

DRDO NEWSLETTER

A monthly house bulletin of Defence Research & Development Organisation ■ Vol. 35 No. 3 ■ March 2015



**Canisterised launch of Agni 5: A giant leap
in country's deterrence capability**

DRDO products displayed in Republic Day 2015



Akash Missile System



Weapon Locating Radar



Editor-in-Chief
SK Jindal

Associate Editor-in-Chief
Ashok Kumar

Editor
Manoj Kumar

Local Correspondents

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

Assistant Editor
Geeta Sharma

Design & Pre-press
Anjan Kumar Das

Multimedia
RK Bhatnagar

Printing
SK Gupta; Hans Kumar

Distribution
RP Singh

Website: <http://www.drdo.gov.in/drdo-nl>
E-mail: director@desidoc.drdo.in; drdonl@desidoc.drdo.in
Tel: 011-2390 2474; Fax: 011-2381 9151

INSIDE THE ISSUE

DRDO test-fires canisterised Agni 5 ICBM..... **4**

LCA Tejas achieves another Milestone..... **5**



LASTEC develops Hand-held Explosive Detection System..... **6**

New Generation Electronic Warfare Equipment integrated on Tejas..... **6**

Workshop on Manufacture of Defence Equipment organised by DRDO..... **7**

Raising Day Celebrations..... **8**



Manpower Development Activities..... **9**

CVRDE initiates Swachh Bharat Abhiyan..... **11**

Personnel News..... **12**

Raksha Mantri visits ARDE..... **13**

NSTL displays advanced Defence Technologies in Pride of India Expo-2015..... **14**



ISO 9001: 2008 Re-certification to HEMRL..... **14**

Sports Round-up..... **15**

Monograph Released..... **15**

Visitors to DRDO Labs/Estts..... **16**

DRDO test-fires canisterised Agni 5 ICBM

India's Inter-Continental Ballistic Missile (ICBM) Agni 5 was successfully test fired from a canister by DRDO on 31 January 2015. It was a historic moment when for the first time Agni 5, about 17 meters long and weighing over 50 ton, majestically rose from the confines of its canister. Having risen to about 20 meters, its first stage motor ignited lifting Agni 5 into the sky. The flight continued on its predetermined path during which the second all composite lightweight motor followed by the third innovatively designed conical all composite rocket motor propelled the missile into the space taking it to a height of more than 600 kilometers. The missile, after reaching peak of its trajectory, turned towards the Earth to continue its journey, directed precisely by the advanced on-board computer and inertial navigation system, towards the intended target with an increased speed due to the Earth's gravitational pull.

As the missile entered the Earth's atmosphere, with temperature raised to beyond 4000 °C, the indigenously designed and developed carbon-carbon composite heat shield protected the payload maintaining the inside temperature below 50 °C. Finally, commanded by the on-board computer with a support of highly accurate ring laser gyro-based inertial navigation system, the most modern micro inertial navigation system (MINS), fully digital control system and advanced compact avionics, the missile hit the designated target accurately meeting all mission objectives.

Shri Ajit Doval, National Security Advisor, congratulated Dr Avinash Chander and the Mission Team for the successful launch.

Congratulating team Agni, Air Chief Marshal Anup Raha, PVSM, AVSM, VM, Chairman Chiefs of staff



Agni 5

Committee and Chief of Air Staff, who witnessed the entire launch operations from the control room, called it a great achievement. Lt Gen Amit Sharma AVSM, VSM, Commander-in-Chief, Strategic Forces Command, who was also present on the occasion, called it a fantastic achievement.

Dr Avinash Chander, SA to RM, Secretary Department of Defence R&D, and Director General (DG) DRDO said, "This is a momentous occasion. It is India's first ever ICBM launch from a canister and is a giant leap in country's deterrence capability". SA to RM termed it a copy book launch with entire command network functioning in loop. He congratulated the DRDO community for the tremendous efforts put in by them in making the country self-reliant

in the area of long-range missile systems.

Announcing the success of the mission, Dr VG Sekaran, Distinguished Scientist (DS), DG Missiles and Strategic Systems, DRDO and Mission Director said, "All mission objectives have been achieved. Down range ships have confirmed final splashdown. The mission is a great success and it is a momentous occasion". A jubilant Dr Rajesh Kumar Gupta, Project Director, Agni 5, described the success as "historic achievement; a dream fulfilled".

