DRDO NEWSLETTER

A Monthly Bulletin of Defence Research and Development Organisation

ISSN: 0971-4391

www.drdo.gov.in

AUGUST 2020 | VOLUME 40 | ISSUE 08

DRDO BUILDS 1000-BED TEMPORARY COVID HOSPITAL IN 12 DAYS

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AUGUST 2020
VOLUME 40 | ISSUE 08
ISSN: 0971-4391

40th Year of Publication

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DRDO BUILDS 1000-BED TEMPORARY COVID HOSPITAL IN 12 DAYS

Raksha Mantri Shri Rajnath Singh along with Home Minister Shri Amit Shah and Minister of Health & Family Welfare Shri Harsh Vardhan visited 1,000-bedded Sardar Vallabhbhai Patel COVID Hospital at Indian Air Force land on Ulan Batar Marg on 5 July 2020. The facility was built in a record time of 12 days by DRDO along with Ministry of Home Affairs (MHA), Ministry of Health and Family Welfare (MoHFW), the Armed Forces, Tata Sons and other industry players. Delhi Chief Minister Shri Arvind Kejriwal and Minister of State for Home Shri G Kishan Reddy were also present. Secretary DDR&D and Chairman DRDO Dr G Satheesh Reddy explained about the facilities to the visiting dignitaries. Shri Rajnath Singh expressed satisfaction after visiting the hospital. He appreciated the efforts of DRDO and all associated in building the facility in such a short span of time.

The national capital is experiencing a surge in number of COVID-19 infections with an increasing number of patients requiring medical care. An urgent need to augment the existing hospital capacity of Delhi for the COVID-19 patients was discussed between MHA and MoD. The modalities of establishing a 1,000 bed temporary hospital in a span of less than 14 days was decided with DRDO as the nodal agency.

DRDO undertook the design, development and operationalization of the facility on a war footing. Indian Air Force (IAF) land situated near the New Delhi Domestic Airport Terminal T1 was identified and construction commenced on 23 June 2020.

Chairman DRDO Dr G Satheesh Reddy briefing about the hospital to Raksha Mantri Shri Rajnath Singh; Home Minister Shri Amit Shah; and Minister of Health & Family Welfare Shri Harsh Vardhan

DRDO has named the ICU and other wards after the Galwan martyrs.

The hospital is being operated by medical team of doctors, nurses and support staff from the Armed Forces Medical Services (AFMS). It would be maintained by the DRDO. Hospital also has a dedicated psychological counselling centre fully managed by DRDO for the patients. The COVID-19 patients referred by the district administration will be admitted and treated free of cost at this facility. Critical cases will be referred to All India Institute of Medical Sciences (AIIMS), New Delhi.

The unique centrally air-conditioned medical facility is spread over 25,000 square metres and comprises one reserved ICU hangar named after Col. B Santosh Babu who lost his life along with 19 others in the clash with Chinese soldiers in Galwan, Ladakh. The ICU has 250 beds equipped with monitoring equipment and ventilator. The other general wards are named after other fallen soldiers – Shaheed Nb Sub Satnam Singh Medical Ward, Shaheed Nb Sub Nuduram Soren and Shaheed Nb Sub Mandeep Singh Medical Ward. Each of the wards are connected via an internal concrete pathway. There is a well-defined area in the premises for the medical staff, where they will

be doffing and donning the PPE. The hospital also comprises a separate dining and accommodation area for on-duty staff.

The infrastructure is built with negative internal pressure gradient for safe contagion containment. The facility has been engineered using rapid fabrication technique based on octanorm modules. The hospital consists of a separate reception-cum-patient admission block, medical block with pharmacy and laboratory, duty doctors and nurses accommodation and four modular patient blocks each consisting of 250 beds. The corridor network has been designed to keep the patient's movement separate from the movement of the doctors and staff. Sanitation facilities and toilets are situated between the blocks for easy access to patients and facility personnel.

