

DRDO SUCCESSFULLY FLIGHT-TESTS MAN PORTABLE ANTITANK GUIDED MISSILE



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DRDO FLIGHT-TESTS LOW WEIGHT, FIRE & FORGET MAN PORTABLE ANTITANK GUIDED MISSILE

This is the third series of successful testing of MPATGM. The missile is incorporated with state-of-the-art Infrared Imaging Seeker along with advanced avionics.

In a major boost for Indian Army, DRDO on 11 September 2019 successfully flight tested indigenously developed low weight, fire and forget Man Portable Antitank Guided Missile (MPATGM) in the ranges of Kurnool, Andhra Pradesh. The missile was launched from a man portable Tripod launcher and

the target was mimicking a functional tank. The missile hit the target in top attack mode and destroyed it with precision. All the mission objectives were met.

This is the third series of successful testing of MPATGM. The missile is incorporated with state-of-the-art Infrared Imaging Seeker along with

advanced avionics. The test paves the way for the Army to have developed 3rd generation man portable Anti-Tank Guided Missile indigenously.

Raksha Mantri Shri Rajnath Singh has congratulated DRDO for the successful test.





LCA (NAVY) MAKES SUCCESSFUL ARRESTED LANDING

The first ever arrested landing of Light Combat Aircraft (Navy) at the Shore Based Test Facility (SBTF) INS Hansa, Goa, took place successfully on 13 September 2019. The test will pave the way for the indigenous platform to undertake aircraft carrier landing demonstration on board the Indian Naval Aircraft Carrier, Vikramaditya.

After several years of flight testing and four campaigns of dedicated testing, the LCA (Navy) Flight Test Team led by Cmde JA Maolankar, Chief Test Pilot, Capt Shivnath Dahiya, LSO and Cdr JD Raturi, Test Director, successfully executed a text

book arrested landing at the SBTF. This arrested landing heralds the arrival of true indigenous capability and displays the professional prowess of our scientific community. Aeronautical Development Agency (ADA) embedded with design and build capability of HAL (ARDC), DRDO and CSIR labs involved in executing this land mark event.

The event marks the start of a new era where multiple agencies have come together to achieve a common goal. The participation of Centre for Military Airworthiness Certification (CEMILAC), Directorate General of Aeronautical Quality

Assurance (DGAQA) and all the men and women on the ground who serviced the aircraft and monitored it during strenuous trails is truly commendable. The support of Indian Navy through the Navy Project Office and Directorate of Aviation Projects Management (DAPM) at Integrated Headquarters of Ministry of Defence (Navy) is noteworthy.

The successful testing has put India on the world map as a nation with the capability to design a deck landing aircraft.

Raksha Mantri Shri Rajnath Singh congratulated ADA, HAL, DRDO and the Indian Navy for this major feat.



DRDO CONDUCTS FIVE TRIALS OF AIR-TO-AIR MISSILE ASTRA

DRDO successfully flight-tested the Beyond Visual Range Air-to-Air Missile (BVRAAM) Astra from Su-30 MKI platform off the coast of Chandipur, Odisha. The trials were held from 16-19 September 2019. Indian Air Force (IAF) conducted the trials against Jet Banshee target aircraft simulating all possible threat scenarios.

The five trials conducted during this period, tested missiles in different configurations. During the campaign, three missiles were launched in combat configuration with warhead and manoeuvring targets were neutralized to establish the end game capability of the missile. The trial campaign also included a direct hit of the target by the telemetered missile at maximum range. All the sub-systems performed

accurately meeting all the mission parameters and objectives.

Astra has a range of more than 100 km with modern guidance and navigation systems. The missile has mid-course guidance and RF seeker-based terminal guidance to hit target with pinpoint accuracy.

Astra weapon system has completed the user trial phase successfully. Hindustan Aeronautics Limited (HAL) has played a role in modifying Su-30 for weapon integration. More than 50 public and private industries have contributed in building the Astra weapon system.

The present flight trials have proved the end-to-end performance of the missile system in various combat scenarios giving greater confidence to

users. The five successful trials of Astra will culminate into induction of the missile system into IAF and will certainly be a force multiplier considering its accuracy and effectiveness in neutralizing aerial threats.

Dr G Satheesh Reddy, Secretary, Department of Defence R&D and Chairman, DRDO congratulated team Astra for developing and flight testing such a formidable class of weapon system. The technologies developed under the programme will be the building blocks for development of future variants of air-to-air and surface-to-air missiles.

Raksha Mantri Shri Rajnath Singh congratulated DRDO and IAF teams for the successful trials.



