

**QUESTIONNAIRE FOR AUTONOMOUS SURFACE VESSELS - ANTISUBMARINE
WARFARE (SAVIOR-ASW)**

1. **Introduction.** IN is examining the feasibility of inducting Semi-Submersible Autonomous Vessel for Intelligence, Operations & Reconnaissance (SAVIOR-ASW) **MAKE-II category of DAP-2020.** Quantity required for prototype is two (02) SAVIOR-ASW and one (01) Control station and tentative total quantity required is 40 x SAVIOUR ASW along with 3 x Control Stations.

2. **Questionnaire.** The questionnaire is divided into following parts:-

- (a) Part A - Description of SAVIOR-ASW
- (b) Part B - Instructions for filling up questionnaire.
- (c) Appendix A - Technical Questionnaire.
- (d) Appendix B - General Questionnaire
- (e) Appendix C - Vendor Information.
- (f) Appendix D - Statement of Costs.
- (g) Appendix E - list of certifications to be provided.

3. The above information is being sought with no financial commitment and the Ministry of Defence reserves the right to change or vary any part thereof at any stage.

PART A- DESCRIPTION OF SAVIOR-ASW

1. **Components.** Components of the SAVIOR-ASW should include the following: -

(a) Unmanned Re-usable ASW (Surveillance) Autonomous Surface Vessel.

(b) Mission Payload to undertake ASW Surveillance mission along with associated accessories.

(c) Containerised Control Station, capable of shore based and/or ship-based Command, Control and Communication (C³) operations. The communication is envisaged over indigenous satellite from vessel to shore based control station and ship, line of sight communication and hard wired communication with control station post recovery of the vessel.

(d) Launch and Recovery mechanism for shore as well as ship borne use.

(e) Equipment required to support deployment.

2. **Role.** SAVIOR-ASW should be capable of undertaking sub-surface ASW surveillance.

3. **Area of Operation.** The SAVIOR-ASW should be capable of operations in littoral waters as well as high seas by both day and night.

4. **Launch and Recovery.** The SAVIOR-ASW is to be able to be launched and recovered from jetty with suitable crane capacity and should be provided with as fitted arrangements for launch and recovery from a ship at sea.

System Description

5. **Vessel Specifications.** The SAVIOR-ASW should possess the following general specifications: -

(a) **Dimensions.**

(i) Length - -Not more than 3.5 m

- (ii) Weight (with payload) - Not more than 350 Kg
- (iii) Tow Capability - Upto 500 Kg (Depending upon drag)
- (iv) Average Continuous Power - As per design
- (v) Min Solar Collection - 180 Watts
- (vi) Battery Storage - As per design
- (vii) Mission Endurance - 03-06 months

(b) **Speed.** The vessel should be capable of proceeding at speeds of 1-3 Kn (subject to oceanographic conditions in the Area of Operation).

(c) **Endurance.** Notwithstanding the specifications at Sub Para 5 (vii), the vessel is to have adequate mechanism to generate power as necessary to fulfil its envisaged role for a period of at least 3 months (90 days) on station, utilising solar power and wave thrusters

(d) **Winch.** SAVIOR-ASW should be fitted with a winch that can pay out or retract the cable remotely. Motion Isolating Tow Cable should be attached between the winch and the Passive Towed Array to ensure smooth movement of the sensor.

6. **Equipment fit.** Each SAVIOR-ASW is to be fitted with following equipment fit:-

(a) ASW Payload comprising of Passive Acoustic Array with following specifications:-

- (i) A thin line array of not less than 32 hydrophones arranged in a nested line array.
- (ii) Length of array - 40-50m
- (iii) Depth of deployment- upto 120 m

(b) Payload to know the wave height and other parameters in order to calculate their effect and maintain in position.

(c) Primary GPS receiver.

(d) Water Speed Sensor.

