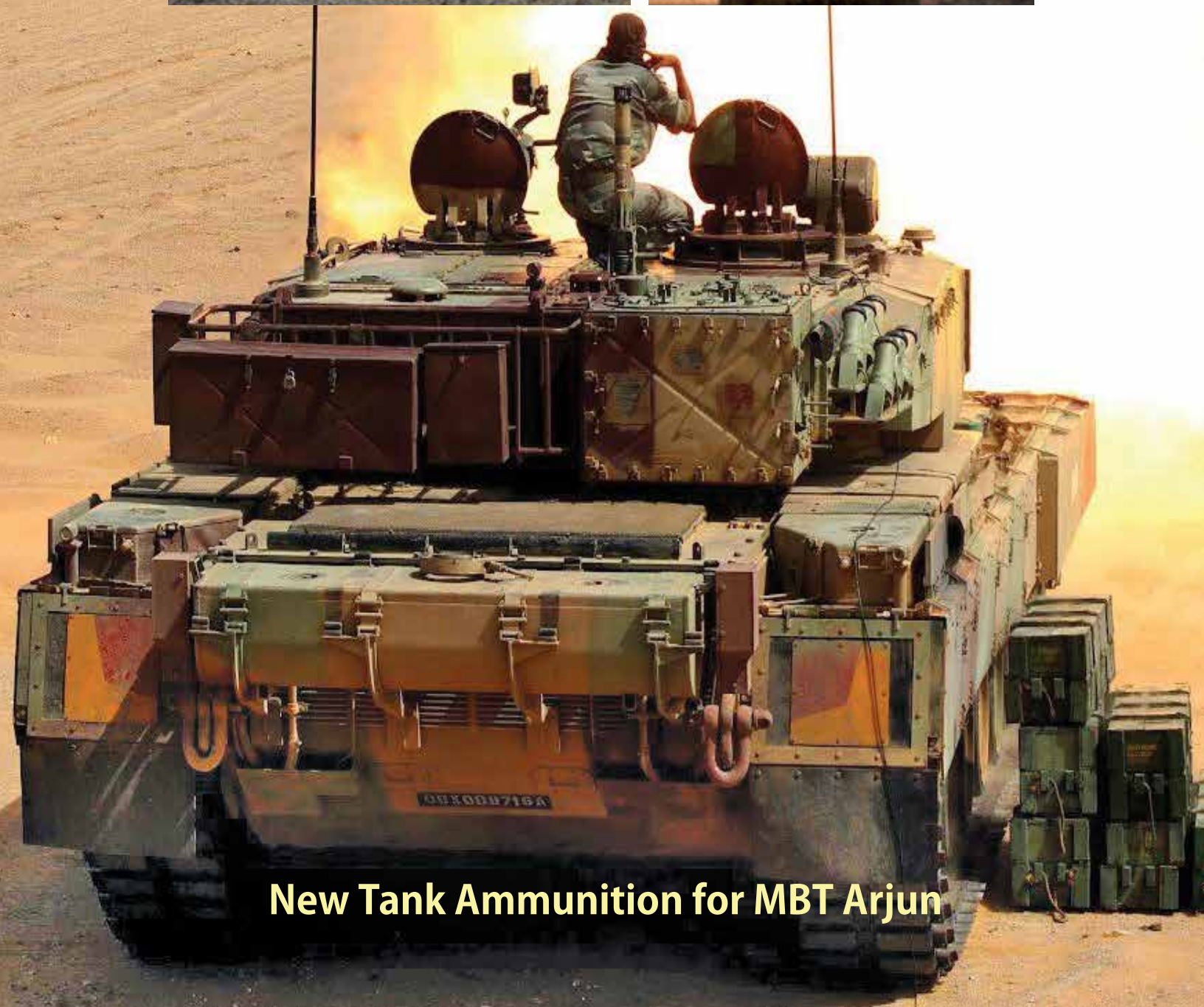


# DRDO NEWSLETTER

A monthly in-house bulletin of Defence Research & Development Organisation ■ Vol. 36 No. 3 March 2016



**New Tank Ammunition for MBT Arjun**



## Visitors to DRDO Labs/Estts

### Gas Turbine Research Establishment



Dr S Christopher, Secretary, Department of Defence R&D and DG, DRDO, along with Dr K Tamilmani, DS and DG (Aero Systems) and Dr CP Ramanarayanan, DS and CC R&D (HR), visited Gas Turbine Research Establishment (GTRE), Bengaluru. Shri MZ Siddique, OS and Director, GTRE, briefed about the latest achievements in the engine development programme. Dr Christopher witnessed the test run demonstrations of Kaveri and Manik engines.

### Naval Materials Research Laboratory



Dr SC Sati, DS and DG (NS&M), visited Naval Materials Research Laboratory (NMRL), Ambarnath. Dr SB Singh, OS and Director, NMRL, gave presentation on overall activities of the NMRL. Dr Sati discussed in details the ongoing as well as new projects including Air Independent Propulsion Programme. He visited the Fuel Cell Department and other Divisions of the Laboratory.

### Naval Physical & Oceanographic Laboratory



Commodore Himanshu Sapre, PDAA, IHQ, MoD (N), visited Naval Physical and Oceanographic Laboratory (NPOL), Kochi, on 14 January 2016. He was briefed about NPOL projects.

