

**QUESTIONNAIRE: DEVELOPMENT OF 30 kW SHIP BORNE LASER WEAPON
SYSTEM UNDER MAKE-I CATEGORY**

1. **Introduction.** The Ministry of Defence, Government of India, intends to procure 30 kW Ship borne Laser Weapon System (SLWS) through Make-I procedure of DAP-2020, as a new induction.

2. **Questionnaire.** The questionnaire is divided into following parts:-
 - (a) Part A - Description of Ship borne Laser Weapon System
 - (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.

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 SLWS

1. **System Composition.** The basic configuration of Shipborne Laser Weapon (30 kW), must include:-

- (a) Laser Source Output - 30 KW
- (b) Integral Radar for detection of incoming threats especially detection of mini/ micro drones of RCS 0.01 m²
- (c) Inbuilt RF Directional Finder
- (d) Active RF Jammer for control signals and positioning satellite signals
- (e) Integrated EO/IR Sensor with detection and tracking capability with 360⁰ coverage.
- (f) Laser Control System with associated director and thermal management unit
- (g) WCS/Operator Control Panel including Recording Unit.

SECTION I - OPERATIONAL REQUIREMENTS

2. Shipborne Laser Weapon (30 kW) should be capable of the following:-

- (a) **Target Engagement Capability.** Shipborne Laser Weapon with its integral equipment should be capable of detecting Mini/Micro drones (upto 0.01m² RCS) and engaging Mini/Micro drones / loitering munitions/ small boats.
- (b) **Weight.** Less than 8 Tonnes.

(c) **Shipborne Power Requirement.** The system should have either inbuilt power supply generation and supply equipment or be able to run on standard shipborne power supply.

(d) **Operating/Stowage Temperature.** Shipborne Laser Weapon should be capable of withstanding temperatures from -5°C to $+50^{\circ}\text{C}$ and relative humidity of 95% at 32°C .

(e) **Environmental Conditions.** It should be possible to exploit the system upto Sea State 3 and wind speed upto 35 Knots both during day and night. Shipborne Laser Weapon should meet environmental conditions as per latest MIL STD 810 G and meet shock requirements as per NSS II/equivalent.

3. **30 KW Laser Source.** The laser source should be capable of following:-

(a) **Beam Power Density.** More than 250 W/cm^2

(b) **Operation Time (Duty Cycle).** More than 20% over a given duration.

4. **EO/IR Sensor.** EO/IR sensor should be integral to the Shipborne Laser Weapon (30kW) should have 360° coverage and Detection, Recognition & Identification (DRI) ranges would be mutually decided.

5. **Integral Radar.** The integral radar should have detection and tracking capability with 360° coverage for aerial and surface target. The radar should have capability for detection and tracking of Mini/Micro drone (0.01m^2 RCS) as follows:-

(a) Detection range: 10 Km

(b) Tracking range: 8 Km

6. **RF DF/SIGINT.** The system should have capability to detect, intercept, triangulate/identify direction of drone's communication/ control signals between 2 to 6 GHz.

7. **Jammer**. The system should have ability to jam communication/ control signals, positioning satellite signals for drones at specified frequencies.

8. **Weapon Control System (WCS)**. The WCS should contain all controlling elements of the system. It should be capable of the following:-

(a) **General Features**.

(i) Capable of carrying out automatic weapon specific threat evaluation, target classification, prioritisation, engagement planning, generate fire control solution and assignment of targets to weapons with operator control.

(ii) Continuously assess the state of the entire Shipborne Laser Weapon (Low Power) including various shipboard interfaces and associated systems to provide the user with relevant data for optimum exploitation of the system.

(iii) Generation of the fire control solution including intercept range, details for firing of laser beam, dwell time, power output required and kill probability.

(iv) Engagement of multiple targets by assigning priority to targets.

(v) Display information of the status of all linked sensors and associated systems.

(vi) Perform Kill Assessment, to determine if additional power/dwell time on particular target is required on the same target.

