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Indian Defence delegation at Vietnam

36th year of Publication

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Cover (L to R): Dr S Christopher, Secretary, Department of Defence R&D and DG DRDO; Shri Manohar Parrikar Hon'ble Raksha Mantri and Dr Surendra Pal, VC, DIAT releasing Compendium of Granted & Active Patents to DRDO

In this Issue

Hon'ble Raksha Mantri releases Compendium of Granted & Active Patents to DRDO

Hon'ble Raksha Mantri Shri Manohar Parrikar released the Compendium of Granted and Active Patents of DRDO on 31 May 2016 during 8th Convocation of Defence Institute of Advanced Technology (DIAT), an autonomous deemed university under DRDO at Pune.

A strong focus on creativity, innovation and IP generation has always been the corner stone of DRDO corporate policy. The Compendium is a culmination of our consistent efforts towards IP generation and also a testimony to the innovation skills of our 7500 strong scientific community. The Compendium, comprising entire bibliographic information including abstracts of all granted and active patents of DRDO till 1 January 2016 will not only serve as a ready reference for the scientists as well as potential licensees, but also work as a catalyst for spurring innovations.

It is befitting that the release of Compendium almost coincides with the release of our National Intellectual Property Rights Policy by Ministry of Commerce and Industry on 12 May 2016. The new IPR Policy aims to integrate IP as a policy and strategic tool in national development and provides a framework for fostering creativity and innovation. It also calls for improving IPR output of public funded academic and R&D organizations by encouraging researchers by way of linking it with their career progression and having uniform guidelines for division of royalties between the organizations and individual researchers and innovators.

DRDO remains committed to the holistic slogan of our new National IPR Policy, i.e., "Creative India: Innovative India" by intensifying efforts for enhancing IP output as well as IP filings and leveraging these for providing state-of-the art sensors, weapons, platforms and equipment for our defence forces.

A Compilation of 817 patent applications of DRDO, which are under various stages of examination in Patent Office, has also been made available separately.

DRDO Directors' Conclave 2016

Dr S Christopher, Secretary, Department of Defence R&D and DG DRDO inaugurated DRDO Directors' Conclave 2016, an annual event of DRDO, on 29 May 2016 at Dr APJ Abdul Kalam Auditorium, Pashan, Pune. The theme of the conclave was 'Productive DRDO'. The annual event was organized by Armament Research and Development Establishment (ARDE), Pune.

The objective of the two-day conclave was to evolve synergy among DRDO HQ, Technology Clusters and various DRDO laboratories across the country. More than 110 top officials of DRDO including DGs of Technology Clusters, Chief Controllers (R&D), DRDO Laboratories Directors, Corporate Directors and IFAs attended the conclave.

Dr S Christopher, in his inaugural address, expressed the need to find innovative mechanisms for better coordination among the laboratories, DGs and Corporate HQ to meet challenges of Defence R&D in the 21st century and for protecting IPR issues of DRDO. He also emphasized the necessity of inclusive user-friendly and collaborative Defence R&D with Industry and Academia to ensure a 'Productive DRDO'.

The two-day event included deliberations on various issues of DRDO through six technical sessions each followed by a panel discussion. Topics discussed included: Simplification of Corporate Procedures, Leveraging Industry, Defence Procurement Procedures 2106: Opportunities for DRDO, Cyber Security and DRDO Knowledge Management.

A monograph "Fundamental of Guided Missiles" and the first issue of "DRDO Life Science Journal" brought out by DESIDOC, Delhi, were released by the Secretary DDR&D and DG DRDO, DS and CC R&D (HR), and DS and DG Life Sciences.

The conclave concluded with the distribution of DRDO Young Scientist, and Best Performance Awards.

DIPAS organises Yoga Training for Defence Wing Staff

Defence Institute of Physiology and Allied Sciences (DIPAS), Delhi conducted a yoga training programme for Defence Wing Staff during 25-30 April 2016 in collaboration with HQ Integrated Defence Staff and Central Council for Research in Yoga and Naturopathy (CCRYN). Lt General Velu Nair, AVSM, VSM, DCIDS (Medical) inaugurated the programme as the Chief Guest. Dr IN Acharya, Director, CCRYN was the Guest of Honour. Dr Shashi Bala Singh, OS and Director, DIPAS, welcomed the guests, and a gave brief account of the achievements of the Institute in the field of yoga. Lt General Nair, spoke about the benefits of regular yoga practice and its therapeutic effects.

The invited lectures were delivered by yoga experts from Times of India, AIIMS Delhi, Morarji Desai National Institute of Yoga, Delhi, CCRYN AYUSH Wellness Clinic, Delhi, talked about basic principles and physiology of shatkarma and yogasanas. Thirty-three participants from IHQ MoD (Army), Def Wing staff, IHQ MoD (Navy) and Air Headquarter (VB) participated in the training programme.

Shri Ashok Kumar, Director, Directorate of Human Resource Development, DRDO HQ, the Chief Guest of the valedictory function, emphasized on regular yogic practice, as it improves quality of life under extremes of environment.

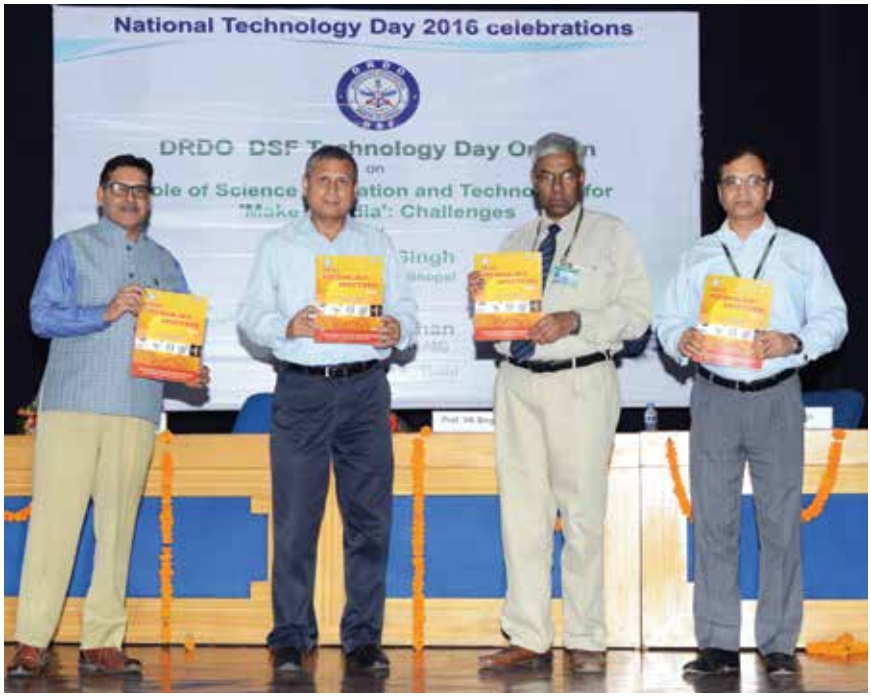
License agreement for Commercialization of Microbiological Quality Test Kit

The National Research Development Corporation (NRDC), under Ministry of Science and Technology, has entered into a license agreement with M/s Ramashree Chemicals Pvt Ltd, Bhopal, for commercialisation of "Test kit for Microbiological Quality of Drinking Water." The kit has been developed by Defence Research and Development Establishment (DRDE), Gwalior, an Indian defence laboratory of the DRDO, involved in the research and development of detection and protection against toxic chemical and biological agents.

The company plans to take this technology across the country through a network of dealers. The kit has been licensed to more than 20 companies in India so far and is useful to ascertain the quality of drinking water especially in developing countries.

The kit is used for detection of H2S producing organism in drinking water, which are present along with coliforms. Waterborne diseases like typhoid, cholera, diarrhea and jaundice are caused by polluted water supply. It is an inexpensive, reliable and convenient method of testing in field conditions and is approved by World Health Organization (WHO). The initiative of NRDC aids the "Make in India" Mission of the Government of India.