- (e) Weather Station with capability for secondary GPS data.
- (f) Emergency Location Beacon with independent power & communication system.
- (g) Over The Horizon Satellite Communication Payload.
- (h) Line of Sight Relay Radio Payload.
- (j) IRPCS compliant Navigation Aids.
- (k) IRPCS compliant lighting system.
- (l) Secure Data Recorder.
- (m) Storage capacity of at least 2 TB.

7. **Technical Systems.** Each SAVIOR-ASW should have following technical systems:-

- (a) Power generation, distribution and management system.
- (b) The vessel is to be capable of primarily using wave motion to propel itself and should be equipped with auxiliary thrusters for additional speed.

Command and Control

8. **Modes of Operation.** The SAVIOR-ASW should be capable of offering varied levels of autonomy as follows:-

- (a) **Autonomous.** The vessel should enable complete autonomous navigation for mission.
- (b) **Remote.** The vessel should enable remote controlled operation from the Command and Control Station and acoustic operations. Remote control should be available in LOS mode using RF and OTH mode using SATCOM compatible with an Indian Satellite.

9. **Control Station.** Each SAVIOR-ASW is to be controlled through a Control Station for Command Control and Communications (C³) functions to provide the following functionality:-

- (a) Operation and monitoring of all systems of SAVIOR-ASWs.

- (b) Operation and monitoring of all payloads of SAVIOR-ASWs.
- (c) Mission planning and monitoring.

10. **Compatibility with Combat Management Systems.** A software application for Combat Management systems of *IN* would be developed which would enable a ship's Combat Management System to undertake following:-

- (a) Monitoring of Mission execution by SAVIOR-ASW.
- (b) Mission Planning for SAVIOR-ASW.

PART B- INSTRUCTION FOR FILLING UP QUESTIONNAIRE

1. Following documents are required to be submitted by respondents:-
 - (a) Appendix A.
 - (b) Appendix B.
 - (c) Appendix C.
 - (d) Appendix D
 - (e) Appendix E.
2. In case a proposed solution does not confirm to the limits as per questionnaire respondents may respond with recommended limit or proposed specifications. Further respondents are to justify the recommended limit.
3. The respondents shall submit one (01) copy of response, clearly marking one copy as 'Original Copy'. The respondents are also required to submit a soft copy of the response in a CD/ DVD in PDF format and in word format. In the event of any discrepancy between the content in copies of documents submitted, the contents in the 'original copy' shall govern/ prevail.
4. The responses should be submitted strictly as per the formats given in respective appendices. Should a Vendor need to mention any other information, a separate column may be added as the last column only or as a separate attachment.
5. All response appendices should be submitted in a single file or folder. Supporting documents or additional reference should be submitted in a separate folder with proper reference mentioned against each parameter or sub parameter in respective appendices.
6. Responses are to be addressed to following address

Project SAVIOR-ASW
Directorate of Staff Requirements
IHQ MoD (Navy)
D Block
Defence Officers Complex
Africa Avenue
New Delhi - 110 029

APPENDIX A - TECHNICAL QUESTIONNAIRE

<u>Ser</u>	<u>Specification/ Parameters/ Information Required</u>	<u>Information about proposed solution</u>
<u>Dimensions</u>		
1.	What is the length of the proposed autonomous vessel? (Limit - Not more than 3.5 m)	
2.	What is the weight of the proposed autonomous vessel including payload? (Limit - Not more than 350 kg)	
3.	What is the tow capability of the proposed autonomous vessel? (Limit - up to 500kg, depending upon drag)	
4.	What is the average continuous power? (as per design)	
5.	What is the maximum solar collection? (not less than 180watts)	
6.	What is the storage capacity of the battery? (as per design)	
<u>Speed</u>		
7.	What is the speed of the proposed autonomous vessel? (Limit between 1-3kn)	
<u>Endurance</u>		
8.	What is the endurance of the proposed autonomous vessel? (Limit between 30-90 days)	
<u>Equipment fit.</u>		
9.	What is the capability of the winch?	
10.	What are the capabilities of launching and recovery mechanism? Please provide brief description and technical details included limitations, if any.	
11.	What are the specifications of the passive array, including hydrophones, weight, operating depth, length?	
12.	What are the details and specifications of various payloads available with the autonomous vessel?(Reference para 6 of part A)	

