

DRDO HANDS OVER TOTAL ACCRUED TOT FEE OF AROUND Rs 192 Cr TO RAKSHA MANTRI



India : The Emerging Defence Manufacturing Hub

DEFEXPO 18
INDIA 11-14 APRIL 2018 CHENNAI



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Dr S Christopher

CHAIRMAN

Defence Research & Development Organisation

&

SECRETARY

Department of Defence Research & Development

Dear friends,

“Perform or Perish”. As the saying goes, it is upon us to decide our future and fate. The nation has bestowed upon us the responsibility to be self-reliant in indigenous defence technologies. So let's give our best shot in our endeavour and niche a special place in history. I am sanguine that with the abundance of exceptional and best talent in our organisation, we can achieve the nation's aspirations. Yes! “We can do it.”

International DefExpo-2018, inaugurated by Hon'ble Prime Minister, in Chennai on 12 April 2017, was a mega event and DRDO's participation was very well organized by CVRDE and DPI along with other DRDO labs. The live demo of the DRDO products had a tsunami of spectators witnessing the indigenous military might aptly making it a huge success. DRDO-Industry partnership saw a new high with signing of major ToTs. The new ToT procedure saw enormous success, enhancing DRDO's contribution in nation building under 'Make in India'. Well done and keep it up.

In DRDO@60, 'DRUSE-DRDO Robotics and Unmanned System Exposition' is closing curtains with talent hunt on AI and Robotics pan India. The 30 finalists would showcase their ideas in a function being organized shortly. This would further our aim of providing the best, technology has to offer in this stream and plan future research. 'Navrachna-Online Innovation Challenge' has seen our scientists participating whole heartedly. Their ideas would be co-opted in the labs for others to contribute and make them happen. Young Scientists Forum (YSF), Delhi Chapter, has contributed immensely in DRDO@60. Hyderabad Chapter was inaugurated on 15th April, the Bangalore Chapter is all set for opening on 28th April and the Pune Chapter on 25th May. I expect the young generation to excel in all areas and contribute wholeheartedly towards achieving the organizational goals. They are the future and the reputation of this great organization rests on their genuine efforts to excel in all spheres.

'Director's Conclave' held during 6-7 April 2018 at TBRL, Chandigarh, was a major opportunity to collectively introspect and take decisions having far reaching effects in the best interest of the organisation.

Friends, 'last but not the least', as we move into future, the wars would be fought for the water. We have seen the environmental changes in the last few decades and how scarcity of water has made us decide our policies. Therefore, “Save Water-Save Earth”. Let us give safe water to our future generations. Save it wherever possible, in your houses, offices, gardens and even in public places. Become a responsible citizen.

Jai Hind !

DRDO CELEBRATES 'MAKE IN INDIA' SPIRIT IN DEFEXPO – 2018

A commemorative postal stamp was released on the occasion to honour DRDO scientists, both past and present.

Defence Research and Development Organisation (DRDO) transferred eight technologies to seven industries from private and public sector in the presence of Hon'ble Raksha Mantri Smt Nirmala Sitharaman during DefExpo India-2018 held at Thiruvudanthai, Kancheepuram district on the East Coast Road near Chennai, on 11 April 2018. The spectrum of products included missiles, torpedoes, grenades, sonar, sonar dome, gas turbine technologies and Identification of Friend and Foe (IFF) systems.

Hon'ble Raksha Mantri Smt Nirmala Sitharaman handed over Processor-based Moored Mines, Advanced VLF

Modulator and De-Modulator, and Modern ESM System-Varuna to the Chief of the Naval Staff Admiral Sunil Lanba, PVSM, AVSM, ADC.

The technologies transferred to industry partners included: ASTRA Missile to M/s BDL, Hyderabad; Heavy Weight Torpedo Varunastra to M/s BDL, Hyderabad; Anti-Thermal/Anti Laser Grenade to Ordnance Factory, Dehu Road; IFF to M/s Data Pattern, Chennai, BEL, Bengaluru and M/s Alpha Design Ltd, Bengaluru; Sonar Dome to M/s Keneco Pvt LTD, Goa; Small Turbo Fan Engine to M/s Lakshmi Machine Works, Coimbatore; HUMSA-UG Sonar and ABHAY Sonar to BEL, Bengaluru.

The occasion saw the symbolic handing over of the total accrued Transfer of Technology (ToT) fee of around Rs 192 crore- arising from 290 ToTs by DRDO to industries from 2015 till date-by Dr S Christopher, Chairman DRDO and Secretary, Department of Defence R&D to Hon'ble Raksha Mantri. A record number of 112 ToTs were executed in 2017 and a record ToT fee of Rs 158 crore has been accrued in this year alone till date, breaking all previous records. This will provide a major boost to the "Make in India" programme envisioned by the Prime Minister Shri Narendra Modi.

The Light Combat Aircraft, Tejas,



Hon'ble Raksha Mantri Dr Subhash Bhamare handing over the ToT agreement.



designed and developed by ADA, an autonomous society of DRDO, was amongst the major product that found mention during the function. So was BrahMos missile, the major sub-systems of which have been indigenized and developed in line with 'Make in India' by Defence Research and Development Laboratory (DRDL), a laboratory of DRDO, and productionized as well

as marketed by BrahMos Aerospace Limited, a joint venture of DRDO and NPOM, Russia.

To commemorate its 60 years, DRDO is organising a number of events such as outreach programmes for industry and S&T in schools and colleges, S&T exhibitions, Cyber Challenge, Public Lectures by Young Scientists, National Level Essay Competition and Skill India

initiatives.

A commemorative postal stamp designed by the Department of Post and Telegraph was released on the occasion to honour DRDO scientists, both past and present, who have contributed in the 60-year journey of making India self-sufficient and self-reliant in Defence technologies and systems.



Hon'ble Raksha Mantri Smt Nirmla Sitharaman releasing the commemorative postal stamp of DRDO.



Team DRDO with entrepreneurs.



GROUND-BASED MOBILE ELINT SYSTEM HANDED OVER TO THE INDIAN AIR FORCE

The Ground-based Mobile Electronic Intelligence (ELINT) System (GBMES) was handed over to the Indian Air Force (IAF) at the BEL, Hyderabad Unit on 18 March 2018. DRDO's Defence Electronics Research Laboratory (DLRL), Hyderabad, is responsible for the system design, development of critical sub-systems, and realization of engineered version of truncated GBMES system as successfully proved in the field. BEL, Hyderabad is the production agency for GBMES.

Dr S Christopher, Chairman, DRDO, and Secretary, Department of Defence R&D, Ms J Manjula, DS and DG (ECS), DRDO, along with Mr MV Gowtama,

CMD, BEL, handed over the system to the Air Vice Marshal BR Krishna, AVSM, SC, ACAS (Plans).

The GBMES comprises one Control Station (CS) and three Receiving Stations (RS) integrated in master/slave concept to search, detect, monitor, record and process the hostile emissions as well as to find out the location of the emitter fulfilling the strategic EW requirements of the IAF. One of the three RS has also been configured to operate in master/slave configuration (with minimal degradation) in the absence of control station. Each RS contains three ELINT Receiver Segments in the 70 MHz – 40 GHz frequency range. In addition, one Communication Intelligence (COMINT)

Receiver Segment, operating in 30-1000 MHz frequency range, intercepts and monitors the COMINT signals.

SALIENT FEATURES

- * Wide Frequency coverage from 70 MHz to 40 GHz and COMINT segment 30-1000 MHz
- * Quad Superhet Receiver Front-end Technology
- * Quad Digital Receiver Technology
- * Built-in Radar Finger Printing System (RFPS)
- * Location Fixing (LF) using triangulation





BRAHMOS TESTED WITH INDIGENOUS SEEKER

BrahMos, the formidable supersonic cruise missile with indigenous seeker was successfully flight tested at 0842 hrs on 22 March 2018 at the Pokhran Test Range in Rajasthan. DRDO and BrahMos Aerospace have developed the supersonic cruise missile and the seeker jointly.

The precision strike weapon with indigenous seeker flew in its designated trajectory and hit the pre-set target. The scientists of DRDO and BrahMos along with the Indian Army conducted the flight test. A high level team, led by Chairman, DRDO, and Secretary, Department of Defence R&D, Dr S Christopher, Dr G Satheesh Reddy SA to RM and DG (Missiles and Strategic Systems), DRDO, and Dr Sudhir Mishra DG, CEO and MD BrahMos was present during the flight trial.

Programme Director Dr Dashrath Ram and Project Director Mrs V Prameela, who had led the effort for development of the indigenous seeker, were also part of the team. Senior IAF officials also witnessed the successful launch of the tactical weapon.



File Photo

HIGH ALTITUDE STARTING TRIAL OF SMALL TURBO FAN ENGINE AT LEH

Gas Turbine Research Establishment (GTRE), Bengaluru, successfully tested prototype of Small Turbo Fan Engine (STFE) for High Altitude Cold Climate Starting trials in Leh during February 2018. The successful demonstration validated the design, selection of

materials and the control logics used for lighting and acceleration of engine to minimum sustained speed. The performance of pyro systems was as per expectations.