The patient blocks are self-sufficient with facilities for patients and medical care staff. Patient facilities include oxygen supply to each bed, x-ray, electrocardiogram (ECG), haematological test facilities, ventilators, COVID Test Lab, wheel chairs, stretchers and other medical equipment. The DRDO developed COVID-19 technologies productionised by the industry in the last 3 months such as ventilators, decontamination tunnels, personal protective equipment, N95 masks, contact-free sanitiser dispensers, sanitisation chambers and medical robots trolleys will be utilised at the facility.

The facility will be secured with security staff, closed-circuit television (CCTV) and surveillance and access control systems. The hospital is equipped with an integrated fire safety and control system. Environmental safety and waste disposal processes have been built in to the design of operations. A large parking area has been designated for staff, public, ambulances and firefighting services.

Hon'ble Raksha Mantri and Grah Mantri pursuing the facilities at the hospital

Commissioning of the Hospital has contributed to an increase of 11 per cent additional COVID-19 beds in Delhi, thus overcoming the current critical situation. The project has been funded with major contribution from Tata Sons. Other contributors are Bharat Electronics Limited (BEL), Bharat Dynamics Limited (BDL), Astra Microwave Products Limited (AMPL), Sri Venkateswara Engineers, BrahMos Private Limited, Bharat Forge and the DRDO employees who voluntarily contributed one day salary.

The hospital is a unique effort made possible by the synergy between DRDO, MHA, MoHFW, the Armed Forces, industry, South Delhi Municipal Corporation (SDMC) and Delhi Administration who have come together in the time of crisis.

DRDO COMBATS COVID-19

Application for Combating Stress & Building Resilience

Defence Institute of Psychological Research (DIPR), Delhi, has developed an application called Manokavach for Android as well as Window operated devices for combating stress and building resilience during the Corona pandemic. The App enables users to upkeep their mental, emotional and familial well-being during current crisis through use of certain psychological techniques and practical exercises. It has different audio sessions for maintaining positivity, peace and immunity boosting mind-body connections with doable tips on managing stress. App is audible and is in a simple language for anyone to use comfortably.

Virus Obliterating Conveyor for Baggage Disinfection

Naval Physical and Oceanographic Laboratory (NPOL), a Kochi-based laboratory of DRDO in partnership with Apollo Micro Systems Ltd, Hyderabad, has developed a virus obliterating conveyor for the disinfection of baggages. The automated stand-alone system uses UV baths for sanitization and disinfects the baggages within seconds. The disinfector is based on a roller-based conveyor carriage system that carries the baggage through a chamber equipped with calibrated and optimally placed UVC sources. The sensing mechanism of the system automatically detects the entry of bags and powers on the UV illumination. The system has been specifically designed to irradiate the body of the luggage in all directions and disinfects its entire surface at the required intensity levels and exposure

time. It also has in-built safety features for ensuring the prevention of any direct UV exposure outside the chamber. The baggage disinfector can be installed at airports, railway stations, metro stations, bus stations, etc.

Hydrogen Peroxide PPE Disinfectant

Disinfection with Hydrogen peroxide (H2O2) is a low-pressure, low-temperature, nontoxic process that uses vaporized H2O2 to reduce the level of infectious agents. Human health depends on the quality and thoroughness of a surface disinfection. H2O2 is a strong oxidant and can be used as potent broad-spectrum germicide. It belongs to the category of High Level Disinfectant (HLD) and is safer than chlorine to humans and the environment. Disinfectants of this level kill all vegetative microorganisms, mycobacteria, lipid and non-lipid viruses, fungal spores, and some bacterial spores.

H2O2 solutions are inherently unstable and decompose over time to oxygen and water. These solutions are packaged in opaque containers to prevent decomposition from external light.

Defence Institute of Physiology and Allied Sciences (DIPAS) has standardized a Fogging Disinfection System for disinfection of PPE and masks.

