

**Expression of Interest**  
**Transfer of Technology (ToT) of**  
**MAAREECH - ADVANCED TORPEDO DEFENCE SYSTEM**  
**(Maareech-ATDS)**

**1. Introduction**

NPOL, Kochi, a premier laboratory under Defence R&D Organisation invites Expression of Interest (EOI) from Indian manufacturers having sufficient experience, expertise and willingness to undertake the role of Lead System Integrator (LSI) of Maareech Advanced Torpedo Defence System (Maareech-ATDS) for Naval Platforms. The MAAREECH system is used to detect, classify and offer countermeasures against an impending torpedo attack on the ship equipped with Maareech. Maareech system consists of mainly four subsystems i.e. Wet end system, Winch System, On-board Electronics and System Software.

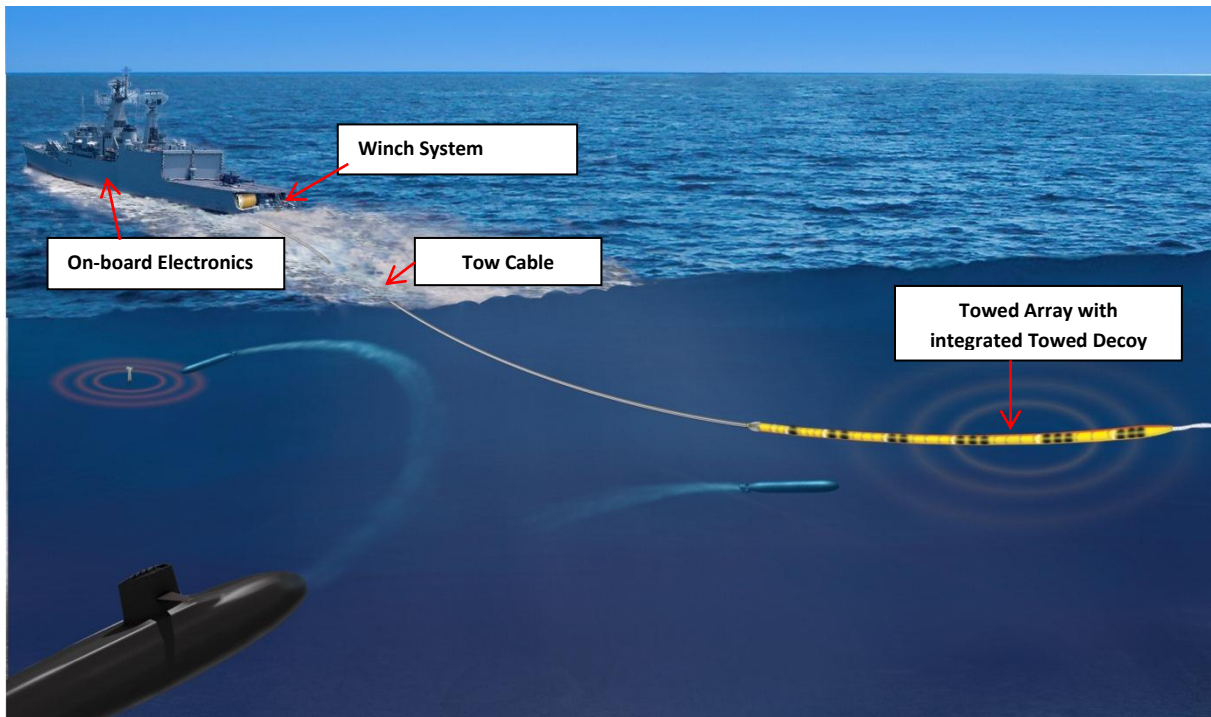


Fig.1. Scheme of MAAREECH Advanced Torpedo Defence System

The Wet End System consists of different modules of sonar arrays such as the main array for detection, L/R ambiguity resolution array, Towed decoy module, fiber optic conversion module, tow cable and tail rope for inducing drag. The tow cable gets attached to the Winch system which is used for Deployment, Retrieval and Stowage of the wet end. It has multiple modes of operation, various safety interlocks and remote operation capability. Data is received at Onboard electronics by fibre optic telemetry from Array to winch, and by electrical telemetry from winch onwards. The on-board electronics comprise of specific hardware modules for signal processing and display, data recording and data sharing with