**Editor-in-Chief**

Gopal Bhushan

**Senior Editor**

B Nityanand

**Editor**

Manoj Kumar

**Assistant Editor**

Geeta Sharma

**Design & Pre-press**

Anjan Kumar Das

**Multimedia**

RK Bhatnagar

**Printing**

SK Gupta; Hans Kumar

**Marketing**

Tapesha Sinha, RP Singh

**Local Correspondents**

**Ahmednagar:** Lt Col. AK Singh, Vehicles Research & Development Establishment (VRDE); **Ambarnath:** Dr Susan Titus, Naval Materials Research Laboratory (NMRL); **Balasore/Chandipur:** Shri PK Mohanty, Integrated Test Range (ITR); Dr AK Sannigrahi, Proof & Experimental Establishment (PXE); **Bengaluru:** Shri Subbukutti S, Aeronautical Development Establishment (ADE); Smt MR Bhuvanewari, Centre for Airborne Systems (CABS); Smt Faheema AGJ, Centre for Artificial Intelligence & Robotics (CAIR); Ms Tripty Rani Bose, Centre for Military Airworthiness & Certification (CEMILAC); Smt Josephine Nirmala M, Defence Avionics Research Establishment (DARE); Shri Kiran G, Gas Turbine Research Establishment (GTRE); Shri KM Veerabhadra, Electronics & Radar Development Establishment (LRDE); Dr Vishal Kesari, Microwave Tube Research & Development Centre (MTRDC); **Chandigarh:** Shri HS Gusain, Snow & Avalanche Study Establishment (SASE); Shri Ashok Kumar Dahiya, Terminal Ballistics Research Laboratory (TBRL); **Chennai:** Shri PD Jayaram, Combat Vehicles Research & Development Establishment (CVRDE); **Dehradun:** Shri Abhai Mishra, Defence Electronics Applications Laboratory (DEAL); Shri JP Singh, Instruments Research & Development Establishment (IRDE); **Delhi:** Shri Ashutosh Bhatnagar, Centre for Personnel Talent Management (CEPTAM); Dr Rajendra Singh, Centre for Fire, Explosive & Environment Safety (CFEES); Dr KP Mishra, Defence Institute of Physiology & Allied Sciences (DIPAS); Shri Ram Prakash, Defence Terrain Research Laboratory (DTRL); Shri Navin Soni, Institute of Nuclear Medicine and Allied Sciences (INMAS); Smt Anjana Sharma, Institute for Systems Studies & Analyses (ISSA); Dr Indu Gupta, Laser Science & Technology Centre (LASTEC); Shri Sanjay Pal, Recruitment & Assessment Centre (RAC); Smt Kamini Malhotra, Scientific Analysis Group (SAG); Dr Rupesh Kumar Chaubey, Solid State Physics Laboratory (SSPL); **Gwalior:** Shri RK Srivastava, Defence R&D Establishment (DRDE); **Haldwani:** Dr Atul Grover, Defence Institute of Bio-Energy Research (DIBER); **Hyderabad:** Shri Hemant Kumar, Advanced Systems Laboratory (ASL); Dr JK Rai, Advanced Numerical Research & Analysis Group (ANURAG); Shri JP Singh, Centre for High Energy Systems & Sciences (CHESS); Shri ARC Murthy, Defence Electronics Research Laboratory (DLRL); Dr Manoj Kumar Jain, Defence Metallurgical Research Laboratory (DMRL); Dr K Nageswara Rao, Defence Research & Development Laboratory (DRDL); Shri N Venkatesh, Research Centre Imarat (RCI); **Jodhpur:** Shri Ravindra Kumar, Defence Laboratory (DL); **Kanpur:** Shri Ashok Kumar Gautam, Defence Materials & Stores Research & Development Establishment (DMSRDE); **Kochi:** Shri S Radhakrishnan, Naval Physical & Oceanographic Laboratory (NPOL); **Leh:** Dr Somen Acharya, Defence Institute of High Altitude Research (DIHAR); **Mussoorie:** Shri Ashish Joshi, Institute of Technology Management (ITM); **Pune:** Dr (Mrs) JA Kanetkar, Armament Research and Development Establishment (ARDE); Shri AM Devale, High Energy Materials Research Laboratory (HEMRL); Shri SS Arole, Research & Development Establishment (Engrs) [R&DE (E)]; **Tezpur:** Dr Jayshree Das, Defence Research Laboratory (DRL); **Visakhapatnam:** Dr (Mrs) V Vijaya Sudha, Naval Science & Technological Laboratory (NSTL)

Website: <http://www.drdo.gov.in/drdo-nl>E-mail: [director@desidoc.drdo.in](mailto:director@desidoc.drdo.in); [drdonl@desidoc.drdo.in](mailto:drdonl@desidoc.drdo.in)

Tel: 011-2390 2474; Fax: 011-2381 9151

**Cover: Arjun (file photo). Inset: Penetration-cum-Blast (top left) and Thermobaric Ammunition (top right).**

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## Test Firing of New Tank Ammunition for MBT Arjun

DRDO successfully conducted test firing of new tank ammunition Penetration-cum-Blast (PCB) and Thermobaric (TB) Ammunition, specially designed for Arjun Tank at Chandipur, Odisha, on 6 January 2016. The trials were very effective and the damage was devastating with the firing of ammunition successfully destroying the target tank and severely damaging its turret, barrel, tracks, ammunition bin, various sights, antennas, etc. The ammunitions have been developed by Armament Research and Development Establishment (ARDE) and High Energy Materials Research Laboratory (HEMRL), the Pune-based DRDO laboratories.