WARGAMING SOFTWARE HANDED OVER TO INDIAN NAVY

Dr G Satheesh Reddy Secretary, Department of Defence R&D and Chairman, DRDO handed over a new generation Wargaming Software 'ARNAV' to Commodore Sushant Dam, Director, Maritime Warfare Centre (MWC), Visakhapatnam in the presence of Vice Chief of the Naval Staff Vice Admiral G Ashok Kumar. The wargame has been designed and developed by DRDO's Institute for Systems Studies and Analysis (ISSA), Delhi, in collaboration with MWC, Visakhapatnam. The software would meet the contemporary operational and tactical level wargaming requirement of the Indian Navy. The wargame has been successfully tested with IPLES and TLIU network security components developed by Centre for Artificial Intelligence and Robotics, a Bengaluru-based DRDO

lab. It has also been extensively tested over Navy's Wide Area Network (WAN) between Kochi, Visakhapatnam and Chennai.

ARNAV integrates all the facets of naval operations. The key focus of the wargame has been to create a wargaming environment, which facilitates MWCs to train using the latest technological and computing tools. The software has versatile and user-friendly features, which enable globally playable wargaming scenarios between multiple forces.

The wargame also allows exercises to be conducted between geographically dispersed locations over WAN. The architecture is forward compatible and new functional and equipment modules can be developed and easily plugged in.

ARNAV is a perfect example of how the collaborative efforts of the two agencies, DRDO and Navy can result in a state-of-the-art system in a record time.

ARNAV—Salient Features

- ✧ Web-based 3-tier architecture of the software provides scalability, platform independence.
- ✧ It can be scaled from procedural to theatre level games in real-time as well as in high speed.
- ✧ Also supports Electronic Navigational Charts overlay.
- ✧ ARNAV's Record and Replay Module enables hi-fidelity recording of game parameters, which can be subsequently used for video-like replay during exercise de-briefing.



Dr G Satheesh Reddy handing over the ARNAV to Commodore Sushant Dam

DRDO HANDS OVER SECOND INDIGENOUS AEW&C SYSTEM TO IAF

DRDO handed over the second of three indigenously designed Airborne Early Warning and Control (AEW&C) systems to the Indian Air Force (IAF) on 11 September to augment the service's network centric capabilities. The system was delivered to Bhatinda Air Force Station in Punjab.

The system comprises an Active Electronically Scanned Array (AESA) radar, secondary surveillance radar, electronic and communication countermeasures,

beyond line-of-sight datalinks, satellite communication systems, and advanced identification friend-or-foe system and provides 240-degree coverage, surveillance ranges between 250 km and 375 km.

Netra platform is capable of delivering a 'recognisable air surveillance picture' of aerial threats via search, track-while-scan and priority-track modes to provide airborne and ground-based assets and their exact location for possible exploitation.

DRDO's Centre for Airborne Systems (CABS), Bengaluru, is the nodal agency for design and system integration and testing of the system. Electronics and Radar Development Establishment (LRDE), Bengaluru, and Defence Electronics Application Laboratory (DEAL), Dehradun, the other two DRDO laboratories involved in the development, chipped in with the design of Radar Array and Datalink and Communication Systems, respectively.



DIPAS SIGNS LATOT FOR MAN MOUNTED COOLING SYSTEM

Defence Institute of Physiology and Allied Sciences (DIPAS), Delhi, signed the License Agreement for Technology Transfer (LAToT) with competent firms for absorption of Man Mounted Cooling System technology developed by DIPAS. The solid-state cooling system, is based on the principle of 'Pelter Effect'. The unit can be used for providing micro-climatic cooling and heating (on reversing direction flow).

Dr Bhuvnesh Kumar, Director, DIPAS signed the agreements on 20 August 2019 with the proprietors/ authorised signatories of the firms. The inventors Dr TP Baburaj, Sc 'F' and Dr A Bhardwaj, Sc 'E' were also present on the occasion.



MOU

INMAS SIGNS MOU WITH NII

Institute of Nuclear Medicine and Allied Sciences (INMAS), Delhi, and National Institute of Immunology (NII), New Delhi, signed a Memorandum of Understanding (MoU) to explore, extend and strengthen the academic and scientific research relationship in biomedical, medical and allied sciences in order to share the facilities and expertise of each other. Dr Tarun Sekhri, Director, INMAS, and Dr Amulya K Panda, Director, NII, signed the MoU documents in the presence of senior scientists of both the institutions.

Apart from academic collaborations and facility sharing, NII will extend its NHP facility for the radiation countermeasure programme of INMAS. INMAS will support NII in taking joint projects having translational research work relevant to healthcare



of defence personnel from the national and international funding agencies with joint patent rights. Dr BG Roy, Sc 'D', INMAS and Dr Anil Kumar,

Staff Scientist, NII, were designated as coordinating officers between both the institutions.

SHRI RAJNATH SINGH BECOMES THE FIRST RAKSHA MANTRI TO FLY LCA TEJAS

Shri Rajnath Singh became the first Raksha Mantri (RM) to fly the indigenous Light Combat Aircraft (LCA) 'Tejas' on 19 September 2019. Shri Rajnath Singh undertook a 30-minute sortie in the multi-role fighter aircraft with Air Vice Marshal Narmadeshwar Tiwari, at the Hindustan Aeronautics Limited (HAL) Airport in Bengaluru.

