display Moving Havens and Waterspace Management areas.	Essential
TECH_IBS_NAVRAD.Req.28	The WECDIS shall include the ability to calculate the position of tracks using Target Motion Analysis (TMA)	Essential
TECH_IBS_NAVRAD.Req.29	WECDIS screen shall be at least 23 inches, 16:10.	Essential
TECH_IBS_NAVRAD.Req.30	WECDIS stations shall be installed with keyboard and trackball. In order to maintain the uniformity of material in this area and the commonality of this equipment in the Navy and to promote the efficiency of the existing logistic and training chain, similar or equivalent equipment shall be provided and compatible with those found in use in the Navy.	Essential
TECH_IBS_NAVRAD.Req.31	WECDIS shall be capable to command and control the NAV radars.	Essential
TECH_IBS_NAVRAD.Req.32	WECDIS shall be able to perform radar fusion.	Essential
TECH_IBS_NAVRAD.Req.33	The WECDIS system should have an integrated Ship Helicopter Operating Limits (SHOL) display, which is a polar plot of relative Wind Speed and Direction with safe flying conditions indicated along with current & historic wind speed and direction.	Desirable Lvl1

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Requirement Number	Requirement	Requirement Type
TECH_IBS_NAVRAD.Req.34	The system should the operator to select a SHOL pattern for display which will include Aircraft, Operation / Condition and Aircraft Weight and indicate which relative wind speeds & directions are safe / unsafe.	Desirable Lvl1
TECH_IBS_NAVRAD.Req.35	The WECDIS system should have an integrated Cones of Courses (CoC) display which will consist of three (3) graphical polar plots showing ownship courses which will support flying operations based on three (3) operator-entered speeds (e.g.: 10, 20, 30 kts).	Desirable Lvl1
TECH_IBS_NAVRAD.Req.36	The WECDIS system should have a graphical display of Pitch & Roll showing current & historic values compared against the limits specified within the currently selected SHOL pattern.	Desirable Lvl1
TECH_IBS_NAVRAD.Req.37	The WECDIS system should provide a facility for a maintainer / administrator to create, edit, delete SHOL patterns.	Desirable Lvl1
GNSS denied		
Fixing		
TECH_IBS_NAVRAD.Req.38	In order to navigate in a GNSS-denied environment, the WECDIS system shall have the necessary optional modules to provide tools such as: -Position Fixing methods -Dead Reckoning and Estimated Position -Set & Drift -Pool of Errors	Essential
TECH_IBS_NAVRAD.Req.39	WECDIS allows the operator to enter Lines of Position ("LOPs") which are used to calculate the ownship's position and uncertainty	Essential
TECH_IBS_NAVRAD.Req.40	WECDIS shall allow up to eight (8) individually timestamped LOPs to be entered as any of the following types: -Bearings – taken from a Bearing Repeater or EO/IR -Ranges – taken from a Radar or EO/IR -Soundings – captured from the depth sounder -Contours – captured from the electronic chart -Vertical Sextant Angle – measured using a sextant -Horizontal Sextant Angle – measured using a sextant -Transit – alignment of two reference points	Essential
TECH_IBS_NAVRAD.Req.41	Fixes created using Sounding LOP types shall follow the Line of Soundings fixing method	Essential

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Requirement Number	Requirement	Requirement Type
TECH_IBS_NAVRAD.Req.42	Fixes created using Contour LOP types shall follow the Contour Advancement fixing method	Essential
TECH_IBS_NAVRAD.Req.43	The use of different measurement times supports the "Running Fix" method and older LOP measurements are dead reckoned to the most recent LOP measurement time based on ownship's Mean Line of Advance (MLA)	Essential
Dead Reckoning		
TECH_IBS_NAVRAD.Req.44	WECDIS shall calculate a Dead Reckoned position based on the most recent Position Fix, Heading and STW continuously integrated over time since the last Fix	Essential
TECH_IBS_NAVRAD.Req.45	WECDIS shall calculate an Estimated Position based on the most recent Position Fix, Heading, STW and Set & Drift continuously integrated over time since the last Fix	Essential
TECH_IBS_NAVRAD.Req.46	WECDIS shall be capable of using live heading and STW or data or "ordered" course and speed	Essential
TECH_IBS_NAVRAD.Req.47	WECDIS shall use Advance & Transfer turning data to compute turns when Ordered Course or Speed changes	Essential
Set & Drift		
TECH_IBS_NAVRAD.Req.48	WECDIS shall support the development and maintenance of Set & Drift for use in EP and Pool of Errors functions	Essential
TECH_IBS_NAVRAD.Req.49	WECDIS shall support the calculation of Set & Drift as the difference between the last DR position and the new Fix.	Essential
TECH_IBS_NAVRAD.Req.50	WECDIS shall be able to calculate Set & Drift experienced between two previous fixes and use it as the ownship's Set & Drift data.	Essential
TECH_IBS_NAVRAD.Req.51	WECDIS shall allow the operator to manually enter the Set & Drift values.	Essential
Pool of Errors		
TECH_IBS_NAVRAD.Req.52	WECDIS shall include a Pool of Errors (POE) function provides an envelope as to where the ownship could be, based on all of the uncertainties associated with: a. last position fix, b. heading error, c. speed log error and d. set & drift error	Essential
TECH_IBS_NAVRAD.Req.53	The POE expands both along and across the Mean Line of Advance (MLA) and is updated every 5 seconds.	Essential

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Requirement Number	Requirement	Requirement Type
	Pool of Errors Reduction	
TECH_IBS_NAVRAD.Req.54	WECDIS shall allow the operator to reduce the POE by intersecting the POE with the polygon(s) created by one or more LOPs and their respective uncertainties.	Essential
TECH_IBS_NAVRAD.Req.55	On placing a new Position Fix, the POE shall reset in size to the Fix's uncertainty and then grow based on the POE construction model described above.	Essential
TECH_IBS_NAVRAD.Req.56	WECDIS shall allow the operator to reduce the POE by intersecting the POE with one or more operator-specified charted depth areas.	Essential
	Future Pool of Errors	
TECH_IBS_NAVRAD.Req.57	WECDIS shall provide up to 12 predicted Pools of Error based on operator specified positions and Speeds of Advance (SOA).	Essential
TECH_IBS_NAVRAD.Req.58	WECDIS shall construct the future POEs in sequence as if the ownship travelled from current position to each successive future POE in turn.	Essential
	Small Craft Support	
TECH_IBS_NAVRAD.Req.59	The WECDIS shall be supplied with a system (hardware and software) that enables two RHIBS to navigate, operate, and communicate securely.	Essential
TECH_IBS_NAVRAD.Req.60	It shall display WECDIS to the small craft operator.	Essential
TECH_IBS_NAVRAD.Req.61	It shall display AIS, operator-created, and shared contacts.	Essential
TECH_IBS_NAVRAD.Req.62	It shall work with Saab R5S/R6S secure AIS devices.	Essential
TECH_IBS_NAVRAD.Req.63	It shall allow for encrypted communications and data transfer within the group.	Essential
TECH_IBS_NAVRAD.Req.64	It shall allow for VHF-based line of sight communication.	Essential
TECH_IBS_NAVRAD.Req.65	It shall be capable to be connected to a beyond-line-of-sight (BLOS)/over-the-horizon (OTH) system.	Essential
	Navigation Radars General Requirements	
TECH_IBS_NAVRAD.Req.66	The ship shall have two navigation radars, in bands I (India) and E/F (Echo/Foxtrot) with ARPA (Automatic Radar Plotting Aid) capability that comply with IEC 62388 and IMO MSC certification 192.	Essential
TECH_IBS_NAVRAD.Req.67	They shall have a STANDBY function and condition, from which the radar can start working immediately.	Essential

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Requirement Number	Requirement	Requirement Type
TECH_IBS_NAVRAD.Req.68	The system shall provide all Data Outputs according to ASTERIX formats, compatible with WECDIS.	Essential
TECH_IBS_NAVRAD.Req.69	They shall have the ability to memorize radar planning, maps or guard zones introduced by an operator;	Essential
TECH_IBS_NAVRAD.Req.70	They shall have the possibility of backing up the plans in external memory via connection to a USB port;	Essential
TECH_IBS_NAVRAD.Req.71	They shall have the ability to inhibit transmission in sectors to be defined by the operator;	Essential
TECH_IBS_NAVRAD.Req.72	They shall allow the creation of at least one alarm zone ("GUARD ZONE");	Essential
TECH_IBS_NAVRAD.Req.73	They shall have, with the ability to export to an external device, the functionality of recording the occurrence of events and errors in the system ("data logger");	Essential
TECH_IBS_NAVRAD.Req.74	They shall have "North-up", "Head-up" and "Course-up" presentation modes;	Essential
TECH_IBS_NAVRAD.Req.75	They shall allow selection of relative motion and true motion;	Essential
TECH_IBS_NAVRAD.Req.76	They shall allow the detection and tracking of more than 100 contacts in manual and automatic mode;	Essential
TECH_IBS_NAVRAD.Req.77	They shall allow for the definition of at least one area of automatic acquisition of contacts;	Essential
TECH_IBS_NAVRAD.Req.78	They shall have a minimum range of 40m;	Essential
TECH_IBS_NAVRAD.Req.79	The placement of the antennas shall be such as to maximize coverage around the ship 360º and the E/F band radar shall not have a shadow in the sector from BB to AFT.	Essential
TECH_IBS_NAVRAD.Req.80	Navigation radars shall fulfil the following tactical functions: a. Ability to caption contacts; b. Contact correlation; c. Ability to carry out radar planning, maps or guard zones to be carried out by the operator, in relative mode without external geo-positioning references.	Essential
TECH_IBS_NAVRAD.Req.81	Radar panoramas shall be made available to overlay over the image in the ECDIS overlay radar.	Essential
Monitors		
TECH_IBS_NAVRAD.Req.82	Smallest scale shall be 0.25 miles;	Essential
TECH_IBS_NAVRAD.Req.83	They shall have a variable distance measurement between 0.125 and 96 miles, or greater;	Essential
TECH_IBS_NAVRAD.Req.84	They shall have a radar panorama area with a diameter of 250mm;	Essential

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Requirement Number	Requirement	Requirement Type
TECH_IBS_NAVRAD.Req.85	They shall allow the creation and memorization of maps;	Essential
TECH_IBS_NAVRAD.Req.86	They shall allow navigation using parallel index lines;	Essential
TECH_IBS_NAVRAD.Req.87	They shall have a detection and viewing distance of 30m;	Essential
TECH_IBS_NAVRAD.Req.88	They shall make a discrimination in distance of 30m;	Essential
TECH_IBS_NAVRAD.Req.89	They shall have distance rings accuracy of 1%;	Essential
I-Band Navigation Radar		
TECH_IBS_NAVRAD.Req.90	The Radar shall allow the detection of targets within a range of at least 0.5m2 of Radar Cross Section (RCS) at 5 NM, with a sea state of 2.5m to 4m of swell and unfavourable ionospheric conditions;	Essential
Antenna		
TECH_IBS_NAVRAD.Req.91	Horizontal beam width shall be at -3dB * 1º;	Essential
TECH_IBS_NAVRAD.Req.92	Vertical beam width shall be at -24º;	Essential
TECH_IBS_NAVRAD.Req.93	Antenna gain shall be 31dB;	Essential
TECH_IBS_NAVRAD.Req.94	Rotation speed shall be higher than 20RPM (with relative speed winds up to 80 knots);	Essential
TECH_IBS_NAVRAD.Req.95	It shall be provided without any reference to brands. Alternatively, care shall be taken to paint the antenna with paint (anticorrosive) accepted by the manufacturer and in accordance with the colour scheme used in the ship's painting.	Essential
Transceiver		
TECH_IBS_NAVRAD.Req.96	The transceiver shall operate in band I (9.2 - 9.5GHz);	Essential
TECH_IBS_NAVRAD.Req.97	It shall have a power of not less than 25 kW;	Essential
TECH_IBS_NAVRAD.Req.98	It shall allow multiple pulse widths;	Essential
TECH_IBS_NAVRAD.Req.99	It shall allow for manual and automatic tuning;	Essential
TECH_IBS_NAVRAD.Req.100	It shall have a PRF's between 785Hz and 2300 Hz;	Essential
TECH_IBS_NAVRAD.Req.101	It shall comprehend pulses between 0.05µS and 1µS.	Essential

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Requirement Number	Requirement	Requirement Type
E/F-Band Navigation Radar		
TECH_IBS_NAVRAD.Req.102	The Radar shall allow the detection of targets within a range of at least 0.5m2 of Radar Cross Section (RCS) at 3 NM, with a sea state of 2.5m to 4m of swell and unfavourable ionospheric conditions;	Essential
Antenna		
TECH_IBS_NAVRAD.Req.103	Horizontal beam width shall be at -3dB * 2.0º;	Essential
TECH_IBS_NAVRAD.Req.104	Vertical beam width shall be at -30º;	Essential
TECH_IBS_NAVRAD.Req.105	Antenna gain shall be 26dB;	Essential
TECH_IBS_NAVRAD.Req.106	It shall be provided without any reference to brands. Alternatively, care shall be taken to paint the antenna with paint accepted by the manufacturer and in accordance with the colour scheme used in the ship's painting.	Essential
Transceiver		
TECH_IBS_NAVRAD.Req.107	The transceiver shall operate in the E/F band (2.9G - 3.1GHz);	Essential
TECH_IBS_NAVRAD.Req.108	It shall have a power of not less than 30 kW;	Essential
TECH_IBS_NAVRAD.Req.109	It shall allow multiple pulse widths;	Essential
TECH_IBS_NAVRAD.Req.110	It shall allow for manual and automatic tuning;	Essential
TECH_IBS_NAVRAD.Req.111	It shall have a PRF's between 785Hz and 2300 Hz;	Essential
TECH_IBS_NAVRAD.Req.112	It shall comprehend pulses between 0.05µS and 1µS.	Essential

