

QUESTIONNAIRE FOR DESIGN AND DEVELOPMENT OF
EXTRA LARGE UNMANNED UNDERWATER VEHICLE
(XLUUV) UNDER MAKE I

**QUESTIONNAIRE FOR DESIGN AND DEVELOPMENT OF EXTRA LARGE
UNMANNED UNDERWATER VEHICLE (XLUUV) UNDER MAKE I**

1. The Ministry of Defence, Government of India, is desirous of **design and development of one prototype Extra Large Unmanned Underwater Vehicle (XLUUV)** under Make I scheme *iaw* Chapter III of DAP 20. Post successful development of prototype, case for procurement of twelve (12) XLUUVs would be progressed. The responses to this Questionnaire are invited only from Original Equipment Manufacturers (OEM)/ Authorised Vendors/ Government Sponsored Export Agencies/ Vendors with experience of production of XLUUV of equivalent complexity. The end user of the equipment is the Indian Navy.

2. This information is being issued with no financial commitment and the Ministry of Defence reserves the right to change or vary any part thereof at any stage. The Government of India also reserves the right to withdraw it, should it be so necessary at any stage

3. **The Intended Use of Equipment.** Extra Large Unmanned Underwater Vehicle (XLUUV) is required to meet the demand for undersea operational awareness and ordnance delivery. The XLUUV should be capable of undertaking missions such as Intelligence Surveillance and Reconnaissance (ISR), Anti-Submarine Warfare (ASW), Anti Surface Warfare (ASuW) and Mine Warfare (MW). The XLUUVs should be capable of undertaking long duration missions in restricted and shallow waters.

4. **Important Technical Parameters.** This Questionnaire solicits information regarding **compliance with critical technical specifications** of the **Extra Large Unmanned Underwater Vehicle (XLUUV)**. A detailed response is essential so as to analyze the proposed solution of the vendor with regards to technical capabilities and features of the Extra Large Unmanned Underwater Vehicle (XLUUV). Certain important aspects are as follows:-

(a) **Operation and Technical Parameters.** The broad operational and technical characteristics for the Extra Large Unmanned Underwater Vehicle (XLUUV) are placed at **Appendix 'A'**.

(b) **Cost Estimate.** The vendor is to provide the indicative cost including taxes and duties (to be indicated separately) for design and development of prototype Extra Large Unmanned Underwater Vehicle (XLUUV) as well as the total project (bulk production). This should take into account all aspects of supply, installation, integration, training, Factory Acceptance Trials (FATs), Harbour Acceptance Trials (HATs), Sea Acceptance Trials (SATs) and through Life Cycle Support. The indicative cost should also cater for the All Inclusive Annual Maintenance Contract (AIAMC) as per details in Appendix 'A'. Other aspects (if any), may be mentioned specifically.

- (c) **Field Evaluation Trials (FET)**. The FET for the XLUUV would be conducted by /N. The Trial Methodology including parameters for product evaluation are to be indicated along with the mode of FET for each parameter viz. Physical Trials/ Documentation/ Certification/ Simulation. Acceptance will be through FATs & HATs and SATs to be suitably undertaken prior induction as per mutually agreed protocols.
- (d) Vendor is to indicate whether he has supplied the same or similar Vehicle to any other customer. Additionally, the vendor is to indicate whether similar Vehicle is in use in any other Navy.
- (e) Whether the vendor would be able to comply with all provisions of Defence Acquisition Procedure 2020 (DAP 20) or not. If not, which Para/Clause of DAP 20 would not be agreed with reasons is to be indicated.
- (f) **Tentative Delivery Schedule**. The overall timeframe for design and development of one prototype followed by production, delivery of 12 XLUUVs with stage wise break-up of the entire project post signing of contract along with Programme Evaluation and Review Technique (PERT) details is required to be submitted. The timeline for the acquisition process will be as per Make I scheme *in* Chapter III of DAP 20.
- (g) **Manpower and Training**. Vendor is to indicate the manpower required to operate and maintain the XLUUV. Additionally, the details of training required for such personnel is also to be indicated.
- (h) **Documentation**. Vendor should confirm provisioning of details of the documentation with respect to conceptualization manual, design concept manual / doctrine, design document, manufacturing, testing and trials manual for individual equipment of XLUUV, installation manual, technical description, operating and troubleshooting manual, repair manual and diagrams (including concept design, actual design, main drawing, drawings pertaining to production, installation, working level drawings, flowcharts from start to end of an equipment, system, plug, module, integrated unit) of all the stages.
- (j) **Simulator**. Vendor is to indicate whether the Firm will be able to provision a simulator for imparting operational training to personnel for XLUUV. The feasibility of COTS simulator for the training is also to be indicated.
- (k) **Product Support**. Vendor is to indicate his capability to execute the project and provide product support including:-
- (i) Technical support being provided for maintenance and support of the facility during its service life, including warranty. The service life of the facility should be at least fifteen (15) years.