An innovative chemical composition has been developed by HEMRL after extensive research for the TB ammunition. The TB ammunition uses oxygen from air for burning as against the conventional one, in which the fuel is mixed with the oxydiser. So for equal weight of explosives, TB ammunition is far more effective. During the development phase, these ammunitions were extensively evaluated against different simulated targets, viz., armour plates, concrete structures and fortifications.



The trials were conducted jointly with Army and were aimed to demonstrate the effectiveness of the ammunitions on derelict tank fitted with instrumentation to measure the shocks, blast pressure and temperature at various locations and on advanced imaging systems. The trials were unique as for the first time such evaluation was carried out in India. The ammunition will give a quantum jump to the fire-power of Arjun tank.

The technical trials were witnessed by Directors of HEMRL and PXE, Director DQRS, Army representatives and other senior officials from DRDO.

## DRDO-Industry Meet on Next Generation Protective Ensemble

A DRDO-Industry Meet was organized by Defence Bio-engineering and Electromedical Laboratory (DEBEL), Bengaluru, on 8 January 2016 to evolve qualitative requirements for the development of comfortable next generation protective ensemble for protection against chemical and biological (CB) agents by bringing together all the stakeholders from Services, DRDO, Research Associations and most importantly the Industry.

Shri UK Singh, Director, DEBEL, and Chairman, Next Generation Protective Ensemble (NGPE), highlighted the factors that led to the signing of the Project Agreement and the expectations of all the stakeholders.

Dr Manas K Mandal, DS and DG (Life Sciences), DRDO HQ, inaugurated the meet. During his inaugural address, he emphasized the importance of collaboration among DRDO, private and public institutes and academia to realize state-of-the-art protective equipment to meet the stringent requirements of the services.

Brig. PP Malhotra, VSM, DDG PP (CBRN), Army HQ, while presenting the User Perspective, highlighted the requirements for the next generation protective ensemble.

Shri Punit Lalbhai, Executive Director, Arvind Group, presenting the industry's perspective, highlighted the potential of technical textiles not only in driving

the growth of the Indian textile sector but also in meeting the stringent specification requirements of protective textiles of the future.

Three sessions, dedicated to DRDO/ Academia, Textile and Rubber Research Associations, and Industry were conducted in which more than hundred participants from academia, research institutes and industries participated. The meet captured the capability and shared the experience of various stakeholders to define the roadmap for NGPE.



Dr Manas K Mandal delivering the inaugural address

## DEAL celebrates Golden Jubilee

Defence Electronics Applications Laboratory (DEAL), Dehradun, celebrated its Golden Jubilee on 20 February 2016. DEAL was established in 1965 as Himalayan Radio Propagation Unit at Landour Cantt, Mussoorie and shifted to its present campus in Dehradun in 1976. During its journey of 50 years, DEAL has followed the vision to “be a center of excellence in the field of military communication and surveillance technologies.”

The Golden Jubilee function was inaugurated by Dr S Christopher, Secretary, Department of Defence R&D, and Director General DRDO. The function was also graced by Dr KD Nayak, DG (MED&CoS); Dr Manas K Mandal, DG (LS); Dr Satish Kumar, DG (MSS); Dr G Athithan, CC R&D (SAM); Shri Mohamad Hafizur Rahaman, CC R&D (TM); Dr SC Sati, DG (NS&M); Dr SS Negi, Director, IRDE; dignitaries from DRDO HQ and present and former employees of DEAL. Former Directors of DEAL, viz., Dr EB Rao, Dr Shanker Swaroop, Shri VP Sandlas and Shri Asok Sen were felicitated with a memento of appreciation.

In his inaugural address, Dr Christopher highlighted the importance of the research and development for Armed forces and appreciated the work in cutting-edge technologies being carried out by DEAL in the area of Military Software Defined Radios, Cognitive Radios, Data Links for UAVs and AEW&CS, Data Links, etc.



In his address Dr RS Pundir, Director, DEAL, elaborated the achievements of DEAL and said, “with an outstanding contribution by providing state-of-the-art products and technologies to the Armed forces in the past five decades, DEAL in its Golden Jubilee Year is committed in its endeavoring mission to empower services with wireless communication and surveillance technologies.”

A souvenir highlighting the journey of DEAL and its achievements was released on this occasion and a short documentary elucidating the saga of five decades was also screened. Various developed systems and technologies under development at DEAL were showcased to the guests.



## Raising Day Celebrations

### Aerial Delivery Research & Development Establishment

Aerial Delivery Research and Development Establishment (ADRDE), Agra, celebrated its 48<sup>th</sup> Raising Day on 20 January 2016. The function was inaugurated by Shri Debasish Chakraborti, Director, ADRDE, by lighting the lamp along with other senior officers of the laboratory. The day was filled with cultural programmes by employees, their children and professional artists. A Fonian Army band also performed as part of cultural event. Retired employees of ADRDE also attended the function.