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II. OSD System

Requirement Number	Requirements	Requirement Type
General Requirements		
TECH_OSD.Req.1	The contractor shall provide an Own Ship Data Distribution System that allows processing, handling and distributing the data supplied by the sensors to it´s clients (New systems, GFE systems, and Legacy systems).	Essential
TECH_OSD.Req.2	The contractor shall supply at least one central processing unit. Note: Henceforth called DDU (Data Distribution Unit).	Essential
TECH_OSD.Req.3	The contractor shall supply a DDU that allows redundancy for at least one of each type of data (1 DDU with a redundant Data Distribution Network (DDN) configuration).	Desirable LV1
TECH_OSD.Req.4	The contractor shall supply a second DDU that is fully redundant (2 DDUs configuration).	Desirable LV2
TECH_OSD.Req.5	The system shall continue to determine geographic position without any external inputs (e.g., Loss of GPS system) using primarily, but limited to, the INS system.	Essential
TECH_OSD.Req.6	The DDU shall allow that all subsystems (sensors) functionalities are available according to their full ICD's.	Essential
TECH_OSD.Req.7	The DDU shall output all data, in compatible format, to the clients of Own Ship Data System.	Essential
TECH_OSD.Req.8	The DDU should use data fusion techniques from multi-sources to improve data resilience, and supply/deliver best quality data.	Desirable LV1
TECH_OSD.Req.9	System shall distribute at all times the ships heading, roll, and pitch, with the precision of the most demanding client.	Essential
TECH_OSD.Req.10	System shall have the capacity to synchronize every system that requires time reference data.	Essential

TECH_OSD.Req.11	The DDU architecture shall not have any single points of failure (internal DDU architecture) for critical systems, namely CMS, all SEWACO Sensors and Weapons, and IBS.	Essential
TECH_OSD.Req.12	The system shall have a diagnostic function to continuously monitor the system operation (hardware and software).	Essential
TECH_OSD.Req.13	The system shall have a test and simulation function, capable of simulating all the output data.	Essential
TECH_OSD.Req.14	The system shall be the main time source and distribute Local time (manually adjustable) and UTC, clearly identified. The system shall have the capacity to provide time reference data without any external inputs.	Essential
TECH_OSD.Req.15	The system should use external alignment inputs to stand as valid references.	Desirable LV1
TECH_OSD.Req.16	The system shall be capable of operating from multiple ship's power source, as well as from his own uninterruptible power source (UPS). The UPS shall last for, at least, 15 minutes. (FFGH ONLY)	Essential
TECH_OSD.Req.17	The DDU UPS should last for 45 minutes.(FFGH ONLY)	Desirable LV1
TECH_OSD.Req.18	The system shall have dedicated, hot swappable, interfaces for all sensors and clients.	Desirable LV1
TECH_OSD.Req.19	The system shall ensure that only authorized users can access the DDU.	Essential
TECH_OSD.Req.20	Time and synchronization data should be distributed via a dedicated network	Desirable LV1
TECH_OSD.Req.21	For data input, the system should have a growth capacity of, at least, 20% (input interfaces).	Desirable LV1
TECH_OSD.Req.22	The system shall provide Atmospheric pressure information for sea level and helideck level.	Essential
TECH_OSD.Req.23	The system shall integrate the GFE Military GPS receiver from CS Group.(FFGH ONLY)	Essential
TECH_OSD.Req.24	The system should be able to distribute magnetic compass information, either by interfacing with existing legacy magnetic compass or by providing a new fluxgate based system. (FFGH ONLY)	Desirable LV2
Data Processing Requirements		
TECH_OSD.Req.25	The system shall have the capability to use the simulated parameter as source data, selected individually by data type and operators decision.	Essential

TECH_OSD.Req.26	The DDU processing, handling and protection function induced latency shall not compromise the compliance with the users/clients' systems and subsystems requirements. Note: The input and output interface induced latency needs to be taken into consideration.	Essential
TECH_OSD.Req.27	The information delivered shall be consistent across all the users, i.e., all the users shall receive the same information for the same domain of information.	Essential
TECH_OSD.Req.28	For data output, the system should have a growth capacity of, at least, 20% (processing capacity).	Desirable LV1
TECH_OSD.Req.29	The system shall choose the best source of data available.	Essential
TECH_OSD.Req.30	The system shall provide true and relative wind data.	Essential
TECH_OSD.Req.31	The system should allow user source selection, for each type/domain of information.	Desirable LV1
TECH_OSD.Req.32	The systems shall have a GUI interface to allow maintainers interaction with it, i.e., monitor and control system status and input/output data, establish simulations, troubleshoot issues, initiate/extract data logs and perform update.	Essential
TECH_OSD.Req.33	The system visual interface should be locally accessible but also from remote locations on premises (weapons section base, bridge, CIC, Containers rooms).	Desirable LV1
TECH_OSD.Req.34	The system faults shall be clearly visible by an alarm/warning in the main HMI page and in real time.	Essential
Data Output Requirements		
TECH_OSD.Req.35	For data output, the system should have a growth capacity of, at least, 20% (output interfaces).	Desirable LV1
TECH_OSD.Req.36	The system shall have available output interfaces with the following data: NMEA: 5 RJ45 outputs with following groups: time, position, course, pitch, roll, dept, wind, speed and pressure; COAX: 2 output with time reference;	Essential
TECH_OSD.Req.37	The system shall display information to users in accordance with table 16, assuring all users visualize all information simultaneously. (FFGH ONLY)	Essential
TECH_OSD.Req.38	The contractor should deliver new repeaters (or use legacy).(FFGH ONLY)	Desirable LV1

Requirement Number	Requirements	Requirement Type
TECH_OSD.Req.39	The contractor should increase the number of repeaters on-board to show information in the following spaces: - Commander's cabin (HRP, Time, Speed and Wind) - Staff room (Heading, Time, Speed) - Machinery control room (HRP, Time, Speed, Dept and Sea Water Temperature) - Weapon and Eletronics Technical Base (HRP, Time, Speed and Wind) - Comms container (Time) (FFGH ONLY)	Desirable LV1
TECH_OSD.Req.40	The Unmanned vehicles will have the capability to receive information (at least HRP) to support autonomous landing. As provisions for, the system shall have a dedicated output interface for this, distributing the data to the hangar area.	Essential
Requirement Number	**Requirements**	**Requirement Type**
Subsystems Requirements		
DGPS		
TECH_OSD.Req.41	The contractor shall deliver at least one source of position that uses the global navigation satellite system (GNSS), including the capability to utilize differential data.(FFGH ONLY)	Essential
TECH_OSD.Req.42	The DGPS system should use a M-Code signal.(FFGH ONLY)	Desirable LV1
TECH_OSD.Req.43	The DPGS system shall have the capability to determine geographical position with precision lower than 2 meters in standard conditions of operation.(FFGH ONLY)	Essential
TECH_OSD.Req.44	The DGPS system should have available an alert in case of jamming or spoofing. (FFGH ONLY)	Desirable LV1
TECH_OSD.Req.45	The DGPS system should be designed with anti-jam and anti-spoofing capability. (FFGH ONLY)	Desirable LV2
TECH_OSD.Req.46	The DPGS system shall allow for 360 degrees coverage.(FFGH ONLY)	Essential
TECH_OSD.Req.47	The DPGS system shall comply with IMO Resolution MSC.112(73). (FFGH ONLY)	Essential

TECH_OSD.Req.48	The DPGS system shall comply with IMO Resolution MSC.114(73). (FFGH ONLY)	Essential
TECH_OSD.Req.49	The DPGS system shall have the capability to use Multi - GNSS. (FFGH ONLY)	Essential
TECH_OSD.Req.50	The DPGS system shall have the capability to use SBAS (service areas of Satellite-Based Augmentation Systems). (FFGH ONLY)	Essential
TECH_OSD.Req.51	In case of main power failure, the system shall operate on battery power only, either from ship's batteries or own uninterruptible power source.	Essential
Inertial Navigation System (INS)		
TECH_OSD.Req.52	The contractor shall deliver at least one INS. (FFGH ONLY)	Essential
TECH_OSD.Req.53	The position precision determination in autonomous mode shall be less than 4 NM/h (FFGH ONLY)	Essential
TECH_OSD.Req.54	The position precision determination in autonomous mode should be less than 1 NM/h. (FFGH ONLY)	Desirable LV1
TECH_OSD.Req.55	The ship shall have two INS. Note: The contractor can comply with this requirement by either reusing legacy INS (MINS 1) or by also supplying a second INS. (FFGH ONLY)	Essential
TECH_OSD.Req.56	The contractor shall deliver two INS, with a performance at least equivalent to the legacy INS	Desirable LV2
TECH_OSD.Req.57	The INS shall provide a direct connection of heading information, for the repeater on Bridge and the repeater on the Steering Room. (FFGH ONLY)	Essential
TECH_OSD.Req.58	In case of main power failure, at least one INS shall operate on battery power only, at least during 15 minutes, either from ship's batteries or own uninterruptible power source. (FFGH ONLY)	Essential
TECH_OSD.Req.59	In case of main power failure, both INS should operate on battery power only, either from ship's batteries or own uninterruptible power source. (FFGH ONLY)	Desirable LV2
Echo Sounder		
TECH_OSD.Req.60	The contractor shall deliver at least one Echo Sounder system. (FFGH ONLY)	Essential

TECH_OSD.Req.61	The Echo Sounder system shall have two transducers on the hull of the ship. Note: One transducer shall be placed in an aft position and the other in a forward position. (FFGH ONLY)	Essential
TECH_OSD.Req.62	The Echo Sounder system shall sound an alarm when a minimum threshold level is passed, the threshold level shall be configured by the user. (FFGH ONLY)	Essential
TECH_OSD.Req.63	The Echo Sounder system shall allow depth reading from 0 to 1500m.(FFGH ONLY)	Essential
TECH_OSD.Req.64	The Echo Sounder system shall have an accuracy of at least 0,5m up to 200m range.(FFGH ONLY)	Essential
TECH_OSD.Req.65	The Echo Sounder system shall have an accuracy of at least 2,5% of depth range.(FFGH ONLY)	Essential
TECH_OSD.Req.66	In case of main power failure, the system shall operate on battery power only, at least during 15 minutes, either from ship's batteries or own uninterruptible power source. (FFGH ONLY)	Essential
Time Server		
TECH_OSD.Req.67	The contractor shall deliver at least one precise time and frequency.(FFGH ONLY)	Essential
TECH_OSD.Req.68	This system shall automatically synchronizes with all external UTC sources, integrated in the DDU.(FFGH ONLY)	Essential
TECH_OSD.Req.69	This system should use a M-Code signal.(FFGH ONLY)	Desirable LV1
TECH_OSD.Req.70	This system shall distribute its information through at least PTP and NTP protocols (FFGH ONLY)	Essential
TECH_OSD.Req.71	This system shall be able to operate without external input after initial synchronization, alignment and disciplining for three months with a time figure of merit below 7 (TFOM 7).(FFGH ONLY)	Essential
TECH_OSD.Req.72	This system shall at least distribute the following signals: - Pulse per second (1PPS) with 5V and 10V levels. - Have Quick II (HQ II) - 10 MHz reference	Essential
TECH_OSD.Req.73	System should be scalable in interface and footprint across the platform.(FFGH ONLY)	Desirable LV1

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TECH_OSD.Req.74	In case of main power failure, the system shall operate on battery power only, either from ship's batteries or own uninterruptible power source at least during 15 minutes.(FFGH ONLY)	Essential
Weather Station		
TECH_OSD.Req.75	The contractor shall deliver a multisensor weather station.(FFGH ONLY)	Essential
TECH_OSD.Req.76	The weather station shall have one source of Air Temperature to operate between -40°C-50°C with less than ±1.5°C accuracy at a known temperature and less than 0.5°C resolution. (FFGH ONLY)	Essential
TECH_OSD.Req.77	The weather station shall have a source of Atmospheric Pressure to measure to the expect range of Atmospheric pressure at sea-level (800hPa – 1100hPa), with an accuracy at a known temperature of at least 0.5hPa and resolution of at least 0.1 hPa. (FFGH ONLY)	Essential
TECH_OSD.Req.78	The weather station shall have one source of relative humidity source from the 0-100% range, an accuracy of 5% and a resolution of 0.5%.(FFGH ONLY)	Essential
TECH_OSD.Req.79	The weather station shall have one source that measures rainfall dimension in millimeters and accumulation mm/h in and Hail in hits/cm. It will be used to assess UAV operations conditions and weather data collection.	Essential
Precise Barometer		
TECH_OSD.Req.80	The contractor shall deliver a precise barometer.(FFGH ONLY)	Essential
TECH_OSD.Req.81	This barometer shall be able to measure to the expected range of Atmospheric pressure at sea level (800hPa – 1100hPa), with an accuracy at a known temperature of at least 0.2hPa and resolution of at least 0.01 hPa.(FFGH ONLY)	Essential
TECH_OSD.Req.82	In case of main power failure, the system shall operate on battery power only, either from ship's batteries or own uninterruptible power source at least during 15 minutes.	Essential
Sea Water Temperature		
TECH_OSD.Req.83	The contractor shall deliver a source for sea water temperature	Essential