(ii) Modalities for All Inclusive Annual Maintenance Contract (AIAMC) including spares, post warranty period.

(l) **Obsolescence Management.** Vendor is to indicate the provisions for upgradability of equipment to avoid system obsolescence.

(m) **Indigenisation Content (IC).** In line with the 'Make in India' initiative of the GoI, the OEM is to ensure that all efforts are made to maximize the **Indigenous Content (IC) of the project, to be indicated explicitly for the instant proposal**, without any deterioration in performance standards as specified at **Appendix 'A'**.

4. **Design Requirement.** As this project is being developed under Make I scheme, the design, development and manufacture is to be indigenous. Therefore, an undertaking is to be furnished *iaw* Appendix 'A' to Chapter I of DAP 2020.

5. **Procedure for Response.**

(a) Vendors are to provide para wise compliance in a tabular format to this questionnaire along with reasons for non-compliance, if any. Additional literature on the product can also be attached with the form. All the serials of the tables are to be answered section wise without fail. Non response to any serial will make the respondent liable for disqualification. The format of responding is as mentioned below: -

- (i) Compliant/ Non-Compliant.
- (ii) Details.
- (iii) Figures (cost, quantity etc)
- (iv) Specifications (Range with units).
- (v) Remarks, if any to amplify and support.

Example as below: -

<u>Ser</u>	<u>Attribute</u>	<u>Description</u>	<u>Response</u>
1.	Role	ISR	(a) Compliant. (b) The XLUUV is meant for ISR role as defined at Para __ of RFI. Equipment fit for ISR role _____ (c) Qty :- Prototype - ____, Bulk - _____ Cost – Rs.XX.XX denomination (d) Specifications : - (if any) (e) Remarks: - to support the response.

(b) The filled form should be dispatched at under mentioned address: -

Commodore Submarine Acquisition

Directorate of Submarine Acquisition
IHQ MoD (Navy)
Room No. 120, 'C' Wing Sena Bhawan
New Delhi – 110 010
Tel: +91-11-2301 0162
Fax No.: +91-11- 23010830
e-mail: dsmaq@navy.gov.in

(c) The last date of submission and acceptance of response to this Questionnaire is **DD MM 2023**.

6. The proposal would be progressed under the provisions of DAP 2020.

Appendix 'A'
{Refers to Para 4(a)}

**OPERATIONAL AND TECHNICAL PARAMETERS FOR DESIGN AND
DEVELOPMENT OF EXTRA LARGE UNMANNED
UNDERWATER VEHICLE (XLUUV)**

1. The proposal pertains to design and development of prototype Extra Large Unmanned Underwater Vehicle (XLUUV). In case your company is interested in the proposal, the details of the same may be forwarded to this office in the format given below. Section 'A' pertains to the operational and technical requirements of the XLUUV and Section 'B' deals with the broad based operational and technical requirements envisaged for the XLUUV.

SECTION -A

<u>S. No.</u>	<u>Particulars</u>	<u>Bidder Reply</u>
1.	Name of XLUUV (Platform)	
2.	Roles of XLUUV	
3.	Can XLUUV be designed indigenously?	
4.	Who will be the designer?	
5.	Who will be the Certifying Agency for the design?	
6.	Overall dimension of XLUUV- (a) Without payload. (b) With payload.	
7.	Weight in Air: - (a) Without payload. (b) With payload.	
8.	Minimum and Maximum Depths to which XLUUV can dive? (without limitation on number of diving cycles throughout the designed life of the XLUUV)	
9.	Minimum Depth required for XLUUV to dive? (without limitation on number of diving cycles throughout the designed life of the XLUUV)	
10.	Periscope Depth (PD) of the XLUUV?	
11.	What will be the Endurance of XLUUV?	
12.	What will be the Range of XLUUV?	
13.	<u>Capabilities</u> . List out the capabilities of XLUUV.	
14.	Dived Displacement of the XLUUV.	