The ships located in midrange and at the target point tracked the vehicle and witnessed the final event. All the radars and electro-optical systems along the path monitored all the parameters of the missile displayed in real time. The earlier successful two flights of Agni 5 were in open configuration and had already proved the missile. The launch from a canister, integrated with a mobile sophisticated launcher, was in its deliverable configuration that enables launch of the missile within a very short time as compared to an open launch. It also has advantages of higher reliability, longer

shelf-life, less maintenance and enhanced mobility. Dr Manas K Mandal, DS, DG Life Sciences, DRDO; Dr G Satish Reddy, DS, Director, Research Centre Imarat (RCI); Shri GS Malik, Outstanding Scientist (OS), Chief Controller R&D (HR), DRDO; Dr Tessy Thomas, OS, Director, Advanced Systems Laboratory (ASL); Dr PS Subramaniam, DS, Programme Director, Combat

Aircraft, and Director, Aeronautical Development Agency (ADA); Dr Manmohan Singh, OS, Director, Vehicles Research and Development Establishment (VRDE); Shri Manjit Singh, Director, Terminal Ballistics Research Laboratory (TBRL) and Shri SK Patel, Director, Quality Reliability and Safety, DRDO HQ, were among other senior DRDO scientists present on the occasion.

LCA Tejas achieves another Milestone



Tejas being readied for test

With three consecutive start-ups of its engine after overnight soak in extreme cold (around -15 °C) conditions of Laddakh winter, Tejas, the Indian Light Combat Aircraft (LCA), has achieved yet another rare distinction. Starting the fighter aircraft under such extreme conditions without any external assistance or heating is a technological challenge. The requirements become further stringent when the starting is to be done three times consecutively with a partially charged battery. Team LCA led by Aero Engine Research and Design Centre (AERDC) of Hindustan Aeronautical Limited (HAL), and members from ADA, National Flight Test Centre (NFTC), Indian Air Force (IAF), Centre for

Military Airworthiness and Certification (CEMILAC) and Director General of Aeronautical Quality Assurance (DGAQA) succeeded in achieving this.

The engine starter has been developed indigenously by the AERDC. Prior to aircraft tests, the Jet Fuel Starter (JFS) was extensively tested on test rig to meet starting conditions across the operating altitudes including Leh (10,700 feet) and Khardungla (18,300 feet). The control software of JFS was fine tuned to work at all operating altitudes with no adjustments from cockpit. GE-F404-IN20 engine start-up control schedule was also varied with several control patches to establish reliable start.

LASTEC develops Hand-held Explosive Detection System

Laser Science and Technology Centre (LASTEC), Delhi, has developed a hand-held stand-off explosive detection system, called 'Preemptor', to detect and identify explosives in solid and liquid forms from a stand-off distance up to 5 meters. The system utilises Raman backscattering technique, which provides a 'finger print' of explosive material in terms of Raman shifted light signals. The technique can detect multiple species of explosives contained in transparent bottles in a single measurement within few seconds.

The system is first of its kind in terms of its software used for online analysis and identification of targeted materials in stand-off mode. The integrated peak finding and matching software provides information about targeted materials in text as well as audio alarm simultaneously.

Raman spectra for different types of explosives like TNT, TATP, DNT, RDX, HMX, etc., have been generated within response time of 10-12 seconds. Sub-systems of the 'Preemptor' are packaged in an aluminium alloy casing. The system has potential applications in screening of unattended explosives, screening of liquid



Hand-held Explosive Detection System

explosives in transparent bottles and screening of explosive threats in the form of powder and pills. It has undergone user evaluation with paramilitary forces.

Salient Features

- ✘ Easy transportation
- ✘ Low false alarm rate
- ✘ Online identification of explosives
- ✘ Stand-off identification

New Generation Electronic Warfare Equipment integrated on Tejas

An advanced electronic warfare (EW) suite developed by Defence Avionics Research Establishment (DARE), a DRDO laboratory specialising in avionics and electronic warfare systems for combat aircraft, has been tested on-board LCA Tejas PV1 on 10 January 2015 at Bengaluru.

In addition to the Radar Warner, the EW suite is also equipped with a Jammer. The suite gives pilot an additional capability of nullifying the effect of detected radar threat by appropriate mode of jamming. Existing EW systems, fitted on various combat aircraft, are basic

EW equipment known as Radar Warner Receiver and provide warning to the pilot in case of detection of a radar threat.

Ms J Manjula, OS, Director, DARE said, "LCA is the first fighter aircraft of India fitted with a Radar Warner and Jammer equipment. It has capability for both radar warning and jamming using a unified EW technology. Over the coming few months, ADA and DARE will be scheduling further sorties of LCA to evaluate the system under various signal scenarios".