DRDO celebrates National Technology Day



DRDO celebrated National Technology Day (NTD) organised by the Defence Science Forum at Bhagavantham Auditorium, Metcalfe House, Delhi, with scientific fervour. Presiding over the function, Dr G Athithan, DS and CC R&D (SAM), DRDO, presented a roadmap on DRDO technology innovation. The occasion also marked NTD Oration on "Role of Science Education and Technology for Make in India: Challenges" by Prof. VK Singh, eminent scientist (Shanti Swarup Bhatnagar Awardee) and Director, Indian Institute of Science Education and Research (IISER), Bhopal. Prof. Singh highlighted the glorious achievements of Indian science and technology.

DRDO Technology Spectrum, a compendium of NTD Orations delivered by DRDO scientists at their respective labs/estts, brought out by Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, was also released on the occasion. Directors and scientists from DRDO HQ and Delhi-based labs/estts attended the function.

The following DRDO labs/estts observed the day by organizing NTD Oration, Open House Session, Science Quiz, Essay Writing Competition, etc.

Armament Research & Development Establishment

Dr Balachandran, Head (R&D), Kalyani Carpenter Special Steels Ltd. (KCSSL), Pune, was the Chief Guest of the NTD function and gave an invited talk on "Advanced Materials for High Technology Development".

Shri AS Badrinarayanan, Sc C, delivered NTD Oration on "Computational Simulation of Intermediate Ballistics of Gun Launched Projectiles". Shri Badrinarayanan was presented NTD Medal and Certificate by the Chief Guest. Shri KJ Daniel, OS and Officiating Director, ARDE, was also present on the occasion.

Advanced Systems Laboratory

Dr Tessy Thomas, OS and Director, Advanced Systems Laboratory (ASL), Hyderabad, in her inaugural address spoke about the significance of the NTD. Smt Sanchita Malik, Sc F, delivered NTD Oration on “Secure IT Infrastructure to Mitigate Cyber Attacks”. In her address, she demonstrated how to secure our IT infrastructure, the current state, steps taken and the roadmap ahead to achieve Enterprise Security based on Multi-Layered

Approach. Shri U Ramamohan, SP (Cyber Crimes) delivered colloquium talk on “Cyber Crime and Law: A Perspective”. He advised to use internet, mobile and social media with care to avoid any cyber fraud/ crime. Dr Tessy Thomas presented NTD Medal and Commendation Certificate to Smt Malik.

Centre for Air Borne Systems

Shri MS Easwaran, OS and Director, Centre for Air Borne Systems (CABS), Bengaluru, presided over the NTD function and delivered a message.

Shri MR Shankar, Sc F, delivered NTD Oration on Multidisciplinary Design Optimization—Advances and Applications”. He was presented NTD Medal and Commendation Certificate.

Centre for Artificial Intelligence & Robotics

Shri Siddharth Trivedi, Sc D, delivered NTD oration on “Operating Environment Runtime Integrity Preservation: An Approach for End Point Security”. In his talk he explained, end points and outlined an approach for realizing an integrity preserving operating environment, on modern Intel architecture.

Defence Scientific Information & Documentation Centre

Dr HK Kaul, founder Director, Developing Library Network (DELNET), Delhi, was the Chief Guest of the function and delivered an invited talk on "Challenges before LIS Professionals". He reiterated the need of providing information to the users instead of users asking for the services.

Shri Gopal Bhushan, Director, Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, in his inaugural address, described the role of DRDO in the Pokharan nuclear tests and how indigenous S&T benefitted after technology control regime was enforced by the developed countries.

Shri Tapesh Sinha, Sc D, delivered NTD oration on ‘’Innovative Marketing Strategies for Enhancing Visibility and Awareness of DRDO Publications: An Insight into DESIDOC Approach’’. He highlighted new promotional activities undertaken by DESIDOC for increasing the visibility of various in-house scientific publications being brought out by the Centre.

Defence Avionics Research Establishment

Defence Avionics Research Establishment (DARE), Bengaluru, celebrated the day by organising a talk on “Digital Receiver Implementation of Radar Location Estimation Algorithm Based on Adaptive, Non-Linear Minimization” by Shri Sachin AR, Sc D. He explained

the design and implementation of an iterative algorithm for radar location estimation by Airborne, Electronic Warfare (EW) Digital Receiver.

Defence Food Research Laboratory

Dr Ramana KV, Sc F, delivered NTD Oration on “Biotechnological Applications of Biopolymers and Biomaterials“. Dr Ramana explained potential applications of biopolymer from microbial and plant sources in the field of life sciences, engineering, nanotechnology, behavioral science, food technology and biomedical sciences. He further explained applications of bacterial cellulose produced by Gluconacetobacter xylinum and its usage as hydrogels, aerogels, high strength materials, and nanocomposites. He also briefed about recently developed edible films and edible cutlery, i.e., spoons, forks, bowls, cups using food grade ingredients at DFRL, Mysore. Dr RK Sharma, Director, DFRL, presented NTD Oration Medal and Citation to Dr Ramana KV.

An exhibition of technologies and products of DFRL in food processing sector was also organized. Students from different colleges and schools, general public and members of print and electronic media visited the exhibition. The open day exhibition received more than 2000 footfalls and wide publicity in print and electronic media.

Defence Laboratory

Dr SR Vadera, OS and Director, Defence Laboratory Jodhpur, in his inaugural address expressed need to be better aware and confident to cross the technology barriers so as to become technology leader in the world. Shri Ajay Jain, Sc F, delivered NTD Oration on "Deception Technologies in Defence". He was presented NTD Medal and Commendation Certificate for his oration. DLJ showcased its technologies in an exhibition organized for the general public. Forty working science models prepared by 100 students from various schools of Jodhpur were also displayed in the exhibition. The three best models were awarded. A competition for collecting ideas of the young minds on the topic “Technology to develop Expertise for Self-reliance” was also organised and best three views were awarded.

Defence Metallurgical Research Laboratory

Dr VV Satya Prasad, Sc G, delivered NTD oration on “Materials for Hypersonic Vehicles”. Dr Prasad highlighted the work carried out at Defence Metallurgical Research Laboratory (DMRL), Hyderabad, in the last five years on materials development for three important parts of the long duration hypersonic vehicles such as leading edges, controlled surfaces, housing for

electronic equipment and combustion chamber under project HYPERMET.

Dr Samir V Kamat, OS and Director, DMRL, presented NTD Commendation Certificate and Medal to Dr VV Satya Prasad.

Defence Research Laboratory

Dr Sibnarayan Datta, Sc D, delivered NTD Oration on “Recent Advances in Molecular Detection Technologies and their Applications in Military Research”. His talk covered the evolution of molecular detection technologies from culture-based detection to Polymerase Chain Reaction (PCR) and Next Generation sequencing (NGS)-based Identification Techniques. His talk concluded with the discussion on development of NGS technologies and their potential applications in military research.

Instruments Research & Development Establishment

Shri AK Sahay, Sc G, delivered NTD oration on “Infra Red Imaging Technology—Emerging Trends and Recent Developments". Instruments Research and Development Establishment (IRDE), Dehradun, organised exhibition of cutting-edge defence equipment, developed by it. Dr Rajendra Dobhal, DG, UCOST, Dehradun, inaugurated the exhibition and took keen interest in technologies and products developed by IRDE. Dr SS Negi, OS and Director, IRDE and Dr AK Sahini, Coordinator, NTD, briefed about the product range and technologies.

Students from various colleges and schools enthusiastically participated in science quiz organised on the occasion. Press and general public also showed keen interest in IRDE's products and technologies.