fire control system. The system uses Hull Mounted Sonar sensor data also for torpedo detection. The system software which resides on the on-board hardware modules implements advanced signal processing algorithms for torpedo detection, classification and decoying of torpedoes. Technical Specifications are enclosed at Annexure 'A'

## **2. Responsibilities of System Integrator**

MAAREECH ATDS is a multidisciplinary sonar system which demands implementation of technologies in various domains such as transducers, mechanical engineering, ocean engineering, electrical and electronics engineering, power electronics and software. The purpose of this EOI is to identify potential Lead System Integrators (LSI) for MAAREECH ATDS. The scope of TOT, after completing all official formalities, will be restricted to system level configuration, integration and specifications, interface controls, supply chain and Bill of Materials, Acceptance Test procedure for subsystems and components, software and hardware integration procedures, binding data for installation, performance validation criteria and system maintenance tips. Responsibilities of Lead System Integrator are further elaborated in the succeeding sections.

### **2.1 Act as a single point contact between the Indian Navy/NPOL**

- a. The sub-systems of MAAREECH ATDS has been developed through specialised Industries through a consortium mode of development approach. The selected LSI should maintain the existing supply chain for all major subsystems as per NPOL's recommendations.
- b. Detailed Specifications, Quality policy / program for component level to system level, ATP, FAT's, HAT's and SAT's documents and BOM will be provided in the TOT documents.
- c. The LSI will field MAAREECH ATDS against RFP from Indian Navy/other sources by submitting Technical, commercial and price bids appropriately.
- d. Once a Supply order is placed on the Lead System Integrator (LSI), the LSI will execute the order within the stipulated time frame and budget by liaising with the sub-system manufacturers for realising the hardware, strictly adhering to the supply chain given in the TOT documents, and by integrating software as per procedure.

### **2.2 Organising QT/ET/ATP at the premises of sub-system manufacturer**

- a. System Integrator has to organise QT/ET at the manufacturers end as per sub-system acceptance document provided in the TOT document.

- b. System Integrator has to conduct FAT's at the manufacturers end as per sub-system Factory acceptance document provided in the TOT document before despatch of sub-system for system Integration
- c. System integrator will ensure the presence of competent authority responsible for Quality assurance during all inspection stages.

### **2.3 System Integration at own factory before despatch to the destination**

- a. Before despatch to destination Onboard electronics and wet end subsystems of MAAREECH ATDS have to be Integrated and evaluated as per FAT's document issued along with TOT Document at the own factory premises of System Integrator.
- b. All facilities essential for conduct of System Integration will be organised by the system Integrator.
- c. System integrator will ensure the presence of competent authority responsible for Quality assurance and inspection.

### **2.4 Installation On-board designated Platforms**

- a. System integrator will carry out the installation of MAAREECH ATDS on-board Naval Ship identified by Navy/NPOL. System integrator will be responsible for survey of the Ship and association with board of officers nominated for the Siting board for installation of MAAREECH ATDS
- b. System integrator will prepare all necessary installation drawing specific to the designated Naval Ship.
- c. System integrator will transport all the sub-system to the harbour identified for the installation of MAAREECH ATDS.
- d. System integrator will ship-in all the necessary sub-systems and carry out the installation and Integration on-board the designated Naval Ship.
- e. System integrator is responsible for Laying of power cables, junction boxes and control panels required for system integration. System integrator has to procure all the necessary accessories for the same.
- f. System integrator is responsible for Air-conditioning, lighting and ventilation at the area where subsystems of MAAREECH ATDS are installed. Air conditioning includes cooling of cabinets for On-board electronics.
- g. System integrator is responsible for Providing False roof, Wall panelling and flooring at the area of installation as per Ship standard.
- h. System integrator is responsible for Plumbing works to make available fresh water and sea water necessary for system operation

- i. System integrator will carry out the installation as per procedure, safety norms and security norms of ship.
- j. System integrator will ensure the presence of competent authority responsible for Quality assurance throughout the installation procedure and will be responsible for completing installation inspection by the competent authority.