<u>S. No.</u>	<u>Particulars</u>	<u>Bidder Reply</u>								
15.	<p><u>Propulsion and Speed.</u></p> <p>(a) What will be the type of Propulsion that will be used? (b) Speed of XLUUV in different combination. (in knots)</p> <table border="1" data-bbox="387 443 1145 600"> <tr> <td>State</td> <td>XLUUV</td> </tr> <tr> <td>Surface</td> <td></td> </tr> <tr> <td>Dived state</td> <td></td> </tr> <tr> <td>Snorkeling depth/ Periscope depth</td> <td></td> </tr> </table> <p>(c) What is the redundancy provided in propulsion system to prevent loss in the event of damage to main propeller/ propulsion system?</p>	State	XLUUV	Surface		Dived state		Snorkeling depth/ Periscope depth		
State	XLUUV									
Surface										
Dived state										
Snorkeling depth/ Periscope depth										
16.	What are the platform manoeuvring capabilities in the event of a jammed rudder(s)/ control surface(s)?									
17.	What will be the Indiscretion Rate?									
18.	What will be the Power supply source for XLUUV?									
19.	What will be the type of fuel used?									
20.	<u>Manpower required to operate and maintain XLUUV</u> Strength= ___ ? { ___ ? Officers + ___ ? Crew}.									
21.	What is the Service life (in Years) of XLUUV?									
22.	<p><u>Operational cum Refit Details.</u></p> <p>(a) Operational cycle - _____(?) months. (b) Types of refit that will be required to be undertaken? (c) Time duration of Refit (?) - _____, _____ (months) (d) Docking period during refit (in months) or otherwise? (e) Any intermediate Maintenance period is envisaged between Operational Cycle till Refit commences. (f) Average Availability in an operational cycle _____. (g) What is the Operational cum Refit Cycle of XLUUV?</p>									
23.	<p><u>Sea Worthiness</u></p> <p>(a) Undertake envisaged operations on surface, periscope depth and submerged up to sea state ____ (?) (b) Sea worthiness up to Sea State_____.</p>									
24.	<p><u>General Remarks</u></p> <p>(a) What will be the Reserve Buoyancy? (b) What will be the Transverse Metacentric Height:- (i) In Submerged state? (ii) On Surface? (c) Safety Factor of pressure Hull - _____(?) times of designed maximum diving depth. (d) Designed Life of XLUUV - _____(?) years.</p>									

<u>S. No.</u>	<u>Particulars</u>	<u>Bidder Reply</u>
	(e) All machinery, equipment & systems should have continuous availability, reliability and maintainability for the full mission endurance. (f) Planned Inter docking interval ____ (?) months/years. (g) Capability to operate unhindered in tropical Climate. (h) What are the safety and recovery features provided?	
25.	What will be the limits of Operating Conditions so as to ensure satisfactory and reliable operation of all system at rated power under: - (a) Permanent heel \pm ____ degree. (b) Temporary heel \pm ____ degree. (c) Permanent trim \pm ____ degree. (d) Temporary trim \pm ____ degree (3 minutes). (e) Roll Upto \pm ____ degree. (f) Pitch Upto \pm ____ degree (period not less than ____ sec). (g) Conditions above need not be assumed to occur concurrently. (h) Sea water temperature on surface - upto 35°C. (j) Sea water Specific Gravity - 1.010 to 1.028. Shock withstanding ability of the installed equipment onboard the platform: - ____ g ² ____ milli second.	
26.	<u>Rules and Regulations</u> The XLUUV is to conform to standards for design and construction of UUVs or as per other international classification society norms as chosen by designer for UUVs. The rules and regulations should be latest in force at the time of commencement of construction of the XLUUV.	
27.	<u>Overall System Integration</u> Vendor will be responsible to integrate all systems of the XLUUV.	
28.	<u>Autonomous Operation</u> Vendor is to indicate the ability to demonstrate the functionality of autonomous operation at a Shore Integration Facility for "Proof of Concept" to be indicated.	
29.	<u>Percentage wise distribution of items of XLUUV</u> Percentage of items that are : - (a) Indigenously designed and developed in India. (b) Indigenously developed/manufactured/ assembled in	