Institute for Systems Studies & Analyses

Ms Upika Mittal, Sc C, delivered NTD oration on “Artificial Weather Alteration—Non Contact Warfare Impact on Battlefield and Sensors”. The oration introduced Weather Alteration as possible non-contact warfare. Possibility of a future weather modification system to achieve military goals was highlighted. The orator demonstrated the effect of weather on the system

and the sensors by conducting a simulation study on AD Scenarios.

Interim Test Range

Dr BK Das, OS and Director, Interim Test Range (ITR), Chandipur, explained the importance of the day and encouraged scientists and technologists to be more creative and innovative in their approach. Shri BR Panda, Sc C, delivered NTD Oration on "Implementation of PCMA Technology in Range to increase the Spectral Efficiency". He was rewarded with NTD Commendation Certificate and Medal. Shri Palash Parmar, Sc B, also presented the paper titled "Wind-Thermal Scheduling incorporating Reactive Power Cost".

To be in harmony with nature, plantation of fruit bearing and medicinal plants have been made at Sport ground complex of ITR, which is a small step towards "Green and Clean India".

Institute of Technology Management

Shri M Sankar Kishore, Director, Institute of Technology Management (ITM), in his address, emphasized on the role of scientific community in building nation through technological advancement. A guest lecture was delivered by Prof. (Dr) Raju Ganesh Sunder, Faculty UPES, Dehradun. In his lecture, Dr Sunder emphasized on the application of Internet in the area of Defence, Space, Communication, Agriculture, Weather Forecasting, etc. Videos showcasing technological achievements of DRDO, advancement in Energy Studies and using of technology in curbing pollution were screened. A quiz competition on the DRDO products/services and S&T was also organised for the employees of ITM.

Naval Materials Research Laboratory

Speaking on the occasion, Dr SB Singh, OS and Director, Naval Materials Research Laboratory (NMRL), Ambernath, encouraged young scientists to dedicate themselves to innovative research for cutting-edge defence technologies. A group discussion entitled 'DRISHTI' (Discover Research Ideas in Science to Harness Technology Innovation) was also organised for young scientists to discuss on topics like metamaterials, smart materials and devices, biotechnology for pollutant oil, and perovskite cell—a real potential.

Shri P Sreenivasan, Sc D, delivered NTD Oration on "Stealth Technology for Underwater Acoustic Signature Management of New Generation Submarines". He was presented the NTD Oration Medal and Citation by Dr SB Singh.

Naval Physical & Oceanographic Laboratory

Naval Physical and Oceanographic Laboratory (NPOL), Kochi, celebrated NTD by organizing a series of

events. Dr Sabu Sebastian, Sc F, delivered NTD oration on "Technological Growth: Development of Vibration Isolator for Towed Sensor Array". The oration focused on the technological development of vibration isolation and noise reduction on towed array sonar systems of NPOL. Shri S Kedarnath Shenoy, OS and Director, NPOL, presented NTD Medal and Commendation Certificate to the orator.

As a part of the celebrations, an invited talk on "Underwater Vehicles" by Dr GA Ramadass, Sc G, National Institute of Ocean Technology (NIOT), Chennai, was also organized. The informative talk was a lucid exposition of the features, need and applications of underwater vehicles for deep sea technologies. Latest issue of the technical journal of NPOL, Sea Tech, was also released on the occasion.

Naval Science & Technological Laboratory

Naval Science and Technological Laboratory (NSTL), Visakhapatnam, celebrated NTD during 11-12 May 2016. Shri AVVS Murthy, Sc G and Associate Director NSTL, inaugurated the NTD celebrations. Dr A Srinivas Kumar, Sc G and Chairman NTDC-2016, in his welcome address brought out the scientific temper behind conducting technology Day. Dr BN Jagatap, Distinguished Scientist, Bhabha Atomic Research Center (BARC), Mumbai, delivered a scintillating talk on "Expanding Horizons of Nuclear Science and Technology". He gave an exhaustive coverage on availability of energy, demand and the means to bridge the gap. He also covered issues related to application of radiation isotopes for the benefit of society in terms of health care and well-being.

On 12 May 2016, Dr CD Malleswar, OS and Director, NSTL, emphasized on the requirement of growing innovative scientific and technical temper in the society, and said that scientific findings need to be converted to technologies for the benefit of the society. Shri M Padmanabham, Sc D, delivered NTD Oration on "Partial Coherence-based Technique for Noise Source Identification and Ranking". He was presented NTD Certificate and Medal by Dr Malleswar.

Prof. K Niranjan of Andhra University, Visakhapatnam also gave a talk on "Challenges in Space Weather Forecasting". He dealt extensively on the challenges for accurate forecasting of weather and proposed techniques to minimize the errors.

ISO 9001:2008 Accreditation Certificate to NSTL was released on the occasion.

Recruitment & Assessment Centre

A group of 50 students along with their teachers from Govt Sarvodya Vidyalaya, Lancer's Road, Delhi visited DARPAN Exhibition at RAC. Senior scientists of Recruitment and Assessment Centre (RAC) interacted with the students and highlighted importance of NTD celebration. Students were also informed about various career opportunities and entry-level schemes in DRDO.

Technical presentations, demonstration of effective office automation system on TD module and final settlement, plantation by Director, RAC and officials were the other activities organised to mark the occasion

Speaking on the occasion Shri Sudhir Gupta, OS and Director, RAC, stressed on the need of using competency tools/methodologies for efficient working.

He asked the officials to participate in such events and practice exchange of ideas and information for enhancing the knowledge bank and skills.

Research Centre Imarat

Shri SN Subramanyan, Deputy Managing Director and President L&T was the Chief Guest on the occasion. Shri Vishal Kumar, Sc D, gave technology day oration on "Indigenously developed RF MEMS Switch". Dr G Satheesh Reddy, SA to RM and Director, RCI in his address appreciated scientists for development of Ku-band seeker. He stressed on flight trail programmes and need for faster development in areas of seekers, gyros and control systems. Shri SN Subramanyan presented role of L&T in all areas of defence programmes and nation building activities. Dr M Sree Ramana, Sc E, proposed the vote of thanks.

Scientific Analysis Group

Shri Ashok Kumar, Sc E, gave NTD Oration on "Analysis of IP and TDM Traffic Transported through VSAT Links over Satellite Channels". In his talk he brought out the essentials of satellite communication and technologies available for transportation of IP and TDM traffic over VSAT channels. He also brought out the state-of-art techniques for satellite communications, highlighting the challenges in this area. Ms Anu Khosla, Director, SAG, presented a memento and a book to the orator. In her address to the employees, Ms Khosla took the house through the journey of various unusual technologies developed in different related and unrelated fields. She highlighted motivating examples and encouraged all to derive motivation from these and develop good technology for our users.

Raising Day Celebrations

Defence Laboratory

Defence Laboratory, Jodhpur (DLJ), celebrated its 57th Raising day on 16 May 2016. Shri JS Ramesh Bapu, Sc F and Chairman Works Committee, welcomed the august gathering. A slide show on "Defence Laboratory Jodhpur – A Golden Journey down the Memory Lane" was screened on this occasion to show growth profile along with the glimpses of the success stories of the laboratory highlighting the contribution of all directors, officers and staff over last 57 years.

Dr SR Vadera, OS and Director, DLJ, paid his tribute to the founder of the lab Dr DS Kothari, and expressed his gratitude to all former Directors, scientists and

staff for their outstanding contributions. He elaborated upon various achievements in the fields of scientific and technological development, administration, management and sports activities during the last one year. He also spoke about future technology challenges that laboratory need to work upon.

Dr Vadera also gave away DRDO lab-level awards for the outstanding contributions made by DRDS, DRTC, Admin and Allied category employees of the laboratory. Cash awards and commendation certificates were also distributed to the meritorious employees of DLJ. Mementoes were also presented to 29 officers and staff who have rendered 25 years of outstanding service in DRDO.

