DRDO NEWSLETTER

A Monthly Bulletin of Defence Research and Development Organisation

ISSN: 0971-4391

www.drdo.gov.in

SEPTEMBER 2020 | VOLUME 40 | ISSUE 09

# ANTI-TANK GUIDED MISSILE DHRUVASTRA TESTED SUCCESSFULLY

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SEPTEMBER 2020
VOLUME 40 | ISSUE 09
ISSN: 0971-4391



**40th Year of Publication**

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# ANTI-TANK GUIDED MISSILE DHRUVASTRA TESTED SUCCESSFULLY

## *Dhruvastra is designed to destroy tanks, armoured vehicles and bunkers.*

Anti-tank Guided Missile Dhruvastra developed by DRDO was successfully flight tested on 15 and 16 July 2020 from Integrated Test Range (ITR), Chandipur in Odisha. The trials of the missile were carried out with a static launcher under simulated conditions.

The helicopter launched Dhruvastra is equipped with Imaging Infra Red (IIR) seeker and operates in "lock on before launch" mode. The fire and forget missile is capable of engaging targets up to 4 km range.

The missile can engage targets both in direct hit mode as well as top attack mode. The all weather capability of the missile has been tested under severe weather conditions including summer desert conditions.

Extreme precautionary measures such as social distancing, sanitization of all facilities, use of masks and sanitizers, shield and Personal Protective Suits were taken during the testing.

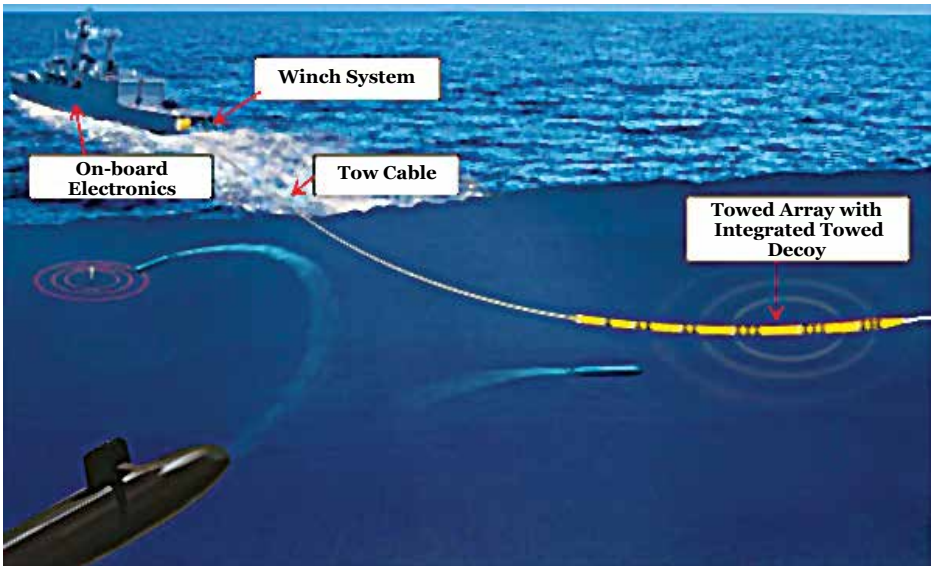
**Anti-tank Guided Missile Dhruvastra**

# NAVY INDUCTS INDIGENOUSLY DEVELOPED TORPEDO DECOY SYSTEM

Anti-Submarine Warfare capability of the Indian Navy received a major boost with the conclusion of a contract for Advanced Torpedo Decoy System (ATDS) 'Maareech' capable of launch from all frontline warships of Indian Navy. The decoy system has been designed and developed indigenously by DRDO's Naval Systems and Materials (NS&M) cluster lab Naval Physical & Oceanographic Laboratory (NPOL), Kochi. Naval Science and Technological Laboratory (NSTL), the other naval laboratory in the NS&M cluster, has developed the expendable decoy counter measure system, which is integrated with the Maareech system.

Maareech ATDS is capable of providing reliable defence mechanism against a possible torpedo attack by vintage as well as modern torpedoes. The system has both torpedo detection and countermeasure capability. Its functions include automatic detection, tracking and sounding alert of incoming torpedoes, and decoying of acoustic homing torpedoes.