Hon'ble Raksha Mantri described his experience of flying the fourth-generation aircraft as 'thrilling and special'. Congratulating HAL, DRDO and Aeronautical Development Agency (ADA) for building the multi-role fighter aircraft, Shri Rajnath Singh said

demand has been received for 'Tejas' from different countries. He expressed pride that India has reached a stage where fighter aircraft and arms and ammunition can be exported to the world.

Raksha Mantri also praised the Indian Air Force, Army and the Navy for their professionalism, courage and bravery. "I am proud of the soldiers of our Armed Forces", he said.

Air Vice Marshal Narmadeshwar Tiwari said Raksha Mantri even controlled 'Tejas' in the air for some time and was shown the avionics and sophisticated systems onboard the aircraft. He said "Shri Rajnath Singh

was very happy with the quality and smoothness of the aircraft".

Earlier, Hon'ble RM was briefed about the functioning of the 'Tejas' by senior officials of Air Force.

Dr G Satheesh Reddy, Secretary, Department of Defence R&D and Chairman, DRDO; Shri R. Madhavan, CMD, HAL and other senior officials of DRDO and HAL were present on the occasion.

Tejas is a multi-role fighter with several critical capabilities. It is meant to strengthen India's air defence capabilities.



NSTL CELEBRATES GOLDEN JUBILEE



Hon'ble Vice President Shri Venkaiah Naidu releasing photo essay—NSTL's Golden Journey

Naval Science and Technological Laboratory (NSTL), Vishakapatnam celebrated its Golden Jubilee on 28 August 2019. Shri M Venkaiah Naidu, Hon'ble Vice President of India was the Chief Guest of the function. Shri Muttamsetti Srinivas, Hon'ble Minister of Tourism, Culture and Youth Advancement, Government of AP, Dr G Satheesh Reddy, Secretary DDR&D and Chairman DRDO; Vice Admiral Atul Kumar Jain, AVSM, VSM, Flag Officer Command-in-Chief (Eastern Naval Command), Dr Samir V Kamat, DS & DG (NSM), DRDO; Col. M Eleesha, Chief Postmaster General, Andhra Pradesh Circle; former Directors of NSTL Dr V Bhujanga Rao, Shri SV Rangarajan, Dr CD Malleswar and Prof. N Vedachalam were present on the occasion. Directors of sister DRDO laboratories, senior Naval Officers, and representatives of industries also participated in the function.

Dr OR Nandagopan, OS and Director, NSTL, in his welcome address briefed on the five-decade journey of NSTL. He paid rich tributes to his predecessors for their leadership in guiding the laboratory towards success and outlined the roadmap for future research in the laboratory.

Vice Admiral Atul Kumar Jain, FOC-in-C (ENC) congratulated NSTL for successfully developing underwater weapons and associated systems. He commended the efforts of the laboratory for their role in indigenous design and development of naval systems.

Dr G Satheesh Reddy, Chairman DRDO handed over 'Sahayak-NG System' to Indian Navy. This system has been jointly developed by NSTL and ADRDE, Agra. Speaking on the occasion, Dr Reddy congratulated NSTL on the Golden Jubilee. He exhorted NSTL to work on emerging technologies, take up new challenges with clear roadmap

for delivery of systems in the coming five years, with more than 75 per cent indigenous content.

Shri M Venkaiah Naidu, released a special postal cover commemorating NSTL Golden Jubilee. The Vice President also laid the foundation stone for Sports and Swimming Pool Complex and Married Officers' Accommodation and released a photo essay—NSTL's Golden Journey. Addressing the large gathering, the Chief Guest praised the services of the DRDO and expressed happiness over the working culture of DRDO like a joint family and appreciated coordination and cooperation among its various labs.

Shri R Srihari, Sc 'G' & Chairman Celebration Committee; Members of NSTL Civil Employees Union, Works Committee, JCM, Scientists, Officers and Staff of NSTL participated in the programme.

RAISING DAY CELEBRATIONS

LASTECH, DELHI

Laser Science & Technology Centre (LASTEC) celebrated its 60th Raising Day on 1 August 2019. Lt Gen Taranjit Singh, AVSM, VSM, Director General, Perspective Planning, graced the occasion as the Chief Guest and Maj Gen A K Channan, SM, Addl Director General, Perspective Planning, IHQ MoD (Army), was the Guest of Honour. Shri Hari Babu Srivastava, OS and Director LASTEC welcomed the august gathering and presented the important achievements of the laboratory. Annual magazine 'Arunodaya', technical compendium 'Pragyashrot', technical book "विस्फोटक और उसके अनुप्रयोग", Safety Manual 'Fire Standing Order', and LASTEC Newsletter were released on the occasion. ToT documents of 'Laser Fence' to M/s BEL and 'OTL 300' to M/s Data Patterns were given in the presence of Dr Mayank Dwivedi, Director, DIITM. Awards were presented to employees for their commendable performance in the year 2018. Programme ended with a cultural programme followed by distribution of sports award.