(vii) Electronically steer the beam of the laser to intercept chosen targets at desired ranges in sea states upto 3.

(b) **Shipboard Interfaces**. The WCS should have feasibility to be interfaced with following ship's systems:-

(i) Log

- (ii) Gyro
- (iii) GPS
- (iv) INS
- (v) Combat Management System (CMS) and other Weapon and Sensors

(c) **Modes of Operation.**

(i) **Combat Mode.** This mode of operation is to undertake combat operations through WCS.

(ii) **Maintenance Mode.** This mode of operation is to undertake maintenance and health checks of the system. The system should have the capability for online and offline diagnostics upto PCB level and Power On Self Test (POST).

(iii) **Training/Simulation Mode.** This mode of operation is to undertake training of the crew.

(d) **Recording Unit.** Recording and logging of all operational activities using an internal Recording Unit (RU) connected to the system network. The RU should be capable of the following:-

- (i) Extracting data from the system network.
- (ii) Recording operator console data, EO/IR images/videos including synthetic data, display data of all displays and operator push button history.
- (iii) Time-tagging recorded data to allow time synchronisation with data from different sources.
- (iv) Maintaining a data base of recorded data to facilitate post-engagement analysis.
- (v) Playing back the entire engagement sequence.

- (vi) Generating reports for meaningful analysis of engagements and system operation.
 - (vii) It should have sufficient capacity for storage of multiple engagement sequences.
- (e) **Design**. The WCS should be of modular design and open architecture including Plug and Play feature to interface other user defined equipment/hardware. The Make I project envisages indigenous design of equipment and the same is to be confirmed in the response.
- (f) **Simulator**. The WCS should have an embedded simulator capable of generating various target scenarios for operator training. It should be capable of simulating target interception.
- (g) **Response Time**. The response time of the WCS from assignment of the target to engagement should be such that it is able to achieve threat neutralization prior reaching the desired minimum interception range and to the extent feasible and should not exceed the following:-
- (i) **System Readiness Time**. The system should be capable of being fully ready for an engagement within 03 min from cold start.
 - (ii) **Fire Control Solution**. Post detection, the system should not take more than 10s to generate the fire control solution.
 - (iii) **Time to Engage**. Post generation of the fire control solution, the system should be ready to engage the target in NMT 10s.
- (h) **EMI/EMC Hardening**. Comprehensive electro-magnetic compatibility with all equipment of the ship should be catered in the system. It should be provided with EMI shielding during transportation and stowage on board ship.
- (j) **Safeties**. System should cater for the provision of requisite safety switches.

19. **Service Life**. All critical components of the system should have a Service Life of at least 10 years.

20. **Transportation**. System should be transportable by air, rail, road and sea. Limits imposed, if any, are to be specified.

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 Ship borne Laser Weapon System
Directorate of Staff Requirements
IHQ MoD (Navy)
D Block
Defence Officers Complex
Africa Avenue
New Delhi - 110 023

APPENDIX A - TECHNICAL QUESTIONNAIRE

Ser	Specification/Parameters/ Information Required	Information About Proposed Solution
Operational Parameters		
1.	What is the proposed system composition? Please provide brief description and technical details	
2.	What is the power of laser source output?	
3.	What is the target engagement capability of laser in terms of range and height? Please provide brief description and technical details	
4.	What are the beam power density and duty cycle of laser weapon? Please provide brief description and technical details	
5.	What is the Beam Quality (BQ) of the laser? (BQ is a measure of how focused the beam)	
6.	What are the types of targets with RCS the system is envisaged to engage? Please provide brief description and technical details	
7.	What is the weight of the system? Please provide brief description and technical details	
8.	What are the power requirements of the system?	
9.	What are the capabilities of EO/IR sensor (Coverage and DRI ranges?)	
10.	What are the detection and tracking capabilities of the integral radar?	
11.	What are the dimensions and frequency band of radar operation?	
12.	What are the system capabilities of RF Directional Finder?	
13.	What are the system capabilities of jammer (jamming frequencies)?	
14.	What is the type of stabilisation employed in the system including the laser weapon?	
15.	What are the capabilities/features of Weapon Control System?	
16.	What is the multiple target engagement capability?	
17.	Does the system has capability to undertake kill assessment to determine additional power/dwell time on particular if required?	
18.	Does the system have feasibility to interface with ship's system?	
19.	What are the system's modes of operation?	