TECH_OSD.Req.84	This system shall have an accuracy of ±0.3°C and a range between -5 to 45°C (FFGH ONLY)	Essential
Wind Meter		
TECH_OSD.Req.85	The contractor shall deliver one source of wind speed and direction.(FFGH ONLY)	Essential
TECH_OSD.Req.86	The source shall allow for 360º unobstructed wind reception.(FFGH ONLY)	Essential
TECH_OSD.Req.87	The source of relative wind speed shall operate within a range of 0-60m/s, accuracy of 2% of full scale and resolution of 0,1m/s.(FFGH ONLY)	Essential
TECH_OSD.Req.88	The source of wind direction from 0-359° with operating range from 0-65m/s, accuracy of ±2° at a known velocity and 1° resolution.(FFGH ONLY)	Essential
TECH_OSD.Req.89	To reduce maintenance tasks, the solution provided shall consider a sensor than has no moving parts for both the primary and secondary source.(FFGH ONLY)	Essential
TECH_OSD.Req.90	In case of main power failure, the primary source wind meter shall operate on battery power only, either from ship's batteries or own uninterruptible power source at least during 15 minutes.(FFGH ONLY)	Essential
Speed Log		
TECH_OSD.Req.91	The contractor shall deliver a speed log.(FFGH ONLY)	Essential
TECH_OSD.Req.92	The speed log shall be able to determine, display and record its speed and distance travelled through the water in both the fore and aft and athwart ships axes.(FFGH ONLY)	Essential
TECH_OSD.Req.93	The speed log shall have at least 0.2 knots or 2% of the measured value, in a scale between -10 to 40 knots.(FFGH ONLY)	Essential
TECH_OSD.Req.94	The provided speed logs should allow for replacement or maintenance without needing to dock the ship.(FFGH ONLY)	Desirable LV1

TECH_OSD.Req.95	In case of main power failure, the speed log shall operate on battery power only, either from ship's batteries or own uninterruptible power source.(FFGH ONLY)	Essential

Table 16 - List os Repeaters

SYSTEM	INFORMATION	REPEATER TYPE and MODEL	LOCATION / POSITION
Windmeter	Wind Speed and Direction	Type: Analog Model:	Bridge (OOW)
			Bridge (Navigation Table)
			Operation Room (HC)
			Operation Room (CCO)
			Heli Deck (FDO)
EM Speed log	Speed Over Ground	Type: Digital	Bridge (OOW)
			Bridge (Navigation Rack)

			Operation Room (CCO)
		Model: RS422 115V - 80033/0200.00	Operation Room (HC)
			Machinery Control Room
			Flight Deck (FDO)
Time	Time (Z)	Type: Digital Model: Wempe Chronometerwerke - 20690L	Operation Room (Supervisor)
	Time (LT)	Type: Analog Model: Wempe Chronometerwerke - 20622	Bridge (OOW)
			Operation Room (CMDT)
			Machinery Control Room
			Machinery Control Room

PERFORMANCE

			Damage Control Station (FWD)
			Damage Control Station (AFT)
			Officers Room
			CPO`S Office SB
			CPO`S Office PS
Retransmission Unit	Heading	Type: Digital Model:	Operation Room (Supervisor)
	Heading	Type: Analog Model: 133-452NG005	Bridge (OOW)
			Bridge Wing (PS)
			Bridge Wing (SB)

			Bridge (Autopilot)
			Bridge (Navigation Rack)
			Operation Room (CCO)
			Operation Room (HC)
			Flight Deck (FDO)
			Steering Weel`s Room
Barometer	Air Pressure	Type: Digital Model: Lambrecht - Digem F96x48EK	Operation Room (HC)
			Bridge (OOW)
Echosounder	Depth	Type: Digital Model: Honeyweell - ELAC - DAZ 23-12	Bridge (Steering Whell Console)
			Operation Room (CCO)

GPS	Position	Type: Digital Model:	Bridge (Navigation Rack)
			Operation Room (Supervisor)

APPENDIX F   INTEGRATED LOGISTIC SUPPORT

F.1.   References and Applicable Document

The references and the applicable documents which were mentioned throughout the document are listed in Annex F References of the SOW which, in their most current version/revision, are considered relevant in whole or in part to the object of this SOW.

F.2.   Integrated Logistics Support Project

TECH_ILS. Req.1.   The Contractor shall plan, integrate and manage Integrated Logistics Support (ILS) in accordance with the individual logistics support sections that follow and shall ensure that logistics considerations and logistics planning are an integral part of the production and support identification processes [Essential]

TECH_ILS. Req.2.   The Contractor shall provide a single **Integrated Logistics Support (ILS) Plan (ILSP)** in accordance with **MIL-STD-1369**. [Essential]

F.3.   ILS Management

TECH_ILS. Req.3.   The Contractor shall designate an experienced ILS Manager who will be responsible for the implementation of the Contractor's ILS Program. [Essential]

F.4.   Maintenance Concept

F.4.1.   Maintenance Levels

Maintenance levels to be considered are: Organizational Level Maintenance (OLM), Intermediate Level Maintenance (ILM), Intermediate Level Maintenance+ (ILM+) and Depot Level Maintenance (DLM). The skills levels and the associated tasks are defined below:

a) **Organizational Level Maintenance (OLM):** capable of being carried out by on-board technicians and maintainers. Includes preventive maintenance and corrective maintenance following OEM standard fault finding and troubleshooting procedures. Typical tasks will include visual inspection, preventive maintenance tasks, manual reconfiguration, external adjustments, the incorporation of minor modifications, installing software patches, and the removal and replacement of consumables, LRUs and Equipment Groups. Organizational Maintenance includes system failure recovery by the application of on-line diagnostics and the use of off-line diagnostics which do not require external test module support;

b) **Intermediate Level Maintenance (ILM):** comprises activities to be performed mainly on-board and through on-site intervention/ work by external maintenance personnel with higher level of knowledge, skills and experience, and using Automatic Test Equipment (ATE), external test equipment, general purpose and special-to-type TTE, calibration equipment and any applicable software. Typical tasks performed will include repair, pre-overhaul inspections and analysis, systems disassembling and removal from the ship, transport to, workshop, and back, systems installation on-board, STW, integration, HAT and SAT. Based on workshop capabilities, would also include testing and calibration of LRUs, Shop Replaceable Units (SRUs) and fitted-form parts, onsite correction of failures, including servicing hardware, beyond OLM capabilities.

c) **Intermediate Level Maintenance + (ILM+):** carried out by the shipyard personnel, at their facilities. Typical tasks will include major scheduled overhaul (disassembly and reassembly of groups for inspections), scheduled maintenance, (dis-)assembly of subcomponents, detailed inspection,   and   system/equipment/subcomponent testing.

d) **Depot Level Maintenance (DLM):** performed by the Contractor/ Original Equipment Manufacturer (OEM) personnel, using available-in-house tools, test equipment and support equipment, calibration equipment and technical documentation. Tasks to be carried out at this level of maintenance are those beyond the skills of the previously described levels of maintenance, including Post Design Services (PDS).

F.4.2.   Hardware Maintenance Concept

The hardware maintenance concept is based on the modularity of the equipment. The modules to be removed from the systems for replacement, repair or any other off-equipment maintenance will be LRUs, with the following characteristics:

a. Its failure can be detected and indicated by a Fault Management and/ or Monitoring System or by abnormal condition/ failure display, in conjunction with TMs and general purpose test equipment;

b. It is easily accessed for replacement purposes;

c. It is easy to replace, through the use of a plug-in connector, screwed terminal, nut/ bolt fixing or similar connector;

d. It has minimal adjustment requirements, such as voltage level settings; adjustments may be carried out with the BIT or with general purpose tools and test equipment; and

e. When only one LRU has failed, its replacement returns the system to full operational status within a given mean time for the time of failure.

All OLM and ILM activities will be performed by the End User technicians. OLM will be carried out on-board, whereas ILM and ILM+ will be developed on shore. ILM+ activities for the Systems indicated below, will be performed by the End User's personnel. All DLM activities will be performed by the Contractor/ OEM.

Table 173: Maintenance Levels Coverage per System

Systems	OLM	ILM	ILM+
CMS Hardware	Essential	Essential	Optional
CMS Software	Essential	N/A	N/A
3D Radar	Essential	Essential	Optional
2D Radar(*)	Essential	Essential	Optional
IFF	Essential	Essential	Desirable
ESM	Essential	Essential	Desirable
IBS-NAVRAD	Essential	Essential	Optional
EOD	Essential	Essential	Desirable
EOS(**)	Essential	Essential	Desirable
FCR	Essential	Essential	Optional
OSD	Essential	Essential	Optional

(*) In the case of the FFGH, only applicable if the 2D Radar Option is exercised.

(**) In the case of the FFGH, only applicable if the EOS Option is exercised.

F.4.3. Software Support Concept

Limited maintenance tasks will be performed by the End User at the OLM, according to the necessary skills at each level as described in the Maintenance Concept. No SW maintenance tasks will be carried out at the ILM or ILM+ levels of maintenance.

F.5. Reliability, Availability, and Maintainability (RAM) Program

F.5.1. RAM Program

TECH_ILS. Req.4.   The Contractor shall deliver a RAM Program study to plan, integrate and manage Reliability, Availability and Maintainability (RAM) in accordance with the individual RAM sections that follow and shall ensure that RAM considerations and planning are an integral part of the production and support identification processes. [OPV3S Desirable Lvl1] [FFGH Optional]

In case requirement TECH_ILS.Req.4. is met, requirements from 5 until 50 (Chapter G.5 - Reliability, Availability, and Maintainability (RAM) Program) will became mandatory.

F.5.2. RAM Program Plan

TECH_ILS. Req.5.   The Contractor shall provide a single **Reliability, Availability and Maintainability (RAM) Plan**, describing the different RAM Program elements, tasks and subtasks to be implemented and how they will be conducted, in accordance with **MIL-STD-470B, Task 101, and MIL-STD-785B, Task 101**. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.6.   The Contractor shall ensure revisions incorporate End User approved changes, additions and deletions. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.3. RAM Requirement

TECH_ILS. Req.7.   The Contractor shall ensure that Reliability, Availability and Maintainability (RAM) for the Systems provided under this contract can be predicted and updated in accordance with the required standards and tasking. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.8.   The Contractor shall consider in their analyses the operation and environmental conditions as described in the Statement of Work (SOW), paragraph 10.2, and the Maintenance Concept described in the pertinent section in the present document. [Desirable Lvl1]

TECH_ILS. Req.9.   The Contractor shall ensure that his subcontractors' and suppliers' products are incorporated into the Reliability, Availability and Maintainability Program Plan, tasks and calculations in accordance with **MIL-STD-785B, Task 102, and MIL-STD-470B, Task 102**. The Contractor may propose additional tasks or modifications to tasks within this section and its subparagraphs for End User approval. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.4. RAM Program Reviews

TECH_ILS. Req.10.   The Contractor shall conduct RAM Program Reviews (PR) and provide the **Reliability, Availability and Maintainability Program Status Report** to the End User in accordance with **MIL-STD-785B, Task 103, and MIL-STD-470B, Task 103**. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.11.   The Contractor shall provide the **agenda and minutes** of these reviews. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.12.   The Contractor shall conduct these RAM Program Reviews in conjunction with, or as part of, other program reviews (i.e., Project Management Reviews) or technical reviews when possible. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.5. Reliability

F.5.5.1. Reliability Standards

TECH_ILS. Req.13. The Contractor shall establish, conduct and maintain the reliability portion of his RAM Program using **MIL-STD-756B and MIL-STD-785B** as a guidance. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.5.2. Reliability Models, Allocations and Predictions

TECH_ILS. Req.14. The Contractor shall provide reliability models, allocations and predictions for the Systems provided under this contract in accordance with **MIL-STD-785B, Task 202, and MIL-STD-756B, Task 101, 102, 201 and 202** as part of the **Reliability Prediction Report.** [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.15. The Contractor shall assume operation conditions as defined in the Statement of Work (SOW), paragraph 10.2 Concept of Operation (CONOPS). [Desirable Lvl1]