RCI, HYDERABAD

Research Centre Imarat (RCI) celebrated its 31st Raising Day on 27 August 2019. Dr G Satheesh Reddy, Secretary DDR&D and Chairman, DRDO was the Chief Guest. Shri KS Varaprasad, DS and DG (HR) and Shri MSR Prasad, DS and DG (MSS), graced the occasion. Shri BHVS Narayana Murthy, DS & Director, RCI welcomed the august gathering and briefed about the achievements and activities of the RCI. Dr G Satheesh Reddy, appreciated the progress of RCI in last 31 years. He congratulated the entire team of RCI on successful in wide



Release of technical compendium Pragyashrot during LASTEC Raising day celebration

range of missile programmes. He also released various publications by RCI.

Chairman, DRDO presented the lab-level DRDO Awards. DG (HR) presented mementoes to the employees who completed 20 years of service.

DG (MSS) presented mementoes to the employees who completed 25 years of service. Various events and sports activities were conducted to commemorate the occasion.



Dr Satheesh Reddy being presented memento on the occasion of RCI Raising Day celebration

ARDE CELEBRATES NATIONAL LIBRARY WEEK

Information Centre for Armament Technology (ICAT), Armament Research and Development Establishment, Pune celebrated Library Week during 12-16 August 2019. A guest lecture by Dr Sunita Barve, Head, Knowledge Resource Centre, NCL, Pune on “Reference Management Tools—Endnote, Zotero and Mendeley” was organised. It gave the scientists an insight into tools and techniques for systematic organization of references/citations during research.

An exhibition of ICAT resources on ‘Infantry Weapons & Ammunitions’ and a display of small arms weapons developed by ARDE was arranged. The exhibition was inaugurated by Shri Hari Bhau, Sc ‘G’, Officiating Director. Various dignitaries, including Dr VV Palikar, OS & Director, R&DE(E), Dr SC Sati, DRDO Chair, Shri M Manickavasagam, OS, ASL, and Shri Mukesh Kumar Sinha, IFA, R&D Pune, visited the exhibition. Technical talks by scientists on Infantry weapons and ammunition were held.



Book exhibition during Library Week celebration at ARDE Pune

A quiz and Meet the Author was also organised on the occasion. Dr Himanshu Shekhar, Sc ‘G’, an author of 11 books highlighted the contribution of libraries and librarians and delivered a talk on, “Challenges in Propellants, Explosives and Pyrotechnics.” On

this occasion, a book in Hindi, titled, “गत-अनागत आयुध” (Present and Future Armaments) authored by Dr Himanshu Shekhar was released by Dr V Venkateswara Rao, OS & Director, ARDE.

MTRDC CELEBRATES 73RD INDEPENDENCE DAY

Microwave Tube Research and Development Centre (MTRDC), Bengaluru celebrated 73rd Independence Day on 15 August 2019 at MTRDC township. The celebration began with unfurling of the National Flag by Director MTRDC, Dr SUM Reddy and recital of the Rashtragaan by the employees and their family members. In his speech, Dr Reddy put forward the rise of India since its independence. He also mentioned about the achievements and upcoming research at MTRDC. Children sung the patriotic songs on the occasion.



Dr SUM Reddy addressing the employees of MTRDC and their family members

DESIDOC CELEBRATES VAN MAHOTSAV

To raise awareness about environmental issues as well as to encourage everyone to participate in protection of environment, Defence Scientific Information and Documentation Centre (DESIDOC), Delhi organised Van Mahotsav on 3 September 2019 at Metcalfe House. Dr Alka Suri, Director DESIDOC, inaugurated the programme and highlighted the importance of tree plantation. A large number of employees enthusiastically took part in the programme and more than 203 saplings were planted in DESIDOC premises. The event provided a golden opportunity to the employees to connect with the Mother Nature and to demonstrate their commitment to social responsibility. Dr Rajeev Vij, Associate Director, organised the programme.



HRD ACTIVITIES

WORKSHOP ON ACCELERATED COMPUTING

Advanced Numerical Research & Analysis Group (ANURAG), Hyderabad organized a two-day workshop on Accelerated Computing during 22-23 August 2019 to highlight the emerging trends in High Performance Computing and requirement of Peta Scale Computing. The keynote address on Computing and Accelerators was delivered by Prof. PJ Narayanan, Director, IIIT, Hyderabad. Eminent speakers from the academia, DRDO and other R&D laboratories delivered talks on Accelerated Computing to solve various computational problems. The participants took keen interest in Multi Peta Flop Computing Facility.