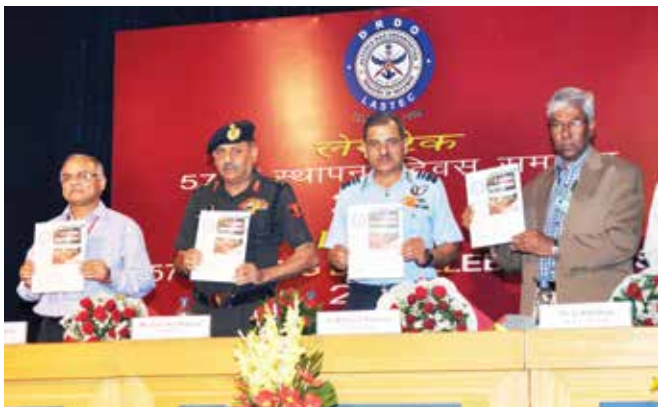
A Bada Khana (lunch) was also organized in the Community Hall of the laboratory. A large number of retired officers and staff joined the event with great enthusiasm. The programme was organised by a committee headed by Shri Ravindra Kumar, Sc F with the help of Works Committee of DLJ. Shri Santosh Kumar, Welfare Officer, was the Convenor for the whole programme. Shri Ashwani Sharma, member Works Committee, proposed the vote of thanks.

Laser Science & Technology Centre

Laser Science and Technology Centre (LASTEC), Delhi, celebrated its 57th Raising Day at Dr Bhagvantham Auditorium, Metcalfe House, Delhi. The Chief Guest of the function was Air Marshal VM Khanna, AVSM, VSM. Dr G Athithan, DS and CC R&D (Simulation and Modelling), DRDO, and Maj Gen Anil Kapoor, MGEME, Northern Command were the Guests of Honour.

Shri Haribabu Srivastava, OS and Director, LASTEC, welcomed the guests and presented the Annual Report of the Centre for the year 2015. The Chief Guest and the Guests of Honour also addressed the august gathering and appreciated the work being done by the LASTEC. Live demonstration of Project LORDS and Laser Wall was also given to the dignitaries LASTEC Newsletter, Annual Hindi Magazine, Arunodaya, and book on lasers in Hindi, Manav Anuprayagon mein Bhumika, by Shri Anuj Varshnay, Sc D, were released on the occasion. Lab-level DRDO Awards, Cash Awards and Sports Awards were also distributed to the meritorious employees and the winners of the sports events organised to mark the occasion. Mementos were given to employees who completed 25 years of service in DRDO.

An exhibition of Products developed by LASTEC including ADITYA, Dazzlers, Pre-emptors, LACSMI, LPAS, OTL, LWS, LPS, LTTS was also organized. The function concluded with a scintillating cultural programme performed by the employees of LASTEC.



Social Activity

Electronics and Radar Development Establishment (LRDE), Bengaluru, has initiated a programme “A Tree for every Official in LRDE Campus” with an aim to prevent global warming to preserve the nature and greenery for the future generation planting saplings in LRDE campus on the last working day of every month. With a view to achieve the goal, every month, Officers and Staff who are born in the month will be planting the saplings on the last working day of the every month.

To commence with, 92 LRDE officials who are born in the month of April planted saplings on 29 April 2016 to commemorate their birthday. Dr S Christopher,

Secretary, DD R&D and DG DRDO, graced the occasion and planted a sapling.

Manpower Development Activities

Conferences/Seminars/Symposia/Training Courses/Meetings

Course on Frozen/Chilled Chicken and Meat

A capsule course on "Frozen/Chilled Chicken and Meat" was conducted at Defence Food Research Laboratory (DFRL), Mysore, during 18-22 April 2016. This course was a specific requirement from the services and designed and executed by Freeze Drying and Animal Products Technology Division of DFRL to fulfill the requirement of services. Dr Rakesh Kumar Sharma, Director, DFRL, inaugurated the course, released the course material. In his inaugural address, Dr Sharma enlightened the participants about safety preservation of frozen/chilled chicken and meat for the usage in Armed Forces.

Dr MC Pandey, Sc G, Course Director welcomed the participants. Ten officers from Army Service Corps attended the course. The course syllabus included: cold chain management, importance of chilling/freezing of meat and poultry in Defence perspective, quality changes, packaging requirements, safety and standard protocols and microbiological testing of chilled/frozen meat and poultry. Live demonstrations of the test kits were conducted for microbial quality evaluation of frozen chicken and meat. Experts from Central Food Technological Research Institute (CFTRI, Mysore) and Meat Technology Unit, College of Veterinary and Animal Science, Mannuthy, Thrissur, Kerala delivered lectures in the concerned field. Dr K Jayathilakan, Sc E and Course Coordinator, presented the vote of thanks.

User Interactive Workshop on Improving Health and Habitability in North-East Sector

A user interactive workshop on 'Improving Health and Habitability in North-East Sector' was organized jointly by Defence Institute of Physiology and Allied Sciences (DIPAS), Defence Research Laboratory (DRL) and HQ 4 Corps on 5 May 2016 at DRL Tezpur. The workshop was inaugurated by Major General K Ravi Prasad, VSM and COS, HQ 4 Corps and was attended by about 15 senior Army officers and about 25 scientists from DIPAS, DRL and DRDO HQ.

Dr Shashi Bala Singh, OS and Director, DIPAS, Dr PS Raju, Director DRL and Dr Manoj Bali, Director, Directorate of Low Intensity Conflicts (LIC), DRDO HQ, gave overview of research activities of DRDO followed by presentation about DIPAS technologies and products by Dr SK Sharma, Dr Som Nath Singh and Dr MS Pal. Col SK Pandian, Dy Cdr, 46 Inf Bde and Col Animesh Sharan, HQ 4 Corps discussed different issues related to R&D activities and products installed/being tested at their location by DIPAS and DRL. A panel discussion was organized to identify areas for research with future and immediate applications to improve the health and habitability of the soldier in the tough terrains of North-East Sector.

During interactive session and panel discussion Brig Atul Bajpai and Brig S Baweja highlighted research needs and several logistic issues for smooth functioning of research work.

The products developed by DIPAS and DRL were displayed during the workshop. Users gave their feedback to suite their requirements in North-East Sector.

Personnel News

Appointment

Director General Armaments & Combat Engineering, DRDO

Shri Pravin Kumar Mehta, Outstanding Scientist, has taken over as Director General Armaments and Combat Engineering (ACE) Cluster, DRDO. Shri Mehta will be guiding the team of scientists under the Armament Cluster Group of DRDO laboratories located at Pune, Ahmednagar, Nasik, Chennai, Delhi, Balasore and Chandigarh/Manali for design and development of Armament systems. His area of specialisation is structural design, development, realisation, delivery and deployment of multi-disciplinary large complex systems leading to indigenisation.

Shri Mehta is a Civil Engineering Graduate from NIT Nagpur and a trained Structural Engineer from IIT Delhi. He has been awarded MPhil (Defence and Strategic Studies) for his research work on "Self-Reliance in Defence Research and Production through Private Sector Participation" during the 51st NDC course. The research work included a "Comprehensive National Mission based on technologically calibrated fixed time frame based, moratorium on import of defence equipment" taking into account the available resources within the country in public and private sector, the indigenization and classification of products, based on the technology involved. The study concluded formulating roadmap for self-reliance in Defence Research and Development identifying the major milestones for achieving the goal of self-reliance in Defence R&D.

Shri Mehta has been associated with prestigious Agni Missile Programme right from its inception, and was responsible for the design and development of all critical ground support systems, which were essential for deployment of different Agni variants including Rail/ Road Mobile Launch Platforms.