GTRE had designed and realised a mobile test bed and fuel supply

system simulating unmanned vehicle configuration exclusively for adapting to High Altitude trials. Suitable Operator Console in a climate controlled cabin for safe operation of control desk, data acquisition systems and vibration monitoring panels were also positioned to ensure that tests are carried out



High Altitude starting trials of small turbo fan at Leh.

without compromising safety and other design criteria.

Apart from the scientists of GTRE, scientists from the other participating DRDO labs, viz., High Energy Materials

Research Laboratory, Pune, Advanced Systems Laboratory, Hyderabad, and Centre for Military Airworthiness and Certification/Regional Centre for Military Airworthiness (Engrs)

were also there. The team was led by N Balamurali Krishnan, OS, Project Director (STFE), GTRE.

TOT

DIPAS TRANSFERS BACKPACK TECHNOLOGY

Defence Institute of Physiology and Allied Sciences (DIPAS), Delhi, transferred the technology of ergonomically designed Backpack to M/s Shiva Taxyarn Limited, New Delhi. Dr Bhuvnesh Kumar, Director, DIPAS, Dr PK Reddy, Sc 'F', Shri Ajay Kumar Gupta, and inventor scientists were present on the occasion.

The Backpack is designed using indigenous anthropometric database of the Indian soldiers for better balance, stability, mobility, comfort and enhance load carrying capacity by deducing energy expenditure.





DRDO PAVILION ADJUDGED MOST INFORMATIVE AT 105TH ISC

DRDO PaviliOn received the 'Most Informative Pavilion' Award in the Pride of India Expo organized as part of the 105th Indian Science Congress (ISC) held from 16 to 20 March 2018 at Manipur University, Imphal. Prime Minister Shri Narendra Modi inaugurated this annual mega event on 16 March 2018. DRDO participated in the Expo showcasing cutting-edge indigenous defence

technologies with over 150 exhibits and models from 18 DRDO laboratories.

The DRDO pavilion at the Expo was a big attraction among the visitors particularly students, who got opportunity to interact with DRDO scientists who engaged the visitors in the lively discussions on science and technology.

The participation of DRDO in the ISC reaffirmed the message to

masses that strength of 'science and knowledge' and the resultant self-reliance by converting this knowledge into technologies and systems through innovation were essential to ensure peace and national security.

Dr S Christopher, Chairman, DRDO, and Secretary, Department of Defence R&D, congratulated the organizing team for the award.



Students through DRDO Pavilion at Pride of India Exhibition.

INTERNATIONAL WOMEN'S DAY

Traditionally International Women's Day (IWD) is celebrated to draw global attention to women's concerns, to commemorate elimination of discrimination against women, and their participation in global development.

The following DRDO labs/estts celebrated IWD at their respective places:

ARDE, PUNE

Dr KM Rajan, DS and Director, Armament Research and Development Establishment (ARDE), flagged off a 2 km walkathon organized for the women employees. An Ayudh Mahila Fun Fair, a pot decoration competition as well as mehendi application and fun games were also arranged. The Women's Cell of ARDE donated Rs 2 lakh to Mamata Foundation – a charitable organization working for the welfare of HIV affected children and women. The donation was handed over to Ms Shilpa Budukh, the Founder President, who was invited as the Chief Guest. She spoke on the myths and reality of HIV and AIDS.

CAIR, BENGALURU

The function started with welcome address by Smt Anshu Bhardwaj, Sc 'F'. Smt Manimozhi Theodore, Director, CAIR, addressed the gathering. Colourful cultural programmes and games were arranged as part of the celebration. The function concluded with the vote of thanks by Smt Chitra Vishwanathan, Sc 'F'.

DIPR, DELHI

Defence Institute of Psychological Research (DIPR), celebrated a women's day special afternoon to honour the women staff of the institute. The event gave the ladies an opportunity to come together, bond, share and indulge in various activities.



IWD celebration at ARDE.



Director CAIR addressing women employee on the occasion of IWD.



Ladies enjoying a special afternoon at DIPR.



DLRL, HYDERABAD

Smt Soma Vashishta, Sc 'G', Chairperson, DLRL Women's Cell, presented a report on activities of DLRL Women's Cell. Dr P Sasikala, MD, DGO (Obstetrics and Gynaecologist), the Chief Guest, delivered a talk on "Problems and Precautions in Obstetrics and Gynaecology" and Smt M Archana Rao, Legal Advisor, Bharosa SHE Team, was the Guest Speaker. Prizes were distributed to the winners of various events held during the celebrations. Dr AK Singh, Director, DLRL, senior scientists and around 100 lady employees participated in the celebration.

DFRL, MYSURU

Dr Shiby Varghese, Chairperson, Women's Cell, presented a report on DFRL Women's Cell activities. Smt Sonia Jacob, Principal, Sneha Kiran, Mysuru

Spastic Society, was the Chief Guest and delivered a talk on "Empowerment of Women in Society". She emphasised the role of Sneha Kiran in supporting the mothers of challenged children and providing them opportunities to pursue their professional aspirations. Director, DFRL, distributed prizes for various competitions conducted as part of IWD celebration. A video on "Women Achievers" was screened with special reference to Jessica Cox, the only licensed woman pilot without arms and the life sketch of late film star Sridevi.

IRDE, DEHRADUN

Smt Veenu Yadav, graced the occasion as the Chief Guest along with Guest of Honour Maj Gen JS Yadav, SM, GOC, at Instruments Research and Development Establishment (IRDE). The Chief Guest, in her address, accentuated on women empowerment.

Slogan and theme-based collage competition were organised. The Chief Guest also took part in tree plantation.

NPOL, KOCHI

Smt Pradeepa, R, Sc 'F', Coordinator, NPOL Women's Cell, elaborated the achievements of the women cell. Shri S Kedarnath Shenoy, OS and Director, NPOL, elucidated the ancient tradition of depicting women as sources of power citing examples of the success stories of strong women including the meritorious achievements of women in DRDO. Dr Chitra Venkateswaran, Founder/Clinical Director, Mental Health Action Foundation, was the Chief Guest and delivered an enlightening talk on "A Shift to Value Based Health Care." A video on the successful role of women workforce in both technical and non-technical areas in NPOL depicting their contributions and achievements was also shown on the occasion.



Clockwise from top left: IWD celebration at DLRL, DFRL, IRDE and NPOL.

NATIONAL SAFETY WEEK

ANURAG, HYDERABAD

To commemorate the National Safety Week, a function was held at the Chitra Auditorium on 9 March 2018. Dr JVR Sagar, Director, Advanced Numerical Research and Analysis Group (ANURAG), read out the message on the 47th National Safety Day received from Chairman, DRDO.

Safety and Health Pledge was taken by the employees of ANURAG. A presentation on ANURAG Safety Committee's achievements and plans was delivered by Shri Amit Kumar Saha, Member Secretary, ANURAG Safety Committee. It was followed by a talk on 'Safety Practices in DRDO' by Shri N Vijay, Sc 'E', DRDL, Hyderabad.

Later, a team of Firemen from Fire Brigade, DRDL, conducted a live demo on how to control different types of fire and instructed the audience about first aid fire fighting and operation of different types of extinguishers. Employees also operated the fire extinguishers for training purpose.



Fire fighting drill at ANURAG.



Life safety drill at CFEES.

CFEES, DELHI

National Safety Week was celebrated from 4 March to 10 March 2018 in Centre for Fire, Explosives and Environment Safety (CFEES), for creating a preventive culture, scientific mindset and organized approach to safety issues while working in chemical lab/hazardous atmosphere. The week long celebrations were focused on sensitizing the employees on safe practices at work place, at all working levels, for the prevention of accidents. This was in line with this year's safety theme "Reinforce Positive Behaviour at the Workplace to Achieve Safety and Health Goals".

Director, CFEES, addressed the employees and emphasized on integrating safety with all hazardous activities in the lab. An SOP for safe

operation and building a safety culture in the laboratory were brought out. Lectures, rescue drills, slogan and poster competitions, etc., were organised during the week.

DL JODHPUR

Defence Laboratory, Jodhpur (DLJ), celebrated 47th National Safety Week with great enthusiasm. In observance to the week, various events were organized for safety awareness of DLJ employee. Dr SR Vadera, OS and Director, DLJ

and Shri Ravindra Kumar, Sc 'G' and Chairman Safety Committee, and DLJ employees participated in the fire rehearsal and got awareness about types of fires and use of fire extinguishers. First aid training was given by Dr JK Arora, Medical Officer, DLJ.