Specifications

Volume of the chamber: 1296 ft^3
Concentration of H2O2: 5.5 %
Time of fogging: 10 min
Time of dwell: 150 min
Temperature: 30 °C

On testing of PPE and mask there was log 4 reduction in microbial growth after fogging. Protocol for disinfection of a 1500 ft^3 chamber/ room is:
Concentration of H_2O_2: 5.5 % with 0.01 per cent Silver nitrate

Volume: 600 ml
Fogging time: 10-12 min
Dwelling time: 60-70 min
Temperature: 30±3 °C

Herbal Sanitizers

Washing hands with soap and water or alcohol-based hand sanitizers helps in prevention of COVID-19. WHO recommends hand sanitizer formulation that contains at least 60 per cent alcohol, 1.45 per cent glycerin and 0.125 per cent H_2O_2. However, the main ingredient alcohol has harsh drying effects on skin. Further, prolonged use of H_2O_2 causes peeling and loosening of the skin. DIPAS has developed a herbal sanitizer, called Herbo-Safe, containing 70 per cent Isopropyl alcohol that helps in killing 99.9 per cent microbes and neutralizes the harsh drying effects of alcohol on skin. H_2O_2 has been replaced with natural bio-active extracts exhibiting anti-microbial and anti-viral effects. Both gel as well as liquid forms have been made.

DIPAS has also developed herbal disinfecting towels, Herbo Swachh, for manifold disinfection applications, including multi-tasking cleaning to remove germs, bacteria and viruses from computers, laptops, mobiles, working desks and daily use items. The non-toxic Herbo Swachh

can be used by medical and nursing professionals for disinfection and as an alternative to bathing.

Long-term use of protective face/mouth covering devices and appliances, especially during the pandemic, pose problems amongst doctors and nurses due to difficulties in breathing, fatigue and sometimes due to mask phobia. DIPAS has developed a herbal spray, Herbo Shwaas, by using organic components like antimicrobial, antiviral, anti-inflammatory, antiseptic, bronchodilatory, decongestant with soothing properties for the respiratory system and for effective prevention and management of respiratory problems, including viral diseases like respiratory syncytial virus, SARS, MERS, H1N1, influenza A, herpes simplex virus, vaccinia virus, etc. The product being totally natural is non-toxic, soothes and relaxes breathing, eases long-term usage fatigue, disinfects and deodorizes and reduces maskaphobia. It can be effectively applied on various kinds of masks, including cotton home-made masks, gamchhas, handkerchiefs, etc., used by the common man. The formulation is safe, easy to use and useful for Corona warriors, patients with co-morbidities, the general population at large, including children and geriatrics who are at higher risk of developing respiratory diseases and ailments.

Yoga Package for Improving Immunity

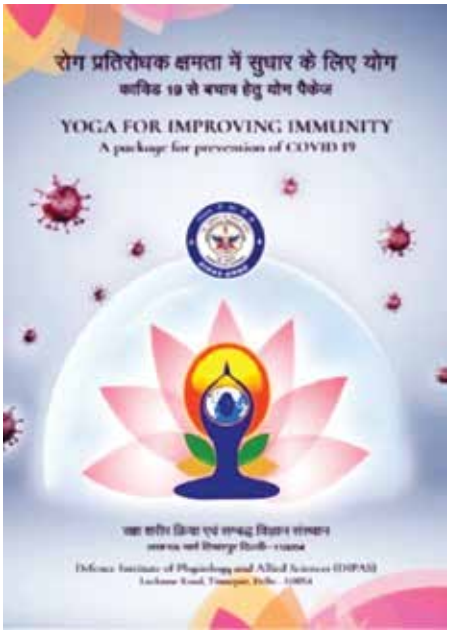
In the wake of outbreak of COVID-19, the whole world is reeling under a state of fear and anxiety. Patients with poor immunity, obesity, preexisting cardiovascular disease, hypertension and related conditions are more susceptible to the pandemic. Besides symptomatic management and supportive therapy, there is no specific antiviral drug in line for the treatment of COVID-19 as of now. It is a well-known fact that prevention is better than cure. Therefore, by improving functional capacity of physiological systems with special reference to enhancing the innate/ acquired immunity, one can maintain optimum health and performance in this time of crisis.