F.5.5.3. Reliability Models

TECH_ILS. Req.16. The Contractor shall prepare, provide and maintain reliability models for basic and mission reliability for the Systems for which the Contractor is the design authority. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.17. The Contractor shall request, collect and integrate reliability models for basic and mission reliability for the Systems in the scope of supply of this Contract for which they are not the design authority. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.18. The reliability models shall be prepared, provided and maintained in accordance with **MIL-STD-785B, Task 201, and MIL-STD-756B, Task 101 and 102**. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.19. The reliability models are to be based on a defined System configuration, which shall be proposed by the Contractor and will be agreed upon by the End User and the Contractor. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.20. The reliability models shall be developed at least down to the maintenance significant item level for hardware (LRU and SRU). [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.5.4. Reliability Allocations

TECH_ILS. Req.21. The Contractor shall provide reliability allocations, covering basic reliability requirements, in accordance with **MIL-STD-785B, Task 202.** [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.22. The Contractor shall develop reliability allocations to the levels as specified in the Maintenance Concept section in the present document. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.5.5. Reliability Predictions

TECH_ILS. Req.23. The Contractor shall provide reliability predictions in accordance with **MIL-STD-785, Task 203, and MIL-STD-756B, Task 201 and 202**, and based on a defined configuration and associated reliability models. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.24. The Contractor shall identify the source(s) to be used for failure data in the RAM Program Plan. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.25. The models and the hardware configuration shall be updated for design changes, mission profile changes, and/ or verifiable field data including previous demonstrations that affect the predicted reliability or allocated reliability of an end item or any of its components. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.5.6. Reliability Prediction Report

TECH_ILS. Req.26. The Contractor shall integrate into a single **Reliability Prediction Report** the individual reliability analysis (modelling, allocations and prediction) developed and/ or collected for the different Systems. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.27. The Contractor shall develop pertinent Reliability Analysis on the systems for which the Contractor is the design authority that are specifically develop for the contract. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.28. The Contractor shall request, collect and integrate the Reliability data/ analysis from his subcontractors/ providers/ OEM for the systems/ equipment in the scope of supply of this Contract for which the Contractor is not the design authority. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.5.7. Reliability Critical Items

TECH_ILS. Req.29. The Contractor shall identify reliability critical items and their manufacturer or supplier in accordance with **MIL-STD-785B, Task 208**. [Desirable Lvl1]

TECH_ILS. Req.30. The Contractor shall provide the list of critical items and their suppliers as part of the **Reliability Prediction Report**. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.6. Availability

F.5.6.1. Availability Requirement

TECH_ILS. Req.31. The Contractor shall provide his proposed availability modelling methodology as part of the availability mathematical modelling submission. The Contractor shall provide availability figures in his Availability Prediction Report. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.6.2. Availability Modelling

TECH_ILS. Req.32. The modelling method used by the Contractor shall mathematically determine Operational Availability (Ao) based on the reliability and maintainability of all equipment parts of the Systems and incorporate Administrative Logistics Delay Time (ALDT), taking into consideration the real support scenario of the Systems. The ALDT that shall be considered for the Analyses is 45 minutes. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.33. The Contractor shall develop the availability models to the maintenance significant item (LRU and SRU) level for hardware and software. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.34. The Contractor shall revise the mission availability models to incorporate End User-approved changes, additions, or deletions which evolve during the conduct of the contract and which affect availability. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.6.3. Availability Prediction Report

TECH_ILS. Req.35. The Contractor shall provide an **Availability Prediction Report** which is based on the reliability and maintainability predictions, and the availability modelling. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.7. Maintainability

F.5.7.1. Maintainability Standard

TECH_ILS. Req.36. The Contractor shall establish and conduct the maintainability portion of the RAM Program in accordance with **MIL-STD-470B**. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.7.2. Maintainability Models, Allocations and Predictions

TECH_ILS. Req.37. The Contractor shall provide and update maintainability models, allocations and predictions for the Systems in accordance with **MIL-STD-470B, Tasks 201, 203 and 203.** [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.38. The Contractor shall incorporate firmware and software support operations tasks within his maintainability models, allocations and predictions. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.39. The Contractor shall perform the maintainability models, allocations and predictions to the maintenance significant item (LRU and SRU) level for all hardware. For modelling purposes, the Contractor shall utilize operational and environmental as specified in the Statement of Work (SOW), paragraph 10.2 Concept of Operation (CONOPS). [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.7.3. Maintainability Prediction Report

TECH_ILS. Req.40.   The Contractor shall integrate into a single **Maintainability Prediction Report** the individual maintainability analysis (modelling, allocations and prediction) developed and/ or collected for the different Systems. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.41.   The Contractor shall develop pertinent Maintainability Analysis on the systems for which the Contractor is the design authority that are specifically develop for the contract. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.42.   The Contractor shall request, collect, validate and integrate the Maintainability data/ analysis from his subcontractors/ providers/ OEM for the systems/ equipment in the scope of supply of this Contract for which the Contractor is not the design authority. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.8.   Maintainability Analysis

F.5.8.1.   Maintainability Analysis Requirement

TECH_ILS. Req.43.   The Contractor shall perform a Maintainability Task Analysis (MTA) in accordance with **MIL-STD-470B, Task 205**, addressing all corrective and preventive maintenance tasks, for the Systems for which they are the design authority. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.44.   For other Systems for which the Contractor is not the design authority, the Contractor shall request, collect, validate and integrate the maintainability task analysis from the subcontractors/ providers/ OEM, addressing all corrective and preventive maintenance tasks. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.8.2.   Maintainability Analysis Conduct

TECH_ILS. Req.45.   The Contractor shall perform the analysis to all levels as specified in the present document, assuming the following: [OPV3S Desirable Lvl1] [FFGH Optional]

a. Operational and support requirements and concepts as defined in the Statement of Work (SOW), paragraph 10.2 Concept of Operation (CONOPS) and the maintenance concept defined in the Maintenance Concept section in the present document;

b. Projected training program as agreed in the Training Plan; and

c. Standard tools available, as provided by the End User.

F.5.8.3.   Maintainability Task Analysis Report

TECH_ILS. Req.46. The Contractor shall provide a single **Maintainability Task Analysis (MTA) Report** in accordance with **MIL-STD-470B, Task 205** and based on the defined System configuration. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.47. The **Maintainability Task Analysis (MTA) Report** shall address at least item classification (LRU/ SRU), maintenance levels, corrective and preventive maintenance tasks, operations support tasks, set-up tasks, task duration, task frequency, technical manual cross-reference, required personnel, personnel skills/ profile, safety considerations and any other maintenance-related relevant information. [OPV3S Desirable Lvl1] [FFGH Optional]

TECH_ILS. Req.48. The **Maintainability Task Analysis (MTA) Report** shall reflect the approved configuration for each System, including as a minimum indenture, item name, reference number, quantity, item criticality, NATO Stock Number (NSN), NCAGE and SMR codes. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.9. Source Maintenance Recoverability (SMR) Codes

F.5.9.1. SMR Methodology

TECH_ILS. Req.49. The Contractor shall propose a Source Maintenance and Recoverability (SMR) coding methodology in the ILS Plan, using **AR 700-82** as guidance. [OPV3S Desirable Lvl1] [FFGH Optional]

F.5.9.2. SMR Coverage

TECH_ILS. Req.50. For all maintenance significant items, as a minimum: [OPV3S Desirable Lvl1] [FFGH Optional]

    a. The Contractor's 'Source' code shall indicate either the Hardware Support Contractor or the End User;

    b. The 'Maintenance' codes shall indicate the level of repair (Organizational, Intermediate/Intermediate +, Depot remove, Depot, remove/ replace or repair);

    c. The 'Recoverability' code shall indicate either the Hardware Support Contractor or the End User as condemn/ discard authority.

F.6. Technical Documentation

TECH_ILS. Req.51. The Contractor shall provide technical documentation which consists of the following functional groupings:

    a. **Technical Manuals (TM);** [Essential]

    b. **Training Documentation**; and [Essential]

c. **ILS Repository**. [Optional]

F.6.1. Language

TECH_ILS. Req.52. All Contractor-developed technical documentation, COTS Manuals and CFE manuals shall be in the English language. [Essential]

F.6.2. Commercial Off-The-Shelf Manuals

TECH_ILS. Req.53. The Contractor shall provide **manufacturers' standard user manuals and technical documentation (COTS Manuals)** to enable operation and maintenance of the Systems, in accordance with the maintenance concept described in the Maintenance Concept section in the present document. [Essential].

TECH_ILS. Req.54. The Contractor shall integrate the COTS TMs (in PDF format) into the developed TMs. [Essential]

TECH_ILS. Req.55. COTS TMs shall be in the PDF format: interactive PDF documents that shall resolve all internal document references as hyperlinks. [Essential]

F.6.3. Technical Manuals Content

TECH_ILS. Req.56. **Technical Manuals (TM)** shall include as a minimum, but not be limited to, system manuals, equipment manuals, user manuals, maintenance manuals and Illustrated Parts' Breakdowns, which detail all user/ operator/ technician functions to support fault isolation and recovery and on-system hardware/ software maintenance and repair. [Essential]

F.6.4. Technical Manuals Format

TECH_ILS. Req.57. The Contractor shall provide Technical Manuals in the editable PDF format. TMs shall be navigable and searchable to allow quick identification of information. [Essential]

TECH_ILS. Req.58. The Contractor shall provide the required Technical Manuals implementing a navigable Table of Content, where the main relevant sections are identified (i.e. Systems Description –physical and functional–, Corrective and Preventive Maintenance for each System according to the applicable Maintenance Concept, Troubleshooting Procedures, Operation, IPB). [Essential]

TECH_ILS. Req.59. The TMs developed by the Contractor may be based on a single relationally structured IETM data repository based on ASD S1000D (preferably version 4 and above). This may avoid all unnecessary duplication and ensure that information accessed is as complete and as up-to-date as is possible. [Optional]

TECH_ILS. Req.60. The IETM data may be delivered to the End User in SpD format and according to the following structure: [Optional]

a. Data Module Requirement List (XML or Excel format);

b. Publication Module (XML format);

c. Brex Data Module (XML format);

d. Data Modules (XML format);

e. Graphics (CGM, SVG, JPG or PNG format);

f. External Publications/ COTS TMs (PDF format);

TECH_ILS. Req.61. The IETM data may be compatible with the selected IETM viewer. [Optional]

TECH_ILS. Req.62. The Contractor may be responsible for the publication of the IETM data using the provided IETM Viewer. [Optional]

TECH_ILS. Req.63. The IETM provided by the Contractor may not be in a proprietary format. [Optional]

TECH_ILS. Req.64. The End User may have the right to use the IETM data received by the Contractor and to use the IETM data with all their partners. [Optional]

F.6.5. Operation and Support

TECH_ILS. Req.65. The Contractor shall provide TMs for the operation and support of all hardware and software within the Systems. [Essential]

F.6.6. System Manual

The Technical Manuals to be provided shall consider Table 17Table 3 Maintenance Levels Coverage per System, in the Maintenance Concept section in the present document. The Contractor shall consider

TECH_ILS. Req.66. Table 18Table 4 Technical Manuals Coverage per System as follows, stating the required TMs per System and Maintenance Level. [Essential]

Table 184:Technical Manuals Coverage per System

Technical Manuals			
Systems	**OLM**	**ILM**	**ILM+**
CMS Hardware	Essential	Essential	Optional
CMS Software	Essential	N/A	N/A
3D Radar	Essential	Essential	Optional
2D Radar(*)	Essential	Essential	Optional
IFF	Essential	Essential	Desirable Lvl1
ESM	Essential	Essential	DesirableLvl1
IBS-NAVRAD	Essential	Essential	Optional
EOD	Essential	Essential	DesirableLvl1
EOS(**)	Essential	Essential	DesirableLvl1
FCR	Essential	Essential	Optional
OSD	Essential	Essential	Optional

(*) In the case of the FFGH, only applicable if the 2D Radar Option is exercised.

(**) In the case of the FFGH, only applicable if the EOS Option is exercised.

TECH_ILS. Req.67. The Contractor shall provide an **Operation and Maintenance System Manual** for each delivered System type (i.e. 3D Radar, 2D Radar, ESM, CMS, EOS, etc.), including installation and update of any software for the OLM and the ILM, in accordance with

TECH_ILS. Req.68.

TECH_ILS. Req.69.

~~**TECH_ILS. Req.67.**~~**TECH_ILS. Req.70.**   Table 18~~Table 4~~ Technical Manuals Coverage per System. [Essential].

The Contractor shall provide an Operation and Maintenance System Manual for the ILM+ for the Systems where the Technical Manuals at ILM+ have been identified as 'Essential' in

~~**TECH_ILS. Req.68.**~~**TECH_ILS. Req.71.**   Table 18~~Table 4~~: Technical Manuals Coverage per System. [Essential]

TECH_ILS. Req.72. The Contractor should provide an **Operation and Maintenance System Manual** for the ILM+ for the Systems where the Technical Manuals at ILM+ have been identified as 'Desirable' in

TECH_ILS. Req.73.

TECH_ILS. Req.74.

TECH_ILS. Req.69.TECH_ILS. Req.75. Table 18~~Table 4~~ Technical Manuals Coverage per System. [Desirable Lvl1]

The Contractor may provide an Operation and Maintenance System Manual for the (ILM+ for the Systems where the Technical Manuals at ILM+ have been identified as 'Optional' in

TECH_ILS. Req.70.TECH_ILS. Req.76. Table 18~~Table 4~~ Technical Manuals Coverage per System. [Optional]

F.6.7. Maintenance Coverage

TECH_ILS. Req.77. The Contractor provided technical manuals shall comprise all maintenance tasks at the identified levels of repair, with the scope as described in

TECH_ILS. Req.78.