Smt Anuradha Mishra, Principal Income Tax Commissioner, distributed sports prizes to the winner of various sports events organised to mark the occasion. Laboratory-level DRDO Awards were distributed to the meritorious employees.



Kids performing on ADRDE Annual Day

### Naval Materials Research Laboratory

Naval Materials Research Laboratory (NMRL), Ambarnath, celebrated its 63<sup>rd</sup> Lab Raising Day on 5 January 2016. Dr J Narayana Das, Raja Ramanna Fellow graced the occasion as the Chief Guest and addressed the gathering.

Dr SB Singh, OS and Director, NMRL, in his welcome address stressed for setting targets for the year and to



Dr SB Singh addressing employees of NMRL

participate in Swachh Lab Campaign by condemning unused items in each Department. He urged the employees to rise to the occasion to meet the set targets and challenges. Dr Narayana Das presented awards to the employees for their meritorious performances in their field of activities.

The employees, who completed 25 years service in DRDO were felicitated with mementos. Retired employees of NMRL also graced the occasion with their presence. A cultural programme was also arranged where the employees and their children participated.

### Research & Development Establishment (Engineers)

Research and Development Establishment (Engineers) [R&DE (E)], Pune, celebrated its 54<sup>th</sup> Raising Day on 9 February 2016. As a part of Annual Day celebrations, Aga Memorial Lecture was organised in honour of Brig. Aga, the founder Director of R&DE (E). The lecture was delivered by Lt Gen RJ Noronha, AVSM, SM, Chief-of-Staff, Southern Command.

A Samagam of former employees of R&DE (E) and young employees was also organised to share experiences and tacit knowledge. Mementos were distributed to employees who completed 25 years of



service. Laboratory-level DRDO Awards and Cash Awards were given away to the meritorious employees. A colourful cultural programme by the employees of the establishment was the highlight of the Annual Day Celebration.

Annual sports were also organised during the week and prizes were distributed to the winners of the various sport competitions.

◀ Lt Gen RJ Noronha delivering Aga Memorial Lecture

## Patent Clinic

Naval Physical and Oceanographic Laboratory (NPOL), Kochi, in association with Directorate of Extramural Research and Intellectual Property Rights (ER & IPR), DRDO HQ, New Delhi, organized a Patent Clinic on 29 January 2016 to promote the awareness on the essentiality and importance of patents. Dr Reji John, Sc F, Chairman, ER & IPR Council, NPOL, welcomed the participants.

Shri S Kedarnath Shenoy, OS and Director, NPOL, in his opening remarks emphasized the importance of obtaining and safeguarding intellectual property rights

of technologies developed by the laboratory as key strategic necessity.

Programme focused on the use of patent information for Defence R&D projects, importance of patenting defence export products and patent drafting, etc. As part of the programme, scientists were helped at their work bench on patent drafting.

Shri Avinash Kumar, Additional Director, and Dr Nidhi Sandal, Joint Director, Directorate of ER & IPR, DRDO HQ, were the resource persons. The programme concluded with an interactive session.



Shri S Kedarnath Shenoy interacting with the participants



## Manpower Development Activities

Conferences/Seminars/Symposia/Training Courses/Meetings

### All India Joint Scientific and Technical Hindi Conference

To promote the use of Rajbhasha Hindi in the scientific domain, a two-day All India Joint Scientific and Technical Hindi Conference was organized by DEAL, Dehradun during 28-29 January 2016. Shri Rajendramani Tripathi, Surveyor General, Survey of India, was the Chief Guest on the occasion. The conference was jointly organized with Instruments Research and Development Establishment (IRDE) Dehradun, Institute of Technology Management (ITM) Mussoorie and Defence Institute of Bio-Energy Research (DIBER), Haldwani. Thirty-nine research papers on communication, surveillance, agricultural and management techniques in defence area were presented during the conference. The inaugural function was graced by Dr RS Pundir, Director, DEAL, Dr Mohammed Nasim, Director, DIBER and senior scientists of the organizing laboratories.



Inaugural of S&T Hindi Conference organised by DEAL

### DRDO Web Coordinators' & DRONA Administrators' Meet

Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, organised meetings of DRDO Web Coordinators' and DRONA Administrators' on 8 February 2016. Shri Nishant Kumar, Sc D, Coordinator of the Meeting, gave a brief about DRDO website and shared the objective and purpose of the meeting. Shri Gopal Bhushan, Director DESIDOC, chaired the meeting.

In his inaugural address, Shri Gopal Bhushan presented the vision of Secretary Department of Defence R&D and DG DRDO on making DRDO globally visible through DRDO website and how DESIDOC is trying to meet with his aspiration. He said that all DRDO labs are equal stakeholders in this effort and therefore must do their bid as expected from them. To begin with, he expected that labs would send updated contents for the website being revamped. He briefly touched the status of the website. In the end he appreciated the lab Directors for deputing lab representatives for the meeting on a short notice and thanked all participants.

The meeting comprised two technical sessions on "Single Window Services on DRONA" and "Revamping of DRDO Website." Participants discussed various issues like policy guidelines on info to be given on Internet; time bound content approval; showcasing of DRDO developed exported products; online/streaming of videos of eminent scientists; online content approval by the concerned authorities; introduction of expiry date of dynamic contents; load balancing of website; classification of contents on the website under three broad categories, viz., air, land and sea; login-based internet portal, where DRDO scientists and staff can interact; DRDO events' calendar on the home page of website for advertisement; space for international collaboration on DRDO homepage; option for interaction with other academic institution, etc.