<u>Ser</u>	<u>Specification/ Parameters/ Information Required</u>	<u>Information about proposed solution</u>
13.	Which IRPCS compliant Navigation Aids would be fitted on the SAVIOR? Please provide brief description and technical details	
14.	Which SATCOM Communication system would be fitted on the SAVIOR? Please provide brief description and technical details	
15.	Which Line of Sight Communication system would be fitted on the SAVIOR? Please provide brief description and technical details	
16.	Which Secure Data Recorder would be fitted on the SAVIOR? Please provide brief description and technical details	
17.	What is the plan for inclusion of AI in autonomous navigation?	
18.	How will the algorithm for collision avoidance be implemented?	
19.	What level of data transmission is being envisaged between the SAVIOR and mother ship/ ground station? Please provide brief description and technical details	
20.	What is the redundancy deployed for critical systems? Please provide brief description and technical details	
<u>Mission Payload</u>		
21.	Which Thin line Passive Array Sonar or miniaturised Active Towed array Sonar is planned to fit onboard the SAVIOR? List out following details :- Manufacturer, Active Frequency, Passive frequency , length of towed array, winch details, other technical and operational details	
<u>Technical Systems</u>		
22.	How is the Power generation, distribution and management system implemented on the SAVIOR. Provide operational and technical details	
23.	What is methodology to address total power failure in the system?	

<u>Ser</u>	<u>Specification/ Parameters/ Information Required</u>	<u>Information about proposed solution</u>
	Provide operational and technical details	
24.	What is the envisaged Propulsion system? Provide operational and technical details	
25.	What are the details of solar panels that would be used on the SAVIOR ? Provide operational and technical details	
<u>Command and Control</u>		
26.	Give a brief description of how following modes of operation would be implemented on the SAVIORs (a) Autonomous. (b) Remote.	
<u>Control station</u>		
27.	What are the dimensions of control station?	
28.	Can the control station be fitted inside a standard 20ft container?	
29.	What all is envisaged to be fitted on controls station? eg AC, SATCOM antenna etc	
<u>Quality Assurance</u>		
30.	Which are the recommended Environmental Conditions and standards for testing?	
31.	What standards will be employed for Software quality assurance?	
32.	What standards would be employed for EMI/EMC checks?	
33.	What are the recommended Environmental Stress Screening Tests (ESS).	
34.	How would the Configuration Management (CM) be executed?	
35.	What grade of material will be utilised for component/ sub-assemblies (MIL/ Marinised/ Industrial etc.) of the vehicle and Ground station? Please provide brief description and technical details	
36.	What are the specifications of the SAVIOR being followed with respect to:- (a) Design of equipment. (b) Reliability of equipment.	

<u>Ser</u>	<u>Specification/ Parameters/ Information Required</u>	<u>Information about proposed solution</u>
	(c) Ergonomics of equipment. (d) Environmental test specifications. (e) Shock test specifications. (f) Vibration test (if applicable). (g) Mil Standards envisaged. (h) Corrosion resistance. (j) Ingress protection. (k) Wire Harness Assembly. (l) ESD Protection. (m) User documentation.	
37.	What grade of cable/ internal wiring be used?	
38.	What type of cable entry gland will be used and which specification will be followed for testing?	
39.	What types of surface protection schemes/ paint schemes will be utilised?	
<u>Product Support and Maintenance</u>		
40.	Can you provide a separate standalone simulator for training? If yes what is the approximate cost of the simulator?	
41.	What are the capabilities of the simulator?	
42.	How many trainee and instructor nodes are included in one simulator package?	
43.	What are the envisaged facilities for product support of the SAVIOR-ASW?	
44.	What are the envisaged infrastructure requirements of the SAVIOR-ASW?	
45.	Are you willing to set up repair facilities in India or would the repair facilities be provided through an authorised service representative (if applicable)?	
46.	What is the operational life of the SAVIOR-ASW?	
47.	What are the warranty conditions of the SAVIOR-ASW? How long would it be valid? (hardware as well as software warranty)	
48.	To ensure Repair and Maintenance support, what is the proposed methodology for 'Operator (O)',	