Workshop on Manufacture of Defence Equipment organised by DRDO

As a step forward towards achieving the mission of 'Make in India' initiated by the Government of India, Armament Group of Laboratories of DRDO and their industrial partners organised a two-day workshop on Manufacture of Defence Equipment: Challenges and Prospects for Industries in Changing Environment of make Indian, during 16-17 January 2015 at Armament Research and Development Establishment (ARDE), Pune.



Inaugural ceremony of the Workshop on Manufacture of Defence Equipment

The workshop was successful in creating a platform for a dialogue between DRDO and industry on the crucial issues related to manufacturing of weapon systems and components in order to accomplish the challenges thrown open by the 'Buy Indian' and 'Buy and Make Indian' initiatives. Discussions were held on the methodology of working together in the changing environment of indigenous manufacturing and Public Private Partnership (PPP). The industry's viewpoints on collaboration as development partners, pre-requisites for micro, small and medium entrepreneurs and major industries, and the issues that hinder the 'work together' mechanism were also deliberated upon.

More than 200 delegates from DRDO and private industries participated enthusiastically. The workshop was inaugurated by Dr SK Salwan, Chairman, Armament Research Board (ARMREB), DRDO, who emphasised the need for a close association between DRDO, Ordnance factories, PSUs and private industry for the success of defence projects. Guest of Honour, Dr Baba Kalyani, Chairman, Bharat Forge Ltd, put forward expectations of industry and asked for the simplification of the procurement procedures of the Government so that the time taken for decision making can be minimised. He further added that close association of industry and Defence R&D, right from the

initiation of projects, would ensure full involvement of private industry to deliver on time.

Shri Anil M Datar, DS, DG (ACE), DRDO, presented the challenges and opportunities in armament sector. Dr Satish Kumar, DS, CC R&D (TM), DRDO, presented the theme address.

Experts from research, industry and academia shared their opinions in the workshop. Dr Sudershan Kumar, DS, CC R&D (PC&SI); Shri Appavuraj, OS, Director, Proof and Experimental Establishment (PXE); Chandipur, and Dr SN Asthana, OS, Associate Director, High Energy Materials Research Laboratory (HEMRL), Pune, presented DRDO's perspective and Smt Vandana Kumar, IFA, spoke on development scenario and economic models. Dr Kota Harinarayana discussed his experiences involving industries for LCA programme. Shri Rangarajan, VP, L&T, Dr Kannan, Solar Industries, Shri VN Gupta, Premier Explosives Ltd and Prof. AK Ghosh and Prof. Deepu Philip from IIT Kanpur presented their experiences with defence sector.

An action plan for active involvement of the private sector for achieving self-reliance in defence was presented for consideration by the Government. Dr KM Rajan, OS, Director, ARDE, proposed the vote of thanks.

Raising Day Celebrations

ADE, Bengaluru

Aeronautical Development Establishment (ADE), Bengaluru, celebrated its 56th Foundation Day on 6 January 2015. Air Marshal Ramesh Rai, VM, Air Officer Commanding-in-Chief, Training Command, Indian Air Force was the Chief Guest of the inaugural function. Dr K Tamilmani, DS, DG (Aero), DRDO, presided over the function. Shri P Srikumar, DS, Director, ADE, welcomed the august gathering. Air Marshal Ramesh Rai, presented the DRDO Laboratory-level Awards to the meritorious employees and appreciated the efforts made by ADE for the successful launch of Nirbhay missile. Dr Tamilmani, released the 16th issue of Hindi in-house magazine of ADE and also shared his ideas. Shri D Bose, OS, Associate Director, ADE, proposed the vote of thanks.



Release of in-house Hindi magazine of ADE

ADRDE, Agra

Aerial Delivery Research and Development Establishment (ADRDE), Agra, celebrated its 47th Raising Day on 20 January 2015. Dr SC Sati, OS, Director, ADRDE, inaugurated the function. Shri Gaurav Singh, Sc E, briefed about the various games and events organised to mark the occasion. Dr Sati, in his motivational presidential address, spoke about the various achievements of ADRDE in recent times. He also set new goals for the near future. A colourful cultural programme was organised by the employees and their children. Meritorious employees were awarded DRDO Laboratory-level Awards.



Cultural programme being performed during the Laboratory Raising Day of ADRDE

Shri Akhilesh Kashyap, Sc D, Co-convenor of the event, proposed the vote of thanks.