COURSE ON RECENT TRENDS IN BEYOND LINE-OF-SIGHT COMMUNICATION TECHNOLOGIES

Defence Electronics Applications Laboratory (DEAL), Dehradun organized a five-day CEP course on “Recent Trends in Beyond Line-of-Sight (BLOS) Communication Technologies” during 19-23 August 2019. The course was inaugurated by

Shri PK Sharma, Director, DEAL, who in his address, stressed the importance of BLOS communication technologies.

Multiple aspects of BLOS technologies including troposcatter communication, SATCOM, VLF communication, RF & baseband system

design with system qualification and system testing, etc. were covered during the course. Talks from users, the IAF, production partners, industry and academia benefited the participants. Shri Rajendra Singh, Sc ‘F’, was the Course Director.



COURSE ON DIGITAL LIBRARIES & E-SERVICES

DESIDOC conducted a three-day course on Digital Libraries and e-Services under the Continuing Education Programme (CEP) of DRDO during 28-30 August 2019. Dr Rajeev Vij, Sc ‘G’, Course Coordinator, briefed the participants about the objectives and purpose of the training programme. Dr Alka Suri, Director, DESIDOC, inaugurated the CEP and stressed on the need for the course. Twenty-eight participants from 18 DRDO labs/estts attended the course. The topics covered in the course were innovative techniques for libraries, storage and retrieval of video information resources, reference management tools, Koha hands on, etc.



COURSE ON MANAGEMENT OF ARTHROPOD VECTORS & PESTS

Defence Research and Development Establishment (DRDE), Gwalior conducted a course on “Management of Arthropod Vectors and Pests” from 26 to 30 August 2019 to update the knowledge on recent advances in the field of research and management of arthropod vector and vector borne diseases among medical and paramedical force personnel involved in vector control in different

units of tri-services. The course was inaugurated by Dr DK Dubey, Director, DRDE, who highlighted the role of vectors in transmitting various diseases to human beings and requirement for management of these vectors.

A total of 26 participants attended the course. The course covered various topics such as effect of ecological changes and its impact on arthropod vectors, management of arthropod

vectors and pests of defence importance, vector management tools with special reference to malaria, plague surveillance management in India, slow release insecticidal paint, malaria control in tribal areas of India, detection of virus and pathogens in vectors transmitting diseases, etc. Dr D Sukumaran, Sc 'F' and the Course Director, delivered the vote of thanks.

WORKSHOP ON WATER QUALITY ASSESSMENT: ISSUES & CHALLENGES

Defence Research Laboratory (DRL), Tezpur organised a workshop in collaboration with Assam Rifles at HQ IGAR (South), Imphal, Manipur on 'Water Quality Assessment: Issues and Challenges' on 26 August 2019. The aim of the workshop was to address the problem of water quality for the troops stationed

in the remote and forward locations of Manipur.

Brig DS Sisodia, DIG, HQ IGAR (South), graced the event as the Chief Guest. Highlights of the programme were live demonstration of DRDO water testing kit, hand-on training to assess water quality, DRDO products and decontamination technologies

developed by DRL. Fifty-nine delegates including 22 Medical Officers from various units of Assam Rifles under IGAR (S) attended the workshop. Comdt K Guha, Nodal Officer, HQ IGAR (S), Dr IM Umlong, Sc 'D' and Dr Bodhaditya Das, TO 'B', DRL, conducted the programme.



COURSE ON NANOMATERIALS AND LIFE

Institute of Nuclear Medicine & Allied Sciences (INMAS), Delhi, organized a five-day CEP course on “Nanomaterials and Life” during 19-23 August 2019 for DRDS/DRTC candidates.

Nanomaterials are changing the face of life science research at rapid pace. Although nanotechnology has its primary roots in the physical sciences, it has always had important relationships with biology. The purpose

of this course was to update the existing knowledge of people working in the area of nanomaterials and providing the basics to those intending to venture in this exciting area. The idea was to make the participants aware about the fact that the materials remain the same but tweaking the chemistry of the materials changes their properties and hence their application. The course had around 26 talks, which included material synthesis, characterization,

in-vitro, *in vivo* evaluation, toxicity aspects and their possible re-mediation and the last day had deliberation on the requirement of safety and regulatory aspects of the nanomaterials.

The inaugural lecture of the CEP was by Prof. (Dr) Veena Kaul from IIT Delhi. Dr Kaul provided the panorama for the need of nano materials in enhancing the status of the life sciences and also made the audience aware of the way forward.



TECHNICAL WORKSHOP IN HINDI

A technical workshop in Hindi was conducted at Microwave Tube Research and Development (MTRDC), Bengaluru on 27 August 2019. Dr Vishal Kesari, Sc ‘E’, MTRDC, was the Guest Speaker. Dr Malatesh Mailar, Senior Translator, MTRDC, welcomed the participants. Dr Kesari delivered a talk on “Sub-assemblies and Functioning of Gyrotron Device.” He deliberated on working principles and functioning of the device. He also espoused usage of Hindi in official work. More than 30 technical officers and staff attended the workshop.