A half-day Safety Awareness training programme for Work Centre I/Cswas organized. Shri KG Kapoor, Addl Director, DQRS, DRDO HQ, delivered a lecture on 'Safety Culture and Policy' and provided valuable information on



DRDO safety policy, safety framework and process of safety audits. Shri Mukul Rajvanshi, Deputy Chief Inspector, Factory and Boilers, Govt of Rajasthan, delivered a lecture on 'Industrial Safety'. Shri Pardeep Narayan, Sc 'E', provided useful information on Radiation Safety in his lecture. Shri Ved Parkash, Fire Safety Officer, DLJ, delivered a lecture on 'Fire Safety Preparedness'. A function was organized in which Prof. OPN Calla, Director, International Centre for Radio Science, was invited as the Chief Guest. Prof Calla delivered a safety awareness lecture on 'Microwave Radiation Safety'.

Shri Umar Farukh, TO, and Shri Ramesh Chaudhary, Fireman, were presented 'Letter of Appreciation' by the Chief Guest and Director, DLJ, for their outstanding contribution toward safety related activities.

NMRL, AMBERNATH

Safety and Health Pledge was taken by the Director and the NMRL employees. A talk on 'Safety in R&D Laboratory' was delivered by Smt R Vijayalakshmi, Scientific Officer 'G', BARC, Mumbai. Display of safety equipment and conduct of safety training workshop by Shri Hemant Khadse, Fire and Safety Advisor, CEO, M/s Eastcorp; and his colleague Shri Anil Deshpande, were part of the celebrations. A safety



Dr SR Vadera, Director DLJ, demonstrating fire extinguisher.

quiz was also organized about the safety aspects of working in an R&D laboratory. The celebrations came to a close with distribution of prizes.

NPOL, KOCHI

Naval Physical and Oceanographic Laboratory (NPOL) organized several competitions like essay, slogan, short-story, cartoon and quiz focusing on the concept of Industrial and Cyber Safety. A live demo on fire fighting was also conducted to enhance the awareness of fire safety during the week. On the concluding day of the celebration, Dr D Thomas, Sc 'F' and Chairman, Safety Committee, NPOL, welcomed the gathering and

stressed the significance of practicing safety measures in the organization. Shri S Kedarnath Shenoy OS and Director, NPOL, highlighted the relevance and significance of safety practices for ensuring a healthy, safe and accident free environment in the organization.

Dr R Dhanya Menon, Managing Director, Avanzo Cyber Security Solutions, Thrissur and the India's first woman cyber crime investigator delivered an enlightening talk on 'Cyber Safety', which included various traps in the cyber world and the possible solutions and precautions to prevent misuse of data, which may cause unforeseen problems.



A talk on safety being delivered at NMRL (left) and Fire drill at NPOL.

RAISING DAY CELEBRATIONS

DTRL, DELHI

Defence Terrain Research Laboratory (DTRL), Delhi, celebrated its 54th Raising Day on 20 March 2018. Shri P K Mehta, DS and DG (ACE), graced the occasion as the Chief Guest. Maj Gen Girish Kumar, VSM, Surveyor General of India and ADG Military Survey was the Guest of Honour. Directors of sister laboratories and some former directors of the DTRL were also present. Dr MR Bhutiyani, Director, DTRL, in his welcome address, gave the glimpses of the journey of the 53 years and highlighted the achievements of the year 2017. He appreciated the efforts of the officers and the staff for their hard work and hope for the same devotion in future also.

The Chief Guest, in his keynote address, appreciated the efforts put in by the laboratory and said that the work being done by DTRL has a great potential to make difficult terrain conditions of the border areas safe. He advised DTRL to expand its work area and produce many more GeoINT products. DTRL annual House Magazine, 'Vasundhara' and DTRL Annual Report-2017 were released on the occasion. DG (ACE) also distributed lab-level DRDO Awards to the meritorious employees.

Annual sports awards and annual Hindi awards were distributed by Director, DTRL. A cultural programme by the employees of the lab and cultural group was the highlight of the day. The ceremony concluded with the vote of thanks given by Dr LK Sinha, Sc 'G'. Dr Pinaki Roychowdhry, Sc 'F', Chairman, Raising Day Management Committee, coordinated the events.

ITM, MUSSOORIE

Institute of Technology Management (ITM), Mussoorie, celebrated its 57th Raising Day on 26 February 2018. The



event was inaugurated by the Chief Guest Shri Benjamin Lionel, OS and Director, Instruments Research and Development Establishment (IRDE), Dehradun and Shri Sanjay Tandon, OS and Director ITM.

The Chief Guest presented Cash Award, Laboratory Award for DRDS, DRTC and Admin/Allied cadre to the deserving officers/staff of ITM and applauded the efforts put in by ITM in achieving excellence. He also delivered a presentation highlighting futuristic technologies in the domain of Electronics and Computational System.

Shri Sanjay Tandon while bringing out various achievements of the ITM,

thanked 'Team ITM' for their whole hearted support in achieving the various tasks as per time schedule. He dwelled upon all employees to put in their best so that ITM achieves excellence in all its endeavours. The event culminated with lunch for all employees and their families.

As a part of celebration, various events like poster competition, photography competition, games for officers, staff, and families and cultural programme were organised. Annual Hindi Patrika 'Srijan' was also unveiled during the occasion. The highlight of the day was the dance performance by tiny tots of the ITM school.





NATIONAL SCIENCE DAY CELEBRATIONS

ACEM, NASIK

Advanced Centre for Energetic Materials (ACEM), celebrated National Science Day on 28 February 2018. Prof. AK Suresh, Deputy Director, and Chair Professor in the Department of Chemical Engineering, IIT Bombay, was the Chief Guest on the occasion. Shri Srinivasan Seshadri, Sc 'G', and General Manager, ACEM, welcomed the gathering and highlighted the significance of the day. The Chief Guest delivered the keynote talk on "Multi Phase Reacting System: Unity and Diversity of Features".

The National Science Day Orations were presented by Dr Chandra Shekhar Pant, Sc 'E', on "Nitro Functionalized HTPB—A Potential Energetic Polymer for Composite Propellant", and Shri Shadab Ahmed Khan, Sc 'D', on "Stress Analysis of Linear Viscoelastic Material". Commendation certificates were presented to the orators by the Chief Guest.

A number of events was conducted during the week to mark the celebration. Competitions like Science Quiz, and Essay writing were conducted and the winners were awarded. Dr SC Bhattacharya, Sc 'G', and Associate Director, proposed the vote of thanks.

VRDE, AHMEDNAGAR

Vehicles Research and Development Establishment (VRDE), Ahmednagar, celebrated 'National Science Day-2018' on 28 February 2018 with immense exhilaration.

Maj Gen Ajay Gupta, Director, VRDE, inaugurated the programme, at VRDE Kalamandir. Dr SB Nimse, DG, Pravara Rural Education Society, Ahmednagar, delivered a talk on 'S&T for National Development'. He spoke



National Science Day at ACEM

on the different aspects of science and technology on today's scenario and shared his extensive expertise in the field of scientific education.

Technical presentations by Shri VK Viswakarma, Sc 'D' on 'Development of Integrated Starter

Motor for the Rotary Engines for UAV', and Science Exhibition for the school students on the theme, 'Use of S&T for Modern Life Sustainability' were organized to mark the occasion. Fourteen schools actively participated in the science exhibition.



Science Exhibition organised at VRDE on the occasion of National Science Day

DESIDOC HOLDS ROAD SHOW

Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, organized 4th Training-cum-User Awareness/Interaction Programme at Laser Science and Technology Centre (LASTEC), Delhi, on 19 March 2018 with an objective to increase awareness of the

various services provided by the centre. Dr Rajeev Vij, Sc 'G' and organiser of the event, briefed the participants about DESIDOC's library services and publications.

Dr Alka Suri, Director, DESIDOC, informed the participants about the new initiatives taken to strengthen the

user services and future roadmap of DESIDOC. Shri HB Srivastava, Director, LASTEC, encouraged participants to use DESIDOC services. An exhibition, of newly acquired S&T books of relevance to LASTEC was also arranged for three days. Forty-four scientists/officers from LASTEC participated in the programme.



SOCIAL ACTIVITY

LASTEC ORGANIZED AWARENESS WALK ON CLEANNESS

LASTEC organized an awareness walk on 8 March 2018 in accordance with the Swachh Bharat Annual Action Plan to create awareness on cleanliness. Officers and staff joined the walk enthusiastically. The walk started from New Technical Building (NTB) of LASTEC and proceeded to Admin Block, out from North Gate Metcalfe House and back to NTB via Post Office, Vikas Bhawan and Main Gate Metcalfe House.





NBC DEFENCE TECHNOLOGIES

This column covers the pathbreaking and successful projects and programmes of the DRDO.

The regional security implications for India include potential NBC warfare by our adversaries to challenge, erode, marginalize and paralyse India's military and economic power. Our Armed Forces, therefore, needs to be ready to deal with a full spectrum of NBC threats and conduct military operations unconstrained in a NBC environment.

DRDO undertook a Cabinet Committee on Security (CCS) approved programme on NBC Defence Technologies in 2010 to develop products and technologies to continue the sustainment of the indigenous NBC defence capabilities and close the technology gap vis-à-vis the developed countries. This programme involved 10 DRDO laboratories, had a sanctioned budget of ₹ 285 crores to develop products and technologies through 36 projects out of which 12 were in Mission Mode. The programme was completed in the year 2015 with a 35 per cent lesser budget. The newly developed products and technologies along with the upgradation of existing products provide an entire spectrum of NBC countermeasures for the Services and civil administration to deal with any NBC eventuality.