TECH_ILS. Req.79.

~~TECH_ILS. Req.71.~~TECH_ILS. Req.80.   Table 18~~Table 4~~: Technical Manuals Coverage per System and in the Maintenance Concept section in the present document and include the use of support equipment. [Essential]

F.6.8.   Technical Manuals Delivery

~~TECH_ILS. Req.72.~~TECH_ILS. Req.81.   Updated versions of the Technical Manuals publications shall be distributed to the End User at appropriate intervals and in an appropriate format and/or data transfer medium. [Essential]

F.6.9.   Support Equipment

~~TECH_ILS. Req.73.~~TECH_ILS. Req.82.   The Contractor provided manuals shall include the use of all support equipment at Organizational, Intermediate and Intermediate+ levels, with the scope as described in Table 17~~Table 3~~ Maintenance Levels Coverage per System and in the Maintenance Concept section in the present document. [Essential]

F.6.10.   Technical Manuals Viewing Equipment

~~TECH_ILS. Req.74.~~TECH_ILS. Req.83.   The Contractor shall provide technical publications that can be used in an electronic medium, capable of supporting the navigation and search capabilities of the documentation, and one (1) copy for each ship in hard copy manuals. [Essential]

F.6.11.   Publication Plan

~~TECH_ILS. Req.75.~~TECH_ILS. Req.84.   The Contractor shall develop and provide a **Technical Manual Publication Plan (TMPP)** for the Systems as an Appendix to the ILSP. [Essential]

~~TECH_ILS. Req.76.~~TECH_ILS. Req.85.   The Contractor shall provide a first draft of the Table of Contents (TOC)/ Technical Manuals (TM) structure in the TMPP. [Essential]

~~TECH_ILS. Req.77.~~TECH_ILS. Req.86.   The Contractor may provide the first version of the Data Modules Requirement List (DMRL) according to the ASD S1000D with the TMPP. [Optional]

F.6.12.   Development Progress

TECH_ILS. Req.78.TECH_ILS. Req.87.   For the management of the TM development and the control of the progress, the Contractor shall maintain and continuously update the TOC to always reflect the current status of the information in the TMs. [Essential]

TECH_ILS. Req.79.TECH_ILS. Req.88.   For the management of the TM development and the control of progress the Contractor may maintain and continuously update the DMRL to always reflect the current status of each DM. [Optional]

F.6.13.   Data Consistency

TECH_ILS. Req.80.TECH_ILS. Req.89.   To assure data consistency, the Contractor shall follow an Entity-Relationship Model comprising all data relevant to Technical Manuals (i.e. CM data, TM data and references, NATO codification data, MTA data), in order to ensure that the delivered TMs are in accordance with the approved System configuration. [Essential]

TECH_ILS. Req.81.TECH_ILS. Req.90.   The DMs supporting the Illustrated Parts Breakdown (IPB) may be consistent with the ILS Repository. [Optional]

F.6.14.   TM Authoring

TECH_ILS. Req.82.TECH_ILS. Req.91.   The Contractor shall ensure that TM data undergo a desk-top analysis to ensure consistency in the look-and-feel. [Optional]

F.6.15.   Technical Manual Reviews

TECH_ILS. Req.83.TECH_ILS. Req.92.   The Contractor shall consider and describe in the TMPP the review schedule for the Technical Manuals as applicable. [Optional]

TECH_ILS. Req.84.TECH_ILS. Req.93.   The Contractor shall organize and support the reviews, including the provision of the agenda and the minutes of the reviews. [Optional]

TECH_ILS. Req.85.TECH_ILS. Req.94.   The Contractor shall conduct these Technical Manuals Reviews in conjunction with, or as part of, other program reviews (i.e., Project Management Reviews) or technical reviews when possible. [Optional]

TECH_ILS. Req.86.TECH_ILS. Req.95.   The Contractor shall submit to the End User the draft developed TMs to perform reviews at significant milestones of their TM development process to demonstrate that the TMs adequately support the operational and logistics requirements. [Optional]

TECH_ILS. Req.87.TECH_ILS. Req.96.   The Contractor shall correct for subsequent submissions all documented errors and deficiencies arising from reviews by implementing their proposed solutions previously approved by the End User. [Optional]

F.6.16.   Validation Conduct

~~TECH_ILS. Req.88.~~TECH_ILS. Req.97.   The Contractor shall perform TM Validation to ensure that the data the Contractor has developed and/ or assembled are technically accurate and can be used to efficiently operate and maintain the Systems. [Essential]

F.6.16.1.   Validation Planning

~~TECH_ILS. Req.89.~~TECH_ILS. Req.98.   The Contractor should provide a detailed System Technical Manual Validation Program, initially discussed in the **Technical Manual Validation Plan (TMPP)**. [Desirable Lvl2]

F.6.16.2.   Validation Scope

~~TECH_ILS. Req.90.~~TECH_ILS. Req.99.   The Validation Program should describe the tasks to be carried out by the Contractor to ensure that all operating and maintenance procedures (including operation of the System, visual inspection and check-out, calibration, alignment, technical testing, fault monitoring, on and off-line diagnostics and removal, replacement and repair instructions and checklists) have been validated. [Desirable Lvl2]

~~TECH_ILS. Req.91.~~TECH_ILS. Req.100.   **The Technical Manual Validation Plan (TMVP)** should describe the validation methods foreseen to validate the different type of TM data. [Desirable Lvl2]

~~TECH_ILS. Req.92.~~TECH_ILS. Req.101.   The Contractor should provide detailed tables of data to be validated as an appendix to the TMVP (or several appendices if validation increments are foreseen). The tables' format, content and layout will be subject to End User's approval. [Desirable Lvl2]

F.6.16.3.   End User Witness

~~TECH_ILS. Req.93.~~TECH_ILS. Req.102.   Prior to any validation activity, the Contractor should give a 30-day notice to the End User in order that the End User may witness the validation effort. [Essential]

F.6.16.4.   Required tools

~~TECH_ILS. Req.94.~~TECH_ILS. Req.103.   The Contractor should ensure that all the spare parts, consumables, tools and test equipment that are required to support validation activities are available at the validation sites. [Essential]

F.6.16.5.   TM Deficiencies

TECH_ILS. Req.95.TECH_ILS. Req.104.   After the Contractor has taken corrective actions, the Contractor should repeat the relevant validation steps unless otherwise decided by the End User. [Essential]

TECH_ILS. Req.96.TECH_ILS. Req.105.   All deficiencies detected during validation should be corrected by the Contractor. [Essential]

TECH_ILS. Req.97.TECH_ILS. Req.106.   The Contractor should correct in the TMs all documented errors and deficiencies from validation and prepare the final version of the TMs for the final review of the End User. [Essential]

F.7.   Supply Support and Supply Equipment

A consumable is a supply item required on a regular basis to maintain equipment in operation, which is consumed in use, is available through local commercial sources, and is provided by the user nation through normal supply channels. There are two categories of consumables – technical and non-technical. Examples of technical consumables are nuts, bolts, screws, washers, fuses, bulbs (indicators), and filters. Examples of non-technical consumables are fuel, lubricants, cleaning materials, printer paper and toner.

F.7.1.   Supply Concept

F.7.1.1.   Supply Support Requirements

TECH_ILS. Req.98.TECH_ILS. Req.107.   The Contractor shall recommend the necessary maintenance spares, consumables and repair parts to maintain each System within the SOW and according to the mission profiles, SOW, paragraph 10.2.1, and the maintenance concept described in the pertinent section in the present document. [Essential]

F.7.1.2.   Spares and Technical Consumables Coverage

TECH_ILS. Req.99.TECH_ILS. Req.108.   The Contractor shall recommend sufficient spare parts and technical consumables for each System, in order to meet the operational conditions as described in the SOW, paragraph 10.2 Concept of Operation, in particular paragraph 10.2.1 Mission Profiles. [Essential]

F.7.1.3.   Non-technical Consumables

TECH_ILS. Req.100.TECH_ILS. Req.109. The Contractor shall recommend adequate consumables for each System to allow continuous operation for 120 days in the case of the FFGH and 2200 navigation hours in the case of the OPV3S without external support, as specified in the SOW, paragraph 10.2 Concept of Operation, in particular paragraph 10.2.1 Mission Profiles. [Essential]

F.7.1.4. Spares Modelling and Analysis

~~TECH_ILS. Req.101.~~TECH_ILS. Req.110. The Contractor shall present the proposed spares and consumables model and analysis techniques in an **ILS/ RAMT Program Review** and describe it in the **Recommended Spare Parts List** and the **Recommended Consumable Items List** documents (Recommended Provisioning Lists, RPL). [OPV3S Essential] [FFGH Optional]

~~TECH_ILS. Req.102.~~TECH_ILS. Req.111. The Contractor shall use a commercially available spares modelling tool. [OPV3S Essential] [FFGH Optional]

~~TECH_ILS. Req.103.~~TECH_ILS. Req.112. Proposed changes in the model shall be described at **ILS/ RAMT Reviews** and the **Support Material Technical Review (SMTR)** and will be subject to End User approval. [OPV3S Essential] [FFGH Optional]

F.7.1.5. Recommended Spare Parts and Consumable Items Lists

~~TECH_ILS. Req.104.~~TECH_ILS. Req.113. The Recommended Provisioning Lists to be provided shall consider Table 17: Maintenance Levels Coverage per System~~Table 3: Maintenance Levels Coverage per System~~, in the Maintenance Concept section in the present document, and the mission profile described in SOW, paragraph 10.2. The Contractor shall consider Table 19: Recommended Provisioning Lists Coverage per System~~Table 5: Recommended Provisioning Lists Coverage per System~~ as follows, stating the required Recommended Provisioning Lists (Recommended Spare Parts List and the Recommended Items Lists) per System and Maintenance Level. [Essential]

Table 19~~5~~: Recommended Provisioning Lists Coverage per System

Recommended Provisioning Lists			
Systems	**OLM**	**ILM**	**ILM+**
CMS Hardware	Essential	Essential	Optional
CMS Software	N/A	N/A	N/A
3D Radar	Essential	Essential	Optional
2D Radar(*)	Essential	Essential	Optional
IFF	Essential	Essential	Desirable Lvl1
ESM	Essential	Essential	Desirable Lvl1
IBS-NAVRAD	Essential	Essential	Optional
EOD	Essential	Essential	Desirable Lvl1
EOS(**)	Essential	Essential	Desirable Lvl1
FCR	Essential	Essential	Optional
OSD	Essential	Essential	Optional

(*) In the case of the FFGH, only applicable if the 2D Radar Option is exercised

(**) In the case of the FFGH, only applicable if the EOS Option is exercised

~~TECH_ILS. Req.105.~~TECH_ILS. Req.114. The Contractor shall provide the **Recommend Spare Parts List (RSPL)** and the **Recommended Consumable Items List (RCIL)** to perform maintenance activities at OLM and ILM, in accordance with the mission profile, SOW, paragraph 10.2 Concept of Operation, and the maintenance concept described in the pertinent section in the present document, for a period of 24 months. [Essential]

~~TECH_ILS. Req.106.~~TECH_ILS. Req.115. The Contractor shall also specify, as a subset of the previous **Recommend Spare Parts List (RSPL)** and the **Recommended Consumable Items List (RCIL)**, the necessary spares to be carried to perform maintenance activities at OLM while the ship is in a mission. [Essential]

~~TECH_ILS. Req.107.~~TECH_ILS. Req.116. For the Systems in Table 19~~Table 5~~ Recommended Provisioning Lists Coverage per System where the RPL have been identified as 'Essential' at ILM+, the Contractor shall provide the **Recommend Spare Parts List (RSPL)** and the **Recommended Consumable Items List (RCIL)** to perform maintenance activities at ILM+, in accordance with the mission profile and, SOW, paragraph 10.2 Concept of Operation, maintenance concept described in the pertinent section in the present document, for a period of 24 months. [Essential]

~~TECH_ILS. Req.108.~~TECH_ILS. Req.117. For the Systems in Table 19~~Table 5~~ Recommended Provisioning Lists Coverage per System where the RPL have been identified as 'Desirable' at ILM+, the Contractor should provide the **Recommend Spare Parts List (RSPL)** and the **Recommended Consumable Items List (RCIL)** to perform maintenance activities at ILM+, in accordance with the mission profile, SOW, paragraph 10.2 Concept of Operation, and maintenance concept described in the pertinent section in the present document, for a period of 24 months. [Desirable Lvl1]

~~TECH_ILS. Req.109.~~TECH_ILS. Req.118. For the Systems in Table 19~~Table 5~~ Recommended Provisioning Lists Coverage per System where the RPL have been identified as 'Optional' at ILM+, the Contractor may provide the **Recommend Spare Parts List (RSPL)** and the **Recommended Consumable Items List (RCIL)** to perform maintenance activities at ILM+, in accordance with the mission profile, SOW, paragraph 10.2 Concept of Operation, and maintenance concept described in the pertinent section in the present document, for a period of 24 months. [Optional]