<u>S. No.</u>	<u>Particulars</u>	<u>Bidder Reply</u>
	India. (c) Imported.	
30.	<p><u>Percentage of Cost</u></p> <p>Budgetary cost estimate of prototype XLUUV and production of 12 XLUUVs. This should include designing, manufacturing/developing, integrating, STW, energising, trials, endurance checks, derisking phase, HATs and SATs, through life cycle support of XLUUV. Indicative cost including taxes (to be indicated separately).</p> <p>(a) Percentage of cost of items that are indigenously designed and developed in India.</p> <p>(b) Percentage of cost of items not designed in India but are only manufactured/ assembled in India.</p> <p>(c) Percentage of items imported. Details of equipment, system and critical technology requiring import are to be indicated.</p> <p>(d) Percentage of cost of system integration, STW and Trials by Indian or Foreign personnel or by both.</p>	
31.	<p>Capability to execute the project and provide product support including:-</p> <p>(a) <u>Warranty</u>. Technical support being provided for maintenance and support of the platform during its service life including warranty. The in service life of the platform should be at least fifteen (15) years.</p> <p>(b) <u>AIAMC</u>. Modalities for All Inclusive AMC with spares post warranty period to be indicated.</p> <p>(c) <u>Rate Contract Agreement (RCA)/ Annual Maintenance Contract (AMC)</u>. Modalities for RCA for spares/services in addition to AMC post warranty period</p> <p>(d) <u>Obsolescence Management</u>. The Vendor is to indicate the provisions/ philosophy for upgradability of equipment, system modules and COTs modules to avoid system obsolescence.</p>	
32.	<p><u>Timelines to be Indicated</u></p> <p>(a) Design and development of prototype XLUUV.</p> <p>(b) Production and delivery schedule of the twelve (12) XLUUVs.</p>	
33.	Foreign nation(s) / organization(s) to which such platform may have been supplied / planned to be supplied.	
34.	Whether company has manufacturing/ servicing setup in India. If not, what are the future plans to set up a	

<u>S. No.</u>	<u>Particulars</u>	<u>Bidder Reply</u>
	manufacturing / servicing setup in India.	
35.	Vendor is to indicate whether simulator can be provisioned for training XLUUV personnel	
36.	Annual turnover during the preceding 03 years.	
37.	Earliest date at which OEM is willing to give a presentation to Naval Headquarters, New Delhi.	
38.	No. of pages enclosed in the reply.	

Note: -

Alternative Suggestions. Vendors can provide alternatives to meet same or better operational requirements in addition to the response to the Questionnaire.

SECTION – B

2. Further, the broad based requirements envisaged for the Extra Large Unmanned Underwater Vehicle (XLUUV) are also tabulated below. You are requested to bring out ***in detail***, all the features that you are able to offer (with numerical values where applicable) for the XLUUV. The response should be provided taking into consideration the information sought using ***italics and underlined words mentioned as part of amplifying remarks***. Additional information / features available other than those tabulated here may also be given.

<u>Ser</u>	<u>Attribute</u>	<u>Amplifying remarks</u>	<u>Bidder Remarks</u>
(a)	Roles	(i) Intelligence, Surveillance and Reconnaissance (ISR) (ii) Anti-Submarine Warfare (ASW) (iii) Anti-Surface Warfare (ASuW) (iv) Mine Warfare (MW) <u>Payload/ Equipment fit to meet these roles are to be indicated against each role.</u>	
(b)	Capabilities	<u>The design equipment that ensures each of the following capability is to be indicated:-</u> (i) Capable of deploying from an alongside pier in harbour, perform autonomous operations based on mission requirement and return to harbour. (ii) Capable of autonomous operations for transit from harbour to open sea, mission planning, diving/ surfacing, adjusting buoyancy, obstacle avoidance, battery monitoring and recharging, operations and return transit to harbour. (iii) Capable of Surface navigation through restricted waters (areas where there are lesser depths and less maneuvering space) to avoid collision or grounding. (iv) Capable of underwater/ dived transit to a designated area at transit speed as per	