DEVELOPMENT PARTNERS

Other than the nodal laboratory Defence Research and Development Establishment (DRDE), Gwalior, nine DRDO laboratories, viz., Defence Bioengineering and Electromedical Laboratory (DEBEL), Bengaluru; Defence Laboratory Jodhpur (DLJ); Defence Food Research Laboratory (DFRL), Mysuru; Defence Materials and Stores Research and Development Establishment (DMSRDE), Kanpur; Institute of Nuclear Medicine and Allied Sciences (INMAS), Laser Science and Technology Centre (LASTEC), Delhi; Research and Development Establishment [R&DE (E)], Pune; Solid

State Physics Laboratory (SSPL), Delhi and Vehicle Research and Development Establishment (VRDE), Ahmednagar participated in the programme.

DRDE has been instrumental in the development of state-of-the-art technologies and systems for detection, protection and decontamination of chemical and biological warfare. The primary role of DEBEL was to design and develop solutions for percutaneous, ocular and respiratory protection. While R&DE (E) developed NBC protective shelters, VRDE developed CBRN unmanned ground vehicle and multi-purpose decontamination system. DLJ developed radioactive contamination monitoring equipment. LASTEC developed laser-based standoff detection of chemical and biological warfare agents and SSPL developed chemical agent detector based on gas chromatograph-surface acoustic wave technology. DMSRDE worked on the development of materials for NBC protective clothing, INMAS developed radio-protectors, decorporating agents and antidotes and DFRL developed NBC protected food packaging.

ACHIEVEMENTS

The programme has been one of the major achievements of the organisation. Today, the entire NBC inventory of the Army except one item (Chemical Agent Detector) comprises DRDO developed products. A number of products are in the process of induction or are likely to be inducted into Services/Paramilitary/NDRF or for the Civilian use. The following NBC products/technologies have been developed:

NBC Permeable Suit Mk V

DRDE and DEBEL have developed NBC Suit Mk V for personnel protection in a NBC scenario. The earlier NBC Suit with powdered active carbon as the adsorbent has many drawbacks, viz., heat stress, low mechanical strength, wearing-off carbon adsorbent, low protection, etc. On the other hand, activated carbon sphere (ACS)-coated fabric has many advantages like wear resistance, effective protection barrier, more air permeability/physical comfort and lightweight. ACS required for the NBC suit coating has been indigenously developed at DRDE, NBC permeable



Dr S Christopher, Chairman DRDO and Secretary of DDR&D handing over NBC Permeable Suit Mk V to the COAS Gen Bipin Rawat

suit based on state-of-the-art technology of ACS spheres sandwiched between the fabric layers having high adsorption capacity, leading to much higher protection levels in comparison to NBC Permeable Suit Mk IV has been successfully developed. The salient features of the NBC Suit Mk V are: excellent chemical agent protection, lightweight, high adsorbent ACS, oil and water repellent, fire retardant, physical comfort, washable, anti-static, high resistance and stability. The ACS Process Technology has been transferred to M/s Shiva Texyarn, Coimbatore and M/s Vijay Sabre, Mumbai, for bulk production.

Ion Mobility Spectrometry-based Chemical Agent Detector

DRDE has developed Chemical Agent Detector in the form of CAM (Chemical Agent Monitor), which is a hand-held device and ACADA (Automatic Chemical Agent Detector and Alarm), a standalone device capable of unattended/remote operation for detection of chemical warfare agents. Detector, using Ion Mobility Spectrometry (IMS) technology, samples the environment using an air pump. Contaminants in the sampled air are ionised using a radioactive source and passed through a weak electric field towards an ion detector. The time it takes the species to traverse the distance is proportional to the mass of the ionised chemical species and is used as a means of identification. This travel time in the drift tube and the strength of the charge gives a relative concentration of species in the sample. Industry partner involved is M/s L&T, Bengaluru.



NBC Inflatable Shelter

In NBC environment, individual protection in the battlefield is possible only for a limited period. Inflatable NBC Shelter provides uncontaminated environment against CBR threats for 48 hrs along with Life Support System to 10 persons and command and control centre. The shelter can be adopted for variety of roles. Industry partner involved are M/s BEL, Navi Mumbai and M/s Dass Hitachi Ltd.



NBC Mini Unmanned Ground Vehicle

NBC Mini (<75 kg) Unmanned Ground vehicle (UGV) is fitted with NBC sensors to carry out unmanned recce up to a range of 1 km LoS and can be launched and retrieved from the manned NBC Recce Vehicle. It has a provision of single sample collection. It is operated by a hand-held remote control with display.



GC—SAW technology-based Chemical Agent Detector

Gas Chromatograph (GC) Surface Acoustic Wave (SAW) devices consist of metallic comb like structure called Inter Digital Transducer (IDT) on a piezoelectric substrate, which converts RF signal into surface mechanical waves and vice versa. In SAW devices,

the acoustic energy is confined to the surface and hence any perturbation on or near the surface caused by the adsorption of chemical agent vapours results in change of properties such as amplitude and phase. The gas chromatograph is used for separation of compounds. The Device is capable of detecting chemical warfare agents and toxic industrial chemicals. Industry partner involved is M/s BEL, Pune.



NBC Respiratory Mask Mk II

The NBC Respiratory Mask provides protection to the respiratory tract and face against chemical and biological warfare agents. It provides wide field of vision and has swivel facility for taking liquid refreshments while wearing the respirator. Face piece is made up of specially formulated Bromo Butyl Rubber resistant to chemical and biological warfare agents for 24 hrs. Industry partner involved is M/s Vijay Sabre Safety Ltd.



Integrated Hood Mask Mk II

Integrated Hood Mask provides protection against chemical and biological warfare agents and is specifically intended for soldiers with facial injuries, cuts, bruises, etc. It consists of Respiratory Mask, Canister and the Hood. The hood is made up of three-layered fabric. The head, parts of face and neck, which are not covered by



the mask is detachable and is for one time use only. The breathable three-layered fabric and adjustable features keeps the wearer comfortable. Maintenance is easy and the hood provides protection against chemical warfare agents for six hours. Industry partner involved is M/s Vijay Sabre Safety Ltd.

NBC Canister Mk II

NBC Canister is attached to the NBC respirator and provides protection against chemical, biological warfare agents and against radioactive fallout dust. NBC Canister Mk II provides twice the protection against nerve (for four hr) and blister agents.



NBC Over Boots Mk II

NBC Over Boot is used for protection of the feet from NBC warfare agents and is used in conjunction with CBRN suit. The boots are made up of Butyl Rubber and provides protection up to 24 hr.



NBC Gloves Mk II

NBC Gloves Mk II are used to protect the hands from the CW agents such as sulphur mustard. The ambidextrous gloves are made up of Butyl Rubber and provides protection up to 24 hr.



NBC Haversack Mk II

The Haversack is used for carrying respirator mask, canister detector papers and other items of personal decontamination and medical kits in the event of NBC alert. It is made of the same CBRN protective clothing used in NBC Suit.



Fitment Tester for NBC Respiratory Mask

The Fitment Tester forms an Integral part of NBC warfare test equipment. It is used to test the integrity of the respiratory mask. The tester is provided



with digital display and a logic circuit, which indicates within 15 seconds whether a mask has passed/failed.

NBC Mobile Shelter

A mobile NBC Shelter is collective protection shelter based on TATRA vehicle with NEMP protection designed to operate in nuclear fallout zone. The shelter accommodates 6-8 persons and can perform a variety of roles including command and control centre, mobile medical post, career vehicle for CBRN quick reaction team and CBRN protected logistics.

Personal Decontamination Apparatus Mk II

Portable Decontamination Apparatus is a manual decontaminant dispersal device, which facilitates the spreading of decontaminant over the contaminated surfaces. The spreaded decontaminant chemically degrades the chemical warfare agents and makes the surface clean for reuse. The indigenously developed apparatus is economical. Industry partner involved is M/s Hindustan Metals.



Multipurpose Decontamination System

Multipurpose Decontamination System (MPDS) is a trolley mounted device for small scale dispersal of decontaminants. The equipment is provided with two spray lances one

for high pressure water and one for chemical spray which can be operated independently. The pre-wash, post-wash, personnel, clothing and terrain decontamination can be carried out one at a time by operating appropriate valves and change of nozzles as per the operation. All accessories like hoses with lances, personnel shower and steam bag are to be laid out and attached to the equipment before carrying out the operation.