F.7.1.6. Spares Delivery

The Spares to be provided shall consider Table 17~~Table 3~~ Maintenance Levels Coverage per System, in the Maintenance Concept section in the present document, and the mission profile described in SOW, paragraph 10.2. The Contractor shall consider

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TECH_ILS. Req.110.TECH_ILS. Req.119. Table 20Table 6 Spares Delivery Coverage per System as follows, stating the spares to be delivered per System and Maintenance Level. [Essential]

Table 206 Spares Delivery Coverage per System

Spares Delivery			
Systems	**OLM**	**ILM**	**ILM+**
CMS Hardware	Essential	Optional	Optional
CMS Software	N/A	N/A	N/A
3D Radar	Essential	Essential	Optional
2D Radar(*)	Essential	Essential	Optional
IFF	Essential	Optional	Optional
ESM	Essential	Optional	Optional
IBS-NAVRAD	Essential	Optional	Optional
EOD	Essential	Optional	Optional
EOS(**)	Essential	Optional	Optional
FCR	Essential	Optional	Optional
OSD	Essential	Optional	Optional

(*) In the case of the FFGH, only applicable if the 2D Radar Option is

(**) In the case of the FFGH, only applicable if the EOS Option is exercised

~~TECH_ILS. Req.111.~~TECH_ILS. Req.120. The Contractor shall provide the complete range of spares, repair parts and consumables for each System required to perform maintenance at OLM, as identified in the RSPL and RCIL. [Essential]

For the Systems where the Spares Delivery at ILM has been identified as ''Essential' in

~~TECH_ILS. Req.112.~~TECH_ILS. Req.121. Table 20~~Table 6~~: Spares Delivery Coverage per System, the Contractor shall provide the complete range of spares, repair parts and consumables required to perform maintenance at ILM, as identified in the RSPL and RCIL, for each System. [Essential]

For the Systems where the Spares Delivery at ILM has been identified as 'Optional' in

~~TECH_ILS. Req.113.~~TECH_ILS. Req.122. Table 20~~Table 6~~: Spares Delivery Coverage per System, the Contractor may provide the complete range of spares, repair parts and consumables required to perform maintenance at ILM, as identified in the RSPL and RCIL, for each System. [Optional]

~~TECH_ILS. Req.114.~~TECH_ILS. Req.123. The Contractor may provide the complete range of spares, repair parts and consumables required to perform maintenance at ILM+, as identified in the RSPL and RCIL, for each System. [Optional].

~~TECH_ILS. Req.115.~~TECH_ILS. Req.124. The required spares, repair parts and consumables at OLM, ILM and ILM+ levels respectively shall be delivered to the site not more than 30 calendar days prior to HAT and not later than each HAT. [Essential]

F.7.1.7. Spare Parts Required for Test/ Validation

~~TECH_ILS. Req.116.~~TECH_ILS. Req.125. Spare parts required to support test and validation efforts (prior to HAT), including consumables, shall be the responsibility of the Contractor. Contractor may temporarily use the End User spare parts in support of the test and validation activities. [Essential]

F.7.2. System Nameplates and Product Marking

F.7.2.1. Bar Coding and Item Marking

~~TECH_ILS. Req.117.~~TECH_ILS. Req.126. Nameplates and product markings shall be available for identification of hardware replaceable units. [Essential]

~~TECH_ILS. Req.118.~~TECH_ILS. Req.127. Bar coding, or any other coding system described in **STANAG 4329 (AAITP-09)**, is required for automated identification of hardware items and media containing software and documentation. [Essential]

F.7.2.1.1. Item Marking

TECH_ILS. Req.119.TECH_ILS. Req.128. Markings on equipment, assemblies, component parts that are external and internal to frames and cabins shall be identifiable by permanent and legible markings or labelling which provide unambiguous correlation between the item, the respective configuration documentation and other associated data. [Essential]

F.7.2.1.2. Visibility of Markings/ Labelling

TECH_ILS. Req.120.TECH_ILS. Req.129. Identification markings shall, as far as possible, be readily visible to, and readable by, maintenance personnel without removal of the item or adjacent items. [Essential]

F.7.2.1.3. Characteristics of Markings/ Labelling

TECH_ILS. Req.121.TECH_ILS. Req.130. Markings/ labelling shall be provided which facilitates the assembly, replacement, connection, adjustment or operation of the various portions of the equipment. [Essential]

F.7.2.1.4. Labelling

TECH_ILS. Req.122.TECH_ILS. Req.131. All controls and indicating devices shall be labelled in a way that identifies their function using best commercial practices. [Essential]

F.7.2.1.5. Hardware Security Marking

TECH_ILS. Req.123.TECH_ILS. Req.132. Hardware shall be marked with the security classification of the information it is approved to process and store. [Essential]

F.7.2.1.6. Hazard Warning Labels

TECH_ILS. Req.124.TECH_ILS. Req.133. Hazard warning labels shall be attached to equipment wherever there exists a potential electrical, chemical, electromagnetic radiation or heat caused by human contact with materials, particularly when removal of covers expose the hazard. Any potential hazards (i.e. excessive weight) shall have warning labels attached. [Essential]

F.7.2.2. Support Material Packaging and Labelling

F.7.2.2.1. Packaging and Labelling Standards

TECH_ILS. Req.125.TECH_ILS. Req.134. Packaging and labelling of spare parts and consumables shall be in accordance to STANAG 4280 and STANAG 4281, using best commercial practices. [Essential]

F.7.2.2.2. Manufacturers Packaging Labelling

~~TECH_ILS. Req.126.~~TECH_ILS. Req.135. Manufacturers provided LRU/ SRU packaging labels shall be nonfading, durable, wear resistant, waterproof and identify the item using best commercial practices. [Essential]

F.7.2.2.3. Bar-coding of Spare Parts and Consumables

~~TECH_ILS. Req.127.~~TECH_ILS. Req.136. Spare parts, consumables and their packaging shall contain a bar-code to the established standard using **STANAG 4329 and STANAG 4281 (GS1-128, EAN/UPC symbology and GTIN)** as a guide. [Essential]

F.7.3. Support, Tools and Test Equipment

F.7.3.1. Support, Tools and Test Equipment Identification

~~TECH_ILS. Req.128.~~TECH_ILS. Req.137. The Contractor shall completely identify all required support equipment, to include General Purpose Tools and Test Equipment (GTTE), and Special-to-type Tools, Test Equipment (STTE), jigs, fixtures, material handling equipment and firmware required to perform all maintenance tasks at Organizational, Intermediate and Intermediate + Levels of Maintenance (OLM, ILM and ILM+). [Essential]

F.7.3.2. TTEL and SERD Report Provision

~~TECH_ILS. Req.129.~~TECH_ILS. Req.138. The **Tools and Test Equipment List (TTEL)** and the **Support Equipment Recommendation Data (SERD)** Report to be provided shall consider Table 17~~Table 3~~: Maintenance Levels Coverage per System, in the Maintenance Concept section in the present document. The Contractor shall consider Table 21~~Table 7~~ Tools and Test Equipment and Support Equipment Coverage per System as follows, stating the Tools, Test Equipment (TTE) and the Support Equipment (SE) identified per System. [Essential]

Table 21~~7~~ Tools, Test Equipment and Support Equipment Coverage per System

Tools, Test Equipment and Support Equipment						
Systems	**OLM**	**Qty**	**ILM**	**Qty**	**ILM+**	**Qty**
CMS Hardware	Essential	8	Essential	2	Desirable Lvl1	1
CMS Software	Essential	N/A	N/A	N/A	N/A	N/A
3D Radar	Essential	2	Essential	1	Optional	1
2D Radar(*)	Essential	6	Essential	1	Optional	1
IFF	Essential	8	Essential	2	Desirable Lvl1	1
ESM	Essential	8	Essential	2	Desirable Lvl1	1
IBS-NAVRAD	Essential	2	Essential	1	Desirable Lvl1	1
EOD	Essential	2	Essential	1	Desirable Lvl1	1
EOS(**)	Essential	6	Essential	1	Desirable Lvl1	1
FCR	Essential	2	Essential	1	Desirable Lvl1	1
OSD	Essential	8	Essential	2	Desirable Lvl1	1

(*) In the case of the FFGH, only applicable if the 2D Radar Option is exercised

(**) In the case of the FFGH, only applicable if the EOS Option is exercised

~~TECH_ILS. Req.130.~~TECH_ILS. Req.139. The Contractor shall provide the **Tools and Test Equipment List (TTEL)** to operate and maintain each System at OLM, ILM and ILM+. Additionally, the Contractor shall provide a **Support Equipment Recommendation Data (SERD) Report** for the support equipment required at OLM ILM and ILM+ levels of maintenance. [Essential]

F.7.3.3. Tools, Test Equipment (TTE) and Support Equipment (SE) Provision

~~TECH_ILS. Req.131.~~TECH_ILS. Req.140. The Tools and Test Equipment (TTE) and the Support Equipment (SE) Report to be provided shall consider Table 17~~Table 3~~: Maintenance Levels Coverage per System, in the Maintenance Concept section in the present document. The Contractor shall consider Table 21~~Table 7~~: Tools and Test Equipment and Support Equipment Coverage per System, stating the TTE and the SE to be delivered per System. [Essential]

~~TECH_ILS. Req.132.~~TECH_ILS. Req.141. The Contractor shall provide at the site all required special support equipment and Special-to-type Tools and Test Equipment (STTE) per ship for Organizational Maintenance (OLM), prior to each HAT, in accordance with Table 6 quantities. [Essential]

~~TECH_ILS. Req.133.~~TECH_ILS. Req.142. The Contractor shall provide at the site of all required special support equipment and STTE for Intermediate Maintenance (ILM), prior to each HAT, in accordance with Table 6 quantities. [Essential]

~~TECH_ILS. Req.134.~~TECH_ILS. Req.143. For the Systems in Table 21~~Table 7~~: Tools, Test Equipment and Support Equipment Coverage per System where the TTE and SE have been identified as 'Optional' at ILM+, the Contractor shall provide at the site all required special support equipment and STTE for Intermediate +maintenance, prior to each HAT, in accordance with Table 6 quantities. [Optional]

~~TECH_ILS. Req.135.~~TECH_ILS. Req.144. For the Systems in Table 21~~Table 7~~: Tools, Test Equipment and Support Equipment Coverage per System where the TTE and SE have been identified as 'Desirable' at ILM+, the Contractor should provide at the site all required special support equipment and STTE for Intermediate +maintenance, prior to each HAT, in accordance with Table 6 quantities. [Desirable Lvl1]

F.7.3.4.   ILM+ Maintenance

~~TECH_ILS. Req.136.~~TECH_ILS. Req.145. The Contractor should deliver per System an updated itemized cost listing of all documentation, special-to-type support equipment, spare parts and consumables deemed necessary to perform ILM+ maintenance, for those Systems for which maintenance will not be the responsibility of the End User, and Depot Maintenance (DLM) on the equipment. [Desirable Lvl2]

F.7.4.   Support Material Technical Review

~~TECH_ILS. Req.137.~~TECH_ILS. Req.146. The Contractor shall organize a **Support Material Technical Review** (provisioning technical review) to meet the following requirements:
[Essential]

a. Covering all Systems under contract;

b. Addressing spares, repair parts, support equipment, TTE and consumables to be provided to each System and previously identified;

c. Describing the spares and consumables model and analysis techniques used to produce the recommended provisioning lists; and

d. At a time and place to be mutually agreed but not less than one hundred and eighty (180) calendar days prior first HAT.

~~TECH_ILS. Req.138.~~TECH_ILS. Req.147. The Contractor shall provide the agenda and minutes of the Support Material Technical Review meeting. End User representatives will attend the meeting to ensure the proper assumptions, procedures and calculations are being used.
[Essential]

~~TECH_ILS. Req.139.~~TECH_ILS. Req.148. The Contractor shall conduct these Technical Manuals Reviews in conjunction with, or as part of, other program reviews (i.e., Project Management Reviews) or technical reviews when possible. [Essential]

F.7.5. Equipment Codification

F.7.5.1. Codification Requirement

~~TECH_ILS. Req.140.~~TECH_ILS. Req.149. The following Contractor-provided hardware shall be codified by the Contractor in accordance with **NATO Manual on Codification, ACodP-**1, prior to HAT: [Essential]

    a. LRUs and SRUs;

    b. Technical Consumables;

    c. Software; and

    d. Support Equipment, Tools and Test Equipment required for Organizational, Intermediate and Intermediate+ maintenance, including STTE.