<u>Ser</u>	<u>Attribute</u>	<u>Amplifying remarks</u>	<u>Bidder Remarks</u>
		<p>mission requirement upon reaching deeper waters.</p> <p>(v) Capable of communication at pre-defined interval through satellite link to the Shore Control Station for monitoring information and relaying own position maintaining platform stealth.</p> <p>(vi) Capable of detection of surface, subsurface and air contacts using various sensors namely Sonar, Radar, ESM, Periscope etc – <u>Detection ranges for various sensors customized for the XLUUV dimensions are to be indicated.</u></p> <p>(vii) Capable of relaying target information/ parameters to the Shore Control Station using communication equipment based on the specific mission requirement – <u>Matrix of various communication equipment (RF, Acoustic, SATCOM) with data transfer rates is to be provided.</u></p> <p>(viii) Capable of recording visual, acoustic and electronic data of targets for analysis for the maximum specified mission duration – <u>requirement of data storage capacity and data format is to be indicated.</u></p> <p>(ix) Capable of undertaking re-ballasting as required to maintain neutral buoyancy for maintained depth as per mission requirement.</p> <p>(x) Capable of being stored on land using a customised arrangement.</p> <p>(xi) Capable of transportation by land using trailers and/or sea using Mother Ship/ Vessel of Opportunity (VOO).</p>	
<u>System Description</u>			
(c)	System	(a) The XLUUV should broadly comprise of the following and salient aspects of each	

<u>Ser</u>	<u>Attribute</u>	<u>Amplifying remarks</u>	<u>Bidder Remarks</u>
		<p>are mentioned below:-</p> <p>(i) Underwater Vehicle with integral sensors fixed or modular configuration - <u>The modularity is to be amplified in terms of mission payloads.</u></p> <p>(ii) Command, Control and Communication (C³) System.</p> <p>(iii) Arrangements for Launch and Recovery at a pier.</p> <p>(iv) Stowage and Support Systems.</p> <p>(b) Mission payloads should be able to operate simultaneously without interference up to the maximum depth of the vehicle.</p>	

Underwater Vehicle System

(d)	Principal Dimensions	<u>Ser</u>	<u>Parameter</u>	<u>Remarks</u>	
		(i)	Length with Payload	Not greater than 50 meters.	
		(ii)	Width	Not greater than 5.0 meters.	
		(iii)	Height	Not greater than 10.0 meters.	
		(iv)	Weight in air	Not more than 300 tons (inclusive of payloads).	
		(v)	External Payload (for armament)	Not more than 10 tons.	
(e)	Submerged Speed	>=8 kn (max) in nil current conditions. <u>The duration for which max speed operation while complying with mission endurance requirements at Para 2(j) below is to be indicated.</u>			
(f)	Cruising Speed	>=4 kn in nil current conditions.			
(g)	Max Operating Depth	>=600 meters.			
(h)	Sea State as	Submerged operations upto Sea State 6			

<u>Ser</u>	<u>Attribute</u>	<u>Amplifying remarks</u>	<u>Bidder Remarks</u>
	per Beaufort Scale	and surface operations upto Sea State 5.	
(j)	Endurance	<p>(i) Maximum endurance \geq 45 days with appropriate power source or Air Independent Propulsion (AIP).</p> <p><u>(ii) Details of power source to be indicated.</u></p> <p><u>(iii) Endurance to be indicated for each type of mission such as ISR, ASW, ASuW and MCM.</u></p>	
(k)	Propulsion	<p>(i) Electric motor or Integrated thrusters and propeller optimised for high hydrodynamic efficiency and low acoustic noise.</p> <p>(ii) Reserve propellers or additional thrusters (such as rim driven thrusters) to prevent loss in the event of damage to main propeller/ propulsion system.</p> <p><u>Details, features capabilities and redundancies of propulsion system to be indicated.</u></p>	
(l)	Manoeuvrability	<p>(i) Capable of manoeuvring in six degrees of freedom (diving, surfacing, adjusting trim etc).</p> <p>(ii) Capable of manoeuvring in the event of a jammed rudder(s)/ control surface(s)?</p> <p><u>The details of platform manoeuvring capabilities for normal operations and in event of contingencies to be indicated.</u></p>	
(m)	Power Requirements	<p>(i) Rechargeable Lithium Polymer/ Lithium Ion battery or Fuel Cell based AIP system, safe for use on unmanned platforms – <u>The type, make, quantity, rating, size, weight and source of supply for the battery is to be indicated. Information on Lithium Ion Cell batteries namely, choice of cell chemistry along with specified thermal runaway temperature, capacity of LIB pack, cell/ group voltage etc to be indicated. Details and features of Fuel Cell based AIP are also to be indicated.</u></p>	