Shri Gopal Bhushan delivering the inaugural address



## Workshop on Night-Vision Empowering Technologies

A one-day workshop on Night-Vision Empowering Technologies (NVET-2015), was organized by **Instruments Research and Development Establishment (IRDE), Dehradun**. The workshop focused on latest cutting-edge technological products designed and developed by IRDE, Dehradun, for the use of Indian Army. Shri Avnish Kumar, Sc G, and the Convener of the workshop welcomed the Chief Guest Lt Gen AB Shivane, VSM, DGMF, and the participants. Dr SS Negi, OS and Director, IRDE, elaborated on the objectives and plans of the workshop. He emphasized on the need of multi-sensors, multi weapons, and advanced integrated fire control system platforms to neutralize the Omni-Directional threats of complex warfare scenario.

Lt Gen Shivane, addressed the need for automatic weapons functioning in all weather day and night situations and suggested DRDO to focus on the design and development of equipment at par with contemporary global systems.

Four specialized lectures were delivered by the experts in the areas of Thermal Imaging, Image Intensifier Tubes, Lasers, and Stabilization and Fire Control Systems. Delegates were showcased the state-of-the-art products for search, surveillance and tracking of enemy targets for various platforms. The workshop brought out the achievements and future roadmap in the field of Night Vision Empowering Technologies for India



Lt Gen AB Shivane inaugurating NVET-2015

for bringing synergy among services, researchers and technologists.

## Course for Retiring Employees of NPOL

**Naval Physical and Oceanographic Laboratory (NPOL), Kochi**, organized an In-house Course for Retiring Employees of NPOL (INCREON)-2016 during 9-10 February 2016 for the benefit of the employees who are due to retire in 2016. The aim of the course was to provide a strong knowledge to the participants and their spouses for planning a peaceful, healthy and fruitful retired life. Shri S Kedarnath Shenoy, OS and Director, NPOL, inaugurated the course and highlighted the relevance and significance of the course.

Topics covered in the course included: socio-psycho aspects of retired life, financial management, pensionary benefits, medical reimbursement under Central Government Health Scheme (CGHS) and tips for healthy living. The resource persons comprised financial consultants, physicians and psychologists and included experts both from NPOL and other renowned institutions and hospitals in Kochi. The course served as a platform for the participants to share their valuable experiences as well to update their knowledge on various schemes, rules and regulations useful for the retiring personnel. Dr Sapana Pavithran, Sc E, was the Course Coordinator.

## CEP on Marine Photonics for Naval Applications

**NPOL, Kochi**, conducted a course on Marine Photonics for Naval Applications during 18-22 January 2016 under the Continuing Education Programme (CEP) of DRDO. The course aimed to update the knowledge of the participants on the latest trends and techniques on the above subject. Shri Mohan P Mathew, Associate Director, NPOL, inaugurated the course and delivered the keynote address.

The topics covered in the course included: basics of optics and ocean science, fiber optics and its applications, fiber optic hydrophones, applications of lasers in naval warfare, optics for underwater applications, etc. Visit to facilities and demonstrations of underwater laser



Participants of the course on Marine Photonics for Naval Applications

communication and fiber optic hydrophones were arranged for the participants to provide more exposure. The faculty consisted of scientists from NPOL, LASTEC, SSPL, LRDE, IRDE and Professors from IISc, Bangalore, Cochin University of Science and Technology (CUSAT), Indian Institute of Space Science and Technology (IIST), Thiruvananthapuram and industry experts from SFO Technologies, NEST Group, Cochin.

Shri S Kedarnath Shenoy, OS and Director, NPOL, presided over the valedictory function and distributed the certificates. Dr T Santhanakrishnan, Sc E, was the Course Director.

### Self Awareness Workshop for Proof Ladies

A one-day workshop for 25 ladies of PXE family was organized at **Proof and Experimental Establishment (PXE), Chandipur**, on 30 December 2015 for bringing awareness on Impact of Parental Attitude on Development of Child and their Creativity under the guidance of Dr AK Sannigrahi, Additional Director, PXE. The workshop was inaugurated by the participants themselves. There were discussions on parental attitude, factors for development of attitudes in child,

creativity and barriers on creativity. Participants being in the age group of 25 to 35 years, appreciated the efforts of PXE for conducting the highly useful programme. Shri R Appavuraj, OS and Director, PXE, presided over the valedictory function.



Inauguration of the workshop by the participants

### National Conference on Advances in Sensors: from Lab to Field

**Research Centre Imarat (RCI), Hyderabad**, organised National Conference on Advances in



Sensors: from Lab to Field during 29-30 January 2016. The conference was also sponsored by Sensor Research Society, CSI, India and IEEE Photonics Chapter, Hyderabad. Prof. Ashutosh Sharma, Secretary, Department of Science and Technology (DST), was the Chief Guest and Shri SK Sharma, MD, BEL Bengaluru, was the Guest of Honour. Shri BHVSN Murthy, Associate Director RCI gave the welcome Address.