Bharat Electronics Limited, a Defence PSU, would undertake the production of this decoy system. The prototype of the system installed onboard a nominated naval platform had successfully completed all user evaluation trials and demonstrated the capabilities of the system as per the stringent Naval Staff Qualification Requirements. Maareech features are at par with the global torpedo defence systems; Maareech system possesses detection and decoying capabilities superior to that of global systems. Also, being totally indigenous, continuous support of DRDO and Indian industry is available for up gradation of capabilities based on new requirements arising out of tactical missions.




**Maareech ATDS—Schematic**

**Maareech ATDS (L to R): Fire Control System, Decoy and Expendable Decoy**

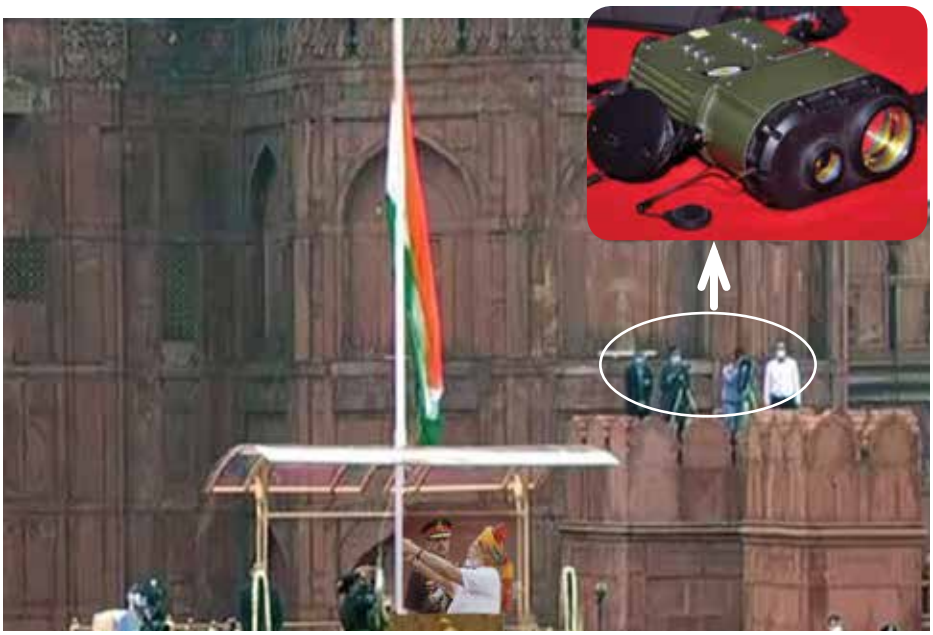
This induction not only stands testimony to the joint resolve of the Indian Navy and DRDO towards indigenous development of Defence technology, but is also a major fillip to the Government's 'Make in India' initiative and the country's resolve to become 'Atmanirbhar' in niche technology.

# LASTEC SYSTEMS DEPLOYED AT RED FORT FOR INDEPENDENCE DAY SECURITY

The short-range Optical Target Locator, and Tripod Mounted Laser Dazzler developed by DRDO's Laser Science and Technology Centre (LASTEC), Delhi, were deployed at Red Fort during Independence Day Celebration on 15 August 2020 for Prime Minister's security and area sanitisation during his speech from the rampart of the Red Fort. The devices were deployed to counter possible electro-optical threats from frontal build-up area.

Optical Target Locater 600 is used for detection of any passive or active surveillance devices like binoculars, day sights, night vision devices, CCD cameras, etc. This gives a tactical advantage to the user in deciding defensive or offensive action. Technology has been transferred to the industry.

Tripod Mounted Laser Dazzler is a non-lethal anti-personnel weapon system for crowd control applications. Bright radiation from the system causes credible glare in eyes leading to immediate but temporary functional capability degradation. The system has been realised using indigenously developed laser projection system, which comprises high speed x-y mirror-based scanning mechanism.



**Prime Minister hoisting the tricolor. Inset: OTL 600**

# DRDO LAUNCHES DARE TO DREAM 2.0 CONTEST FOR INNOVATORS & START-UPS

DRDO launched its innovation contest 'Dare to Dream 2.0' on the 5th death anniversary of former President of India and Secretary DDR&D, SA to RM and DG DRDO, Dr APJ Abdul Kalam. Dr Kalam, also known as missile man, had the vision of self-reliance. The scheme is being launched to promote individuals and start-ups for innovation in defence and aerospace technologies in the country.