<u>Ser</u>	<u>Attribute</u>	<u>Amplifying remarks</u>	<u>Bidder Remarks</u>
		<p>(ii) Safety features of Battery Management System.</p> <p>(iii) Pressure tolerant up to maximum operating depth.</p> <p>(iv) To cater for maximum endurance – <u>The capacity of the battery pack with recharging frequency to be indicated.</u></p> <p>(v) Charging time for full charge of batteries after a state of complete discharge should not be not more 10 hours.</p> <p>(vi) Provision for conversion to stabilised voltages for use by various systems and sub-systems is to be included.</p> <p>(vii) In case of failure of main supply, alternate inbuilt provision for emergency supply for energising critical systems is to be indicated – <u>The duration and operations of the vehicle possible on emergency supply is to be indicated.</u></p>	
(p)	Battery Charging and Battery Management System (BMS)	<p>(i) Battery Charging is to be undertaken using charging arrangements such as Diesel Engine(s) and Diesel Generator(s) with suitable fuel and exhaust arrangements OR Fuel Cell based Battery Charging System OR any other suitable means – <u>The capacity of the recharging mechanism is to be indicated.</u></p> <p>(ii) Battery Management System (BMS) for managing battery parameters during charge/ discharge such as current, voltage, temperature etc. – <u>The State of Charge (SoC) of the battery for battery charging and details of the BMS is to be indicated.</u></p>	
(q)	Navigation	(i) The navigation suite should facilitate accurate navigation of the XLUUV in surface and dived condition in pilotage	

<u>Ser</u>	<u>Attribute</u>	<u>Amplifying remarks</u>	<u>Bidder Remarks</u>
		<p>waters, coastal areas and Open Ocean. All Navigational system should be WGS 84 compliant or standard prevalent at the time of signing of contract – <u>The details of navigation equipment, settling time, accuracy, drift etc to be indicated.</u></p> <p>(ii) Provision for incorporating NAVIC/ GAGAN.</p> <p>(iii) Equipment details are as follows:-</p> <ul style="list-style-type: none"> - Doppler Velocity Log (DVL) aided Inertial Navigation System (INS) with high accuracy. - GPS. - USBL (Ultra-Short Base Line). <p><u>The accuracy of navigation equipment i.e., drift, stabilization time etc to be indicated.</u></p>	
(r)	Communication	<p>XLUUV should be able to communicate through SATCOM to the Control Station at maximum range of platform at Periscope Depth (PD). Communication equipment details are as follows:-</p> <p>(i) On-deck Ethernet.</p> <p>(ii) Radio Frequency (RF).</p> <p>(iii) Acoustic Communication (Command and Data Links).</p> <p>(iv) wLAN.</p> <p>(v) Satellite Communication (SATCOM) - <u>Feasibility of incorporating UHF SATCOM/ MSS SATCOM to be indicated.</u></p> <p><u>The individual communication equipment details are to be indicated.</u></p> <p>Note. <u>The Periscope Depth (PD) of the XLUUV is to be indicated.</u></p>	
(s)	Sensors	Availability of following sensors/ sensor suite/ alternative sensor is to be indicated:-	