Regular practice of yoga can increase both the arms of immunity—the humoral and cell-mediated at rest and in response to vaccination—and reduce the markers of inflammation. Yogic practice helps to improve innate immune system by increasing concentrations and expression rate of human beta defensin 2 (HBD-2), an antimicrobial peptide in innate immunity that provides a biochemical barrier by exhibiting anti-pathogenic activity and also decrease the concentration of nuclear factor kappa-light-chain-enhancer of activated B cells (NF-κB). An increase in immunoglobulin A (IgA), a first line of defence against pathogenic microbial invasion of the human body is reported. In a study it was observed that regular practice of yoga can improve lung function and capacity, had beneficial effects in allergic rhinitis and cytokine profiles – IL-2 levels. Yoga practice also significantly increases immune-related cytokines, such as interleukin-12 and interferon-γ.

It has also been reported that serum levels of glutathione peroxidase and oxidized glutathione significantly decreased whereas activities of superoxide dismutase, glutathione S-transferase, glutathione reductase, reduced glutathione and total antioxidant status remarkably increased after yoga practice compared with the control group. Practice of

yoga can also help in the repair and regeneration of tissues by inducing stem cell trafficking from bone marrow to the peripheral blood. Stress, anxiety, loneliness and depressive feelings that may be generated at the time of crisis has been reported to reduce chronic inflammation, enhance immunological memory in the context of vaccination and even reduce the number of sick days associated with the common cold and other upper respiratory tract infections. Scientific publications also reported that yogic practices can calm down mind to get rid of all kind emotions, depression, anxiety, stress and better mental function. Yogic controlled breathing, pranayama, is very potent to improve immunity and helps to manage anxiety and stress. Regular yoga practice can also change autonomic balance towards more parasympathetic,which helps the practitioner to stay in a relaxed state of mind and helps in the process of regeneration. Parasympatho-dominance can also increase the resilience of the practitioner to face challenges and mind becomes focused and still. Studies also showed that regular yogic practice can increase the baroreflex sensitivity, decrease the release of stress hormones, cortisol and adrenocorticotropic hormone (ACTH) and increase the release of serotonin, dopamine and brain-derived neurotropic factor (BDNF). Yoga can also increase the activity and number of natural killer cells, CD4+ and CD8+ T-cells, which play a major role in the cellular defence mechanism against pathogens.

DIPAS by incorporating selected yogic suddhi kriyas (for cleansing), asanas, pranayamas and meditation, has formulated a yoga package with the aim to increase the immunity, lung function and overall health of a



Yoga Package for Immunity Improvement

person. This yoga module might be helpful as a preventive measure to check respiratory distress as observed in Corona affected patients.

Medical Oxygen Plant

The Medical Oxygen Plant (MOP) is an offshoot of the On Board Oxygen Generation System (OBOGS) used on-board Tejas for generation of medical grade oxygen. It utilises Pressure Swing Adsorption (PSA) technique and molecular sieve technology to generate oxygen directly from atmospheric air. The technology has been developed by Defence Bioengineering and Electromedical Laboratory (DEBEL), Bengaluru and approved by safety certification agency Centre for Military Airworthiness and Certification (CEMILAC). The oxygen generator components have been developed by DRDO and technology has been transferred to industry.

The technology is being used to install oxygen plants on some of the army sites on North East and Leh-Ladhakh Region. The first plant is operational since 2017. The plant complies to international standards like ISO 1008, European, US and Indian Pharmacopeia.

This oxygen plant will be helpful in supplying low cost, continuous and reliable oxygen available round the clock during the Corona pandemic in hospitals in urban and rural areas and in avoiding hospitals' dependency on scarce oxygen cylinders especially at high altitude and inaccessible remote areas. The facility can be used for filling the cylinders in addition to direct installations at the hospitals resulting in reduced logistics of transporting cylinders.