DRDE, Gwalior

Defence Research and Development Establishment (DRDE), Gwalior, celebrated its Laboratory Raising Day with gaiety and enthusiasm on 28 December 2014. Dr Lokendra Singh, OS, Director, DRDE, presided over the function. Dr Singh, in his address, gave the brief account of significant achievements of DRDE in the year 2014. He presented the DRDO Laboratory-level Awards to scientists and staff for their significant contribution and also felicitated DRDE staff who completed 25 years of service. Dr Singh also presented prizes to the winners of various sport events. A cultural programme was organised by the children of DRDE employees.



Dr Lokendra Singh (right) presenting Technology Group Award

Manpower Development Activities

Conferences/Seminars/Symposia/Training Courses/Meetings

Laboratory Council Meeting

Defence Institute of Bio-Energy Research (DIBER), Haldwani, organised second 'Laboratory Council Meeting' on 19 January 2015 at its HQ Haldwani. The meeting was chaired by Prof. (Retd) BL Khandelwal, Indian Institute of Technology, Delhi; Prof. AK Gaur, Govind Ballabh Pant University of Agriculture and Technology, Pantnagar; Dr PK Mishra, Senior Scientist, Vivekanand Parvatiya Krishi Anusandhan Sansthan, ICAR, Almora and Dr Rajender Singh, Sc G, Center for Fire, Explosives and Environment Safety (CFEES), Delhi, attended the meeting. Achievements in recently completed projects were underlined by the respective investigators, which were appreciated by the council. Project proposals under submission were also presented by respective scientists. Council deliberated on various technical issues pertaining to ongoing projects and recommended goals for future research.

CEP on Advances in Chemical Engineering Practices

High Energy Materials Research Laboratory (HEMRL), Pune, organised a Continuing Education

Programme (CEP) course on 'Advances in Chemical Engineering Practices for Scale-up of High Energy Materials' during 12-16 January 2015. Dr BD Kulkarni, DS, Engineering Sciences, CSIR, inaugurated the course. Dr RK Pandey, Sc G, Course Director, delivered welcome address and presented the overview of the course and its relevance to the ongoing and futuristic R&D activities in the area of high energy materials. Dr B Bhattacharya, OS, Director, HEMRL, in his address, brought out the importance and utility of the state-of-the-art pilot plant facility including Universal Pilot Plant (UPP), micro reactor, etc., established at HEMRL for scale-up of futuristic high energy materials. A compendium of invited talks at CEP was also released.

Twenty-eight participants from various DRDO laboratories and Ordnance Factories attended the course. Experienced scientists/engineers from DRDO, CSIR, academia, research institutes and technocrats from various industries delivered talks on diverse topics like process simulation, scale-up, optimisation, separation technologies, instrumentation, propellant processing, composites, bioremediation, nano materials, composites, etc.



Release of the compendium of invited talks delivered in the CEP on Advances in Chemical Engineering Practices

CEP on Emerging Trends in Electronic Packaging

Naval Physical and Oceanographic Laboratory (NPOL), Kochi, organised a CEP course on 'Emerging Trends in Electronics Packaging: Structural, Thermal and Ergonomics Aspects' during 19-23 January 2015. The course was aimed to update the knowledge on the design and development of electronic packaging enclosures and emerging trends in the above subject. Dr Badari Narayanan, RV College of Engineering, Bengaluru, delivered the keynote address on Thermal Control of Spacecraft Electronics. A compendium, entitled, Electronic Packaging: Products and Facilities, highlighting the developments carried out in the electronic packaging at NPOL was released on the occasion.

Nineteen participants from BrahMos Aerospace, Naval Aeronautical Quality Assurance Service, sister DRDO laboratories and NPOL attended the course. The topics covered in the course focused on different aspects of electronic packaging. The faculty was drawn from Electronics and Radar Development Establishment (LRDE), Aeronautical Development Establishment (ADE), Microwave Tube Research and Development Centre (MTRDC), RCI, Indian Space Research Organisation (ISRO), and reputed private industries as well as NPOL. Dr Sabu Sebastian, Sc F and Shri S Madhavan Namboodhiri, Sc C, were the Course Director and Deputy Course Director, respectively.



Participants of CEP on Emerging Trends in Electronic Packaging at NPOL

CEP on Structural Design of Composites using FEM

A CEP course on 'Structural Design of Composites using FEM' was organised by **Naval Science and Technological Laboratory (NSTL), Visakhapatnam**, during 5-9 January 2015 to enhance the knowledge base of Scientists and Technical Officers working in the area of FEM and composites. Shri CD Malleswar, OS, Director, NSTL, inaugurated the Course.