He joined DRDO at R&DE (Engrs), Pune, in 1986, and is one of the pioneer member of Agni ground support system development team, initially, in IGMDP and subsequently, in Program SF&D. As Project Director GC and IA2 programme, he led the team towards successful development of missile launch platform for Agni variants, viz, Agni I, II and III. These launch systems are configured on rail/road mobile platforms as per the specific deployment strategy for each of the Agni variants. The critical technologies required for the realization of these multi-disciplinary systems are mastered with validation through simulation, rigorous proof testing, extensive field trials, as well as mobility trials. He has been instrumental in devising innovative schemes/solutions and establishing effective interfaces among all stake holders through continuous interaction with various organizations like, Indian Railways, ISRO, CSIR, leading Industry partners, Academia and Users, for development of various critical ground support systems required for operationalization and development of long range strategic missile weapon system. Mother Operating Base at MSC Begedewadi was established to master the deployment technologies, finalization of system with user, operational training and drills for Agni missile ground systems.

He joined Advanced Centre for Energetic Materials (ACEM), Nasik, in March 2012 as General Manager, and led the team for successful realization of case bonded rocket motors for ANS Programme for deliverables, static and flight trials. He has successfully geared the team for achieving the rated plant capacity by processing 85 T of composite propellant in the year 2013. Large number of motors for project B-05 and K-4 were successfully processed in record time, meeting the pressing schedule by establishing in-house insulation laying facility, production friendly techniques to process large size batches, and optimizing the process parameters, resulting in significant reduction in process lead time. All the motors processed performed flawlessly in various flight trials of B-05 and maiden flight of K4. To further enhance the reach of every indigenously developed missile, processing of propellant having high Specific Impulse with due safety consideration is a critical requirement. Detailed road map has been drawn up to establish all the facilities to undertake processing of superior performance next generation propellant, capable of delivering Isp > 260 seconds. The state of art Nitramine Grinding and Spherodising plant for manufacture of spherical nitramine has been commissioned, marking an important milestone in

processing of high energy raw materials. Once the critical long lead items such as bladeless mixer of different capacity are installed, this work centre will acquire unique capability of processing 3 T class motor with next generation composite propellant. Indigenous development of 5T Vertical Planetary Mixer, the biggest capacity mixer in the country has been completed and commissioned successfully.

Shri Mehta is the recipient of a number of prestigious awards including: DRDO Scientist of the Year Award by Prime Minister of India in the year 2007; DRDO Agni Award for Excellence in Self-reliance in 1999; DRDO Path Breaking Research/Outstanding Technology Development Award in 2007; DRDO laboratory-level Scientist of the Year Award in 2002, Technology Group Award in 2006; DEMA Appreciation Award in 2008 and DRDO Special Award in 2014 for strategic contribution towards significant design and development of Submarine Launch Ballistic Missile K4.

He is a fellow of Institute of Engineers (India) and Life Member of prestigious National Defence College, New Delhi.

Higher Qualification Acquired

Center for High Energy Systems and Sciences

Shri JP Singh, Sc G, Center for High Energy Systems and Sciences (CHESS), Hyderabad, has been awarded PhD by Jadavpur University Kolkata for the thesis titled “Designing an Electrohydraulic Stewart Platform for Tracking Uncoupled Motions.”

Ms Deepti Joshi, Sc D, CHESS, Hyderabad, has been awarded PhD by IIT Delhi, for the thesis titled "Laser-assisted Synthesis of Gold and Silver Nanoparticles and Spectroscopic Study of their Interaction with Protein."

Defence Food Research Laboratory

Shri R Kumar, Sc F, Defence Food Research Laboratory (DFRL), Mysore, has been awarded PhD by Bharathiar University, Coimbatore for the thesis titled “Pulsed Electrical Field Processing of Mango Nectar.”

Awards

Young Promising Professional Award

Shri U Ravi Kiran, Sc D, Defence Metallurgical Research Laboratory (DMRL), Hyderabad, has been awarded ‘Powder Metallurgy Association of India (PMAI) Young Promising Professional Award-2016’ for his paper entitled “Effect of cyclic heat treatment and swaging on mechanical properties of cobalt molybdenum containing tungsten heavy alloys” in International Conference on Powder Metallurgy and Particulate Materials.

Rajbhasha Rolling Trophy

Naval Physical and Oceanographic Laboratory (NPOL), Kochi, bagged the Rajbhasha Rolling Trophy (2014-15) for the 14th consecutive year from Town Official Language Implementation Committee (TOLIC), Kochi. The award was in recognition of securing the first place for the best performance in official language implementation. Dr K Sudarsan, Associate Director, NPOL, received the Trophy from Dr R Sasidharan, former Head of Department, Hindi, Cochin University of Science and Technology on 12 May 2016.

Dr K Sudarsan, Associate Director, NPOL, receiving the Trophy

Fellow of USI

Dr Chandra Prakash, Sc G, Solid State Physics Laboratory (SSPL), Delhi, has been elected as the Life Fellow of Ultrasonic Society of India (USI) and member Executive Council of the USI. The honour was conferred upon him for his outstanding contribution to the field of Piezoelectrics.

DRDO: Harnessing Science for Peace and Security-V

Chapter 1: The Beginning — Defence Science

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

Aftermath of the World War II

The Indian Scenario

The question of setting up a scientific research organisation for defence did not surface till after the end of World War II. In 1946, when it became evident to the Britishers that controlling India as part of the British Empire in the postwar period was going to be increasingly difficult, and that India and Indians would play a greater role in determining their own destiny, it was decided to invite Dr OH Wansborough Jones, who was the Scientific Adviser to the Army Council in UK, to advise the Defence Department on the organisation of scientific research in India for defence. Dr Wansborough Jones had an intimate knowledge of the utilisation of science and scientists within the defence forces in UK in the course of his 30 years of association. During the war years, he was involved in operational research in UK. He visited India and submitted his report on a proposed organisation for the Defence Services to the Commander-in-Chief in November 1946. He was given to understand that the Government of India intended to make the country, as nearly as possible, a self-supporting defence entity as may be at the earliest possible date, which means reducing its dependence on import of defence equipment from abroad as early as possible. To reach this goal, India would have to initiate scientific effort to explore scientific advances in their application to defence, and simultaneously take steps for development and production of the relevant scientific findings into actual stores or weapons for utilisation by the Services. The latter part would be dependent on the industrial infrastructure. Thus, Dr Jones observed, "for realising the aim, first, at a higher (that is, at the national level), it will be necessary to determine scientific strategy for the defence of India, that is, to determine the best allocation of total scientific effort available in the country". Then he emphasised the necessity for a strong industrial base by stating , "treating the defence problem as a whole, the maintenance of the Armed Forces must be based on civil economy and it would be futile to develop well trained and adequately equipped Armed Forces without sufficient civil and industrial forces to maintain them." He also pointed out that unlike UK, India has a single integrated Defence Department which administered to the needs of three Services, and therefore, there need be only one Scientific Adviser for the Defence Department and the three Services.

In the period immediately after the World War II, the Services were also undergoing changes in their organisations for aligning with the needs of the postwar peacetime requirements. For example, the ordnance factories where the various inspectorates were situated, were separated and placed under the Ministry of Defence. A review was carried out with respect to the research and technical development activities under the Army, and as a first step, the inspectorates which continued under the Services were placed under the Directorate of Technical Development. The Directorate of Technical Development was made responsible for technical services to the General Staff regarding arms, equipment, clothing and general stores, to certify the quality of every kind of store in the Army (except food) and to maintain particulars of production for all stores manufactured in India. In addition, the Directorate of Technical Development advised and assisted the ordnance factories and the industries in establishing the manufacture of the army requirements in India. In the two-year period (1945-1947), the inspectorates underwent some more changes to emerge in early 1947, as Technical Development Establishments. Under the Directorate of Technical Development three principal Controllerates, namely Armaments, Weapons and Ammunition, Vehicles and General Stores, were set up and made responsible for the work of the Technical Development Establishments (TDEs). The TDEs were spread out all over the country with main centres at Kanpur, Jabalpur, Khadkee, Ahmednagar, and Dehradun, in the different disciplines of armaments, vehicles, instruments and electronics, general stores and so on. The functions allotted were design, development, and modification of equipment for the Services and setting up of indigenous production and

inspection establishment. One such TDE (Instruments and Electronics), which was set up at Dehradun in April 1947 later became two DRDO laboratories, LRDE in Bangalore and IRDE in Dehradun.