NBC First Aid Kit Type A & B

The First Aid Kits type A and B contain all emergency medicines required for treating NBC warfare agents. The kits are made up of lightweight plastic material and their overall dimensions have been chosen to suite fast movements of the person during emergency. The kits contain: three-colour detector papers for nerve and blister agents detection; personal decontaminants, antidotes nerve agents—reusable autoject injectors and pyridostigmine bromide tablets, antidote for Cyanide-amyl nitrite inhalant, potassium iodate tablets for radiation exposure, medicines for treatment of sulphur mustard/phosgene/bacterial agents exposure, pain, and inflammation, NBC protective dressing for open wounds and user handbook with a simple Standard Operating Procedure.



H1N1 Detection Kit

H1N1 detection Kit has been developed for swine flu detection by one step real-time reverse transcription loop mediated isothermal gene amplification

(RTLAMP) assay for rapid and real-time detection of novel S-OIV RNA in clinical specimens by targeting the HA gene, requiring 30 minutes for confirmation. The S-OIV H1 gene-specific RTLAMP assay reported is simple, rapid, reliable, and inexpensive method as well as highly sensitive and specific. The technology has been transferred to private firms. Industry partner involved is M/s RAS Life Sciences.

Apart from the above, the following prototypes, proof of concepts and processes have also been developed through the programme:

Prototypes

- * Flame Photometry based chemical agent detector
- * NBC protected Composite underground shelter
- * Large span inflatable hanger/shelter
- * Radiation contamination monitoring system (10 products including aerial dosimetry, radioactive source locator, security portal for radioactive substance, food, water and clothing contamination monitor, wireless radiation sensor network)

Proof of Concepts

- * IR LIDAR for standoff detection of chemical agents
- * UV LIDAR for standoff detection of biological agents
- * Electrochemical Bio-sensor

Process Development

- * Trace level detection and identification of chemical agents in various matrices (DRDE performed the roles of assessor laboratory in 32nd proficiency testing of OPCW designated laboratories worldwide)

CURRENT STATUS AND WAY FOREWORD

The current status of products developed under NBC programme are as under:

Inducted in the Services

- * NBC Permeable Suit Mk V

User Trial Completed

- * NBC Respirator Mask Mk II
- * Chemical Agent Detector Paper Mk II
- * Fitment tester for NBC Respiratory Mask
- * NBC First Aid Kit Type A & B Mk II

User Trial Ready

- * Ion Mobility Spectrometry based chemical agent detector
- * NBC mini Unmanned Ground Vehicle
- * NBC Hazard Prediction Software Mk II
- * NBC Integrated Hood Mask Mk II
- * NBC Canister Mk II
- * NBC Haversack Mk II
- * NBC Inflatable Shelter
- * NBC Mobile Shelter
- * Evacuation Bag for NBC Casualty (Half and Full) Mk II
- * NBC Protected Food and Water Packaging
- * Multipurpose Decontamination System
- * Personal Decontamination Apparatus Mk II
- * Personal Decontamination Kit Mk II
- Regulatory Clearance Completed:
- * H1N1 Detection Kit
- * Decorporating agents and antidotes
- * Repellents and Attracticides
- Under Development
- * NBC Over boots Mk II
- * NBC Gloves Mk II

The need of the hour is to take up the NBC Phase II projects where some notable products such as (i) Biological agent detector; (ii) Standoff chemical detector; (iii) standoff biological detector; (iv) Mobile decontamination system Mk II; (v) Next generation protective ensembles, etc., are envisaged to maintain continuity of technology development and retain the technological edge.



INTERNATIONAL CONFERENCE ON SONAR SYSTEMS AND SENSORS (ICONS – 2018)

Naval Physical and Oceanographic Laboratory (NPOL), Kochi, organised an International Conference on Sonar Systems and Sensors (ICONS-2018) during 22-24 February 2018. The basic aim of the conference was to provide a forum to exchange the knowledge on sonar and underwater surveillance and communication from across the world. The themes of the conference were chosen such that all current and futuristic aspects of sonar technology of interest to NPOL were covered.

The conference was inaugurated by Dr K Sivan, Secretary, Department of Space, and Chairman, ISRO. In his inaugural speech, Dr Sivan emphasized the scope for effective collaboration between ISRO and DRDO for fusion of

technologies to make best use of both and thereby producing novel products and technologies useful for the nation.

Dr S Christopher, Chairman, DRDO and Secretary, Department of Defence R&D, in his presidential address, pointed out DRDO's interest in collaboration with academia and industries in India and abroad. Shri S Kedarnath Shenoy, OS and Director, NPOL, spoke about the evolution of the ICONS from 2002 to ICONS 2018. Dr VK Aatre, former SA to RM, and Chairman, National Advisory Committee, ICONS 2018, Dr Samir V Kamat, DS and DG (NS&M), DRDO, and Rear Admiral Antony George, NM, VSM, ACNS (SR) were present on the occasion.

Dr Arogyaswami Paulraj, Professor Emeritus, Stanford University, USA,

delivered the keynote address on "Indian Navy Sonar: Past Reminiscence and Future Glimpses." Prof. John Summerscales, School of Engineering Plymouth University, UK, and Vice Admiral AR Karve, FoC-in-C, Southern Naval Command, Kochi, delivered talks on "Durability of Composites in the Marine Environment" and "ASW: Naval Perspective", respectively.

A Souvenir and a book of abstract of the papers presented in the Conference were released on the occasion. The conference was attended by about 200 participants including 20 young naval officers. More than 300 delegates including invited speakers attended the conference. Dr T Mukundan, Convener of the ICONS-2018, proposed the vote of thanks.





COURSES/WORKSHOPS

COURSE ON SCIENTIFIC WRITING & PUBLISHING TOOLS

Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, organised a three-day course on “Scientific Writing and Publishing

Tools” under the Continuing Education Programme (CEP) of DRDO, during 14-16 March 2018. Dr Rajeev Vij, Sc ‘G’, Course Coordinator, in his welcome address, asked the participants to be interactive. Shri Sudhanshu Bhushan, Sc ‘E’, Course Director, explained the objective of the course.

Dr Alka Suri, Director, DESIDOC, inaugurated the CEP and elucidated the importance of such need-based courses. Topics covered during the course included: Research paper writing, plagiarism checking tools, citation analysis, reference management tools, etc.



WORKSHOP ON QUALITY, RELIABILITY & SAFETY

DESIDOC organised a one-day workshop on “Quality, Reliability and Safety in DRDO” on 27 March 2018. Dr Rajeev Vij, Sc ‘G’, Workshop Convener, in his welcome address, asked the participants to be interactive with the faculty. Dr Alka Suri, Director, DESIDOC, presided over the function and elucidated the importance of awareness generation amongst scientific and technical persons about importance of Quality, Reliability & Safety.

Shri Suryanarayana Nandula, Director, Quality, Reliability and Safety (QR&S), DRDO, delivered an informative lecture on “Overview

of DRDO Quality Policy” with three videos presentations on QR&S and gave an update on the initiatives taken to implement QR&S practices in DRDO. Shri Suryanarayana stressed that QR&S have to be the major selling

points of DRDO products. Ninety-six participants from various DRDO labs/essts and Directors from ISSA and CEPTAM attended the workshop. Dr Vij summarized the take-away from the workshop.





COURSE ON GOOD FOOD LABORATORY PRACTICES

Defence Food Research Laboratory (DFRL), Mysuru conducted a five-day course on “Good Food Laboratory Practices” organized by FSSAI during 12-16 March 2018. The course was aimed to refresh the knowledge/skills in good food laboratory practices as per FSSAI guidelines. Dr GK Sharma, Sc ‘G’, Associate Director, welcomed the participants representing state food laboratories and certain private laboratories from Goa, Maharashtra, Kerala, Karnataka and Andhra Pradesh.

The course was inaugurated by Dr N Bhaskar, Advisor (QA) FSSAI, New Delhi. He deliberated the purpose

of organising the course. Dr Rakesh Kumar Sharma, Director, DFRL, briefed about the DFRL and FSSAI interaction and asked participants to

utilise this opportunity to gain expertise in good food laboratory practices. The course had 18 lectures and practical/demonstrative exposure.



COURSE ON CHEMICAL AND BIOLOGICAL EMERGENCIES

Defence Research and Development Establishment (DRDE), Gwalior, organized a course on “Chemical

and Biological Emergencies” for IB Officers during 13-16 February 2018. Twenty-one officers across the country attended the course. The course had lectures and demonstration pertaining to the detection, protection and decontamination of chemical and

biological agents.

Dr DK Dubey, Director, DRDE, highlighted the relevance of the course for sensitization of intelligence officers towards mitigation of chemical and biological emergencies.



ADVANCE COURSE IN PM FOR SENIOR SCIENTISTS

An ‘Advance Course in Project Management (PM) for Senior Level Scientists’ was conducted by Institute of Technology Management (ITM),

Mussoorie, from 14-16 February 2018. Fourteen senior scientists/officers from different DRDO labs, Directorates and BrahMos Aerospace Pvt Ltd attended the course. The course dealt with advance project management issues in organizational context and deliberated

on best practices and systems within organization that facilitate effective project management.