Salient Features

- High reliability, fully independent and automated
- On-site production of oxygen in-stantaneously from ambient air
- Minimum maintenance
- Absolutely oil free and safe
- 24 x 7 x 365 days operation
- Electric Oxygen compressor to charge the cylinders up to 200 bar (g)
- High performance molecular sieve (Li-LSX: Lithium-based low Silca X-type zeolite)
- Stored oxygen supply for transient power failures
- Low energy consumption
- Frame built, skid mounted design
- High quality touch screen control unit and remote control access

Brief Specification

Product Oxygen concentration: 93±3 %

Outlet pressure: 4-6 bar 'g'

Capacity: 18 NM^3/hr (300 LPM)

Oil content: ≤ 0.1 ppm

Dew point: < -50 °C

Oxygen compressor can charge 47-litre water capacity oxygen cylinders at the rate of 20 cylinders per 8 hours. The plant is designed for a capacity of 18 NM^3/hr. The system

caters for 60 patients at a flow rate of 5 lpm and can fill 60 cylinders per day. The capacity can be varied as per hospital requirement.

Apart from the standard cylinders available in the market, the details of Oxygen cylinders designed by DRDO are:

Type-I: Aluminium cylinder (6061-T6)

- Service Pressure: 150 bar
- Burst Pressure: 400 bar
- Cost: 2-5 litre ₹ 5,000-6,000 per unit; 10 liters: ₹ 11,000 21 liters: ₹ 16,000-18,000

Type-II: Aluminium cylinder

- Proof pressure: 225 bar
- Burst pressure: 400 bar
- Cylinder volume (water capacity): 2.3±0.2 litre
- Volumetric expansion at proof pressure: < 10 %

Type-III: Carbon fibre-based composite cylinder

- Service pressure: 200 bar
- Burst pressure: >600 bar
- Cost: 2-5 litre ₹ 25,000-30,000 per unit
- Weight: 1.65 kg (max.)

NSTL DISTRIBUTES RELIEF MATERIAL

Naval Science and Technological Laboratory (NSTL), Visakhapatnam distributed 1500 litre of sanitizers packed in 100 ml bottles and face masks to various departments in Visakhapatnam including ACP Police, Naval Dockyard, Media Personnel, Postal Department and their personnel deployed on field. Alcohol-based hand rubs/ sanitizers were prepared in-house at NSTL in accordance with WHO guidelines. Dr OR Nandagopan, Director, NSTL, handed over around 5000 food packets to the poor and needy people at various places of Visakhapatnam.

Dr OR Nandagopan handing over hand sanitizer to Visakhapatnam Police

Mahila Kalyan Manch (MKM), NSTL, donated ₹ 50,000/- to Executive Officer of Simhachalam Varaha Lakshmi Nrusimha Temple. Smt Lalitha Mai Nandagopan, wife of Dr OR Nangadopan, and President MKM, NSTL, informed that the donation is for needy poor workers of Simhachalam Devasthanam.

DEBEL SIGNS LICENSE AGREEMENT FOR TOT OF SOAR TO INDIAN TELEPHONE INDUSTRIES LTD

Defence Bioengineering and Electromedical Laboratory (DEBEL), Bengaluru, signed License Agreement for Transfer of Technology (LAToT) of Single Outlet Automatic Resuscitator (SOAR) with Indian Telephone Industries (ITI) Limited, Bengaluru.

SOAR is an 'assisted breathing device' originally developed by DEBEL for NBC contaminated environment. It is used for providing CBRN contaminant-free air for forced breathing to the patients/casualties who cannot breathe on their own. The system works with a blower/turbine as the source of breathing air. It is a standalone system, which can run on AC/DC/external battery and also by direct pneumatic supply. This system can provide respiratory support to a COVID-19 patient in hospital setting, during transit or a suspected patient at home, with compressed air/Oxygen source.

Smt Manimozhi Theodore, Director, DEBEL (4th from right) handing over LAToT documents to Shri D Venkateshwarlu, Director (Production), ITI Limited. Inset: Single Outlet Automatic Resuscitator

PATENT GRANTED

Defence Metallurgical Research Laboratory (DMRL) has been granted patent for "Hard Steel Alloy Composition and Preparation Thereof" (Patent No. 325548). Shri Bidyapati Mishra, Dr Ranjan Kumar Singh, Dr K Siva Kumar, Dr AK Singh and Dr T Balakrishna Bhat have been named as the inventors.