<u>Ser</u>	<u>Specification/ Parameters/ Information Required</u>	<u>Information about proposed solution</u>
	Intermediate (I)' and 'Depot (D)' Level repairs and maintenance?	
49.	What is the preferred mode of Repair and Maintenance support - Engineering Support Package, Comprehensive Annual Maintenance Contract (including spares) (CAMC), Annual Maintenance Contracts (AMC) or Rate Repair Contracts (RRC)?	
50.	For how many years would support in terms of maintenance/ availability of spares be provided	
51.	What is the Mean Time Between Failure (MTBF) for the system?	
52.	What is the maximum duration the system can be operated continuously?	
53.	What is the type and depth of documentation that would be offered for training, operation and maintenance of the SAVIOR-ASW?	
54.	Is your company the OEM or authorised vendor of the equipment?	
55.	Indicate whether the equipment has been supplied by vendor to any other country and details thereof. (The differences between these versions of equipment and the equipment presently being offered may also be highlighted)	
56.	Indicate if the equipment has been offered to any other Governmental agencies within India and if so, unit price (without taxes/custom duties) and year in which it was supplied.	
57.	Indicate tentative delivery schedule for supply of the equipment after conclusion of contract.	
58.	If not OEM, provide details of MoU with foreign OEM or proof of partnership.	
59.	Is the OEM willing to provide IPR (in case foreign OEM)?	
60.	Turnover of your company for three financial years.	
61.	Other naval equipment being manufactured by your company?	
62.	Other naval equipment supplied by your company to the Indian Navy/ Indian Coast Guard?	

<u>Ser</u>	<u>Specification/ Parameters/ Information Required</u>	<u>Information about proposed solution</u>
63.	(In case of foreign OEM) is the foreign OEM willing to partner with an Indian firm for License production of the equipment in India? If yes, name of firm and exact scope license production?	
64.	(In case of foreign OEM) is the foreign OEM willing to Transfer of Technology of the equipment to an Indian firm? If yes, please elaborate upon exact scope of TOT.	
65.	Are you willing for Field Trial Evaluation of the equipment in India on a No Cost No Commitment basis?	

APPENDIX B- GENERAL QUESTIONNAIRE

- Q1. What are the planned equipment for launch and SAVIOR-ASW at Sea or Harbour?
- Q2. Broadly describe the envisaged Control Station of the SAVIOR-ASW and capabilities.
- Q3. The Control Station is required to have the capability to transfer raw and processed data to the existing Data Centre of *IN*. Interface details would be shared by *IN* during development phase. The feasibility of the same may be commented upon.
- Q4. Being an Autonomous Vessel, collision avoidance is a critical aspect to be incorporated in the vessel. Description of the collision avoidance system, algorithm used and details of testing undertaken/ planned be elaborated.
- Q5. Comment upon the redundancy aspects of mission critical modules/ subsystems to obviate mission failure due to a single point failure.
- Q6. What is the manpower required to operate the vessel in various configurations (including remote mode), including launching and recovery at sea/ harbour?
- Q7. How and where are the prototype trials proposed to be undertaken?
- Q8. What is the envisaged service life of the SAVIOR-ASW- ASW? Is there a requirement of major maintenance/ overhaul of the gliders during their service life?
- Q9. What arrangements (lifting appliances, stowage/ launch cradle etc) are envisaged/ required for lifting the SAVIOR-ASW on jetty for undertaking repairs? Deliverables that would be provided by the vendor to be highlighted.
- Q10. What are the envisaged arrangements/conditions for stowage of the SAVIOR-ASW when not in use?
- Q11. State the reliability and maintainability model and indicate percentage reparability of the system. The vendor to indicate willingness to undergo Maintenance Evaluation Trials at trial stage.