In the meantime, political developments within the country were taking place much faster than anticipated, as a result of which an Interim Government was sworn in on 28 October 1946 with Pandit Jawahar Lal Nehru as Member for External Affairs and Commonwealth Relations Department, and with Mr Goverdhan Shankerlal Bhalja as Secretary, Defence Department. The Commander-in-Chief for the first time ceased to be a part of the Governor General's Executive Council and became adviser to the Defence Member.

Early in 1947, as a first step towards the creation of a defence research organisation, the search for a suitable scientist of stature and of highest calibre and preferably with research experience connected with defence had begun. When it was realised that handful of the distinguished Indian scientists were not available for consideration, the search was extended beyond our shores to UK and two eminent scientists in UK were then approached for appointment as Scientific Adviser to the Defence Department for a short period until a suitable Indian scientist was identified for this post. Due to their academic and other commitments, their services could not be obtained and the creation of the scientific research organisation for defence had to be kept in abeyance. In the mean time, political events were changing rapidly and had led to the British Government announcing the division of the country and transfer of power to the two newly forming national entities, namely India and Pakistan. The search for filling up the post of Scientific Adviser appears to have been deferred till the two nations come into existence in August 1947.

Post-Independence Scenario

Independent India and the Change

Independent India had the good fortune to have Pandit Jawahar Lal Nehru as its first prime minister, a person who considered science and technology as the most important factors for lifting the nation out of the mire of grinding poverty to its true potential. Earlier in 1938, as Chairman of the National Planning Committee set up by the Indian National Congress, he had declared, "industrialisation (as) essential to the elimination of poverty and unemployment, as well as to national defence and economic regeneration in general" for India. He was well aware of the contributions of modern science and technology to the higher standards of living of the advanced countries of Europe and the USA. He therefore took every opportunity to meet scientists and knowing about the progress in science and advances in technology. Thus, in January 1947, as President of the Indian Science Congress, he met a distinguished foreign invitee, Professor PMS Blackett, of Manchester University, who was deeply involved in UK in defence R&D during the World War II and later a Nobel Laureate in Physics, who had been invited to address the Science Congress. Pandit Nehru knew Professor Blackett's experience in war and military affairs and got from him a first hand account of the role and contributions made by scientists in UK during the war to the defence effort.

During lunch at Pandit Nehru's home, Panditji queried Professor Blackett regarding his views about the time it might take to Indianise the command structure of the military and about the indigenisation of military weapon production and supply. Nearly a month later, in February 1947, as part of the interim Government, Panditji had expressed his views on defence policy and national development as follows, "Defence cannot be considered in a vacuum. It bears an intimate relation to international affairs, foreign policy, industrial development, scientific research, and the resources of the country. The expert soldier knows much more about the technique of defence and the building up of defence forces than a layman does. But the expert soldier necessarily looks at the problem from his own narrow viewpoint and he is apt to ignore many other considerations. Our difficulties are increased by the fact that great changes are taking place in the science of war and it is quite possible and indeed probable that new methods of warfare might change the whole conception of war, modern defence as well as modern industry require scientific research, both on a broad basis and in highly specialised ways. Even more than before, war is controlled by latest scientific inventions and devices. If India has not got highly qualified scientists and up-to-date scientific institutions in large numbers, it must remain a weak country incapable of playing a primary part in a war..... ".

Report of Professor PMS Blackett

It was not surprising that Pandit Nehru, as Prime Minister of India, extended an invitation to Professor PMS Blackett through the Defence Minister to visit India and advise the Government on the research and development needs to make the country as early as possible a self-supporting defence entity. Professor Blackett's credentials as defence expert were impeccable and India had no scientists with professional military experience. His association with military research in UK began in 1936 and he was acknowledged during the World War II as a naval expert and also was credited with Blackett Bomb Sight which was standard fitment on Allied bomber aircraft. He sat on key committees of UK that bridged the public and secret use of nuclear fission and he was in touch with those who were looking at future weapon systems. To Professor Blackett, India was not totally unknown as his family had an association with India earlier. His father's brother was a missionary in India, his mother's father had been in the Indian Army, and his mother's uncle had been a tea planter in the country. Professor Blackett had not visited India before 1947 but in the quarter century period from 1947, he visited India at least a dozen times. After 1948, he usually stayed with the Prime Minister; visited the defence installations and held discussions with high ranking Service officers including the heads of the Services, high ranking civilian officers connected with the defence ministry, and also with the scientists.

Professor Blackett's Report to the Defence Minister was submitted in September 194821-22. In the letter forwarding the report to the defence minister, Professor Blackett mentioned that he felt it necessary to widen the scope of his analysis beyond that of organising of defence science to the needs of the Indian Armed Forces. He stated, "weapons and instruments of war can themselves hardly be wisely chosen without some guidance not only as to the general defence plans but also as to the programme for the industrial development of the country". Therefore, he had ventured to take upon... [himself] the task of attempting to discuss in some detail the relationship between (a) defence science, (b) military strategy, and (c) foreign political and domestic industrial policies of India. He pointed out that the lack of experience in formulating defence policies makes this job difficult for the newly independent nation and the difficulty was further compounded by the great size of the country and the relatively low industrial production. He brought out that his report can be considered as a study of how India can best cut her defence cloth according to her scientific, financial, and industrial skill. He then went on to confirm his agreement with nearly all the recommendations made by Dr Wansborough Jones and expressed his happiness that the Government had already implemented some of these. He was delighted by the choice of Dr Daulat Singh Kothari as the Scientific Adviser to the Defence Ministry and stated that he was in complete agreement with the views of Dr Kothari with regard to personnel and organisation given in his proposal and already submitted to the Government.

Professor Blackett, like Dr Wansborough Jones before him, made the observation that the goal of self-supporting defence entity requires a strategy at the national level for best allocation of scientific effort and for building up of the civil and industrial forces. This observation might have been prompted by their being most probably aware, at the outbreak of the war, of the inadequacy of the British industry, which was mostly antiquated and inefficient with machine tools in short supply. Britain also had, at that point of time, a grievous shortage of specialist designers with engineering background which made it difficult for the country to repair and maintain trucks, tanks, engines, and aircraft. The inadequacy of the British factories also forced the Government of Britain to place orders for mechanisms of even moderate complexity, on factories in the USA23.

To decide on the approach to reach the objective stipulated by the Government, Professor Blackett first took up the estimation of the financial resources that might be available. The starting point was the 1948 figures for the national income, the central budget, and the amount allocated for the Armed Services out of the budget. He observed that the industrial productivity was low – it was estimated as 2 per cent of the corresponding figure for Britain -and since the percentage of financial resources allocated for the Armed Services in the central budget was already high (being 40 per cent), he opined that it is very unlikely, the present allocations for Armed Forces could be raised without affecting the rate of growth of industrialisation and the expansion of the national economy.

To be continued...

Special Feature

Multilateral Export Controls Regimes

Gopal Bhushan

Director, Defence Scientific Information & Documentation Centre (DESIDOC)

The global security and defence environment has been in a great flux. Conflicts with non-states, advanced technologies and next generation combats have made a paradigm shift the ways countries had fought wars. It also has changed our understanding of national security and defence capabilities. Among the major efforts to keep international peace and security in twenty-first century has been to control or limit the number of weapons and the ways in which weapons can be used. The proliferation of advanced delivery systems is worrisome, threat from space and cyberspace has incredible potential to damage or degrade critical infrastructure and military assets. These security imperative necessitates that countries discipline themselves and contribute in combating the menace of arms and technology proliferation specially the ones those could potentially exacerbate WMD. A country's credentials and reputation in arms control and disarmament draw on a long history of commitment to promoting the peaceful and just resolution of international conflicts, and of strong support for the multilateral treaty system.