The winners will be decided after due evaluation by an expert committee. Award money, up to ₹ 10 lakh for start-up and ₹ five lakh for individual category, will be given to the winners.

Raksha Mantri Shri Rajnath Singh announced the contest and praised DRDO for promoting 'Atmanirbhar Bharat' call given by Prime Minister Shri Narendra Modi.

# COVID-19 TESTING FACILITY ESTABLISHED AT DIHAR LEH

DRDO established a Covid-19 testing facility at its Leh-based laboratory Defence Institute of High Altitude Research (DIHAR) to enhance the rate of testing to identify the Corona cases in the Union Territory of Ladakh. The testing facility will also help in keeping close watch of the infected persons. The facility meets the safety standards and guidelines of Indian Council of Medical Research (ICMR). The centre was inaugurated by Lieutenant Governor of Ladakh, Shri RK Mathur on 22 July 2020.

The testing facility at DIHAR is capable of screening 50 samples per day. The facility can also be utilized for training manpower for Covid testing and will be of great help to address future bio-threats and carrying out R&D activities pertinent to agro-animals diseases.

In his address, LG Shri RK Mathur lauded the efforts of DRDO in fighting Covid 19 and thanked Dr G Satheesh Reddy, Secretary, Department of Defence R&D & Chairman DRDO for making this facility available at DIHAR. He expressed hope that the facility will help in the treatment of infected persons.

The Lieutenant Governor also inspected the testing facility. He was briefed about the bio-safety aspect of the testing facility and precautionary measures to minimize cross-contamination and safety of researcher, health professionals and the environment.

Dr OP Chaurasia, Director DIHAR, Brig JB Singh Commandant, Dr Padma Gurmet, Director, NRISR, Leh, Dr Mutup Dorjey, CMO, along with his team of doctors from SNM Hospital, Leh and other senior army officials and DRDO scientists were present on the occasion.

DIHAR is one of the life sciences laboratories of DRDO working on cold arid agro-animal technologies. The laboratory is screening and identifying the medicinal and aromatic plants to exploit them for use for defence purposes and also on greenhouse technologies for high altitude and cold desert areas.


**Inauguration of Covid Testing Lab at DIBER Leh**

# DRDO'S 500 BED COVID HOSPITAL INAUGURATED IN PATNA

A 500 bed Covid Hospital with 125 ICU beds, set up by DRDO in Patna was inaugurated on 24 August 2020 by Shri Nityanand Rai, Hon'ble Union Minister of State for Home Affairs. The hospital located in the newly constructed ESIC Hospital at Bihta, has been built on the lines of the 1000 Bed Sardar Vallabhbhai Patel Hospital at Delhi Cantonment built by DRDO.

Prime Minister's Citizen Assistance and Relief in Emergency Situations (PM CARES) Trust has allocated funds for the hospital. Another such hospital will be set up in Muzaffarpur. The infrastructure facilities for the hospital include the already existing seven storied ESIC hospital with power, air conditioning, water supply, fire fighting and power backup, Oxygen piping to each bed, lifts and morgue.

DRDO has provided infrastructure for the hospital such as the Administrative Block including doctor's room, triage area, visitors area and reception, ICU beds with ventilators, 125 monitors, 375 normal beds, 10 kl Cryogenic Liquid Medical Oxygen Vessel, Oxygen supply to every bed, PPE kits and sanitizers, CCTV Surveillance System, housekeeping services including consumable items, pharmacy, medical pathology lab, catering services, laundry services, ambulance service, Computerized Hospital Management System, Professional Manning & Maintenance Staff for specialised services like electrical system, air conditioning system, DG sets, etc.

Doctors, nurses, and other supporting medical staff, etc., for the hospital have been arranged by the Directorate General Armed Forces Medical Services (DGAFMS). Bihar Government will provide free of cost facilities such as 2 lakh lt of water per day, 6 MVA electric supply and security arrangements for the hospital.