F.7.5.2. Codification Data Provisioning

~~TECH_ILS. Req.141.~~TECH_ILS. Req.150. The Contractor shall obtain details of previously allocated NATO Stock Numbers (NSN) from the codification authority and provide the codification data once codification has occurred. This will allow the Contractor to use that data as required in both technical and supply documentation. [Essential]

~~TECH_ILS. Req.142.~~TECH_ILS. Req.151. In addition to the initial provision of technical data, the Contractor shall also provide any updated information on all items resulting from agreed modifications, design or drawing changes as and when these changes are made until the end of the contract. [Essential]

F.7.5.3. Technical Data

~~TECH_ILS. Req.143.~~TECH_ILS. Req.152. The Contractor shall liaise with the codification authority and provide technical data to the codification authority for the identification/ codification purposes for all items specified in this contract and not already codified in the NATO codification system. [Essential]

~~TECH_ILS. Req.144.~~TECH_ILS. Req.153. The documentation provided by the Contractor shall allow full identification of the items including their operational use. [Essential]

F.7.5.4. Subcontractor Information

~~TECH_ILS. Req.145.~~TECH_ILS. Req.154. The Contractor shall ensure the availability of technical data, required for the NATO Codification, from the subcontractors and vendors (e.g. name of the actual manufacturer(s), drawings, part numbers, applicable technical data, draft item identification, operational use). [Essential]

~~TECH_ILS. Req.146.~~TECH_ILS. Req.155. The Contractor shall ensure that his subcontractors, vendors and suppliers comply with these codification requirements. [Essential]

F.7.5.5. Codification Completion

~~TECH_ILS. Req.147.~~TECH_ILS. Req.156. The Contractor shall ensure that the required information needed in the codification process is delivered to the codification authority not later than six (6) months before HAT. [Essential]

F.7.5.6. NSN Utilization During Warranty

~~TECH_ILS. Req.148.~~TECH_ILS. Req.157. During warranty the Contractor shall also utilize NATO Stock Numbers (NSN) where they are available. [Essential]

F.8. Training and Training Support

F.8.1. Training Development

~~TECH_ILS. Req.149.~~TECH_ILS. Req.158. The Contractor shall develop, organize and conduct training courses to enable the End User to operate and maintain the Systems. [Essential]

~~TECH_ILS. Req.150.~~TECH_ILS. Req.159. The Contractor shall ensure that all support equipment is included in the applicable operator and maintainer training. [Essential]

F.8.2. Training Courses

~~TECH_ILS. Req.151.~~TECH_ILS. Req.160. The Contractor shall carry out appropriate courses to cover the following requirements: [Essential]

    a. One (1) training edition per System for each crew (per ship) in the case of the FFGH (OLM);

    b. One (1) training edition per System for the first two (2) crews in the case of the OPV3S (OLM);

    c. One training edition per System for the FFGH at ILM;

    d. One training edition per System for the OPV at ILM;

    e. One training edition per System for the FFGH and OPV at ILM+.

~~TECH_ILS. Req.152.~~TECH_ILS. Req.161. The Contractor shall address in their training courses all maintenance levels (OLM, ILM and ILM+) as described in the Maintenance Concept section in the present document. The Contractor shall consider Table 22~~Table 8~~: Training Courses Coverage per System as follows, stating the Training Courses to be provided per System:

    a)   OLM and ILM [Essential]

b) ILM+:

    I.   3D Radar and 2D Radar [Optional]

    II.   All other systems [Desirable Lvl1]

Table 228 Training Courses Coverage per System

Training Courses			
Systems	**OLM**	**ILM**	**ILM+**
CMS Hardware	Essential	Essential	Desirable Lvl1
CMS Software	Essential	N/A	N/A
3D Radar	Essential	Essential	Optional
2D Radar(*)	Essential	Essential	Optional
IFF	Essential	Essential	Desirable Lvl1
ESM	Essential	Essential	Desirable Lvl1
IBS-NAVRAD	Essential	Essential	Desirable Lvl1
EOD	Essential	Essential	Desirable Lvl1
EOS(**)	Essential	Essential	Desirable Lvl1
FCR	Essential	Essential	Desirable Lvl1
OSD	Essential	Essential	Desirable Lvl1

(*) In the case of the FFGH, only applicable if the 2D Radar Option is exercised

(**) In the case of the FFGH, only applicable if the EOS Option is exercised

F.8.3.   Training Modes

~~TECH_ILS. Req.153.~~TECH_ILS. Req.162. The Contractor shall recommend in the Training Plan the mode(s) of training (e.g. formal classroom, individual computer-based, on-the-job, commercial or a combination) and the rationale for the recommendations. [Essential]

F.8.4.   Plans

F.8.4.1.   Training Program Development

~~TECH_ILS. Req.154.~~TECH_ILS. Req.163. All details as regards the approach to training, milestones, resource requirements, management structure, interrelationships, and other related tasks for training development, shall be finalized in a **Training Needs Analysis (TNA)** session. [Essential]

~~TECH_ILS. Req.155.~~TECH_ILS. Req.164. This Training Needs Analysis (TNA) session shall be held in conjunction with, or as part of, other program reviews (i.e., Project Management Reviews, ILS/ RAM Program Reviews) or technical reviews when possible. [Essential]

F.8.4.2. Training Plan

TECH_ILS. Req.156.TECH_ILS. Req.165. The Contractor shall develop and provide a single **Training Plan** for each ship class, covering all the systems in the scope of this Contract. [Essential]

F.8.5. Initial Training for Site Personnel

TECH_ILS. Req.157.TECH_ILS. Req.166. The Contractor shall provide initial training for a sufficient number of persons who will, after training, be able to operate and maintain the System taking into account any health and safety regulations. [Essential]

F.8.5.1. Course Completion

TECH_ILS. Req.158.TECH_ILS. Req.167. The Contractor shall consider Table 22Table 8: Training Course Coverage per System in the course completion. The Contractor shall conduct the following training courses and iterations of the training: [Essential]

a. Site personnel training course for OLM Operation and Maintenance: four editions (one edition for each FFGH, one edition for each of the two first OPV) shall be completed not earlier than ninety (90) days before HAT;

b. Site personnel training course for ILM Operation and Maintenance: two editions (one edition for FFGH and one edition for OPV) shall be completed not earlier than ninety (90) days before HAT;

c. Site personnel training course for ILM+ Operation and Maintenance, for the Systems where the training has been identified as 'Essential' in Table 22Table 8: one single edition (for FFGH and OPV) shall be completed not earlier than ninety (90) days before HAT.

Final training schedule to be agreed as part of the TNA session.

TECH_ILS. Req.159.TECH_ILS. Req.168. The Contractor should consider Table 22Table 8: Training Course Coverage per System in the course completion. The Contractor should conduct the following training courses and iterations of the training: [Desirable Lvl1]

a. Site personnel training course for ILM+ Operation and Maintenance, for the Systems where the training has been identified as 'Desirable Lvl1' in Table 22Table 8: one single edition (for FFGH and OPV) shall be completed not earlier than ninety (90) days before HAT.

Final training schedule to be agreed as part of the TNA session.

F.8.5.2. Refresher Training

~~TECH_ILS. Req.160.~~TECH_ILS. Req.169. If HAT is delayed for reasons attributable to the Contractor such that the Training Completion requirement is no longer met, the Contractor may give appropriate refresher training to the personnel concerned with no additional cost. [Optional]

F.8.6. Training Courses

F.8.6.1. Training Course Conduct

~~TECH_ILS. Req.161.~~TECH_ILS. Req.170. All training courses shall take place in Portugal, at the End User classroom facilities, unless deemed economically beneficial for the End User to be held in a different location. [Essential]

~~TECH_ILS. Req.162.~~TECH_ILS. Req.171. The Contractor shall conduct courses at the times and in the locations approved by the End User in the Training Plan. [Essential]

F.8.6.2. Course Times

~~TECH_ILS. Req.163.~~TECH_ILS. Req.172. The training shall be conducted for up to 6 hours of instruction per day during daytime and five days per week. [Essential]

F.8.6.3. Official Holidays

~~TECH_ILS. Req.164.~~TECH_ILS. Req.173. Courses shall not be conducted on official holidays specified by the End User or on official holidays of the organization where the training concerned takes place. [Essential]

F.8.6.4. Course Venue

~~TECH_ILS. Req.165.~~TECH_ILS. Req.174. The Contractor shall train the End User personnel at the End User facilities, unless otherwise agreed by the End User. [Essential]

F.8.6.5. Trainee Participation

~~TECH_ILS. Req.166.~~TECH_ILS. Req.175. In the event that more than one course is to be provided, the Contractor shall be cognizant that individual trainees may participate in more than one course. [Essential]

~~TECH_ILS. Req.167.~~TECH_ILS. Req.176. The Contractor shall recommend in the Training Plan the pre-requisites for the trainees to attend each training course. [Essential]

F.8.6.6. Course Organization

~~TECH_ILS. Req.168.~~TECH_ILS. Req.177. Where appropriate, the Contractor shall organize courses as modules, to allow flexibility in attendance. [Essential]

F.8.6.7. Trainee Numbers

~~TECH_ILS. Req.169.~~TECH_ILS. Req.178. The Contractor shall recommend in the Training Plan the number of trainees for each course from 6 attendees up to a maximum of 12 attendees for classroom training and up to a maximum of 6 for hands-on training. [Essential]

~~TECH_ILS. Req.170.~~TECH_ILS. Req.179. For the CMS System, the Contractor shall consider 20 attendees for classroom training and up to a maximum of 5 for hands-on training. [Essential]

~~TECH_ILS. Req.171.~~TECH_ILS. Req.180. The Contractor shall accept that the End User can nominate up to two members of the Project Management Staff to attend each course in a monitoring role; such attendees will be additional to the planned course size. [Essential]

F.8.6.8. Hands-On Training

~~TECH_ILS. Req.172.~~TECH_ILS. Req.181. The Contractor shall include appropriate hands-on training in all courses, using representative System equipment for this purpose with at least 40% of any course being hands-on. [Essential]

F.8.7. Training Documentation and Equipment

F.8.7.1. Classified Data

~~TECH_ILS. Req.173.~~TECH_ILS. Req.182. The **Training Documentation** shall contain unclassified data only to ease the distribution, storage and its use. To enable this, the training documentation shall maintain data classified higher than NATO UNCLASSIFIED, or Contractor equivalent, separately. The external higher classified data shall be represented in the training documentation by coded parameters, allowing people to refer to a separate higher classified document to obtain the classified information. [Essential]

F.8.7.2. Training Documentation Format

~~TECH_ILS. Req.174.~~TECH_ILS. Req.183. The Contractor shall provide the Training Documentation in Microsoft Office and/ or pdf format, and pdfs to be available also in Office format on request. [Essential]

F.8.7.3. Training Documentation Data

~~TECH_ILS. Req.175.~~TECH_ILS. Req.184. Training documentation shall include as a minimum, the source data files required to allow experienced training staff to develop and conduct training courses in all aspects of the System operation, support and maintenance. [Essential]

F.8.7.4. Training Documentation Viewing

~~TECH_ILS. Req.176.~~TECH_ILS. Req.185. Training documentation shall be capable of being viewed in an office environment and by using portable viewing equipment. [Essential]

F.8.7.5. Training Equipment

~~TECH_ILS. Req.177.~~TECH_ILS. Req.186. Specialized training tools required in the performance of maintainer and operator training shall be included as part of the training package. [Essential]

F.8.7.6. Validated TMs

~~TECH_ILS. Req.178.~~TECH_ILS. Req.187. The Contractor shall use validated TMs and portable viewing facilities for training. [Essential]

F.8.7.7. Training Material Delivery

~~TECH_ILS. Req.179.~~TECH_ILS. Req.188. The Contractor shall develop and provide all Training Documentation to the End User for review and approval no later than 90 (ninety) days before the planned starting date of each individual course. [Essential]

F.8.7.8. Training Material Updates

~~TECH_ILS. Req.180.~~TECH_ILS. Req.189. The Contractor shall provide updates following End User's review and whenever the course material is changed. [Essential]

F.8.7.9. Training Equipment

~~TECH_ILS. Req.181.~~TECH_ILS. Req.190. The Contractor shall develop and provide, in the Training Plan, a list of training equipment required for each course. [Essential]

~~TECH_ILS. Req.182.~~TECH_ILS. Req.191. The Contractor shall make available for each course all required training equipment. [Essential]

F.8.7.10. Contractor's Instructional Material

~~TECH_ILS. Req.183.~~TECH_ILS. Req.192. The Contractor shall provide End User approved course material prior to each course, for each trainee, which can be taken away for future reference. [Essential]

F.8.7.11. Training Material and Tools

~~TECH_ILS. Req.184.~~TECH_ILS. Req.193. The Contractor shall make available all the tools in the classroom and also for the hands-on lessons (e.g. Technical Manuals, standard and special TTE already provided or to be provided). [Essential]

F.8.8. Course Instructors

F.8.8.1. Instructors Curriculum Vitae (CV)

~~TECH_ILS. Req.185.~~TECH_ILS. Req.194. The Contractor shall provide the CV of his proposed instructors for each course at the same time as the initial training documentation for that specific

course is delivered for review and approval, i.e. ninety days prior to the planned course start date. [Essential]

~~TECH_ILS. Req.186.~~TECH_ILS. Req.195. The Contractor Instructors shall meet the minimum Standardised Language Proficiency (SLP) of 3333 from **ATrainP-5 (STANAG 6001)** (no certification required). [Essential]

F.8.8.2. Course Administration

F.8.8.2.1. Training Completion Reports

~~TECH_ILS. Req.187.~~TECH_ILS. Req.196. The Contractor shall provide the End User with **Completion Reports** for each applicable course. [Essential]