Shri Malleswar delivering inaugural address

The topics covered during the course included Introduction to composites, design and mechanics of composites, manufacturing of critical composite structures and testing including NDT and life prediction, composites for naval application including stealth applications, etc. The faculty was drawn from Osmania University, Hyderabad; GITAM University, Visakhapatnam; Gayatri University, Visakhapatnam; Research and Development Establishment, Pune; Advanced Systems Laboratory, Hyderabad; RR Industries and NSTL, Visakhapatnam.

Shri KP Reddy, Sc F, was the Course Director.

Seminar on Testing Methodology for Technology Development

Proof and Experimental Establishment (PXE), Chandipur, organised a Scientific Seminar in Hindi on 'Testing Methodology for



Release of Seminar Souvenir

Technology Development' and 'Prospects and Problems of Hindi use in the Laboratories of DRDO' on 4 February 2015. The seminar was inaugurated by Shri P Banerjee, Air Commodore (Retd), by lighting the lamp. Dr AK Sannigrahi, Sc F, the Organising Secretary, emphasised the need of choosing two vital subjects for the seminar.

In his inaugural address, Shri R Appavuraj, OS, Director, PXE, underlined the necessity of use of Hindi in official communication for better understanding among the employees. Shri Banerjee released the Seminar Souvenir and delivered his keynote address on 'Test Evaluation and Test Range'.

A Kavi Sammelan was organised on the occasion in which 10 poets recited their poems. Shri SK Ray, Hindi Officer, presented the vote of thanks.

Science Council Meet

Research Centre Imarat (RCI), Hyderabad, organised 3rd Science Council Meet on 20 January 2015. Shri Sahas Gopinath, CEO, Globals Incorporation, Bengaluru, delivered a lecture on 'Entrepreneurship and Motivation'. A talk on 'Neuro-related Ailments, Diagnosis and Cure' by Prof. BCM Prasad, Dean, and Head, Department of Neurosurgery, SVIMS, Tirupati highlighted advances in neurosurgery. Dr G Satheesh Reddy, DS, Director, RCI, presided over the function.

CVRDE initiates Swachh Bharat Abhiyan

Combat Vehicle Research and Development Establishment (CVRDE), Chennai, has drawn an Annual Action Plan to carry out cleaning/conditioning/disposal tasks and awareness campaign as part of Swachh Bharat Abhiyan. Teams with different monthly assignments to execute these tasks for one year have been constituted. Cleaning of technical work area and library was carried out as per the plan. As part of the awareness campaign, a lecture on 'Think Globally, Act Locally, Do Domestically' by Dr MB Nirmal, founder Excellent Novel and Radical, the largest environmental and civic movement, in Chennai, was organised on 27 January 2015 at CVRDE.

Posters and banners on Swachh Bharat illustrating cleanliness and hygienic living, scientific processing of waste, recycle and disposal of solid waste, awareness about sanitation and its linkages with public health, avoidance of food wastage, effects and impact of alcohol and drugs on individuals and society and reduction of use of plastics were released by Dr P Sivakumar,



Dr P Sivakumar releasing poster on Swachh Bharat Abhiyan

OS, Director, CVRDE at a function held in CVRDE on 29 January 2015.

Lectures on 'Self Upkeep' by Dr K Madhan Raj, MD, and on 'Weeding out of Unwanted Documents', 'Pollution Control', 'Clean India' and 'Effects of Alcohol and Smoking' by the employees of CVRDE, were organised on 6 February 2015.

Personnel News

Appointment

Director, DRDE, Gwalior



Dr Lokendra Singh, OS, has assumed the charge of Director, Defence Research and Development Establishment (DRDE), Gwalior w.e.f 1 November 2014.

Dr Singh joined DRDO in 1984 as Sc B at Defence Food Research Laboratory (DFRL), Mysore, after obtaining MSc and PhD degrees in Microbiology from Punjab Agricultural University, Ludhiana. Later, he joined DRDE as Sc C and headed various R&D projects related to biodigester, biosensor and BW agents. In 1993, he participated in the 14th Indian Scientific Expedition to Antarctica and isolated novel psychrophilic bacteria important for bioremediation.