Dr Avinash Chander, former Secretary, Department of Defence R&D, DG, DRDO and President, Sensors Research Society, in his presidential address, aspired better collaboration between academics, R&D institutions and industry in all areas of sensor development.

Dr G Satheesh Reddy, SA to RM and Director RCI delivered a lecture on strategy for indigenous sensor development. He underlined importance of skill sets, research groups and knowledge base in all areas

of material science, processing and manufacturing. Shri SK Sharma emphasized the role of BEL for DRDO Projects.

Prof. Ashutosh Sharma stressed on action plan for development of materials in all areas of sensors both for present and future requirements. A total number of 20 invited talks and 58 papers were presented during the Conference.

A Panel discussion was also organised under the chairmanship of Dr K Unhi Krishnan, Director SHAR. The panel discussions lead to a roadmap for sensor development for all R&D projects. Prof. Ashutosh Sharma also released CD of Conference Papers.

Shri K Rambabu, Sc G, RCI, was the Convener of the workshop. Dr Jagannath Nayak, Sc G, RCI, proposed the vote of thanks.



Release of Conference Material

## READERS' VIEWS

Your feedback is important for us as it gives us scope for improvement and serve you in a better way. DRDO Newsletter requests its esteemed readers to send their views about the quality of contents and coverage in the Newsletter. Please send your suggestions to:

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

## Personnel News

### Appointment

#### Director, DRL



Dr P Srinivas Raju, Sc G, assumed the charge of Director, Defence Research Laboratory (DRL), Tezpur, wef 21 January 2016. He obtained his degrees of MSc and PhD (Botany, Plant Physiology) from Sardar Patel University, Anand, Gujarat.

Dr Raju joined Defence Food Research Laboratory (DRFL), Mysore, as Sc B on 22 January 1987. During his tenure in DFRL, he developed a number of post harvest handling and processing technologies for fruits and vegetables, i.e. ethylene absorbing filter blankets, modified/controlled atmosphere storage, edible surface coatings, hurdle technology, minimal process technology, zero energy cooling chamber, antifreeze containers, processing of non-conventional commodity from North-East, Central and Northern Himalayas, high pressure processing, microwave processing, vacuum-aided processing besides several functional/logistic/convenience products.

He was instrumental in developing pre-treatment and packaging protocols for fresh fruits and vegetables for troops in Siachen Glacier. Dr Raju has been the project leader for NAIP (World Bank funded) project on "value chain for coconut". He also popularized value-added products from tomato and jack fruit for the benefit of farmers and women entrepreneurs.

Dr PS Raju has authored 9 international book chapters and a comprehensive book on 'Food Science'. He has 12 patents besides 3 design registrations. He has 60 international research papers and 10 reviews.

He is the recipient of 30 awards from various professional bodies and DRDO including Association of Food Scientists and Technologists (I), All India Food Processors' Association and the Federation of Indian Chambers of Commerce and Industry (FICCI).

### Awards

#### National Award for Technology Innovation in Chemicals and Petrochemicals

The team comprising Dr DN Tripathi, Sc G, Dr AK Saxena, former Director, DMSRDE, Dr Vineeta Nigam, Sc E, Shri Mritunjay Kumar Pandey, Sc C, and Smt Anjlina Kerketta, Sc C, from Defence Materials and Stores Research and Development Establishment (DMSRDE), Kanpur, received the 6<sup>th</sup> National Award for Technology Innovation in Chemicals and Petrochemicals and Downstream Plastic Processing Industry from the Department of Chemicals and Petrochemicals in the category of "Innovation in Polymeric Materials" on 20 January 2016 at FICCI Auditorium, New Delhi. The team was awarded for development of Melt Processable Organic Polymer Blends with in-house synthesized Multifunctional Polyphosphazene to obtain thermally stable and flame retardant fibers while maintaining their tenacity and stretchability. The award was presented by Hon'ble Minister for Chemicals and Fertilizers, Shri Ananth Kumar in presence of Shri Hansraj Gangaram Ahir, Hon'ble Minister of State for Chemicals and Fertilizers.

#### Suman Sharma Award



Smt M Remadevi, Sc F, Naval Physical and Oceanographic Laboratory (NPOL), Kochi, was conferred the Suman Sharma Award-2015 instituted by the National Design and Research Forum of the Institute of Engineers (India) in recognition of her significant contributions and lead role in the design of signal processing systems in critical area of submarine sonars.

#### Aryabhata Award

Dr Avinash Chander, former Secretary, Department of Defence R&D, SA to RM and DG, DRDO was awarded prestigious Aryabhata Award 2013 for lifetime contributions to Aeronautics and Astronautics in India, by Dr R Chidambaram, Principal Scientific Adviser to Government of India and Dr AS Kiran Kumar, Chairman,



ISRO during the ASI-ISRO Awards function held at Space Applications Centre (SAC), Ahmedabad, on 25 February 2016.

Shri BHVS Narayana Murthy, OS and Associate Director, Research Centre Imarat (RCI), Hyderabad, received the ASI Rocket and Related Technologies Award on this occasion.



Dr Avinash Chander (centre) receiving Aryabhata Award

## Higher Qualification Achieved

### Combat Vehicles Research & Development Establishment



Shri N Seetharaman, Sc F, Combat Vehicles Research and Development Establishment (CVRDE), Chennai, has been awarded PhD by Anna University, Chennai, for the thesis titled Modelling, analysis and simulation of trajectory generation for Dual arm Mine Detection Mobile Manipulator.