The defence export/import and advanced and niche technology collaborations in the world is largely controlled by a handful of countries that enforce control both direct and dual use goods. Besides, political and strategic compulsions also play an important role in deciding where such transfers are permissible. There are four export control regimes, Wassenaar Arrangement, Australia Group, Missile Technology Control Regime and Nuclear Suppliers Group which seek to control transfers of conventional arms and dual-use goods and technologies, development of chemical or biological weapons, limit the spread of ballistic missiles and other unmanned delivery systems, and ensuring non-proliferation of nuclear weapons and nuclear technology.

The Wassenaar Arrangement (WA) controls transfers of conventional arms and dual-use goods and technologies. The Australia Group (AG) is an informal forum of countries which seeks to ensure that exports do not contribute to the development of chemical or biological weapons. The Missile Technology Control Regime (MTCR) was established in April 1987 aims to limit the spread of ballistic missiles and unmanned delivery systems that could be used for chemical, biological and nuclear attacks by restricting the exports of missiles and related technologies capable of carrying a 500 kg payload at least 300 km, or delivering any type of WMD. The Nuclear Suppliers Group (NSG) which is a 48 member group was formed in 1974 aftermath of India's nuclear test with the aim of ensuring the non-proliferation of nuclear weapons and technology.

India has great potential of becoming a major exporter of defence equipment. Considerable investments have been made over the years in creating indigenous defence research and development, manufacturing infrastructure in the form of DRDO labs, DPSUs, ordnance factories, and industries in the private sector. It is imperative that India which is a growing economy to maximize indigenization and self-reliance in defence equipment get a toehold in the world of defence exports.

So far India has refrained from being an export faring country, but gradually it is opening the export of defence items to friendly neighbouring countries. But more is needed if India aspires to be in the league of technologically advanced countries. It has to leverage home grown technology by supplementing technology acquisition from abroad and inviting multinationals to manufacture in the country. But for that it has to generate faith and confidence in the international community that technology acquired

is safe in the country, then only India can expect to be granted access to the manufacturing processes and technology. India has to enforce legal processes for technology acquisition and export of technology/ items.

A country's credentials and reputation in arms control draw on a long history of commitment to promoting the peace and strong support for the multilateral treaty system. India has been trying for the membership of these regimes as it has realized that membership of multilateral regimes will provide international legitimacy and the status of a responsible nuclear state and access to defence equipment controlled by these regimes. India has outreached to these regimes to showcase its non-proliferation commitments, no first use, stringent control on WMD technology, material and delivery systems and intent to harmonising export policies with international practices on export control guidelines. India has given an account of its impeccable track record of non-leakage of sensitive technologies to third countries and adherence to all the rules of nonproliferation while still not being the part of NPT.

MTCR

The recent admission of India into the MTCR with only formalities and protocol remaining, India has come closer to the first of four multilateral regimes and can now build upon with memberships to the NSG, AG and WA. Entry to the MTCR is expected to pave the way for India to export high technology missiles and purchase hardware and increased defence trade and technology transfer with technologically advanced countries.

NSG

The 48 member group that was formed in 1974 has an aim of ensuring non-proliferation of nuclear weapons and technology. From India's point of view, it was formed to deny India accessing the sophisticated technology after India carried out its first nuclear test. The NSG includes five nuclear weapon states, US, UK, France, China and Russia and 43 countries which are signatories to the Nuclear Non-Proliferation Treaty (NPT).

India is not a signatory to the NPT but the civil nuclear deal in 2008 with the USA paved the way for India's application to the NSG. India's commitment to separate its civilian and military nuclear programmes and its non-proliferation record has worked in its favour. India has also ratified an Additional Protocol with the International Atomic Energy Agency (IAEA) which means that its civilian reactors are under IAEA safeguards and open for inspections.

With the current momentous efforts by parleying with important countries that matter for India's NSG membership, India has improved its chances of joining the NSG. An NSG membership would potentially let India access to nuclear technology for a range of uses from medicine, agriculture, industry, energy, to building civil nuclear plants. Though, India has its own indigenously developed technology but to get its hands on state-of-the-art technology that countries possess, it has to become part of the NSG. India also has a pressing need to scale up its nuclear power production to reducing dependence on fossil fuels which is possible only with International alliances. Access to advanced technologies, will also boost innovation and high technology manufacturing and commercialization/ export to leverage economic and strategic benefits. India's entry into the NSG is currently being opposed on the ground of its being a non-signatory to NPT. Signing of NPT would mean giving up its nuclear arsenal which India would never agree because of its geo-political compulsion and rouge neighbourhood.

Both MTCR and NSG has tremendous potential to boost the 'Make in India' initiative through FDI, high technology trade, growth of domestic industry, job creation and skill enhancement.

Shri Gopal Bhushan pursued DRDO's international affairs with foreign countries at the governmental level and represented DRDO in various multilateral and out reach meetings on Disarmament and International security.

Visitors to DRDO Labs/Estts

Armament Research & Development Establishment

Maj Gen SK Srivastava, DG CE, MoD, visited ARDE on 3 June 2016. He was accompanied by Brig SS Kahlon, DDG CE (B). A presentation on New Family of Munitions projects was given to the visiting dignitaries. Status of the seven different types of Land Munitions and the future course of action was deliberated upon during the subsequent discussions. DG CE expressed satisfaction on the overall progress of the projects and urged that the timeliness be strictly adhered to.

Centre for Artificial Intelligence & Robotics

Lt Gen NPS Hira, AVSM, SM, DCOAS (IS&T), Maj Gen BG Gilganchi, ADG, IS (A), DDG (ICH) and team visited Centre for Artificial Intelligence & Robotics (CAIR) on 6 May 2016. Shri Sanjay Burman, OS and Director, CAIR briefed the visitors about the activities of CAIR and technologies developed by CAIR in the area of Security Solution Architecture and Command and Control were demonstrated to the visitors.

Defence Food Research Laboratory

- Prof. (Dr) A Ganapathi, Vice-Chancellor, Bharathiar University, Coimbatore visited Defence Food Research Laboratory (DFRL), Mysore, on 12 May 2016. He was welcomed by Dr GK Sharma, Sc G, Addl. Director, DFRL and senior scientist of DFRL. Dr SN Sabapathy, Sc G, Head HRD Division made presentation to him about current research activities, past achievements and the details of the students doing PhD under DRDO-BU collaboration programme. Later, Prof. Ganapathi, visited various Divisions of DFRL and showed keen interest in the research and development activities of DFRL.

- Lt Gen Balbir Singh Sandhu, VSM, DGST, IHQ (MOD) Army visited Defence Food Research Laboratory (DFRL) Mysore on 16 May 2016. He was welcomed by Dr R K Sharma, Director, DFRL and senior scientist of DFRL. Director, DFRL briefed him about current research activities and past achievements. Later he visited various Divisions of DFRL and showed keen interest in the research and development activities of DFRL. Lt Gen Balbir Singh Sandhu VSM, DGST, IHQ (MOD) Army praised about the innovativeness and creativity of DFRL in developing several products to meet the operational requirement of Armed Forces deployed in various terrain of India . He also planted tree sapling on this occasion at premises of DFRL, Mysore.

Readers' Feedback

Many of you have been writing back to us with your generous words of praise and encouragement, for which we give our deepest thanks. So please do keep your feedback coming.

We would also like to hear from you on what else would you like to see in the DRDO Newsletter so that we can make it even more relevant for you. So take some time off and fill up the feedback form below.