HINDI PAKHWADA

DEBEL, BENGALURU

Defence Bio-Engineering and Electro Medical Laboratory (DEBEL), Bengaluru celebrated Hindi Pakhwada from 29 August to 12 September, 2019. Hindi Diwas celebrations and valedictory function was held on 16 September 2019. Shri Vikas Suryawanshi, IRS, Addl Commissioner of Income Tax, Bengaluru was the Chief Guest of the occasion. Dr Alka Chatterjee, Vice Chairperson, Rajbhasha in her welcome address highlighted the accomplishments of DEBEL on implementation of Hindi in official work. She also read the extracts of the messages of Hon'ble Raksha Mantri and Grah Mantri and emphasized the use of Hindi in day-to-day life.

The Chief Guest spoke about the significance of learning Hindi and using simple Hindi in routine work. Director DEBEL and Chief Guest distributed the awards to the winners of the competitions held during the pakhwada and rolling trophies to the Technical Divisions who did commendable work in Rajbhasha. Shri Rahul Malhotra, JRF recited a poem on Shaheed Bhagat Singh that left the audience mesmerized.

DIHAR, LEH

Defence Institute of High Altitude Research (DIHAR), Leh organised Hindi Pakhwada 2019 with a plethora of Hindi-based competitions from 2 September 2019 to 16 September 2019 at DIHAR HQ, Leh and its detachments at Siachen Sector and Base Lab, Chandigarh to spread awareness of Rajbhasha among employees. In all Hindi Essay Writing, Hindi Typing, Debate, Joke and Laughter Competition, Administrative Word, and Extempore Speech



Release of DEBEL's Hindi Magazine Sanchayika



Prize distribution at DIHAR

Competitions were organized. Closing and Award Distribution Ceremony at DIHAR HQ Leh and Base Lab Chandigarh was Chaired by Dr Padma Gurmet, Director, National Institute of

Sowa Rigpa, Leh and Shri Pravendra Kumar, OS, TBRL. Dr OP Chaurasia, Director, DIHAR distributed the Award and Certificates to the winners.



AWARDS

Lifetime Achievement Award

Dr Rajeev Vij, Sc ‘G’, Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, has been awarded “Lifetime Achievement Award” in recognition of exemplary contributions in adopting original and innovative practices for library management and meritorious services to the profession. He received the award from the VC, NLU during the ‘2nd International Conference on Digital Transformation’ organised at Rajiv Gandhi National University of Law, Patiala, during 6-8 September 2019.



Dr Rajeev Vij receiving the Lifetime Achievement Award

C-in-C Commendation Card

Shri R Satyanarayana, Sc ‘D’, RCI has been awarded Commander-in-Chief (C-in-C) Commendation Card, Strategic Forces Command (SFC), for his outstanding contributions to Prithvi and Dhanush strategic systems. The award was presented by Dr G Satheesh Reddy, Secretary DDR&D and Chairman, DRDO.



Shri R Satyanarayana receiving the C-in-C Commendation Card

HIGHER QUALIFICATIONS ACQUIRED



Shri Kaushik Halder, Sc ‘D’, Defence Institute of Physiology & Allied Sciences (DIPAS), Delhi, has been awarded PhD in Physiology by Bharathiar University, Coimbatore, for the thesis entitled “Physiological Changes in Healthy Individuals of Different Age Groups by Hatha Yoga Practices.”

Junior Command Course

Smt N Rabita Devi, Sc ‘E’, Institute for Systems Studies & Analyses (ISSA), Delhi recently qualified the Junior Command Course (JC-157), one of the toughest and esteemed Army Training Courses conducted by Army War College, the premier All Arms Tactical Training Institute for officers at Mhow, Indore. She was the only civilian officer among 535 Army officers who attended the course. She successfully completed all outdoor exercises.



Smt N Rabita Devi receiving the JCC Certificate from Commandant AWC

PATENT GRANTED

A Patent No. 312507 for “S-Band RHCP Microstrip Printed Layered Antenna for Satellite Communication” has been granted by Patent Office, Govt. of India to Shri Vinod Kumar Singh, Sc ‘G’, Defence Electronics Applications Laboratory (DEAL), Dehradun. Patented Design has been extensively used for development and production of Ground-based Mobile Satellite Terminals for GSAT-2, INSAT-3C and GSAT-6 satellites during last one decade.

READERS' VIEWS

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DRDO HARNESSING SCIENCE FOR PEACE & SECURITY

CHAPTER 4: MARCHING FORWARD

The article is 43rd in the Series of extracts of the monograph, "Defence Research & Development Organisation: 1958-1982", by Shri RP Shenoy, former Director of Electronics and Radar Development Establishment (LRDE).