**Shri Nityanand Rai, Hon'ble Union Minister of State for Home Affairs inaugurating DRDO's 500-bed Covid Hospital in Bihta, Bihar**

# DRDO IDENTIFIES 108 SYSTEMS & SUB-SYSTEMS FOR INDUSTRY TO DESIGN, DEVELOP & MANUFACTURE TOWARDS ACHIEVING ATMANIRBHAR BHARAT

Responding to the clarion call given by Hon'ble Prime Minister for "Atmanirbhar Bharat", DRDO has taken several initiatives to strengthen the indigenous defence ecosystem. DRDO apprised Raksha Mantri Shri Rajnath Singh on 25 August 2020 about 108 systems and sub-systems for the development by the Indian Industry only. This initiative will pave the way for Indian Defence industry to develop many technologies towards building an Atmanirbhar Bharat.

DRDO will provide support to industries for design, development and testing of these systems on requirement basis. All the requirements of these systems by R&D establishments, Armed Forces, and other Security Agencies can be met through development contracts or production orders on suitable Indian industry. This will allow DRDO to focus on design & development of critical and advanced technologies and systems.

DRDO has been partnering with industry for realization of its systems. Organisation's collaboration with Indian industry has matured to a stage where the industries can develop systems on their own. Indian industry has progressed from a 'build to print' partner to 'build to specification' partner.

The present industry base for DRDO consists of 1800 MSMEs along with DPSUs, Ordnance Factories and large scale industries. DRDO has already taken major initiatives through various policies to involve Indian industry as Development-cum -Production Partners (DcPP), offering its technology to industry at nominal cost and providing free access to its patents.

This initiative will support the fast growing Indian defence industrial ecosystem and will help the industry to contribute towards Atmanirbhar Bharat in a big way.

## INDEPENDENCE DAY CELEBRATIONS

Electronics and Radar Development Establishment (LRDE), Bengaluru, celebrated 74th Independence Day with great enthusiasm. Shri P Radhakrishna, OS & Director, LRDE hoisted the Flag and addressed the gathering.

**Shri P Radhakrishna, OS & Director, LRDE addressing the employees on the occasion of Independence Day**

Naval Materials Research Laboratory (NMRL), Ambernath, celebrated 15th August with a nationalistic spirit. The celebrations commenced with hoisting of National Flag by Dr M Patri, Director, NMRL. Dr Patri deliberated about the progress made and technologies developed by the NMRL. He motivated young scientists to undertake new and challenging projects that would enhance the strength and capabilities of the country. He also emphasised on developing niche technologies relevant to Indian Navy.


**Flag hoisting on Independence Day at NMRL**

# DESIDOC CELEBRATES LIBRARIAN'S DAY

August 12th is celebrated every year in India as National Librarian's Day in remembrance of Dr SR Ranganathan (1892-1972), known as the father of the Library Science in India. Defence Scientific Information and Documentation Centre (DESIDOC) paid her homage to the father of the library science by organising a webinar on Research Data Management. Dr ARD Prasad, former Professor at Documentation Research and Training Centre (DRTC), Bengaluru delivered a lecture on "Open Data and Research Data Management." Shri R Appavuraj, Chairman, Centre for Personnel Talent Management (CEPTAM), Delhi, was the special invitee.

Dr Rajeev Vij, Sc 'G', DESIDOC, briefed about the contributions of Dr Ranganathan and introduced the speaker. In his inaugural address Dr Alka Suri, Director, DESIDOC, apprised about the topic and elucidated data as a valuable resource and how data management is important for the organisational growth.


**Dr Alka Suri, Director, DESIDOC, delivering inaugural address on webinar**

Dr Prasad in his informative presentation spoke extensively on information/digital divide, reuseability of data, diversity of data, open and closed data, stakeholders of big data, importance of research data management (RDM) and role of libraries in RDM. He concluded his presentation with DRTC/ISI activities on big data and open data.

# VAN MAHOTSAV

DESIDOC celebrated Van Mahotsav on 17 August 2020 at Metcalfe House. A Tree Plantation Programme was organised on the occasion. Dr Alka Suri, Director DESIDOC, inaugurated the programme and spoke about the importance of tree plantation. A large number of employees enthusiastically took part in the programme and more than 113 saplings were planted in DESIDOC premises. The event provided a golden opportunity to the employees to connect with Mother Nature and to demonstrate their commitment to social responsibility. Dr Rajeev Vij, Associate Director, coordinated the event.