Dr Singh has developed technology of human waste degradation at low temperature areas like Siachen and successfully delivered the Biodigester Technology. The technology is being used by Indian Railways and is playing a major role in Swachh Bharat Abhiyan. He has also contributed significantly in the development of detection and identification systems including biosensor for toxins and pathogens, which are being used for military and public health programme. In 2009, Dr Singh was appointed Director, Defence Research Laboratory, Tezpur. He transformed the lab and led to development of various products followed by transfer of technology (ToT) to industrial partners. In 2012, he moved to DRDO HQ and served as Director, Directorate of Life Sciences and Director (Admin and Tech), Directorate of Life Sciences and coordinated the research activities of various laboratories of life science cluster.

Dr Singh has more than 150 research publications in various national and international journals, two books and chapters in several books. He has about 33 national and 9 international patents. Dr Singh is also the recipient of several prestigious awards like DRDO Scientist of the

Year Award in 2002, DRDO Technology Group Award in 2002, 2006, 2010 and 2012, and Defence Technology Spin-off Award in 2007 and 2008

Awards

Best Technical Paper Award

Shri Prakash Kumar Yadu, Sc D, Gas Turbine Research Establishment (GTRE), Bengaluru, has been awarded Best Technical Paper Award for his paper entitled 'A Non-destructive Strain Monitoring Technique using Fiber-Optic Bragg Grating (FBG) Sensor for an Aero-Engine Application', during the National Conference on Condition Monitoring-2014 held during 18-19 December 2014. Dr P Sivakumar, OS, Director, CVRDE, Chennai, handed over the award to Shri Yadu.



Shri Prakash Kumar Yadu (left) receiving the award from Dr P Sivakumar

Nomination to Uttarakhand Council for Biotechnology

Dr M Nasim, OS, Director, Defence Institute of Bio-Energy Research (DIBER), Haldwani, has been nominated as a member of Uttarakhand Council for Biotechnology (UCB) by the Government of Uttarakhand. He also attended the first meeting of UCB in Dehradun on 9 January 2015 to discuss the council structure, rules and regulations, futuristic plan, establishment of Biotech Park in Uttarakhand and several other matters pertaining to biotechnology research in the State and its regulation.

Rajbhasa Award to NPOL

Naval Physical and Oceanographic Laboratory (NPOL), Kochi, received Rajbhasa Rolling Trophy 2013-14 instituted by the Kochi Town Official Language



Dr Basil Mathew (right) receiving the Rajbhasa Rolling Trophy

Implementation Committee (TOLIC). The award was given in recognition of the performance excellence in the Rajbhasa implementation in the organisation. Dr Basil Mathew, Associate Director, NPOL, received the Trophy from Shri PR Ravikumar, IRS, Director General of Income Tax (Investigation), Kochi.

Higher Qualification Achieved



Dr Umesh Singh, Sc C, Defence Institute of Bio-Energy Research (DIBER), Haldwani, obtained PhD in Agronomy for the thesis Effect of Diammonium Phosphate Application in Cognisance with Phosphate Solubilising Bacteria on Growth, Yield and Quality of Rainfed Chickpea (*Cicer arietinum L.*) from Narendra Deva University of Agriculture and Technology, Faizabad, UP.

Raksha Mantri visits ARDE

Shri Manohar Parrikar, Hon'ble Raksha Mantri, Lt Gen CA Krishnan, UYSM, AVSM, DCOAS (P&S) and Lt Gen Ravi Thodge, MGO, visited Armament Research and Development Establishment (ARDE), Pune, on 8 January 2015. Shri Anil M Datar, DS, DG (ACE), DRDO, made a presentation highlighting the work of the Armaments and Combat Engineering Cluster of DRDO to the Raksha Mantri. Dr KM Rajan, OS, Director, ARDE, and Dr S Guruprasad, OS, Director, Research and Development Establishment (Engrs) [R&DE (E)], briefed the Raksha Mantri on the important projects of armament as well as combat engineering laboratories of DRDO, respectively.

Shri Parrikar took keen interest in the operation of the flagship Pinaka Multi Barrel Rocket System developed by ARDE. Pinaka system comprises the Multi Barrel Rocket Launcher, Command Post (CP), Loader-cum-Replenishment Vehicle (LCR) and Replenishment Vehicle (RV). A battery of six launchers can fire a salvo



Shri Parrikar being presented a memento

of 72 rockets in 44 seconds to a range of 38 km. The Pinaka Mk-II rocket launcher with an enhanced range of 60+ km has also been developed and is at an advanced stage of trials.

The developmental activities of the ACE cluster were appreciated by Shri Parrikar. He emphasised the importance of project completion on time and assured his full support for creating a synergy between DRDO, Production Agencies and the Armed Forces.