ELECTRONICS

Defence Electronics Applications Laboratory

The activities of Defence Electronics Applications Laboratory (DEAL) in the 1970s were focussed on tropospheric communication systems, airborne/satellite command control and communications. The first major task undertaken by the Laboratory was the development of a 24-channel quadruple diversity troposcatter communication link under the ADGES Plan. The system was designed to meet the requirements of the Indian Air Force so that on completion of development, testing and evaluation, it could form part of the troposcatter communication network of the Indian Air Force. The most challenging task was the successful development of the 1 kW klystron amplifier. The technology of the high power transmitter was transferred successfully to M/s Bharat Electronics Ltd, Ghaziabad for production and supply all troposcatter communications links that were being manufactured by them. The troposcatter communication link developed by the Laboratory was set up between Delhi and Agra for evaluation. It was later accepted by the Services.

In the area of command, control and communications using space as the medium, three R&D projects were undertaken by the Laboratory in the period 1975-80. These were, Door Drishti, Transportable Small Earth Station, Airborne and Ground Segment of Multi-Spectral Scanner System. The aim of the project Door Drishti was to

investigate the performance of a link between an airborne reconnaissance vehicle and the ground control station. For this purpose, the Laboratory had initiated design and development of the necessary ground-based as well as the airborne hardware. The project on the development of a Transportable Small Earth Station was to investigate the feasibility of its use for troops on the move. It involved the development of critical subsystems such as up/down converter, BPSK modem for interfacing with the 6-channel multiplexer of Plan AREN. By 1982, the system was being assembled for integration. The project on the development of Multispectral Scanner aimed at developing an airborne system with real-time data transmission and display of images. A linear array of 2048 charge control devices were used in the 0.5 μm to 1 μm wavelengths and a linear pyroelectric array of 256 elements were used in the 8 to 12 μm band. Push broom mode of scanning was proposed because it needed no moving parts for image scanning in contrast to conventional scanning. The hardware for the airborne scanner was designed, fabricated, and assembled. By 1982, testing was being carried out. In addition, two projects were initiated before the end of 1982 and these were, initiation of image processing activity and development of digital VLF system for the Indian Navy. For the project on image processing, DEAL proposed to install the hardware but to develop its own software in close interaction with IIT's, IISc, ISI and NRSA. The project on the development of a digital VLF system was taken up to meet the requirements

of the Indian Navy for a low level MSK transmitter and MSK-based VLF.

ENGINEERING

Two establishments are grouped under the discipline, engineering and these are – Research & Development Establishment Engineers, R&DE (Engrs), at Dighi, Pune, and the Snow and Avalanche Study Establishment (SASE), at Manali. R&DE (Engrs) was setup in 1962 with the bifurcation of TDE (Vehicles) and moved to the present location at Dighi, Pune, in 1962. The activities of the Laboratory are engineering-oriented and cover weldable aluminium structures, portable and mobile bridges, portable and mobile masts for radar and communication systems, habitats for cold regions including Antarctica, pressurised chambers and life saving equipment for high altitude and fluid power-based systems. From the very early days, the R&DE (Engrs) worked jointly with industry to take up the fabrication and assist in translating the designs into hardware.

The genesis for the setting up of the Snow and Avalanche Study Establishment (SASE) was the difficulty faced by the Armed Forces in the 1949 and 1965 conflicts when they had to combat the hazards of snow and avalanches in the mountainous regions of the Himalayas. The DRDO set up a new laboratory namely, the Snow and Avalanche Study Establishment (SASE) at Manali in 1969 with the specific aim of carrying out scientific and systematic investigations to combat the hazards of



snow and avalanches so that the roads and lines of communication are kept intact throughout the year, and thus, enable the Services to live and fight in the mountain regions of the Himalayas. SASE is one of the select institutions of the world and only the one of its kind in south east Asia, devoted exclusively to the study of snow and avalanches.

Research & Development Establishment (Engineers)

The major activities of Research & Development Establishment (Engineers), R&DE (Engrs) in the 1960s were the development of light metal bridges and power boats for bridging operations, development of light weight water supply pumps, prefabricated shelters for high altitude operations and other engineering equipment.

One of the problems that the Laboratory had to face and resolve during the development of lightweight structures was the inadequacy of indigenous aluminium alloys for military use. These alloys were either not weldable or in case welding was possible, the composite structure lost strength after welding. The Laboratory had to take up investigation about the composition of the alloy and with the assistance from Indian Aluminium Company and in collaboration with Ordnance Factory, Ambernath, experiments were conducted to arrive at a new alloy composition to achieve better strength and stress corrosion resistance. By 1969, welded components of Class 3 Bridge were found to have the desired strength. Experimentation on alloy composition was continued from the point of view of corrosion resistance and ageing characteristics into the 1970s till a self ageing weldable aluminium alloy was established.

Another major activity was aimed at replacing the heavy and bulky pneumatic and conventional electric tools used by the Army engineers in the field by corresponding tools and 400 Hz power supply which would be less bulky and lightweight. This involved evaluation of the high frequency tools for field use, estimating the power requirements in the field, liaising with

industry to develop high frequency generating sets and corresponding tools for use by the Corps of Engineers. The activity would spill over into the 1970s.