Shri R Baskaran, Sc C, CVRDE, Chennai, has been awarded PhD by Anna University, Chennai, for the thesis titled A Study on the effect of Dimensional Instability of Mirror materials for an Opto-mechanical Reference System.

### High Energy Materials Research Laboratory



Shri RS Palaiah, Sc E, High Energy Materials Research Laboratory (HEMRL), Pune, has been awarded PhD (Chemistry) by Savitribai Phule Pune University for the thesis titled Studies

on Magnesium/Sodium Nitrate/ Carbonaceous Fuels-based Pyrotechnic Systems for Advanced Infrared Flares.



Shri Nagarkar Ashok Govind, Sc D, HEMRL, has been awarded PhD (Chemistry) by Savitribai Phule Pune University for the thesis titled Studies on Zirconium and Titanium-based Advanced Solid Incendiary Composition and their Dispersion Pattern.



Shri Tribhuvan Nath, Sc F, HEMRL, has been awarded PhD (Chemistry) by Savitribai Phule Pune University for the thesis titled Studies on Performance and Characteristics of RDX/HMX/NTO/TATB/CL-20 and TPE/HTPB/PU/Azido/Fluoro Polymers-based Advanced Sheet Explosive.

### Naval Science & Technological Laboratory



Smt TVSL Satyavani, Sc E, Naval Science and Technological Laboratory (NSTL), Visakhapatnam, has been awarded PhD by Andhra University, Visakhapatnam, for the thesis titled Synthesis, Characterization and Electrochemical Performance Evaluation of Supervalent Doped Carbon Coated NanoLithium Iron Phosphate for High Rate Li-Ion Cells.



Shri Pradeep Kumar Garu, Sc D, NSTL, has been awarded PhD by Indian Institute of Technology, Kharagpur, for the thesis titled Studies on Development of Acoustically Transparent Polymeric Materials for Encapsulation of Underwater Transducers.

### Snow & Avalanche Study Establishment



Shri Sunil Bhardwaj, Sc E, Snow and Avalanche Study Establishment (SASE), Manali, has been awarded PhD from PEC University of Technology, Chandigarh, for the thesis titled Studies on Behaviour of Micropiles under Oblique Pullout Loading.



## Sports Round-Up

### National Shuttle Badminton Tournament

The 26<sup>th</sup> DRDO National Shuttle Badminton tournament was held at Gas Turbine Research Establishment (GTRE), Bengaluru. The three-day tournament was inaugurated by Dr K Tamilmani, DG (Aero Systems), DRDO. Shri Debabrata Roy, OS, GTRE, Shri R Ganesh, Sc G, GTRE and Shri M Shanker, DFA (R&D) and Add CDA, were the Guests of Honour. Sixty sports persons from DRDO labs participated in the championship. Shri SP Suresh Kumar, Sc G, GTRE, presided over the finale and distributed prizes to the winners. South Zone was crowned with the team championship while team North Zone was the runner-up. Shri Ravikumar, GTRE, was the Man of the Tournament winning four out of five championships.



Shri DK Kankane delivering inaugural address

West Zone Team. Shri DK Kankane, gave away the trophies and medals to Winners and Runners-up team.



Team South Zone with the Championship Cup

### DRDO West Zone Badminton Tournament 2015-16

High Energy Materials Research Laboratory (HEMRL), Pune, conducted DRDO West Zone Badminton tournament from 21-23 December 2015 at DRDO Arjun Sports Complex, Pashan, Pune. Shri DK Kankane, Sc G, Associate Director, HEMRL inaugurated the tournament. Teams from DRDO West Zone labs, viz., HEMRL; ARDE; R&DE (E); MSC, Dehu Road; VRDE, Ahmednagar and NMRL, Ambarnath participated in the tournament. HEMRL won the team Championship. Based on performance eight players (6 men and 2 women) from HEMRL have been selected for the DRDO National Badminton Tournament to represent

### DRDO National Football Tournament

Integrated Test Range (ITR), Balasore, organised DRDO national Football Tournament during 5-7 January 2016. Teams from Central, West, North and South Zones participated in the tournament. Shri PK Mohanty, Sc F, Chairman, Organising Committee, welcomed the teams and wished them good luck. Dr BK Das, OS and Director, ITR, inaugurated the tournament. Shri R Appavuraj, OS and Director, PXE and Shri MV Bhaskarachary were also present on the occasion. South zone won the tournament. Central zone was the runner-up. Shri MV Bhaskarachary gave away the medals and certificates to the winners and runners up. Dr BK Das gave the trophies to the winners. Shri Rajiv K Das, Sc D, Sports Officer, presented the vote of thanks.



Players with Dr BK Das and Shri R Appavuraj





## DRDO: Harnessing Science for Peace and Security

### Part-I

*In continuation of the editorial of the last issue of the DRDO Newsletter, Vol. 36 No. 2 February 2016, the history of DRDO is traced once again based on the monograph, "Defence Research and Development Organisation: 1958-1982", by Dr RP Shenoy, former Director of Electronics Research and Development Establishment (LRDE), Bengaluru. Monograph was published by Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, in 2004.*

#### Defence Scenario before Independence

The First Chapter of the monograph goes with the title, "Defence Scenario before Independence", which essentially, portrays the picture that existed in the country before the independence and circumstances which introduced rudimentary military science for replacing stores.