NPOL OBSERVES WORLD ENVIRONMENT DAY

Naval Physical and Oceanographic Laboratory (NPOL), Kochi observed the World Environment Day on 5 June 2020. To create awareness about environmental issues as well as to encourage participation in environment protection, saplings were planted in the technical and residential campus by Shri S Vijayan Pillai, OS & Director, NPOL and the employees.

Shri S Vijayan Pillai addressed the employees through Intranet webcast. He elucidated the importance of observing the World Environment Day and requested everyone to make sincere efforts for reducing environmental pollution by keeping the campus plastic-free, not cutting tree and by planting more and more trees. The event was coordinated by the Works Estates & Services Group of NPOL.

INTERNATIONAL YOGA DAY

Naval Materials Research Laboratory (NMRL), Ambernath celebrated International Yoga Day with employees participated with their family from home on 21 June 2020. An online yoga session was conducted by a certified Yoga Teacher. Simple exercises helpful in relaxing and maintaining good health were demonstrated. The officers and staff practiced yoga to commemorate the occasion and affirmed to make yoga an indispensable part of their daily schedule. Practicing yoga helps in taking care of our body and mind and is extremely helpful for strengthening our immune system to fight against the recent pandemic.

COURSE ON PROJECT MANAGEMENT COMPETENCIES

A four-day online course on 'Project Management Competencies' was successfully conducted by Institute of Technology Management (ITM), Mussoorie from 29 June 2020 to 2 July 2020 for Defence Research Laboratory (DRL), Tezpur. Thirty officers of DRL participated in the course. Lectures by ITM faculty were delivered online.

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 by Shri Sanjay Tandon, OS & Director, ITM and Dr Sanjai K Dwivedi, Director, DRL, Tezpur.

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

The course concluded with a valedictory address by Shri Sanjay Tandon. Dr DK Panda Sc 'F', ITM, presented the vote of thanks.

Dr Sanjai K Dwivedi, Director, DRL, Tezpur appreciated ITM for conducting the online courses.

COURSE ON NUTRACEUTICALS FOR HEALTH AND PERFORMANCE IMPROVEMENT

Defence Institute of Physiology & Allied Sciences (DIPAS), Delhi, organised an online CEP course during 15-17 July 2020 reflecting the quest for knowledge among researcher is not stopped by COVID-19 pandemic. The course was attended by 98 participants from various DRDO labs, officers from Armed and Paramilitary forces and academic institutions across the country. Course was inaugurated by Dr Bhuvnesh Kumar, OS and Director, DIPAS.

A total of 14 online lectures were delivered by eminent speakers from Armed Force, government R&D and various reputed academic institutions. Different aspects including health promoting effects of nutraceuticals under different environments, disease conditions including their immunity boosting role against infections like COVID-19, developmental and safety issues, regulatory guidelines were discussed during the course. Dr Som Nath Singh was the Course Director and Dr Sarada Surya Kumari, Dr Pankaj Khurana and Ms Vandana Kirar were the Course Coordinators.

Dr Bhuvnesh Kumar, Director, DIPAS interacting with the participants

DRDO HARNESSING SCIENCE FOR PEACE & SECURITY

CHAPTER 4: MARCHING FORWARD

The article is 53rd 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 Materials Research Laboratory

Corrosion and Bio-fouling Mapping: The data on marine corrosion and fouling growth was considered very useful before designing any major structure in the sea water environment. While industrially advanced countries had collected the data in temperate waters, researchers in India were handicapped by the lack of data on behaviour of metals and other materials. Therefore NMRL set up a number of field stations on both sides of the Indian Peninsula as well as in Andaman Islands. Very valuable information on the corrosivity of metals and alloys was generated. Data was also collected on the marine bio-growth and the behaviour of marine structural timbers.

Titanium Welding Technology: Titanium was being increasingly used both in aerospace and marine industries. Titanium also found applications in power generation plants. The Laboratory developed welding technology with a view to weld, repair and fabricate titanium-made structures and components. The studies on fatigue crack growth on titanium and its weld were also being carried out. Techniques for in-situ weld repair of titanium under controlled conditions were developed and titanium weld repair of certain critical components of naval ships was achieved.