NSTL displays advanced Defence Technologies in Pride of India Expo-2015

Naval Science and Technological Laboratory (NSTL), Visakhapatnam, displayed state-of-the-art defence technologies developed by it at Pride of India exhibition held on sideline of 102nd Indian Science Congress 2015 held in the University of Mumbai, Kalina Campus. The exhibition opened for general public on 4 January 2015 and ended on 7 January 2015. NSTL exhibited TAL Advanced Lightweight Torpedo (original system); Shakthi Heavy-weight Thermal Torpedo (model); Autonomous Underwater Vehicle (original system); Lightweight Mine (model); Mareech Expendable Decoy (original system).

Dr Harsh Vardhan, hon'ble Union Minister for Science and Technology, Government of India, inaugurated the exhibition. Many national scientific organisations of the Government of India like Council of Scientific and Industrial Research (CSIR), Indian Council of



State-of-the-art torpedoes on display in Pride of India Expo-2015

Agricultural Research (ICAR), Indian Council of Medical Research (ICMR), Department of Atomic Energy (DAE), ISRO and state governments showcased their science and technology programmes and research initiations at the venue.

About 12000 delegates, young researchers, teachers and around 5000 school and college students from Mumbai visited the exhibition.

ISO 9001: 2008 Re-certification to HEMRL

High Energy Materials Research Laboratory (HEMRL), Pune, one of the DRDO labs engaged in design and development of high energy materials and allied chemicals as well as related technologies required for defence preparedness, has been re-certified ISO 9001: 2008 by TUV Management Services, GmbH trading as TUV South-Asia Pvt Ltd. The certificate is valid up to October 2017.

The scope of the certificate is "Research, Design and Development of Formulations and Technologies in the area of High Energy Materials covering Solid/Liquid Propellants, High Explosives, Pyrotechnics and Allied Chemicals, their Testing and Performance Evaluation".



Sports Round-up

DRDO National Badminton Tournament

Naval Physical and Oceanographic Laboratory (NPOL), Kochi, hosted DRDO National Badminton Tournament during 5-6 January 2015. Shri Sanave Thomas, renowned international badminton player, was the Chief Guest of the inaugural function. Shri S Anantha Narayanan, DS, Director, NPOL, inaugurated the tournament.

Around 45 players representing more than 20 DRDO laboratories from various parts of India participated in the event. The South Zone won the championship. North Zone became the runners-up. Shri Ravi (Central Zone), Smt Gurpreet Kaur (North Zone) were the winners in the Men's and Women's single events, respectively.



Winners receiving Trophy from Shri Anantha Narayan

Shri Anantha Narayanan presented prizes and certificates to the winners.

Monograph Released

Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, has brought out a monograph entitled Pre-flight Calibration of Air Data Sensors of a Fighter Aircraft. The monograph, authored by Dr KP Singh, presents the latest tools and methods for pre-flight calibration of air data sensors of a fighter aircraft. A generic fighter aircraft, designed and developed at Aeronautical Development Agency, Bengaluru, has been used as a typical case study.

The monograph presents the latest tools and methods for pre-flight calibration of air data sensors of a fighter aircraft. The procedure of selection of optimal choice of locations of air data sensors has been presented in detail and Computational Fluid Dynamics (CFD) methods have been extensively used



to generate flow angularity and position error correction data tables for air data sensors for an extensive range of angles of attack, angles of side slip, and Mach numbers. Data from CFD tables has been compared with the data from wind tunnel tests and a close match obtained proving the adequacy of CFD methods for pre-flight calibration. Validation results with the flight tests have also been presented.

Though the monograph discusses a generic fighter aircraft, it is highly applicable and adaptable for any fighter aircraft programme and will serve as a guideline for future engineers and scientists for pre-flight calibration of air data sensors.

ISBN 978-81-86514-52-8; Pages: 536
Price: INR ₹ 700, US \$ 75, UK £ 50



डीआरडीओ न्यूज़लैटर

Visitors to DRDO Labs/Estts

ADE, Bengaluru

A high-ranking delegation from Oman National Defence College (NDC), led by headed by Brigadier General Awadh Mohamed Said Al Mashaikhi, visited ADE, Bengaluru, on 24 January 2015. The 22 member delegation was briefed about the activities at ADE by Dr Kala V, Sc G, Officiating Director, ADE.



Dr Kala V briefing the Oman delegation

ARDE, Pune

Lt Gen Sanjay Kulkarni, AVSM, SC, SM, VSM, DG Infantry, visited ARDE on 29 December 2014. Detailed presentations were given to the visitor on projects on Joint Venture Protective Carbine, 40 mm Under Barrel Grenade Launcher, etc. Issues related to GSQR/PSQR were also discussed at length.