Dr A Sivathanu Pillai, former CEO Brahmos Aerospace Pvt. Ltd was the Chief Guest at the inaugural ceremony. Shri Sanjay Tandon, Director ITM,



welcomed the Chief Guest and the course participants and emphasized on the importance of Project Management in organizations. He encouraged participants to interact freely in deliberations.

Dr Pillai delivered the keynote lecture on “Challenges and Opportunities in Project Management–DRDO Perspective.” Lectures on various topics, viz., Project Life Cycle, Procurement Issues in Projects, Project Management Maturity Models, PPFM–Issues, Challenges and Way Forward and 50 Golden Rules of Project Management,

etc., were delivered by the experienced speakers. Conceptual frameworks, case discussions and skill-oriented activities were blended within each topic.

Smt Anita Mohindra, Sc ‘F’, was the Course Director.

COURSE ON CORPORATE FUNCTIONS OF DRDO

A six-day course on ‘Corporate Functions of DRDO’ was jointly conducted by Directorate of Human Resource Development (DHRD), DRDO HQ and ITM, Mussoorie, from 19-24 February 2018 to build “Competence for

Organisational Key Functional Role.” Thirteen senior scientists from different DRDO labs attended the course.

Shri Sanjay Tandon, OS and Director, ITM, welcomed the participants and deliberated upon the importance of corporate functions in achieving effective organisational goals. Lectures on the functioning of various corporate DRDO Directorates were delivered by senior faculty. Besides, management lectures on Succession Planning and Grooming and OB/Leadership Skills were also delivered by Director ITM and Professor AK Jain from MDI Gurgaon.

Dr SR Vadera, OS and Director, Defence Laboratory (DL), Jodhpur, was the Chief Guest at the valedictory function. In his valedictory address, Dr Vadera highlighted the importance of such training programmes for the benefit of the organisation.

Dr DK Panda, Sc ‘F’, was the Course Director.

HINDI KARYASHALA

Office of the DG (Aero)

The Office of Director General (Aero), Bengaluru, organized second one-day Hindi Workshop on 16 March 2018. Shri Arun Kumar Jha,





Hindi Officer, Gas Turbine Research Establishment (GTRE), was the speaker of the event. Dr PN Tengli, Sc 'G' and Director (Admin & SQR), in his opening address, emphasized on the need to have a common language for connecting people across the country. He highlighted the efforts being made to promote and propagate the use of Hindi in day-to-day office work at the office of the DG (Aero).

Shri Arun Kumar Jha, in his oration, discussed various Acts and Provisions in the Indian Constitution for the usage of languages for official work. Giving a gist about the genesis of Hindi as a language, he brought out that the script has undergone changes from time-to-time to make its usage easy. He also highlighted various schemes introduced by the government to encourage and spread the usage of Hindi.

RCI, Hyderabad

Research Centre Imarat (RCI), organised 4th Hindi Workshop for 2017-18 on 15 March 2018. Shri T Narasimha Rao, Sc 'G', Vice Chairman, OLIC, inaugurated the workshop.

Shri SK Gupta, JD (Admin), RCI, delivered a lecture on Use of Hindi in Noting, Drafting and Record Management. Shri Kazim Ahmed, Senior Translator, delivered a lecture on Rules of Official Language Policy. About 25 Staff members participated in the workshop.



READERS' FEEDBACK

Your feedback is important to us as it gives scope for improvement and helping us to make sure to serve you in a better way. So help us by providing specific and actionable feedback for further improving the contents of the newsletter.

Please send your suggestions to:

The Director
Defence Scientific Information & Documentation Centre (DESIDOC)
Metcalfe House, Delhi-110054

PERSONNEL NEWS

APPOINTMENTS

Director, DRL



Dr Sanjai K Dwivedi, Sc 'F', has joined as Director, Defence Research Laboratory (DRL), Tezpur, on 1 April 2018. Dr Dwivedi joined DRDO in

1996 at Defence Institute of High Altitude Research (DIHAR), Leh, and has extensively contributed in protected cultivation, characterisation, propagation, conservation of plant genetic resources of Ladakh and formulation, patenting and commercialisation of herbal beverages of Seabuckthorn (Popularly known as "Leh Berry"). Thereafter he served at Centre for Personnel Talent Management (CEPTAM), Delhi, and successfully completed seven recruitment cycles. He was instrumental in designing and coordination of DRDO Entry Tests in 25 cities across the country for centralised recruitment of DRTC and Admin and Allied cadre in DRDO.

At Defence Institute of Bio-Energy Research (DIBER), Haldwani, he was engaged in development of agro technologies for development of border areas in the Central Himalayan zone, especially on introduction of a new crop 'Quinoa', low cost green house technology, soil-less cultivation (hydroponics) and utilization of local plant resources for defence purposes.

Dr SK Dwivedi has six patents, 62 research publications, five monographs and 02 books to his credits. He is the life member of six professional societies, Editor-in-Chief of Progressive Horticultural Journal and Fellow of three professional societies. He is also

a recipient of DRDO Young Scientist Award, ICAR Fakhruddin Ali Ahmed Award, ISHRD-Himadri Young Scientist Award and SAI—National Senior Scientist Award.

Director, SASE



Shri Naresh Kumar, Sc 'G', has joined as Director, Snow and Avalanche Study Establishment (SASE), HQ, Manali and Research and Development Centre,

Chandigarh on 1 March 2018. He joined DRDO in 1984 at SASE, as Sc 'B' and contributed in design and execution of avalanche control structures at Shri Badrinath Shrine and Manali-Leh road.

Prior to his appointment as Director SASE, he served as Associate Director at Research and Development Establishment (R&DE), Pune, where he contributed in design and development of 46 m MLC 70 Modular Bridge, 35 m Mountain Foot Bridge, 100 m Infantry Floating Foot Bridge, design of 21 m Manually Launched Bridge for snow scooters and mules, development of RDE 40 m Al Alloy, and preproduction of Sarvatra Bridging System. He obtained his BE in Civil Engineering from Motilal Nehru Regional Engineering College (Now NIT), Allahabad, in 1984 and MTech in structural engineering from IIT Delhi in the year 1997. His areas of expertise are Structural Engineering, Military Bridging and Aluminium alloys.

He has been awarded prestigious DRDO Scientist of the Year Award in 2014 for outstanding contribution in design and development of Military Bridging Systems. He is recipient of Lab Scientist of the Year Award in 2009 and

Technology Group Award in 2013. He is also recipient of Corps of Engineers Award by Institution of Engineers (India) in 1993 for his work and paper on 'Planning, Design and control of Avalanches for the Protection of Shri Badrinath Shrine'.

AWARDS

INSA Young Scientist Medal – 2017



Dr Kartik Prasad, Sc 'E', Defence Materials Research Laboratory (DMRL), Hyderabad, has been conferred the 'Indian National Science Academy (INSA)

Medal for Young Scientist–2017' for his significant contributions in the study of mechanical behaviour, pioneering development of specialised IR heating based thermo-mechanical fatigue test facility, innovative design of experiment for characterization of materials used in aero-engines as well as for supporting the life extension programme of aero-engine components for Indian Air Force.

Prime Minister Shram Bhushan Award

Shri Sanjay Kumar, TO 'B', Research Centre Imarat (RCI), Hyderabad,





received the Prime Minister Shram Bhushan Award. Hon'ble Vice President of India Shri M Venkaiah Naidu gave away the award on 26 February 2018 at Vigyan Bhavan, New Delhi.

Homi J Bhabha Award

Dr Prakash Chand Jain, Scientist, Defence Research and Development Laboratory (DRDL), Hyderabad, has been conferred Homi J Bhabha Award during the 105th Indian Science Congress (ISC) in recognition of his contributions towards development of Science and Technology, specifically in the realm of Aerospace Engineering. Dr Jain an alumnus of IIT Roorkee, IIT Bombay and BOYSCAST (DST) Fellow from Pennsylvania State University USA is specialized in the areas of Aerospace Structures Technologies. He is an Associate Fellow of American Institute of Aeronautics and Astronautics (AIAA), Fellow of Aeronautical Society of India, Fellow of Telangana Academy of Sciences and Fellow of Institution of Engineers India. Dr Jain has made outstanding contributions in Aero Space Engineering through application to the DRDO's prestigious programmes.

Outstanding Safety Performance Award

Naval Physical Oceanographic Laboratory (NPOL), Kochi, bagged the Award for Outstanding Safety Performance. The award has been instituted by the National Safety Council Kerala Chapter, for outstanding performance in Industrial Safety. NPOL



Dr PC Jain receiving Homi J Bhabha Award from Dr Harsh Vardhan at 105th ISC

emerged as Winner by achieving the lowest frequency rate of accidents among medium size engineering industries in Kerala. Dr D Thomas, Chairman, and Shri TM Srinivasan, Member,

NPOL Safety Committee, received the trophy and certificate from Justice JB Koshy, former Chairman Kerala State Human Rights Commission, in the 47th National Safety Day Celebration.



HIGHER QUALIFICATION ACQUIRED

DESIDOC, DELHI



Shri Phuldeep Kumar, Sc 'D', has been awarded PhD by Maharishi Dayanand University Rohtak, for the thesis entitled

'Coverage of Defence Science and Technology by the Indian Press: Study of Select English Dailies.'