Ceramic Materials: Ceramic transducer materials having high dynamic strength, low dielectric loss factor, better stability and linearity in behaviour, were required for designing advanced high power sonar systems for longer range anti-submarine warfare. Materials having longer piezoelectric voltage coefficient were also required for the development of highly sensitive sonar receiver sets (Hydrophones). Therefore, NMRL focussed its efforts on techniques to effect an increase in the intrinsic dynamic strength of piezoelectric lead zirconate titanate ceramic materials used for sonar projectors and hydrophones. In addition, the possibility of developing the transducer ceramic material by fine particle technology was undertaken.

Atmospheric Pollution: The need for the management of environment at Indian naval bases was recognised on account of their proximity to chemical industries and port activities. NMRL took up the work related to air quality monitoring in the year 1979 with a view to ascertaining the environmental status. The work carried out uninterruptedly over a period of three years not only helped to reduce the level of pollution but had created awareness, both amongst industries and public about pollution hazards. A nucleus was created at the Laboratory to carry out anti-pollution work. A variety of techniques to ascertain the values of gaseous and particulate pollutant species were evolved and standardised.

Sea Water Pollution (Microbial Corrosion): The problem of accelerated corrosion as a result of organic pollutants in the near harbour water was identified by NMRL in the mid 1970s. The discharge of untreated sewage, leading to the development of anoxic conditions and the consequential growth of the sulphate-reducing microbes in the near-shore waters was recognised as one of the factors responsible for the accelerated corrosion of harbour structures. The Laboratory, which monitored the water quality parameters as an ongoing programme, succeeded in culturing other microbes under laboratory conditions. An adequate competence was built at NMRL that enabled the Laboratory to investigate harbour water pollution problems and to suggest remedial measures.

Oil Pollution: The problem of possible oil pollution in the sea as a consequence of the nation's offshore oil exploration programme as well as due to increased oil transportation along our coasts, was recognised by the Laboratory a few years ago. The Laboratory developed a standard method for assessing the bio-toxicity of oil-dispersants which were considered to be most suitable for dispersing the errant oil from the surface of the sea water. NMRL recommended the

correct surfactants, whose efficiency as non-toxic dispersants could be assessed by the bio-assay technique developed at the Laboratory.

Fleet Support: The Laboratory developed and standardised several techniques which enabled it to undertake numerous investigations related to POL, metallurgy, rubber and plastics, and a number of other marine materials for the Naval fleet.

Naval Physical & Oceanographic Laboratory (NPOL)

The primary task of NPOL is to develop underwater detection systems—primarily sonars, to be fitted on ships, submarines or aircraft, or to be laid on or moored to the ocean bottom, to provide surveillance and detection capabilities in the ocean areas. In addition, the activities of the Laboratory included study of the ocean and its interaction with sound waves.

The main thrust in the 1960s was towards physical oceanography, ocean acoustics, marine instrumentation and rendering service to the Navy. The ocean is a complex medium in respect of sound transmission because of random variations of its characteristics in time and space and the bounds at the surface and bottom. Variability of the ocean environment critically influences the performance of underwater sensors, weapon systems and platform navigation during naval warfare as well as during routine naval operations. Acoustic transmission loss and probable detection ranges for both active and passive sonar systems depend on this oceanic variability, which manifests itself through eddies, fronts, internal and inertial waves, wind mixing, free convection, fine structure and so on. Extensive data would have to be collected for study and analysis on the distribution and variation of relevant ocean parameters, on the acoustic propagation characteristics, such as transmission loss, reverberation and on the ambient noise in the sea with a view to build an acoustic model for prediction of the variability. The effort to collect data, design and use of better instruments and analysis for improved predictions of the variability of the ocean would be an ongoing process due to its vital importance for naval operations in our ocean environment.