## **2.5 Conduct HATs and SATs**

- a. System integrator will organise the conduct of HATs and SATs post-installation as per Documents provided during TOT.
- b. System integrator will ensure the presence of competent authority responsible for HATs and SATs.

## **2.6 Post Installation support like routine and preventive maintenance, AMC etc.**

- a. System integrator will carry out Post Installation support like routine and preventive maintenance, AMC etc. of the MAAREECH ATDS on the platform in which the MAAREECH ATDS is installed.
- b. The responsibility of the entire "Product Life Cycle Support" lies with the Lead System Integrator.

## **3. TOT TERMS**

1. As per DRDO Guidelines for Transfer of Technology (TOT), the first TOT will normally be given to the industry associated during development on priority so as to ensure high quality of manufacture within the limitations in hand-holding support of DRDO.
2. As more than one industry was involved in the realisation of the various sub-systems during the development of MAAREECH ATDS, the supply chain established by NPOL should not be disturbed by the industry that is nominated as the lead system Integrator.
3. TOT will be given on non-exclusive basis only. The number of license on non-exclusive basis will be restricted. However, additional licence if required will be given by DRDO on need basis. The intellectual property rights shall always remain with DRDO.
4. The amount and payment stages of TOT fee will be as prescribed by DRDO.
5. Royalty fee @ 2% of the annual sales to Indian Govt. Estt, Armed Forces and @ 6% of the annual sales to Export Market.

6. Technical assessment of the industries submitting EOI's will be carried out by a Technical assessment committee for verification of the technical and financial capability/capacity of the industry.
7. Eligible parties will have to sign Confidentiality & Non-Disclosure Agreement (CNDA) with DRDO for technical discussion including specifications, following which they shall be considered for giving Transfer of Technology (TOT) on non-exclusive basis.
8. TOT to industry will be given based on their manufacturing capability, assurance on quality and capacity of production apart from other terms and conditions.
9. The licencing agreement for transfer of technology (LATOT) which is to be signed will be as per the template approved by Department of Legal affairs. Ministry of Law and Justice.
10. DRDO shall have the march-in rights to use the IP for its own use in the interest of the Govt. of India without any restrictions, irrespective of the nature of licence granted.
11. The firm expressing interest should be technically sound to Procure/manufacture, supply, install, Integrate and maintain the system with requisite quality standards. Domain knowledge in installation, integration and maintenance of deployable underwater systems onboard naval ships is considered to be essential for satisfactory completion of system commissioning and sea trials.

#### **4. EOI TERMS**

Interested Industries may write along with their company profile, financial & technical capabilities etc. as per the following format to Director, NPOL, Kochi and copy to Director DIITM on the following addresses within 45 days of this advertisement.

**Director, NPOL**

DRDO, Min. of Defence,  
Thrikkakara P.O.  
Kochi-682021  
Contact No - 0484 2424878  
FAX : 0484-2424858  
Email: [director@npol.drdo.in](mailto:director@npol.drdo.in)

**Director, DIITM**

Room No 446 DRDO Bhawan  
DRDO HQrs Ministry of Defence  
Rajaji Marg New Delhi – 110011  
Contact No - (011) 23016216 / 23007446  
FAX No. 011-23793008

- a) Memorandum and Articles of Association (Should be incorporated as per Indian Companies Act, 1956)
- b) Certificates of registration as a manufacturing unit, if any.
- c) Balance Sheet for the preceding three years.
- d) Income Tax returns for the preceding three year period