RDC, CHANDIGARH

Shri Kamal Kant Singh, Sc 'E', has been awarded PhD by NIT, Kurukshetra, for the thesis entitled 'Microwave



Investigation for Snow Depth Estimation and Glacial Crevasse Detection in Himalayas with Special Emphasis on the use of Ground Penetrating Radar.'



VISITORS TO THE DRDO LABS/ESTTS

ANURAG, HYDERABAD

Dr S Christopher, Chairman, DRDO and Secretary DDR&D, and Dr G Athithan, DG (MED, CoS & CS), DRDO, visited Advanced Numerical Research and Analysis Group (ANURAG), on 18 March 2018 to review projects and other technical activities of ANURAG. Dr JVR, Sagar, Director, ANURAG, presented an overview of the various ongoing projects and activities.

CAIR, BENGALURU

Major General SC Meston, ADG ASEC and ETRC, visited Centre for Artificial Intelligence and Robotics (CAIR), on 22 March 2018. There was

a briefing by Director, CAIR, followed by discussion and demonstration of technologies developed by the centre in the area of Secure Systems and Command and Control systems

DEAL, DEHRADUN

Dr Surendra Pal, Vice Chancellor, Defence Institute of Advanced Technology (DIAT), Pune, visited Defence Electronics Applications Laboratory (DEAL), on 22 February 2018. He was appraised about the different ongoing projects and activities by Dr RS Pundir, Director, DEAL.

IRDE, DEHRADUN

Shri PK Shrivastava, IOFS, ADG

OF and Member (AV), Avadi, Chennai visited Instruments Research and Development Establishment (IRDE), on 30 March 2018. Discussion were held on the ongoing products of IRDE being developed at OFC and OLF, Dehradun.

LRDE, BENGALURU

Shri Harjit Singh Sajjan, Hon'ble Minister of National Defence, Canada, along with Dr S Guruprasad, OS, DG (PC&SI) and Mr Michael George Anthony, Defence Advisor, Canada visited Electronics and Radar Development Establishment (LRDE) on 19 February 2018. Shri SS Nagaraj, Director, LRDE, briefed the visitors about the indigenous Radars.



Clockwise from top left: Dr S Christopher at ANURAG; Dr Surendra Pal at DEAL; Shri PK Shrivastava at IRDE and Shri Harjit Singh Sajjan at LRDE.



DRDO HARNESSING SCIENCE FOR PEACE & SECURITY- XXVI

CHAPTER 3: OVER TO SYSTEMS DEVELOPMENT (1970–1982)

The article is 26th 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).

THE DIRECTORS' ANNUAL CONFERENCE

Consequently, there was a step up in activities from short-term responses to equipment/system development, though the laboratories did not follow the same trajectory. CVRDE interacted with the Armoured Corps in the formulation of the QR for the tank needed by the Indian Army. Thereafter, a study group in 1972 looked into the feasibility of developing the main battle tank and suggested the optimum solution. It was followed up with a proposal to the Political Affairs Committee of the Cabinet and a major project for the development of the main battle tank MBT-80 was sanctioned to CVRDE in March 1974. GTRE which was trying to improve the dry performance of the Orpheus engine, launched research projects in the areas of compressor, combustor, turbine, engine control system, heat transfer to build up the competence to develop power plant for a future combat aircraft. DRDL with a new Director in place, was in the process of building infrastructure for missile development. Dr Nag Chaudhuri encouraged the laboratory to initiate work on liquid propulsion technology and also explore the possibilities for undertaking the development of an indigenous surface-to-air missile system using the latest technology. For this purpose, the engineering and functional analysis of an existing missile system was carried out to derive the functional specifications necessary

for the subsystem development. DLRL undertook the development of the radar system for the surface-to-air missile. With the placement of a new Director at LRDE, a different approach to the development of the radar system for the detection of low flying aircraft for the Indian Air Force was taken up and a feasibility study was initiated. DEAL initiated the development of the troposcatter communication system to meet the functional specifications of the Indian Air Force.

The participation of DRDO in the first nuclear explosion of the Country and the part played by the Scientific Adviser, was placed on record by Dr Raja Ramanna. According to him, the DRDO's contribution was significant and pertained to the development of the lenses and fabrication of the explosives. He has also recorded that, "Prior to 1972, the Bhabha Atomic Research Centre (BARC) and the DRDO had never worked together on any project involving high level secrecy. This collaboration was thus surprising as the two were culturally opposed but thanks to Dr Nag Chaudhuri, things went smoothly on the Pokhran project."

It goes without stating that the armament group of laboratories were involved in the development of the high explosives, in the shaping of the lenses, and in carrying out experiments for calibrating the lenses so that nuclear explosion could take place. Prior to the explosion, emphasis was given at TBRL for modernising and improving the instrumentation facilities at the TBRL for terminal ballistics.

HUMAN RESOURCES DEVELOPMENT

The Scientific Adviser was fully aware of the unhappiness throughout the Organisation about the delays in recruitment of scientists, about the infrequent and irregular holding of promotion boards, uncertainty in career prospects, and the need to revise the annual confidential reporting of performance. DRDO was finding it difficult to attract and retain top scientific and technical talent whereas other Government agencies, such as Department of Atomic Energy, Department of Space, public and private sector industry were not hampered. He found that specific attention and quick resolution of issues could not be provided by an omnibus Directorate of Administration. Therefore, he decided to create a separate directorate of personnel and persuaded Mr AN Bhattacharya, Deputy Director, IRDE, Dehradun, to move to Delhi and organise the Directorate of Personnel.

Mr Bhattacharyya as the first Director of Personnel (DOP) had his task cut out. First, he got the approval of the Scientific Adviser to rescind the earlier order of listing the seniority of scientists and declaration of vacancies for departmental promotions discipline-wise [serrated pyramid] to reduce the disparity that existed in the opportunity for next promotion among the scientific/technical disciplines. Next, he attempted to find ways and means to get around the delay in recruitment as well as in the holding of



the departmental promotion boards due to the non-availability of the member from the UPSC. The reduction of the delay was achieved after a series of meetings with UPSC officials and he finally persuaded them to nominate one UPSC Member exclusively for looking after the needs of DRDO. By this measure, even in extreme cases the delay was brought down to about one year. However, this improvement did not last long because the UPSC could not afford to have one member exclusively earmarked for DRDO and after some time, DRDO found its recruitment/departmental promotion work being sandwiched between the regular work for other All India Services. There were other irritants due to the lack of transparency to DRDO of the process of screening of applicants and selection of the experts for interviewing the candidates. These could not be resolved easily with UPSC but would have to be sorted out over a longer period of time.

In order to bring DRDO at par with other S&T departments/bodies of the Government of India, the Scientific Adviser held discussions with the Chairman, UPSC for getting exemption from UPSC for recruitment and promotion of scientists. The proposal was turned down by the Chairman of the UPSC. Subsequently, the Scientific Adviser approached the Prime Minister who approved a set of guidelines to be followed by DRDO for taking it out of the purview of UPSC for recruitment and promotions. The Director of Personnel at the 15th Annual R&D Conference presented to the Directors, the proposed new personnel policy by which, "the recruitment to DRDO will not be through UPSC but through Selection Boards constituted by DGR&D. The promotions will be independent of the availability of vacancies and a scientist will be promoted *in situ* if necessary. The Scientific Adviser will have the powers to transfer or freeze a post. The existing Defence Science Service (DSS) will be bifurcated and a separate cadre, i.e., DRDS will be formed of scientists engaged on research and development work. The general recruitment will be

at SSO II (present Scientist B) level and made through a training-cum-assessment scheme. A small number of posts will be earmarked for scientists on deputation from universities and other research organisations. Similarly it will be possible for scientists from DRDO to work outside institutions for short periods. There will also be provision to appoint some retiring scientists as Emeritus Scientists". The new personnel policy was received with great enthusiasm and the suggestions made by the Directors in respect of entry into the DRDS cadre of the non-gazetted officers holding the posts of foreman and senior scientific assistant, was accepted for inclusion in the new personnel policy. Due to the opposition by the UPSC and the procedural hurdles that had to be overcome, DRDO had to wait for seven long years, before the policy could be implemented.

The DOP also streamlined the departmental promotions to the cadre of non-gazetted officers (senior scientific assistant downward and foreman downward) by getting the laboratories to indicate in advance the vacancies to be filled up and by getting them to complete the annual confidential reports and dispatch these on time so that the promotion boards could be convened once in a calendar year. Changes in the annual confidential reports of the scientists were also introduced to include comments by the immediate supervisor, making the scientist aware of adverse remarks and stipulating the criteria for grading a scientist "outstanding". The career prospects were improved but these still fell short of the expectations of the scientists. The migration from DRDO slowed down in most technology areas except in computers, communications, radar, including microwaves and antennas, and signal processing.