F.8.8.2.2. Certificate of Training

~~TECH_ILS. Req.188.~~TECH_ILS. Req.197. The Contractor shall provide each trainee with a **Certificate of Training** for each course successfully completed. [Essential]

F.8.8.3. Language

~~TECH_ILS. Req.189.~~TECH_ILS. Req.198. The Contractor shall prepare all training documentation in the English language. [Essential]

~~TECH_ILS. Req.190.~~TECH_ILS. Req.199. The Contractor shall conduct all courses in the English language. [Essential]

F.9. Packaging, Handling, Storage and Transportation

F.9.1. Packaging, Handling, Storage and Transportation Program

~~TECH_ILS. Req.191.~~TECH_ILS. Req.200. The Contractor shall establish and maintain a Packaging, Handling, Storage and Transportation (PHST) Program. [Essential]

F.9.2. Spares, Tools and Test Equipment Storage

The Contractor shall identify the PHST requirements for spare parts, consumables and TTE/SE to support operation and maintenance at the required level (OLM, ILM and ILM+), in accordance with

~~TECH_ILS. Req.192.~~TECH_ILS. Req.201. Table 20~~Table 6~~ and Table 21~~Table 7~~. [Essential]

~~TECH_ILS. Req.193.~~TECH_ILS. Req.202. The Contractor shall document PHST requirements data in the Technical Manuals. [Essential]

F.9.3. PHST Report

~~TECH_ILS. Req.194.~~TECH_ILS. Req.203. The Contractor shall provide a **PHST Report**, to include the identified PHST requirements for spare parts, consumables, TTE and SE, addressing at least unit weight, size (length, width, height), unit of issue, unit of measure, NATO Stock Number (NSN) and hazardous classification. [Essential]

F.9.4. Packaging and Transportation Plan

~~TECH_ILS. Req.195.~~TECH_ILS. Req.204. The Contractor shall provide a single **Packaging and Transportation Plan**, where the Contractor shall identify details of techniques and methods for packaging, transporting, loading, unloading, and storing of all spare parts, consumables and TTE which need to be stored at End User facilities and/ or which may need transportation between them or to/ from the OEM repair facilities. [Essential]

F.9.5. Special Handling Requirements

~~TECH_ILS. Req.196.~~TECH_ILS. Req.205. The Contractor shall give consideration to special handling requirements and other hazards associated with the transportation of equipment. [Essential]

F.9.6.   Packaging Reference

~~TECH_ILS. Req.197.~~TECH_ILS. Req.206. The Contractor shall pack all initial consumables and spare parts provided under supply support in transportable cases designed to meet the requirements of **NATO packaging level 3 of STANAG 4280** and to protect the items from the operation and environmental conditions as specified in Statement of Work (SOW), paragraph 10.2 Concept of Operation (CONOPS). [Essential]

~~TECH_ILS. Req.198.~~TECH_ILS. Req.207. The Contractor shall use reusable containers. [Essential]

~~TECH_ILS. Req.199.~~TECH_ILS. Req.208. Marking of packaging and reusable containers shall be in accordance with **STANAG 4281 and STANAG 4329.** [Essential]

~~TECH_ILS. Req.200.~~TECH_ILS. Req.209. Bar coding of packaging and reusable containers shall be in accordance with **STANAG 4329**. [Optional]

F.9.7.   Special Packaging Instructions

~~TECH_ILS. Req.201.~~TECH_ILS. Req.210. The Contractor shall provide any special instructions for the shipment of spare parts/ repairable items. [Essential]

F.9.8.   Packaging Lift Requirements

~~TECH_ILS. Req.202.~~TECH_ILS. Req.211. The Contractor shall ensure that, when fully packed, support materials (LRUs, SRUs, consumables), shall not exceed the recommended maximum weight per **MIL-STD-1472**. [Essential]

F.9.9.   PHST Support

F.9.9.1.   Packaging of Spare Parts for Transport

~~TECH_ILS. Req.203.~~TECH_ILS. Req.212. The Contractor shall be responsible for packaging all spares and repair parts to be transported to the Site. [Essential]

F.9.9.2.   Packaging of Unserviceable Parts

~~TECH_ILS. Req.204.~~TECH_ILS. Req.213. Unserviceable items returned to the Contractor shall be packed by the End User in the packaging previously used for the replacement, serviceable item. [Essential]

F.9.10. Facilities

F.9.10.1. Spares Storage Details

The Contractor shall provide a Facilities Requirement Report, to include details of spare parts, consumables and TTE storage requirements at the pertinent levels of maintenance (OLM, ILM and ILM+ storage), in accordance with

~~TECH_ILS. Req.205.~~TECH_ILS. Req.214. Table 20~~Table 6~~ and Table 21~~Table 7~~. [Essential]

F.10. ILS Repository [Optional]

F.10.1. ILS Repository Development

F.10.2. ILS Repository Requirement

~~TECH_ILS. Req.206.~~TECH_ILS. Req.215. The Contractor may prepare and provide a repository for the ILS information (already existing or developed for the project), enabling data to be easily presented and efficiently reviewed, avoiding inconsistencies. [Optional]

~~TECH_ILS. Req.207.~~TECH_ILS. Req.216. The Contractor may describe the ILS Repository approach as part of the ILS Plan. [Optional]

~~TECH_ILS. Req.208.~~TECH_ILS. Req.217. The Contractor may develop the ILS Repository in accordance with one of the standards proposed hereafter: [Optional]

    a. **MIL-STD-1388-1A / MIL-STD-1388-2B**

    b. **ASD S3000L**

F.10.3. Repository Development Process

~~TECH_ILS. Req.209.~~TECH_ILS. Req.218. The ILS repository may address hardware and software maintenance significant items down to LRUs/ SRUs and Software Significant Items (SSI) levels. [Optional]

F.10.4. System Support Recommendations

~~TECH_ILS. Req.210.~~ TECH_ILS. Req.219. The Contractor may provide a consolidation of his System support recommendations within the ILS Repository. [Optional]

~~TECH_ILS. Req.211.~~ TECH_ILS. Req.220. The recommendations may be a logical/ physical breakdown of the System that reflects the Configuration of the System and the Configuration Item (CI) number/ identification. [Optional]

~~TECH_ILS. Req.212.~~ TECH_ILS. Req.221. The Contractor may summarize the RAM characteristics of the System/ equipment, maintenance information, logistics resource requirements and the personnel and training implications in his system support recommendations. [Optional]

F.10.5. Initial Logistics Support Baseline Approval

~~TECH_ILS. Req.213.~~ TECH_ILS. Req.222. The Contractor may obtain End User approval in the establishment of the initial logistic support baseline from which all logistic elements will be determined for that equipment. [Optional]

F.10.6. ILS Repository Reviews

F.10.6.1. ILS Repository Data Reviews

~~TECH_ILS. Req.214.~~ TECH_ILS. Req.223. The Contractor may conduct **ILS Repository Data Reviews** with the End User in conjunction with, or as part of, other program reviews (i.e., Project Management Reviews, ILS/ RAM Program Reviews) or technical reviews when possible. [Optional]

~~TECH_ILS. Req.215.~~ TECH_ILS. Req.224. The Contractor may provide the agenda and minutes of the ILS Repository Data Reviews. [Optional]

~~TECH_ILS. Req.216.~~ TECH_ILS. Req.225. The ILS Repository Data Reviews may cover all the Systems under contract. [Optional]

F.10.7. Functional Requirements Identification

F.10.7.1. Functional Requirements Subtasks

~~TECH_ILS. Req.217.~~ TECH_ILS. Req.226. The Contractor may perform the following subtasks: [Optional]

a. Identify and document the support operations and maintenance functions that must be performed;

b. Identify support operation tasks, maintenance tasks (including both corrective and preventive maintenance tasks) and other support tasks;

c. Document the result of these analyses in the ILS Repository and update the results as data become better defined.

F.10.8. Task Analysis [Optional]

F.10.8.1. Task Analysis Identification

~~TECH_ILS. Req.218.~~TECH_ILS. Req.227. The Contractor may perform task analysis for all tasks identified in the paragraph above. [Optional]

F.10.8.2. Task Analysis Coverage

~~TECH_ILS. Req.219.~~TECH_ILS. Req.228. The Contractor may perform task analysis for all project hardware and software and document the results of this task in the ILS Repository. [Optional]

F.10.8.3. Task Analysis

~~TECH_ILS. Req.220.~~TECH_ILS. Req.229. The Contractor may perform new or critical logistic support resources analysis and document the results in the ILS Repository. [Optional]

F.10.8.4. Task Analysis for Training Requirements

~~TECH_ILS. Req.221.~~TECH_ILS. Req.230. The Contractor may identify training requirements and provide training recommendations, and document the results in the ILS Repository. Refer to Training and Training Support section in the present document for further details regarding the Training Program. [Optional]

F.10.9. ILS Repository Updates

~~TECH_ILS. Req.222.~~TECH_ILS. Req.231. The Contractor may update the ILS Repository Data as improved information becomes available. [Optional]

~~TECH_ILS. Req.223.~~TECH_ILS. Req.232. The Contractor may supply regular ILS Repository updates to the End User, to support the use of the Contractor's ILS Repository by the End User's organization. [Optional]

F.10.10. ILS Repository

F.10.10.1. ILS Repository Format

~~TECH_ILS. Req.224.~~TECH_ILS. Req.233. The Contractor may provide End User access to the ILS Repository Data in a format compliant with the selected standard upon option execution. [Optional]

~~TECH_ILS. Req.225.~~TECH_ILS. Req.234. The Contractor may provide the End User access to the ILS Repository Data in a format that enables the generation of dedicated reports (e.g. System

breakdown, RAM characteristics, provisioning and PHST data, maintenance planning, task analysis information and correlation to the Technical Manuals, SMR codes). [Optional]

~~TECH_ILS. Req.226.~~TECH_ILS. Req.235. The Contractor may describe the ILS Repository format and suggest the ILS generated data to be integrated into the ILS Repository as part of the ILS Plan. [Optional]

F.10.10.2. ILS Repository Maintenance

~~TECH_ILS. Req.227.~~TECH_ILS. Req.236. The Contractor may maintain the ILS Repository during the implementation of the Contract. [Optional]

F.10.10.3. ILS Repository Updates

~~TECH_ILS. Req.228.~~TECH_ILS. Req.237. The Contractor may provide regular ILS Repository Data and ILS Repository Reports updates and a final delivery to the End User. [Optional]

F.10.10.4. ILS Repository Requirements

~~TECH_ILS. Req.229.~~TECH_ILS. Req.238. The Contractor may document and maintain data and information generated from the RAM Program, Supply Support analysis, Training Program and the Packaging, Handling, Storage and Transportation (PHST) Program in an automated ILS Repository. [Optional]

~~TECH_ILS. Req.230~~TECH_ILS. Req.239. The Contractor may supply the ILS Repository software tool and licences, compliant to the selected standard, to the End User. [Optional]

F.10.10.5. ILS Repository Data Central File

~~TECH_ILS. Req.231.~~TECH_ILS. Req.240. The Contractor may utilize a single ILS Repository as the central file of validated, integrated, and design-related ILS data for the Systems. [Optional]

F.10.10.6. ILS Repository Data Changes

~~TECH_ILS. Req.232~~TECH_ILS. Req.241. The Contractor may update ILS Repository documentation in accordance with the tasking above to reflect changes in support requirements resulting from: [Optional]

a. Changes to equipment design, support, or operational requirements as a result of logistics demonstrations, technical manual reviews, training results, testing, or any other ILS consideration; and

b. Logistics support improvements or the correction of deficiencies discovered through analysis of test results or by the Contractor's validation of ILS Repository documentation.

F.10.10.7.   ILS Repository Data Reviews and Validation

F.10.10.7.1.   ILS Repository Data Validation

~~TECH_ILS. Req.233.~~TECH_ILS. Req.242. The Contractor may perform ILS Repository data validation to ensure that the data the Contractor has developed and/ or assembled are technically accurate and can be efficiently used for subsequent ILS activities such as, but not limited to, TM data population, RSPL and RCIL compilation, Recommended TTEL, Training design. [Optional]

F.10.10.7.2.   ILS Repository Data Validation Process

~~TECH_ILS. Req.234.~~TECH_ILS. Req.243. The Contractor may describe the ILS Repository data validation process and methods (desktop validation, on-site validation, etc.) as part of the ILS Plan. [Optional]

F.10.10.7.3.   Validation Activity Notification

~~TECH_ILS. Req.235.~~TECH_ILS. Req.244. Prior to any validation activity, the Contractor may give 30 (thirty) days notice to the End User in order that the End User may witness the validation effort. [Optional]

F.10.10.7.4.   Post Validation

~~TECH_ILS. Req.236.~~TECH_ILS. Req.245. Upon completion of validation, the tabulation of items validated (ILS Repository structure) and actions taken, or to be taken, to correct deficiencies may be performed by the Contractor. [Optional]

~~TECH_ILS. Req.237.~~TECH_ILS. Req.246. The Contractor may provide a validation report as an Appendix to the ILS Repository delivery. [Optional]

~~TECH_ILS. Req.238.~~TECH_ILS. Req.247. The ILS Repository may be developed to allow for te creation of reports, which may also be compliant with the applicable standard. [Optional]