**DESIDOCians planting saplings**

# DIAT WINS FIRST PRIZE IN SMART INDIA HACKATHON-2020

Defence Institute of Advanced Technology (DIAT), Pune, an autonomous organization under the Department of Defence Research & Development, DRDO, won 1st prize in Smart India Hackathon (SIH)-2020, where Prime Minister, Shri Narendra Modi interacted with the participants in a live event.

The SIH-2020, the 36-hour non-stop digital product building competition was a national level competition for software edition organized jointly by the Ministry of Human Resource Development (MHRD) and All India Council for Technical Education (AICTE) held during 1-3 August 2020 at Noida Institute of Engineering & Technology (NIET), Uttar Pradesh.

The DIAT student team "Age of Ultron" comprising six members under the guidance of Dr Sunita Dhavale, won the 1st Prize of ₹ 1 lakh for solving problem statement MS331 posed by the Madhya Pradesh Government in the category of software. The team provided the solution titled "Drishti" for the face, expression and gesture recognition using Artificial Intelligence.

Secretary, Department of Defence R&D and Chairman, DRDO, Dr G. Satheesh Reddy congratulated the team DIAT on winning the award for a consecutive second time.

# ONLINE COURSE ON PROJECT MANAGEMENT COMPETENCIES

A four days online course on 'Project Management Competencies' was conducted by Institute of Technology Management (ITM), Mussoorie, from 07 to 10 July 2020 for Defence Laboratory (DL), Jodhpur. Twenty-seven officers participated in the course. Lectures by ITM faculty were delivered via online mode.

The objective of the programme was to prepare scientists to contribute more effectively in time bound R&D projects and also acquaint them with fundamentals of Technology Management, Materials Management, Project Management and Organisational Behaviour.

The course was inaugurated jointly by Shri Sanjay Tandon, OS & Director, ITM and Shri Ravindra Kumar, OS & Director, DL, Jodhpur. Smt Anita Mohindra, Sc 'F', was the Course Director.

Sessions on various topics, viz., Role & Scope of Technology Management in DRDO & Understanding of Technology Life Cycle, An Overview of Project Management & Life Cycle Management, Project Planning through Network, Technology Gap Analysis & Technology Planning and Key success factors in Technology Transfer, An Overview to public Procurement, Public Procurement: Demand Initiation to Conclusion, Group Dynamics & Team Building, Conflict Management and Time and Stress Management were delivered.

The course concluded with a valedictory address by Shri Sanjay Tandon and vote of thanks by Smt Anita Mohindra. Shri Ravindra Kumar appreciated ITM for conducting courses through online mode.


**Shri Sanjay Tandon, Director, ITM delivering the online lecture**

# DRDO HARNESSING SCIENCE FOR PEACE & SECURITY

## CHAPTER 4: MARCHING FORWARD

*The article is 54rd in the Series of extracts of the monograph, "Defence Research & Development Organisation: 1958-1982", by Shri RP Shenoy, former Director of Electronics and Radar Development Establishment (LRDE).*

### NAVAL SYSTEMS LABORATORIES

#### Naval Physical & Oceanographic Laboratory

In the 1970s, oceanographic studies and instrument development continued for improving the predictions of oceanic variability. Towards this end, the second version of the current meter was completed and the development of the expandable bathythermograph for sensing and recording the vertical temperature profiles and that of the sonic ray plotter was initiated. On successful completion of these activities, the know-how for the Expandable Bathythermograph (XBT) was transferred to M/s ECIL, Hyderabad for manufacture to meet the annual needs of institutions including defence and others like Central Marine & Fisheries Research Institute (CMFRI), India Meteorological Department (IMD), National Institute of Oceanography (NIO), Oil & Natural Gas Commission (ONGC). These XBTs were also extensively used during Monsoon, Monex-79 and other expeditions. Technical know-how for manufacture of an earlier instrument, namely the sonobuoy, was transferred to M/s HAL, Hyderabad to meet the needs of Navy and for other applications, such as remote sensing, avalanche prediction, and so on.