- e) Details of shareholding/ownership pattern especially foreign partners/ shareholders, foreign employees, directors, etc. The company must adhere to the prevailing Govt. of India policies and regulations on Foreign Direct Investment (FDI).
- f) Annual budget for R&D during last three years.
- g) Numbers and details of IPR or patents etc. held by the company.
- h) Number of technically or professionally qualified personnel.
- i) Record of past performance (e.g. Supply orders executed against Ministry of Defence orders, public sectors and paramilitary forces, if any).
- j) Availability of adequate infrastructure (List of machines and their production capacities) and technical expertise.
- k) List of Testing and Support equipment.
- l) ISO/ ISI certification or any other certification
- m) Relevant clearances from the authorities/ ministries (if any)
- n) Capacity and capability to undertake developmental work and to accept attendant financial and commercial risks.
- o) Capacity/Capability to market the product through the marketing network, sales and service network, reliability to maintain confidentiality.

**TECHNICAL SPECIFICATION**

**MAAREECH - ADVANCED TORPEDO DEFENSE SYSTEM (Maareech-ATDS)**

**1. Introduction**

“Maareech” is an Advanced Torpedo Defence System (ATDS) for surface ships. Maareech ATDS is capable of providing reliable defence mechanism against a possible torpedo attack by vintage as well as modern torpedoes. Maareech system has both torpedo detection and countermeasure capability. Core functions include automatic detection, tracking and alert of incoming torpedoes and decoying of acoustic homing torpedoes.

**2. System Configuration**

The MAAREECH system is used to detect, classify and offer countermeasures against an impending torpedo attack on the ship equipped with Maareech. The system consists of a linear towed receiver array with appropriate length for the detection of torpedo signatures, towed decoy module for decoying of torpedoes, tow cable, a hydraulically operated winch system for handling the array and tow cable, Hull mounted Array sensor data interface and on-board electronics and system Software for signal processing, display & recording of sonar information (Fig. 1). Brief of each of these subsystems is given in the following sections.

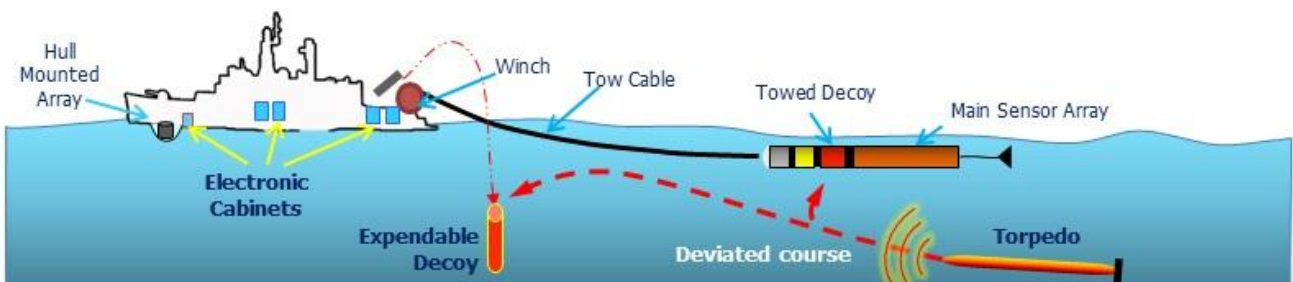


Fig. 1. Schematic diagram of MAAREECH Advanced Torpedo Defence System

**2.1 Towed Array**

This is a system which comprise of various modules arranged in a linear manner interconnected by underwater connectors. Each module has components housed inside a polyurethane hose. Typically a module has an array of hydrophones spaced as per frequency range, capable of detection, L/R ambiguity resolution, decoying by Towed Decoy and Fibre Optic conversion module for telemetry.