<u>Ser</u>	<u>Attribute</u>	<u>Amplifying remarks</u>	<u>Bidder Remarks</u>
		<p>(i) Flank Array Sonar (FAS). (ii) Thin Line Towed Array (TAS). (iii) Bow Sonar (Broadband). (iv) Multi beam Echo Sounder (MBES). (v) Sub-Bottom Profiler (SBP). (vi) Collision Avoidance Sonar. (vii) COTS Radar 'I' Band. (viii) ESM System. (ix) EO/IR capable Periscope Mast with HDTV Camera and HD Infra-Red (IR). (x) Acoustic transponder beacon for sub-surface and GPS/ Active AIS (programmable) for surface. (xi) Recorder Module for Visual, Acoustic and Magnetic Signatures. (xii) Recorder CTD and Bathymetric Data.</p> <p><u>The individual equipment capabilities and the duty cycle for the above sensors for maximum endurance are to be indicated.</u></p>	
(t)	Ordnance	<p>External payload of armament not more than 10 tons capable of carrying and launching of mines.</p> <p><u>The details and design features of external payload are to be indicated.</u></p> <p><u>Feasibility of two NATO standard 533 mm torpedo tubes capable of firing Heavy Weight Torpedo (HWT) is to be indicated.</u></p>	
(u)	Safety and Recovery Features	<p>Information is to include the following:-</p> <p>(i) The safety of the XLUUV should be ensured by providing a Health Monitoring System, pressure, current and voltage sensors.</p> <p>(ii) Multiple strong points on the hull capable of taking the full tow load for emergency tow/ salvage are to be provided.</p>	

<u>Ser</u>	<u>Attribute</u>	<u>Amplifying remarks</u>	<u>Bidder Remarks</u>
		<p>(iii) Equipped with redundant acoustic transponder beacon for sub-surface and GPS/AIS for surface localisation.</p> <p>(iv) Flashing light on vehicle body, water ingress detection sensors, satellite link for position indication and mechanism for emergency surfacing.</p> <p>(v) Logic for safe return to a designated position through satellite link, in case of a critical failure of a sub-system/ loss of signal/ damage or any other incident as laid down in mission requirements.</p> <p>(vi) Feature to report in case the position is compromised/ captured executable remotely via a satellite link.</p> <p>(vii) Safety features and redundancy to ensure unmanned operations.</p> <p>(viii) Means of salvage in event of an emergency.</p> <p><u>Details of the above safety and recovery features of the XLUUV are to be indicated.</u></p>	
(v)	System Architecture	<p>The system architecture of the XLUUV should provide for the following:-</p> <p>(i) Complete automation and integration of all equipment and corresponding systems.</p> <p>(ii) Interface requirements between various systems, priority of operations, networks architecture requirements, level of redundancy and various other aspects of networking.</p> <p><u>Details of the proposed system architecture and Interface requirements of the XLUUV are to be indicated.</u></p>	

<u>Ser</u>	<u>Attribute</u>	<u>Amplifying remarks</u>	<u>Bidder Remarks</u>
(w)	Stealth Features	<p>Suitable design features to minimize RCS, signatures (acoustic/ magnetic/ visual) to minimize detection, radiated noise, noise reduction and monitoring techniques for critical machinery and equipment are to be incorporated.</p> <p><u>What will be the stealth features so as to keep the Defined Radiated Noise Level (RNL) to be minimalistic? The details of the stealth features of the XLUUV are to be indicated.</u></p>	
Command, Control and Communication (C³) System			
(x)	Command, Control and Communication (C ³) System	<p>(i) The XLUUV should have provision of being controlled/ reprogrammed from Control Station (shore / sea based) using secure communication systems. The details of Command, Control and Communication (C³) System are as follows:-</p> <p>(aa) Underwater Communication System (UCS).</p> <p>(ab) Radio Frequency (RF).</p> <p>(ii) Satellite Communication (SATCOM).</p> <p>(iii) Mission Planning and Control System.</p> <p><u>Details of the communication equipment as part of C³ System such as frequency band, etc are to be indicated.</u></p>	
Launch, Recovery and Stowage System			
(y)	Launch, Recovery and Stowage System	<p>Information on the system is to include the following:-</p> <p>(i) Arrangements for launch and recovery of XLUUV from alongside a pier in harbour and/or Vessel of Opportunity (VOO) at sea.</p> <p>(ii) Stowage of XLUUV on land using a customised arrangement.</p> <p>(iii) Provision of transportation using standard container by land using suitable trailers and/or sea using a VOO.</p>	