Some of the other activities, which were successfully completed and accepted by the Navy, related to the development of Diver-held Sonar for use by the divers to locate submerged bodies in the ocean bottom, passive listening and harbour sonars used for detecting torpedoes and submarines, echo injector for training sonar operators, equipment for meeting the user's requirements for demagnetising mine sweepers, and an instrumentation unit to provide independent strolling and range display for naval radar. In addition, a feasibility project was taken up in 1974 for developing a medium- range sonar for Petya class ships, where critical support systems like signal processing, display and signal conditions were developed and interfaced.

Besides the oceanographic studies, the activities of the Laboratory were directed towards the development of electro-acoustic transducers and sonar systems. The transducting material converting electrical energy into acoustic energy and vice versa was lead zirconate titanate (PZT). The development of the indigenous transducer was completed for operation in the frequency band starting from a few Hertz to a few hundred kilo Hertz with varying capabilities for power handling, receiving sensitivities and for the areas of insonification. Transducers of sizes varying from disc of a few centimetres to a cylindrical array of 1 m radius and 1 m height, and operating from a few Hz to KHz, and MHz, were fabricated. A pilot plant was set up for the quantity manufacture of the transducers. NPOL built up a high degree of competence so that the Laboratory could tailor the size, shape and other design features to the specific needs of each application in the frequency range of operation. The need for building specific expertise in this area arose because the transducer consists not only of PZT discs but also of a large variety of passive materials, such as plastics, elastomers, metals, alloys, fibres and even composites for absorption, reflection or windowing to meet the different performance requirements. In the design of underwater transducers, some of the important parameters that had to be taken into account were, resonance frequency, operating frequency range, power handling capacity, source level, impedance, receiving acoustic sensitivity, acoustic phase, directivity pattern and acceleration sensitivity. In addition, other factors, such as hydrostatic pressure, mechanical stress, vibration isolation and so on would have to be taken into account for decisions on the basic transducer element configuration, packaging and encapsulation. Transducer encapsulation was critical from the long-term reliability point of view because of its role in ensuring electrical insulation, in acoustic impedance matching with and in protection from the water medium. The Laboratory also had to build competence in underwater seals, connectors, cables as well as in junction boxes to be used in various underwater systems. Thus, a high degree of expertise

was established in the design and fabrication of piezoelectric transducer elements and arrays as a step towards the design of sonar systems to meet the desired specification for specific applications.

To prove the transducer element as well as the array after fabrication and assembly, test facilities for measurements were set up. An in-house Open Water Acoustic Tank with automatic positioning system and associated measuring instruments and with capability to simulate water pressures to 1500 ft. was fabricated for testing the underwater devices. Different types of calibration techniques were evolved to calibrate the sonar system transducers. For calibration of transducers at very low frequencies and for underwater propagation and reverberation studies, a test barge operating in the Idukki reservoir (about 100 km from Cochin) was set up.

In one sense, these activities were a prelude to the undertaking of a sophisticated modern sonar system development for frigates, APSOH (Advanced Panoramic Sonar Hull mounted), for the Navy in 1980s. The system features and capability were contemporary to the best of this class available in the developed world at that time. The system that was proposed and subsequently developed, was based on the LSI/VLSI hardware, multi- microprocessors for control, digital techniques for transmission, waveform generation and memory backed raster scan display, which were state-of-the art at that point of time. The project was monitored by a Steering Committee with the VCNS as the chairman and right from the beginning the production agency, Bharat Electronics Ltd was closely associated with NPOL. The plan of action was to modularise the system, interface the electronics subsystems with a transducer of an operational sonar and adopt concurrent engineering practices to produce, assemble and integrate the hardware at the premises of the production agency. The hardware was assembled and tested at the production agency with the involvement of the Laboratory scientists. The system development was completed and installed on INS Himgiri in a remarkably short period of about 4 year, that is 1981, and sea trials were begun.

## Naval Science & Technological Laboratory

The main objectives of NSTL are development of underwater weapons/ mines, underwater test ranges, noise and vibration studies, underwater explosion studies, marine navigational aids, and scientific support to Eastern Naval Command.