Ser	Specification/Parameters/ Information Required	Information About Proposed Solution
20.	Does the system has recording facility with playback feature?	
Quality Assurance		
21.	Which are the recommended Environmental Conditions and standards for testing?	
22.	What standards will be employed for Software quality assurance?	
23.	What standards would be employed for EMI/EMC checks?	
24.	What are the recommended Environmental Stress Screening Tests (ESS).	
25.	How would the Configuration Management (CM) be executed?	
26.	<p>What are the specifications of the system being followed with respect to:-</p> <ul style="list-style-type: none"> (a) Design of equipment. (b) Reliability of equipment. (c) Ergonomics of equipment. (d) Environmental test specifications. (e) Shock test specifications. (f) User documentation. (g) Ingress Protection. (h) Wire harness assembly (j) ESD protection. 	
Product Support and Maintenance		
27.	Can you provide a separate standalone simulator for training? If yes what is the approximate cost of the simulator?	
28.	What are the capabilities of the simulator?	
29.	How many trainee and instructor nodes are included in one simulator package?	
30.	What are the envisaged facilities for product support of the SLWS?	
31.	What are the envisaged infrastructure requirements of the SLWS?	
32.	Are you willing to set up repair facilities in India or would the repair facilities be provided through an authorised service representative (if applicable)?	

Ser	Specification/Parameters/ Information Required	Information About Proposed Solution
33.	What is the operational life of the SLWS?	
34.	What are the warranty conditions of the SLWS? How long would it be valid? (hardware as well as software warranty)	
35.	To ensure Repair and Maintenance support, what is the proposed methodology for 'Operator (O)', Intermediate (I)' and 'Depot (D)' Level repairs and maintenance?	
36.	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)?	
37.	For how many years would support in terms of maintenance/ availability of spares be provided	
38.	What is the Mean Time Between Failure (MTBF) for the system?	
39.	What is the maximum duration the system can be operated continuously?	
40.	What is the type and depth of documentation that would be offered for training, operation and maintenance of the SLWS?	
41.	Is your company the OEM or authorised vendor of the equipment?	
42.	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)	
43.	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.	
44.	Indicate tentative delivery schedule for supply of the equipment after conclusion of contract.	
45.	If not OEM, provide details of MoU with foreign OEM or proof of partnership.	
46.	Is the OEM willing to provide IPR (in case foreign OEM)?	

Ser	Specification/Parameters/ Information Required	Information About Proposed Solution
47.	Turnover of your company for three financial years.	
48.	Other naval equipment being manufactured by your company?	
49.	Other naval equipment supplied by your company to the Indian Navy/Indian Coast Guard?	
50.	(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?	
51.	(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.	
52.	What grade of material will be utilised for component/ sub assembly (MIL/Marinised/Industrial etc) of command, control and communication system?	
53.	What grade of cable/ internal wiring be used?	
54.	What type of cable entry gland will be used & which specification will be used followed for testing?	
55.	What type of cable entry gland will be used and specification followed for testing?	
56.	What type of surface protection schemes/ paint schemes will be utilised?	
57.	What types of redundancy for critical system will be incorporated?	