HEADQUARTERS REORGANISATION

The functional chart of the Organisation at the time Dr Bhagavantam became the Scientific Adviser did not envisage any administrative duties to

the technical directorates. Instead, the duties of the technical directorates were broadly termed as "research, design and development in their field of specialisation and rendering technical advice to Staff (Services Headquarters) on such matters." However, in the functional chart of each technical directorate, the responsibilities were mostly of coordination, organisation and attending of meetings related to development, supply or purchase of equipment for the Services. By the time Dr Nag Chaudhuri arrived on the scene, the duties of the personnel manning the technical directorates did not require high technical expertise which led the Scientific Adviser to consider them as "file pushers". The perception of the laboratory directors about the role played by technical directors varied considerably from that of helpfulness and cooperation to that of obstruction and interference. At the 14th Annual R&D Conference, the Scientific Adviser led the discussion stating that he wanted the technical directorates to take up, as one of their major activities, the study of futuristic trends in their technical areas and preparation of position papers which would describe critically and correctly the state of technology within the Country as well as in the rest of the world. There was considerable discussion at the end of which it was decided that a clear delineation of responsibilities of the DRDO Headquarters would help in removing the irritants. As far as the preparation of position papers on the technologies and systems was concerned, the participants of the Conference were of the opinion that with the increase in project activities and with the enhancement of powers delegated to the laboratories, Headquarters would have its hands full with monitoring and evaluation for ensuring that the progress on all projects, infrastructure and competence building activities were proceeding according to the plan.

To be continued...



नवभारत टाइम्स

Tue, 10 April, 2018

कई देशों की भारतीय मिसाइलों में रुचि: सीतारमण

रक्षा मंत्री निर्मला सीतारमण ने सोमवार को कहा कि अनेक देशों की भारतीय मिसाइलों में रक्षा उत्पादन के क्षेत्र में रुचि बढ़ रही है और इस रुचि को बढ़ावा देने के लिए DRDO अपने अग्रणी उत्पादों को प्रदर्शित कर रहा है। उन्होंने कहा कि भारत विश्व देशों को अपने वैश्विक बनाने वाला है।



भारत जैसे विश्वों पर एक ही बदलाव का विकल्प करने पर रक्षा मंत्री ने कहा कि कई बार किसी अर्थी को लक्ष्य के तहत परमाणु उपकरण का ना होना है लेकिन भारतीय मिसाइलों में विकास जारी है। यह भारतीय उपग्रह परियोजना (ISRO) के एक सफलता की झलकियाँ बन रही हैं। कई देशों ने भारतीय मिसाइलों में रुचि व्यक्त की है। विशेष रूप से देश भारत में सुरक्षात्मक ब्रह्मोस मिसाइल खरीदने के इच्छुक हैं। रक्षा मंत्री ने कहा कि वह विश्व निर्यात भारतीय मिसाइलों में मदद करने में नए अतिरिक्तों को शामिल करने और भारतीय निर्यात विभाग की सहायता का उपयोग करने के लिए प्रोत्साहित करेंगे।

FINANCIAL EXPRESS

Thu, 11 April, 2018

Defence Expo 2018 begins in Chennai; big boost for defence production under Make in India initiative

The mega exhibition began today with the participation of major international and domestic defence firms displaying their cutting-edge products. The Defence Minister said that the agenda of this defence exposition was to change India's image as an importer to India as an exporter of defence products.

Defence Minister Nirmala Sitharaman launched the DefExpo 2018 today in Chennai. Addressing the media, she said that the formal inauguration was to be held tomorrow by Prime Minister Narendra Modi. Addressing the media, Defence Minister Nirmala Sitharaman said that all the three services will be displaying their might in this mega defence expo. However, the focal point of the defence expo will be to project India as the next hub of defence production and manufacturing.



"India has always been the largest importer of arms and weapons. The major aspect of this defence expo is that it will mark the indigenous defence manufacturing capabilities of India. This year, we have a clear accent that India will be a major defence manufacturer and an exporter", said Nirmala Sitharaman today.

The Defence Minister also lauded DRDO, HAL and BEL for their immense contribution to research and development of India's defence sector. She also said that DRDO which also has over 50 institutions under its umbrella, has been

TIMES OF INDIA

Sat, 07 April, 2018

India ready to transfer crucial anti-tank missile technology to private industry

Bengaluru: In line with Prime Minister Narendra Modi's privatisation in defence sector policy, India is now ready to transfer crucial technology of its third generation anti-tank guided missile (ATGM) 'Nag' + to private industry.

The Defence Research and Development Organisation (DRDO) has already kick-started initial activities relating to Transfer of Technology (ToT) for both 'Nag' and 'Nag Missile Carrier (Namica)', but public sector units like Bharat Dyanamies Limited (BDL) are not completely out of the race yet.

A senior DRDO official confirmed to TOI that the agency is preparing documents for the ToT. "The thought process is there and we are working on the nuances," the official said, speaking on condition of anonymity.

Nag, with a range of about four kilometres, is an all-weather "fire-and-forget" ATGM, while Namica is equipped with retractable armoured launchers. It contains launchers and a guidance package, including thermal imager for target locking.

THE ECONOMIC TIMES

Thu, 04 April, 2018

97pc BSF personnel satisfied with meals provided on duty: DRDO study

Ninety seven per cent BSF personnel have expressed "satisfaction" with the quantity and quality of meals provided to them on duty at the borders and elsewhere, a special study by a DRDO laboratory has said.

The study was conducted by the Defence Institute of Physiology and Allied Science (DIPAS) on a special commission by the Border Security Force, after a BSF jawan last year posted a video on a social media site claiming bad food was being served to the personnel.

The study, commissioned last year, was conducted by collecting data of "food preference and satisfaction level" from eight frontiers of the force - four each from the western and the eastern command - and



Thu, 11 April, 2018

New WhAP Wheeled Amphibious Platform 8x8 armoured at DefExpo 2018

One of the highlights at the live demonstration of DefExpo 2018 is the new 8x8 amphibious combat vehicle called WhAP (Wheeled Amphibious Platform) developed jointly by the DRDO's Vehicle Research and Development Establishment and the Indian Company TATA Motors. The Whap is fitted with a Russian BMP-2 turret, a Soviet-made Infantry Fighting Vehicle.



Tata Motors is the first private sector OEM in India which has developed WhAP (Wheeled Armoured Amphibious Platform), an Infantry Combat Vehicle, designed for optimized survivability, all-terrain performance and increased lethality jointly with the Indian Defence Research and Development Organisation (DRDO).

Business Standard

Wed, 11 April, 2018

India Pavilion at DefExpo to showcase DRDO, private sector achievements

An exclusive India Pavilion, being set up for the first time to showcase the combined strength of DRDO, public and private sector in defence manufacturing, is going to be the highlight of DefExpo-2018 being organised between April 11-14 in Chennai.

The Defence Research and Development Organisation (DRDO) would be showcasing its flagship products and innovations in all forums -- indoor, outdoor and live demo -- during the event that has the theme of "India: The Emerging Defence Manufacturing Hub", an official statement said on Tuesday.

Another key attraction at the pavilion would be an array of digital experiences including war game simulation zone, augmented reality, virtual reality and physical simulators etc.

"The DRDO is putting up flagship products and systems in two broad categories -- one pertaining to technologies ready for transfer to industries for production and the other pertaining to technologies ready for exports," it said.

DRDO will be participating in the live demo for some of its indigenously designed and developed products, which include light combat aircraft Tejas, main battle tank Arjun MK-II, Arjun Armoured Recovery and Repair Vehicle (ARRV), T-72 Tracked, T-72 Bridge Layer Tank, Wheeled Armoured Platform (WhAP), Mobile Surveillance System and Advanced Towed Artillery Gun System (ATAGS).



Thu, 11 April, 2018

Two regiments of Indian army are equipped with Arjun Mark 1 main battle tanks

Two regiments of Indian army are now equipped with the Indian-made Arjun Mark 1 main battle tank (MBT), currently 134 Arjun Mark 1 have already been produced. Each tank requires less 47 units battle tank.



The Arjun Mark 1 is a main battle tank developed by India's Defence Research and Development Organisation (DRDO), for the Indian Army. The Arjun Mark 1 is presented at DefExpo 2018, the Defence and Security Exhibition at Chennai (India) on the booth of DRDO.

The first 45 main battle tanks Arjun Mark 1 were delivered to the Indian army between August 2008 and May 2009. More than 100 tanks have been delivered to the Indian Army by June 2011. After intensive field evaluations and tests, the tank entered service with the 7th Armoured Regiment on 15 May 2011.

The main armament of the Arjun Mark 1 consists of one 120 mm main rifle gun, able to fire indigenously developed ammunition. Secondary armament includes one PKE 7.62 mm coaxial machine gun, and one 105VT 12.7 mm machine gun mounted on the commander's hatch. This machine gun can be used to protect the tank against aerial threats or helicopters and low flying aircraft.

DOWN THE MEMORY LANE



Former Prime Minister VP Singh being briefed about DRDO products by then SA to RM Dr VS Arunachalam.