1. Please rate DRDO Newsletter as a medium to adequately present DRDO's events?

   Excellent ( ) Very Good ( ) Good ( ) Satisfactory ( )

2. Your preference to read the Newsletter...

   Print ( ) Online ( ) Both ( )

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   Technical Content ( ) Popular S&T News/Articles ( ) HR Activities ( )
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Please send your feed back to:

Editor-in-Chief, DRDO Newsletter
Defence Scientific Information & Documentation Centre (DESIDOC)
Metcalfe House, Delhi-110 054

DRDO in Press

The Tribune
VOICE OF THE PEOPLE

DRDO claims breakthrough in using solar energy forheating at night

By Vijay Mohan
Tech to make troops' shelters cosy

- It utilises phase-change materials (converting solid to liquid and liquid to solid on change of temperature, thereby releasing heat) to store thermal energy
- It has a thermal trap area over the roof that utilises greenhouse concept for creating a tunnelling effect to trap solar heat in the shelters for the troops

The Defence Research and Development Organisation (DRDO) has claimed to have made a breakthrough in developing technology for utilising solar heat harnessed during the day for heating rooms during the night at extreme altitude.

The Defence Institute of High Altitude Research (DIHAR), a DRDO laboratory based at Leh, has developed a shelter for troops that uses non-conventional energy for heating, instead of fossil fuel.

The shelter, costing about Rs 60 lakh, was tested through the winter at Chang La, located at 17,600 feet in Ladakh, with temperature as low as minus 40°C. The DRDO established the world's highest research station there last year.

Scientists at DIHAR said while solar energy could be harnessed and stored in batteries for later use, the same is not applicable for solar heat and conventionally solar heat can be used only while the sun is shining. Claimed to be the only kind of shelter, it utilises phase change materials (converting solid to liquid and liquid to solid on change of temperature, thereby releasing heat) to store thermal energy collected from evacuated tube solar collectors. It has a greenhouse based thermal trap area over the roof and utilises greenhouse concept for creating a tunnelling effect to trap solar heat in the shelter.

"The shelter maintained a temperature of 7-10°C when the ambient temperature stood around minus 30°C. Other shelters in similar conditions have temperature of minus 10-15°C," a DIHAR scientist said. "However, there is a need to operate a diesel generator for six hours during the peak winter months (January and February) when the temperature falls below minus 30°C," he said.

At present, the Army uses "bhukaris" and generator-run electrical appliance to heat spaces like barracks and bunkers in Ladakh as well as the North-East, consuming lakhs of litres of kerosene and diesel every year. The non-conventional energy shelter would be environmentally beneficial in ecologically sensitive areas, besides generating carbon credits.

पंजाब केसरी.com
जून 04, 2016

ड्रैगन को दरकिनार कर भारत ब्रह्मोस मिसाइल बेचेगा

नई दिल्ली, (संवाददाता) : एशिया में चीन के बढ़ते प्रभाव को खत्म करने के लिए भारत ने वियतनाम को ब्रह्मोस सुपरसोनिक क्रूज मिसाइल बेचने का फैसला लिया है। रक्षा मंत्री मनोहर पार्रिकर सिंगापुर और वियतनाम की पांच दिवसीय यात्रा पर जाएंगे। इस दौरान इस डील पर अंतिम फैसला होने की संभावना है। पार्रिकर की यात्रा के दौरान वे ब्रह्मोस मिसाइल को लेकर चर्चा करेंगे। वियतनाम बीते पांच साल से ब्रह्मोस मिसाइल की मांग कर रहा है लेकिन पिछली यूपीए सरकार ने चीन की आपत्तियों के डर से वियतनाम को यह मिसाइल नहीं दी थी। इस फैसले को मोदी सरकार की विदेश नीति में बड़ा बदलाव माना जा रहा है। रक्षा मंत्रालय के सूत्रों के मुताबिक प्रधानमंत्री नरेन्द्र मोदी और रक्षामंत्री ने इसके लिए मंजूरी दे दी है। बता दें कि ब्रह्मोस मिसाइल को भारत और रूस ने साथ में मिलकर विकसित किया है। यह सबसे ताकतवर मिसाइलों में से एक है।

चीन के साथ बढ़ी है तल्खी: चीन के साथ हाल में कई मुद्दों पर भारत की तल्खी सामने आई है। पाकिस्तान में मौजूद आतंकी अजहर मसूद को यूएन से बैन कराने की भारत की कोशिशों को चीन ने विफल कर दिया था। इसके अलावा न्यूक्लियर सप्लायर्स ग्रुप एनएसजी में भारत की एंट्री की कोशिशों में भी चीन ने अड़ंगा लगाने की कोशिश की।

Business Standard

Indo-French aircraft deal may benefit TAAL, says company CEO

The company is associated with the DRDO's unmanned combat vehicle project Rustom 2

By Gireesh Babu

June 03, 2016

Taneja Aerospace Aviation Ltd (TAAL) expects to benefit if India and France strike the proposed deal to bring in Dassault Rafale aircraft to the country, as the company has been successfully evaluated by the aircraft manufacturer, a senior management official of TAAL said.

Speaking to reporters on the sidelines of a conference on defence manufacturing technologies, organised by the Tamil Nadu Technology Development & Promotion Centre of CII, Sudhir Kumar, CEO, TAAL said, "If the French aircraft Dassault Rafale comes we are likely to get some business because Dassault Aviation may give some work. They have already evaluated us and they have finding that we can work for them."

According to reports, both the countries are in talks for a proposed $8.9 billion contract for purchase of fourth-generation Dassault Rafale fighter jets for the Indian Air Force.

At present, TAAL is indirectly handling some works for Rafale, through an Israel-based armament company, under which it supplies certain structural assemblies and pressurised containers to the company in Israel.

TAAL, started with manufacturing of aircraft and the structural assemblies for Vikram Sarabhai Space Centre(VSSC) and Indian Space Research Organisation (Isro) for its space launch vehicles, also works projects for Hindustan Aeronautics Ltd and Defence Research and Development Organization (DRDO).

It is also associated with Rustom-2, an unmanned combat air vehicle developed by DRDO, which is likely to fly shortly. It has been working in two Base Repair Depots (BRDs) of Indian Air Force, where the overhauling of aircraft takes place. Currently, it is working in two such Depots -- in Kanpur and Nasik.

Last year, the company posted a turnover of aroun Rs 56-57 crore. He said that the company see opportunity in offset activities by overseas firms in India and continuously engage with the foreign players for such activities.

The Indian EXPRESS

Take up more responsibilities: Parrikar to DIAT

Parrikar, who was speaking at the 8th convocation of DIAT in Pune on Tuesday, also asked the institute to involve the alumni more for better brand building and growth.

June 1, 2016,

Defence minister Manohar Parrikar has urged the Defence Institute of Advanced Technology (DIAT) to shoulder the responsibility to generate new knowledge, fulfill defence needs and also take this technology to civilian and commercial use after fulfilling the defence needs. Parrikar, who was speaking at the 8th convocation of DIAT in Pune on Tuesday, also asked the institute to involve the alumni more for better brand building and growth. Parrikar said that DIAT is fully complementing DRDO laboratories by carrying out fundamental and exploratory research leading to development of new science and technology at Technology Readiness Levels (TRL) 1, 2 and 3 and work with DRDO labs which take it to higher levels of 4, 5 and 6. "This ecosystem was developed with a lot of thought and is serving long term benefits to the defence of the country," Parrikar said.

DIAT awarded 110 M.Tech, 23 PhD and 8 MS by Research degrees during the convocation. Thirteen M.Tech students received medals for topping M.Tech programmes. S Christopher, secretary, department of defence, said that production value of systems based on DRDO technologies that have been inducted into the services has crossed Rs two lakh crore and is rising progressively. This year, it would go up to Rs 2.5 lakh crore, he said.

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