Q12. The feasibility of undertaking repairs by *IN* for general mechanical, electrical and electronic components be commented upon.

Q13. Are the vessels being built according to class specifications of a particular class?

Q14. What would be the likely cost of comprehensive AMC (AMC with spares) in terms of percentage of the cost of procurement?

Q15. What Quality Assurance (QA) methodologies are proposed to be deployed by the vendor during design, development, production and trial phases to ensure delivery of a completely reliable and fail safe operational platform?

Q16. What testing strategy is proposed to be used by the vendor to check the reliable operations of SAVIOR-ASW, given the fact that it is an Autonomous vessel?

Q17. A platform/system-centric QA approach is necessary for SAVIOR-ASW. In view of the same, vendor may specify which of the global best practices in QA methodology for design and development of Autonomous vehicle and Robotic systems are proposed to be incorporated and how would the same be proven by the vendor? QA requirements/ standards envisaged for various tests/ checks in respect of items/ components/ assemblies/ sub-assemblies/systems etc be brought out for the following: -

- (a) Qualification tests - Environmental and EMI/EMC tests.
- (b) Shock Test - when operating below waterline as well as above waterline.
- (c) Environmental Stress Screening (ESS).
- (d) Tests/ checks for the following to be mentioned: -
 - (i) Electrical checks and safety specifications.
 - (ii) Ship motion test.

- (iii) Switches and cables.
- (iv) Connectors and LED/LCD.
- (v) Soldered Electronic and Electrical assemblies.
- (vi) Burn-in/ Endurance tests.

Q18. In case large quantities are acquired in future, what will be the requirement to set up the ESP (Engineering Support Package)?

Q19. Vendor to bring out what special training/ courses and skills will be required by *IN* personnel to undertake repairs (both hardware and software based).

Q20. Please list out what equipment fit on the SAVIOR would be military grade and what would be commercial grade?

Q21. Please provide any other recommended quality standards for equipment fitted on the SAVIOR (only if equipment is not military grade).

Q22. How will the vendor carry out certification /demonstration of the various standards proposed by the vendor?

APPENDIX C - VENDOR INFORMATION

Q1. Indicate Name, Address and Unique ID (if any) of the Vendor/Company/Firm.

Q2. Furnish complete postal address, details of local office/ liaison office in Delhi area (if any)/ in vicinity. Details of single Point of Contact (PoC) for clarification of queries, if any.

Q3. The following details to be provided (relevant documents to be forwarded):-

- (a) Category of Industry (Large/ Medium/ Small Scale).
- (b) Annual Turnover in INR for last 03 financial years.
- (c) DPIIT certificate if startup.
- (d) Profit/ Loss Statement of the last 03 financial years.
- (e) Number of employees in firm.
- (f) Details of manufacturing infrastructure that would be useful for manufacturing the SAVIOR-ASW and its subsystems.
- (g) Production capacity per annum.
- (h) Details of earlier contracts with Indian Ministry of Defence/ Government agencies:-

Contract Number	Equipment	Quantity	Cost

Q4. Does the firm hold any certification by Quality Assurance Organisation? If yes, the following details to be furnished: -

Name of Agency	Certification	Applicable from (Date & Year)	Valid till (Date & Year)

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Q5. Does the vendor hold membership of FICCI/ ASSOCHAM or other industrial association? If so, name of the organisation, Membership Number and relevant certification to be provided.