During World War I, the world power was divided into the Allied Forces led by Britain, USA and China and Axis Forces led by German, Italy and Japan. Britain was major military and economic power at that time and there was as such no requirement for Britain to evolve any research activities in India.

The colonial policy of Britain's policy and strategy for the defence of the British Empire was formulated in UK. It was enforced rigorously in India to prevent a possible repetition of the 1857 Sepoy Mutiny. The British Government had made sure till World War I that the officers of the Indian Army were exclusively British. The Indian armed forces were predominantly the ground forces,

namely the Army with the Royal Navy providing the backup on sea. As a sop to the increasing criticism by the nationalist elements, the British Government after the World War I created an Indian Navy and an Indian Air Force but these were only token forces. Even after political reforms were introduced in India in the form of legislative assemblies for the governance of the provinces with elected representatives, the subject of defence was kept out of the purview of Indian legislators.

The policy followed by the British in India towards scientific and technical education, scientific and industrial research and development was in keeping with their role as colonial rulers. Even though India had a long and rich history of distinct indigenous techno-scientific traditions, the colonial policy did not encourage generation of technical knowledge or ensure its integration into the knowledge base existing in the country.

The geopolitical considerations led to the Cold War, which polarized the developed world into two main blocks holding distinct ideologies, with the USA being the leader of the Western Block and the USSR the leader of the other. In the decades after the cessation of the war, the US Department of Defense became instrumental in the development of electronics, aerospace engineering and other technologies, and sciences related to military operations. Integrated circuits, real-time applications of computers, software, supersonic aircraft and space technology, came into being and were progressed at a rapid

pace that normally would not have been possible in the commercial competitive environment of that time.

In the aftermath of wars, colonial powers felt the need to involve Indians for the war preparations but even that role was marginally limited only to inspection of products and technical trials.

#### Transformation-Defence Research and Development (1958-1969)

The Second Chapter, "Transformation-Defence Research and Development (1958-1969)", gives a picture of the process of transforming the Defence Science Organisation to Defence Research and Development Organisation for undertaking research and development in hardware, software and processes to meet the needs of the Services. The Chapter goes into detail the stewardship of Dr S Bhagavantam who, as Scientific Adviser over a period of eight years built a cohesive organization while at the same time expanding the scope of its activities to cover all essential science and technology areas of application to the Services. The guidance and direction provided by him and the difficulties faced in operating within the government framework are also brought out. The Chapter ends up with the efforts and contribution of DRDO to meet the short term needs of the Services.

#### Over to Systems Development (1970-1982)

The Third Chapter, "Over to Systems Development (1970-1982)", provides an insight to



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changes that took place in the next twelve years with three eminent physicists of the country assuming charge as Scientific Advisers for a period of about four years each. The contributions of Dr B D Nagchaudhuri, Professor MGK Menon and Dr Raja Ramanna to the growth and to the betterment of DRDO are presented in this Chapter.

## Marching Forward

The fourth Chapter, "Marching Forward" highlights the growth of the major laboratories in the Organisation during the 25 years of the existence of the DRDO. The charter, initial state and status of the major laboratories, the difficulties faced during the learning period, the building up of the infrastructure,

the challenges to be overcome in stepping up of the tasks from short term response to new system development and the achievements up to 1982 are presented.

In series to follow, the chapters will be discussed in detail.

*Kavita Narwal  
Scientist C, DESIDOC*

## Social Activities

### Tree Plantation at DESIDOC

Environmental pollution is a matter of serious concern not only for the Government but also for the citizens of the country and specially for the denizens of Delhi. One of the easiest ways to check the menace of pollution



Shri Bishambar Singh planting tree

is tree plantation. In pursuit of the societal mission and sharing the vision of the Secretary Department of Defence R&D and DG DRDO, Defence Scientific Information and Documentation Centre (DESIDOC) has planned of tree plantation as a memorial gift on superannuation of one of the DESIDOC's family member. Shri Bishambar Singh, Office Attendant, who superannuated on 29 January 2016, planted a tree at the office complex of the DESIDOC.

Speaking on the occasion Shri Gopal Bhushan, Director, DESIDOC, expounded the importance of the trees in checking the rising pollution levels and reconnecting with the nature. A memorial tree would be a perfect gift to honour someone who had served the organisation dedicately, said Shri Gopal Bhushan.

### Health Check-up Camp and Self Service Facility at ITR

A health check-up Camp was organized by ITR on 31 January 2016. A team of specialist Doctors in the field of Cardio, Neuro and Ortho from M/s Sunshine Hospital, Bhubaneswar, conducted health check-up of ITR employees, their family members and the people of Balasore. About 300 personnel got benefitted from the Health Camp. This noble work is a step towards "Swasth Swasthya" for all.

Dr BK Das, OS and Director, ITR, inaugurated a Self-Service CSD Canteen at ITR on 1 February 2016. The canteen was renovated under the guidance of Shri CR Ojha, Sc F and GD (HR&PL), for quick and better service, which was appreciated by all the employees.