<u>Ser</u>	<u>Attribute</u>	<u>Amplifying remarks</u>	<u>Bidder Remarks</u>
		<p>(iv) Mode of transportation on shore.</p> <p>(v) Additional resources required for transportation.</p> <p>(vi) Facility, specifications, environmental conditions for storage.</p> <p>(vii) Periodic/ routine maintenance cycle during storage.</p> <p>(viii) Easy to maintain, simple in design and corrosion resistant, conducive for prolonged operations in a marine environment.</p> <p>(ix) System should have adequate redundancy and fail safe operation.</p>	
Support System			
(z)	Mission Planning, Control and Analysis Unit	<p>To assist the operator in undertaking Mission Planning, Launch and Control of the XLUUV during mission and post-mission analysis. Information on specific features of the unit is to include the following:-</p> <p>(i) Controls settings of Satellite, RF, Acoustic Communication Link with the XLUUV.</p> <p>(ii) Decision Support features to carry out Mission Planning.</p> <p>(iii) Monitoring the progress of the mission.</p> <p>(iv) Fail-safe features and emergency features for various scenarios to avoid hostile capture or for locating in case of being crippled.</p> <p>(v) Comprehensive online recording and analysis of all data transmitted by the XLUUV with playback facility.</p>	

<u>Ser</u>	<u>Attribute</u>	<u>Amplifying remarks</u>	<u>Bidder Remarks</u>
		<p>(vi) Provision of undertaking mission related tasking from a standalone system which could be shore based or sea based (VoO).</p> <p>(vii) Built-in Test feature to localise sub-component level defect.</p> <p><u>The details of data transfer capability using SATCOM, data processing onboard XLUUV and post retrieval of data on mission completion, data retrieval facility etc are to be indicated.</u></p>	
Handling, Maintenance, Reliability and Through Life-Support			
(aa)	Handling, Maintenance, Reliability and Through Life-Support	<p>Information is to include the following:-</p> <p>(i) System service life up to 15 years with scheduled maintenance periods.</p> <p>(ii) Failure-free and reliable operation of the complete system for the entire mission duration without human intervention.</p> <p>(iii) Suitable monitoring systems with autonomous controls for fault detection and taking corrective actions.</p> <p>(iv) Modular design to enable replacement of components and through-life upgrades.</p> <p>(v) Comprehensive Maintenance and Product Support Package including Manufacturers Recommended List of Spares [MRLS {Onboard Spares (OBS) and Base and Depot (B&D)}] for maintenance is to be provided.</p> <p>(vi) Use of material and coatings resistant to prolonged exposure to sea water.</p> <p>(vii) In case of AIP, specific safety features would be required for monitoring and management of fuel and oxidiser.</p>	

<u>Ser</u>	<u>Attribute</u>	<u>Amplifying remarks</u>	<u>Bidder Remarks</u>
(bb)	Training and Documentation	<p>(i) Training requirements for operator and maintainer crew for operating the XLUUV and its associated Mission Planning and Control System are to be indicated.</p> <p>(ii) Detailed documentation covering mission planning aspects and maintenance should be supplied for the XLUUV and its associated support equipment.</p>	
(cc)	Standards, Certifications and Specifications	<p>Details of compliance to various Industrial and Military standards as applicable, related to operations and safety (such as ISI, CE, MIL STD, Electronics etc) for various components and sub-components of XLUUV are to be indicated.</p> <p><u>COTS equipment with proven capability for UUV application are to be indicated.</u></p>	
(dd)	AIAMC and Product Support Package	<p>(i) AIAMC (All inclusive AMC) including Manufacturers Recommended List Of Spares [MRLS {Onboard Spares (OBS) and Base and Depot (B&D)}] for maintenance for a period of at least ten (10) years. The modalities of AIAMC to be indicated.</p> <p>(ii) Obsolescence management plan for upgradability of equipment and replacement of COTs items to avoid obsolescence is to be indicated.</p> <p>(iii) Proposal of providing "Performance Based Logistics" to be indicated.</p>	