Therefore, from the beginning, NPOL turned its attention to developing instruments for collecting data in respect of speed and direction of ocean currents, attenuation of visible light in the sea, sea-wave and tidal records and the profile of the velocity of sound. Two current meters–one using a photovoltaic cell for counting the impeller rotation and the other based on Hall effect–-were developed and used for measuring the speed and direction of ocean currents in the coastal waters. An electronic sea- wave recorder as well as a pneumatic-wave recorder were developed and used for collecting wave data off Trivandrum, Cochin and Port Blair. A pneumatic tide gauge was developed and used for obtaining tidal records off Bhavnagar and Cochin. A transparency meter was developed for measuring the attenuation of visible light in the sea up to depth of 100 m. A modified version of this instrument was used for measuring the concentration of silt or suspended particles in the sea. For detection of underwater noise sources, passive sonobuoys were successfully developed for use in conjunction with a naval aircraft, which would carry a multichannel receiver that would demodulate the signal received from the hydrophone, which would be dropped from the aircraft to a preset depth (Fig. 1). The Laboratory also undertook to produce one hundred of the sonobuoys by setting up a pilot plant.

Sonobuoy

Apart from the development of oceanographic instruments, NPOL built facilities for calibrating some of these, e.g., the mechanical bathythermograph reversing thermometers and wave recorders. NPOL scientists also took a leading part in all the cruises of INS Kistna and the cruises of some foreign ships during the International Indian Ocean Expedition of 1962-65. The results of oceanographic studies were made available in the form of reports, atlases, monographs and charts to the Navy for their planning and operational purpose. Also, it was useful to the scientists of the Laboratory for design of sonars.

To be continued...

Readers' Views

(Your feedback is important to us as it gives scope for improvement and serve the Organisation in a better way)

1. **Name of the Establishment:** _____

2. **How would you rate the *DRDO Newsletter* as a medium to adequately present DRDO developments?**

   Excellent ☐ Very Good ☐ Good ☐ Fair ☐ Satisfactory ☐

3. **How would you rate the technical contents of the *Newsletter*?**

   Excellent ☐ Very Good ☐ Good ☐ Fair ☐ Satisfactory ☐

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8. **Suggestions, if any, to further improve the technical content of the *Newsletter*?**

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Please send your suggestions to:

The Editor, DRDO Newsletter, DESIDOC, DRDO, Metcalfe House, Delhi - 110 054

AIR CHIEF MARSHAL RKS BHADAURIA VISITS AERONAUTICAL DEVELOPMENT ESTABLISHMENT

Air Chief Marshal RKS Bhadauria PVSM, AVSM, VM, ADC, Chief of the Air Staff visited Aeronautical Development Establishment (ADE) on 26 May 2020. He was greeted by Dr S Venugopal, OS & Director, ADE. Dr (Mrs) Tessy Thomas, DS & Director General (Aero); Shri Girish S Deodhare PGD (CA) & Director ADA; Air Mshl Upkarjit Singh, AVSM, Director, IAF PMT; AVM N Tiwari VM, Project Director (Flight Testing), NFTC and Ms Asha Garg, PGD (CA-FCS) were present and briefed the Chief on the recent developments on the LCA programme.

Shri BP Shashidhara, Project Director, Full Mission Simulator (FMS) for LCA, apprised the Air Chief on the recent developments on Real Time Simulator (RTS). The Chief was also briefed about the progress on FMS for LCA Mk-I at AFS, Sulur.

Air Chief flew in RTS and interacted with the flight simulation team and appreciated their achievements. He reiterated the importance of timely delivery of FMS for LCA at AFS, Sulur and desired that the facility be handed over to IAF at the earliest. He assured of complete support from IAF towards overcoming any challenges in development and installation of FMS at AFS, Sulur.

Air Marshal Amit Tiwari, AVSM VM, Air Officer Commanding-in-Chief, Southern Air Command, visited ADE on 10 June 2020. He was briefed by Director, ADE. Air Marshal flew the LCA simulator and was briefed about the recent up gradations/changes on the aircraft by Commanding Officer, 45 Sqn. Air Marshal was also apprised about the recent developments on RTS and the design and development of Full Mission Simulator for LCA Mk-I.

Air Chief Marshal Bhadauria being briefed about Full Mission Simulator for LCA

Air Marshal Amit Tiwari evincing keen interest in upgraded LCA simulator

Published by DESIDOC, Metcalfe House, Delhi-110 054
www.drdo.gov.in