**2.2 Tow Cable**

Tow Cables are electro-optic-mechanical cables having electrical lines, Fiber optic lines, strength members and steel armour. Tow Cable is the life line of Towed Array Sonar, which connects the linear array which is towed behind the ship with the onboard electronics, through the winch system interfaces. The tow cable execute the roles of transferring the operational tow load (drag force) to the winch, transferring power supply to the arrays and providing a data telemetry link and control the depth of operation of the array. Typical length of tow cable is 500m

**2.3 Winch System**

The sonar winch is used for winding, unwinding and stowage of the array and cables. The winch is primarily hydraulically operated, and can be operated in electric mode in emergency (Fig. 2). A winch

control console located adjacent is used to control and monitor the operations of the winch. The system is embedded with various interlocks and safety features which facilitates even remote operation from sonar room.



Fig.2. Cable and Array wound on Winch



Fig. 3. Display Cum Processor Cabinet

## 2.4 Onboard Electronics (OBE)

This subsystem receives the data through a fibre optic data link from the array. The OBE executes all the processing on the data received and presents the sonar information in twin displays using state of art HMI schemes. Display cum processor cabinet houses processing electronics and displays. (Fig. 3). The displays have multiple pages that can be changed by the operator as required. The OBE also provides interfaces with existing Hull Mounted Array. The Digital Data Recorders (DDR) can be used to record sonar data, replay pre-recorded data and even plug in test data to the OBE for evaluation and training.

The data from the OBE is interfaced with Fire Control System to facilitate seamless triggering of expendable Counter measures. The Contact Motion Algorithm is used to predict the motion of incoming Torpedo.

## 3. MAAREECH ATDS Subsystem Parameters

Details of major subsystems of Maareech are given below

### 3.1 Wet-end subsystem

Maareech wet end subsystem comprise of the following

- a) Towed Receiver Array
- b) Towed Left Right Ambiguity Array
- c) Towed Decoy Module
- d) Fibre Optic (Conversion) Module (FOM)
- e) Tail Rope
- f) Electro - mechanical Connectors
- g) Tow Cable integrated with FOM.

The Towed Array modules have typical diameter of 78mm and cumulative length of approximately 40m. The various elements are housed inside a flexible PU hose and is filled with a fluid. The modules



are interconnected using electro mechanical connectors. The Tow cable is terminated to FOM at the towed array end and Winch Rotor box at the winch end.

### **3.2 Winch subsystem**

Maareech winch subsystem comprise of the following

- a) Hydraulic Winch with secondary Electric drive
- b) Hydraulic Power Pack
- c) Control Valve Desk
- d) Winch Master Control
- e) Opto-Electrical Conversion Module
- f) Electrical Slip ring
- g) Load Sensing Unit
- h) Fair Lead Assembly
- i) Winch Remote Control

The system is designed for stowage of 500m tow cable and Towed Array. The Winch system can withstand up to 8000 kgf line pull. Maximum speed is 18 rpm. The system has various safety interlocks for preventing unintended operations. The Spooler system has auto and manual modes, has adjustable arrangements for passage of tow cable and towed array, and can be engaged/ disengaged easily. The system supports remote operation from Sonar Room.

### **3.3 Onboard Electronics sub system**

Maareech Onboard electronics subsystem consists of the following

- a) Display cum Processor cabinet (DcP)
- b) Power Supply Cabinet
- c) Hull Mounted Array (HMA) Interface Cabinet
- d) Digital Data Recorder (DDR)
- e) Isolation Transformer (IT)
- f) Automatic Change Over Switch (ACOS)
- g) Various Junction Boxes

The Display cum processor cabinet houses complete processing electronics of Maareech. Data is presented onto twin displays. Keyboard and Trackball interfaces are provided. Power supply is adapted for ship supply through Automatic Change over Switch and Isolation Transformer. The power supply and signals are distributed through various junction boxes fitted at different locations of the platform. HMA interface cabinet extracts pre amplified sensor data and converts it into Ethernet format for further processing at DcP. Ethernet links are used for Data and Control telemetry.

### **3.4 Software**

The System software which resides on the on-board hardware modules implements advanced signal processing algorithms for torpedo detection classification and counter measures in active and passive mode. Exclusive rights for software will remain with NPOL.