A warship is a complex system which is called upon to provide multi-mission capability with a good degree of survivability in the marine environment against man-made threats and nature's upheavals. The ship's survivability is enhanced if the hit probability of anti-ship weapons and torpedoes are brought down. The ship's characteristic emanations in the infrared, acoustic and magnetic domains signature being an important factor for its survival. NSTL undertook to study noise and vibration in ships, machinery and submarines, and magnetic signatures of ships with a view to create a databank. Facilities for analysis of noise and vibration, data were also built up so that a methodology for mitigation of noise and vibration could be evolved so as to be of help in new naval craft design. In addition to underwater noise mitigation, shock survivability and design optimization for ease and speed of navigation and manoeuvre, require hydrodynamic test facilities and model studies to be carried out. NSTL carried out studies on various hydrodynamic test facilities and proposed creation of a test facility for evaluating performance of indigenously developed major systems.

The initial activities of the Laboratory in the field of underwater weapons were the modifications carried out to an existing underwater homing weapon to update its technology. The development was a success and the know- how for the modifications was passed on to the production agency. It led further to the development of a portable anti-submarine target, which manoeuvred like a submarine at great depths and responded to sonar transmission of various kinds. The deep mobile target was able to operate at low speeds with engines operating on compressed air or batteries. Another effort resulted in the successful transponder system which could be used as a sonar target by ships' operators as well as in torpedo firing.

Several types of transponder systems were successfully developed for evaluation of underwater weapons and for training of operators and were produced in numbers. A project to design and to meet the user's requirements for demagnetising mine sweepers periodically was also successfully completed. The work on the development of weapon launchers to meet the indigenous shipbuilding programme was underway and was being progressed to the satisfaction of the Users.

*To be continued...*

# VISITORS TO DRDO LABS/ESTTS

Shri Pijush Hazarika, Minister of State, Health & Family Welfare, Govt of Assam, along with Shri Pallab Lochan Das, Member of Parliament, Lok Sabha, Shri Anurag Goyal, IAS, Health Commissioner and Shri MP Singh, IAS, DC, Sonitpur, Assam visited Defence Research Laboratory (DRL), Tezpur, and reviewed ongoing progress and issues of COVID-19 testing. DRL has tested over 5000 COVID-19 samples in the first 21 days since inception of the test facility on 8 June 2020. The minister lauded the efforts made by DRL in strengthening the preparedness to combat COVID-19 pandemic.

**Shri Pijush Hazarika, Minister of State, Health & Family Welfare, Govt of Assam being briefed about DRL activities**

❄ Maj Gen SC Mohanty, AVSM, Chief of Staff, HQ 4 Corps, visited DRL on 3 July 2020. Dr SK Dwivedi, Director, DRL, gave a comprehensive overview of the on-going research programme of the laboratory including the Programme Arunodaya. Contributions of DRL in managing Covid-19 were also briefed to the visitor. Gen Mohanty also visited Chitramandap, the DRL Exhibition Hall and took keen interest in exhibits of various innovative products & technologies developed by DRL. The Chief of Staff appreciated the efforts made by DRL for improving and promoting the wellbeing of the troops in the border and forward areas of North East India.


**Maj Gen SC Mohanty, CoS, HQ 4 Corps at DRL Centre for COVID-19 Testing**

## PATENT GRANTED

Defence Materials Research Laboratory (DMRL), Hyderabad, has been granted patent (Patent No. 335169) for "High Strength Steel for Naval Applications." Dr K Muraleedharan, Dr R Balamuralikrishnan, Dr S Nagarjuna, Shri Nirmalya Rarhi, Dr R Veerababu, Shri B Gopalakrishna and Shri HK Nandi are the inventors.

Government of India
Ministry of Defence
Defence Research & Development Organisation

**Let us Build a Self-Reliant India**

# Dare to Dream 2.0

## DRDO Innovation Contest

"Scheme to Promote Individuals & Start-Ups for Innovation in Defence and Aerospace"

**AWARDS**

UPTO
**₹10 Lakh**

**ELIGIBILITY**

**INDIVIDUALS**
Citizen of India above 18 years

**START-UPS**
Recognized by DPITT, Govt. of India

**Last Date of Submission**

**15 October 2020**

For Registration and more details please visit...

**https://www.drdo.gov.in**