Q6. Elaborate in detail upon the capability to indigenously design and develop the required equipment along with justification and documentary evidence. The following are to be specified: -

- (a) Is the design of the equipment and its software Indigenous?
- (b) Details of components that are envisaged to be imported and from where?
- (c) Also indicate willingness to share the Intellectual Property Rights (IPR) of the design.

Q7. What are the technologies currently available with the vendor that would be harnessed towards manufacturing of the SAVIOR-ASW and its associated subsystems and the extent of their availability or accessibility in case they are not available in India?

Q8. Is collaboration with one or more foreign/Indian firms envisaged to design and develop the system? If so, indicate the scope of collaboration and details of ToT envisaged.

Q9. Does the vendor have adequate infrastructure to develop, integrate, test and manufacture SAVIOR-ASW? If yes, provide details of the same. If no, what would be the timeframe for establishing the same?

Q10. What are the anticipated timelines for development of prototype post award of Project Sanction Order and production thereafter (specify timelines separately for each)? Indicate willingness to progress the prototype development under Make II and subsequent procurement under Buy (Indian IDDM) Scheme of DAP-2020.

Q11. What are the areas of uncertainty envisaged by the vendor in the design, development and production of the indigenous development of SAVIOR-ASW?

Q12. Indicate the overall level of indigenisation in the base vehicle and individually for the payloads that is envisaged to be achieved. Approximate breakdown of IC content (in percentage) for each of the sub systems is also to be provided. The procurement would eventually be under Buy (Indian-IDDMM), hence, the willingness to meet overall IC content of 50% as per DAP-20, may be confirmed.

Q13. Will the proposing company/ vendor also be manufacturing the production grade system? If not, what is the plan for production of the system post design and development?

Q14. Does the vendor have the ability to provide product support for complete life cycle of SAVIOR-ASW?

Q15. What Kind of support would be required for testing the equipment of SAVIOR-ASW ASW?

Q16. What kind of consort requirements are envisaged for testing the SAVIOR-ASW ?

Q17. Any other details which the vendor would like to bring before the Feasibility Study may be provided.

APPENDIX -D - STATEMENT OF COST OF PROTOTYPE DEVELOPMENT

Ser	Items	Qty	Imported components cost (i)	Indigenous components cost (ii)	Approximate Unit Cost in Rupees (i)+(ii)	Any other details Please mention specific IC content that will be achieved
A.	Cost of fully formed Basic SAVIOR-ASW	1				
B.	Land based Control Station	1				
C.	Cost of any special maintenance Tools or special test equipment	1				
D.	Project Monitoring and Admin costs	-				
E.	Cost of ToT if any	-				
F.	Any Other Costs (please specify head)					
Mission payloads (Add mission payloads as per proposal of the firm)						
G.						
H.						
	Total					

STATEMENT OF COST FOR PRODUCTION GRADE VERSION (QUANTITY REQUIRED - 16 NOS*)

Ser	Items	Qty	Imported Components Cost	Indigenous components Cost	Approximate Unit Cost in Rupees	Any Other Details
			(i)	(ii)	(i)+(ii)	
A.	Cost of Basic SAVIOR-ASW					
B.	Land Based Control Station					
C.	Mission payloads (please Add mission payloads as per proposal of firm)					
D.	Any other recommended payloads					
E.	Cost of Comprehensive AMC(AMC with spares) for 05 years					
F.	Cost of Documentation					
G.	Cost training by OEM for operators and maintainer's					
H.	Cost of Special Maintenance tools and special maintenance equipment					

I.	Cost of installation , Setting to work, HATs and SATs					
J.	Cost of integration with CMS					
K.	Any other costs					
Total						

* Note: The quantity indicated for production is only an indicative requirement and is not a firm commitment. The quantity has been provided so as to enable firms to arrive at economy of scale prior providing statement of cost of production version SAVIOR-ASW.

APPENDIX E - LIST OF CERTIFICATIONS

1.