APPENDIX B- GENERAL QUESTIONNAIRE

- Q1. What is the manpower required to operate the system?
- Q2. How and where are the prototype trials proposed to be undertaken?
- Q3. What is the envisaged service life of the SLWS?
- Q4. What arrangements (lifting appliances, stowage, etc) are envisaged/required for operating from *IN* ships? Deliverables that would be provided by the vendor to be highlighted.
- Q5. What are the envisaged arrangements/conditions for stowage of the SLWS when not in use?
- Q6. State the reliability and maintainability model and indicate percentage reparability of the system.
- Q7. The feasibility of undertaking repairs by *IN* for general mechanical, electrical and electronic components be commented upon.
- Q8. What would be the likely cost of comprehensive AMC (AMC with spares) in terms of percentage of the cost of procurement?
- Q9. 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?
- Q10. What testing strategy is proposed to be used by the vendor to check the reliable operations of SLWS, given the fact that it is an automated system?
- Q11. A platform/system-centric QA approach is necessary for SLWS. In view of the same, vendor may specify which of the global best practices in QA methodology 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.

Q12. Vendor to bring out what special training/courses and skills will be required by *IN* personnel to undertake repairs (both hardware and software based).

Q13. Please list out what equipment fit on the SLWS would be military grade and what would be commercial grade?

Q14. Please provide any other recommended quality standards for equipment fitted on the SLWS (only if equipment is not military grade).

Q15. How will the vendor carry out certification /demonstration of the various standards proposed by the vendor?

Q16. What are the likely timeline for undertaking Design and Development of the SLWS? Please indicate major milestones of the timeline in following format.

<u>Ser</u>	<u>Timeline (T₀ = Placement of PSO)</u>	<u>Milestone</u>
(a)	T ₀ +__ weeks	

Q17. What is the likely timeline for providing deliveries of the system? Please indicate proposed delivery timeline in following format.

<u>Ser</u>	<u>Timeline (T_0 = Placement of Contract)</u>	<u>No of SLWS</u>
(a)	$T_0 + \underline{\hspace{1cm}}$ weeks	

Are you willing for Single Stage composite Trials of the equipment in India on a No Cost No Commitment basis?

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 SLWS 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)

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 SLWS 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 as well as components/ sub-assemblies planned to be sourced from outside.

Q9. Does the vendor have adequate infrastructure to develop, integrate, test and manufacture SLWS? 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 SLWS?

Q12. Indicate the overall level of indigenisation in the SLWS and individually for the sub-systems 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-IDD), 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 SLWS?

Q15. What kind of support would be required for testing the equipment of SLWS?

Q16. What kind of consort requirements are envisaged for testing the SLWS?

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

Q18. *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)

Q19. *Are* you partner with an Indian firm for License production of the equipment in India? If yes, name of firm and exact scope license production? Is the OEM willing to provide IPR (in case ToT with foreign OEM)?

Q20. *Please* provide details of other equipment that is being designed and developed by your company for Navy/Coast Guard/Airforce or Army.

Q21. *If* the proposal is being forwarded as a consortium or AoP please provided details of all the participants and who will be the lead agency? In such a case who will be the final production partner? What is the likely workshare envisaged between all agencies.

APPENDIX -D - STATEMENT OF COST OF PROTOTYPE DEVELOPMENT

Ser	Items	Qty	Imported components cost	Indigenous components cost	Approximate Unit Cost in Rupees	Any other details Please mention specific IC content that will be achieved
			(i)	(ii)	(i)+(ii)	
A.	Cost of fully formed Basic SLWS	1				
B.	Cost of associated equipment (specify each line item)	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 (<i>please specify head</i>)					
Total						

STATEMENT OF COST FOR PRODUCTION GRADE VERSION (QUANTITY REQUIRED - 15 SYSTEMS*)

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 SLWS					
B.	Cost of associated equipment (specify each line item)					
C.	Cost of Comprehensive AMC(AMC with spares) for 05 years					
D.	Cost of Documentation					
E.	Cost training by OEM for operators and maintainer's					
F.	Cost of Special Maintenance tools and special maintenance equipment					
G.	Cost of installation , Setting to work, HATs and SATs					
H.	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 SLWS.