Lt Gen Sanjay Kulkarni showing interest in the Corner Firing Weapon

DL, Jodhpur

Dr Sudarshan Kumar, DS, Chief Controller R&D (PC & SI), DRDO, visited Defence Laboratory, Jodhpur

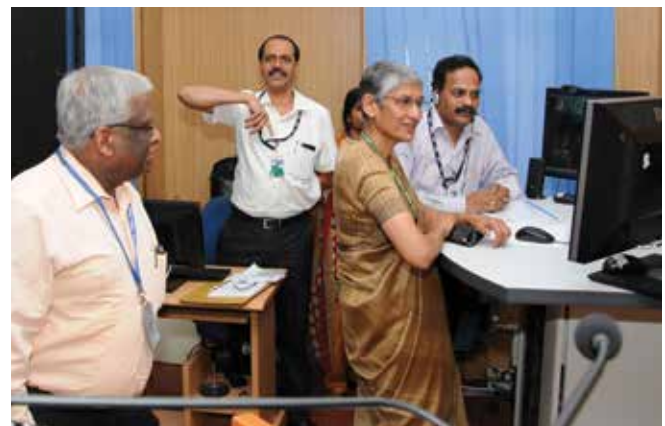
(DLJ) during 2-3 January 2015. Dr SR Vadera, OS, Director, DLJ, briefed him about the achievements of the laboratory. Dr Kumar visited various technical facilities of the laboratory and laid the foundation stone of Chaff Development Centre.



Dr Sudarshan Kumar laying foundation stone of Chaff Development Centre

GTRE, Bengaluru

Ms Vandana Srivastava, IDAS, Financial Adviser (Defence Service), visited Gas Turbine Research Establishment (GTRE), Bengaluru, on 12 January 2015. She was accompanied by Shri RG Viswanathan, Addl FA and JS, DRDO HQ. Dr K Tamilmani, DS, DG (Aero), DRDO, and Dr CP Ramanarayanan, OS, Director, GTRE, briefed the visitors about the latest achievements in engine development programmes. The visitors went around Engine Test Facility and witnessed the after burner and autonomous test demonstration of the Kaveri engine.



Ms Vandana Srivastava showing keen interest in GTRE technologies





Readers' Views

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

1. **Name of the Establishment:** _____
2. **How would you rate the *DRDO Newsletter* as a medium to adequately present DRDO developments?**
Excellent Very Good Good Fair Satisfactory
3. **How would you rate the technical contents of the *Newsletter*?**
Excellent Very Good Good Fair Satisfactory
4. **How would you rate the quality of photographs in the *Newsletter*?**
Excellent Very Good Good Fair Satisfactory
5. **Ideal number of pages you would like for the *Newsletter*?**
8 Pages 12 Pages 16 Pages 20 Pages
6. **In which format do you prefers the *Newsletter*?**
Print E-pub Video magazine
7. **When are you receiving the *Newsletter*:**
In the previous month of publishing In the same month of publishing
In the next month of publishing
8. **Suggestions, if any, to further improve the technical content of the *Newsletter*?**

Signature:

Name:

Address:.....

.....
.....

Please send your suggestions to:

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

DRDO Monographs

Defence Scientific Information and Documentation Centre (DESIDOC) on behalf of Defence Research and Development Organisation (DRDO) brings out a large number of publications covering current developments in Indian Defence R&D.

DESIDOC publishes scholarly books and treatises authored by eminent scientists of DRDO as Monographs/Special Publications Series. These Series aim at capturing the tacit knowledge of senior scientists gained through their life-long research in their area of expertise and disseminating the specialised information covering different aspects of Defence R&D to interested readers. Each title of this Series provides in-depth information on a specific subject area, indicating the current and future trends.

Copies of the monographs can be obtained by sending the appropriate amount in the form of a crossed bank draft drawn in favor of 'The Director, DESIDOC', payable at Delhi.

Discount: * Libraries/individuals: 15 %

Distributors/booksellers: Please contact DESIDOC for attractive discount.

* Add Rs 50 for delivery by registered post.



For further information, please contact:

The Director

**Defence Scientific Information and
Documentation Centre (DESIDOC)**

Metcalfe House, Delhi – 110 054, India

Tel: +(011) 23902402-03, 23902466-67;

Fax: +(011) 23813465

E-mail: director@desidoc.drdo.in