The development of a Class 30 Assault Trackway to permit Class 30 wheeled vehicles to cross soft areas especially approaches at bridge and ferry sites, class 60 tank approach to support movement of tanks over soft ground, punched tape, which is electro-galvanised carbon steel strip with sharp barbs for replacing bulky barbed wires used by the Army, and transportable water purification set were some of the other contributions of the Laboratory. R&DE (Engrs) also assisted other DRDO laboratories in their projects by designing, developing and supplying specialised equipments and components. For example, portable lightweight antenna mast capable of withstanding winds up to 160 kmph and weighing less than 150 kg was designed and fabricated for use by DLRL for mounting HF Log Periodic Antenna up to heights of 22 metres. Another example was the development and fabrication of a tower of 47 metres length with an inclination of 20° to the vertical to ARDE for testing indigenously developed cartridges used for emergency ejection of seats in military aircraft. A specialised development work carried out by the Laboratory was to design and fabricate a re-compression chamber which was 2.44 m long and 0.7822 m diameter cylinder capable of withstanding 150 psi pressure for the Indian Navy for their diving operations.

The activity on the development of aluminium alloy reached a logical conclusion in 1976 with aluminium alloy D 745, which was found to be self-ageing and weldable. Consequently, design, development and fabrication of a series of bridges, such as the assault bridges—Class 13, Class 19 and Class 50T, assault floating bridge—class 19 were successfully completed. In addition, assault bridge—Class 9, fixed bridge Class 3, were also developed and fabricated. Consequently, military bridge development became a major activity in this period. The search for better aluminium alloys for the next

generation of military bridges with greater strength and stress corrosion resistance was continued. Varying percentages of zinc, magnesium, manganese and chromium for the composition was initiated in 1977. Small quantities of the alloy with different compositions were extruded by Ordnance Factory, Ambajhari and were tested for stress corrosion, susceptibility to heat treatment cycle, composition variation at grain boundary and matrix, precipitate distribution, and electrochemical effects. Welding trials were carried out at the Bhabha Atomic Research Centre, Trombay. Simultaneously with the expertise that was gained in military bridges, a major effort was initiated for developing mobile bridges involving sophisticated powering systems so that the country would be self-reliant in this area.

The development work on high frequency generator system and powered tools was continued. The replacement of the 50 Hz electric and fluid power in such applications as lighting, welding, heating for surgical tools, ventilation and air conditioning, water pumping, sawing and felling of trees, drilling for boreholes and surface breaking, winching, grinding and machining by the 400 Hz high frequency power would have the advantage of high power-to-weight ratio. The other features to be incorporated were, good efficiency with low power consumption, safety, constant speed, robustness, reliability, and ease of maintenance. The power range covered portable tool requirements and operations in the type of environments found in our country. Under the direction of the Laboratory, 3-phase generating sets of capacity 12.5 kVA and 5 kVA with 208 volt output along with such tools, as medium breaker hammer, rock drill hammer with pressure blower, light demolition hammer, heavy concrete breaker, portable electric drill, portable electric chain saw and centrifugal pump, which met the various GSQRs (General Staff Qualitative Requirements) of the Army, were successfully fabricated by the industry.

To be continued...

RAKSHA MANTRI APPRECIATES DEVELOPMENT OF INDIGENOUS DEFENCE SYSTEMS

During his day-long visit on 19 September 2019 to Bengaluru, Hon'ble Raksha Mantri Shri Rajnath Singh visited Centre for Airborne Systems (CABS), a DRDO laboratory, where he was shown several indigenous products of various DRDO labs. The products shown included Airborne Early Warning and Control (AEW&C) System, Radar Systems, EW Systems, Unmanned Air Vehicles, Nirbhay Missile, Robotic Vehicles, Indigenous Aircraft Engine, Small Turbofan Engine, Bio Medical Systems, Microwave Transmitters for Missiles, Semiconductor Components and several other products.

Addressing the DRDO fraternity at CABS, Raksha Mantri appreciated the

constant effort put forth by the scientists and technicians in the development of indigenous defence systems and said that continuing success of ASTRA missile, LCA Tejas and successful utilization of Netra AEW&C System in Balakot air strike has re-imposed the confidence of country in DRDO and the organisation should continuously aim at meeting the requirement of our Defence Services through indigenous efforts.

Raksha Mantri complemented the Indian industries who are part of the manufacturing ecosystem of the country. He said indigenous content shall reach 75 per cent by 2030. He congratulated all the scientists and personnel of DRDO on various successes and for excellent

organization of exhibition of indigenous products.

Dr G Satheesh Reddy, Secretary, Department of Defence R&D and Chairman, DRDO said Raksha Mantri flying LCA Tejas and his visit to DRDO exhibition is an immense boost to the DRDO scientists and technologists and would enthuse them to work towards indigenous efforts.

Eminent dignitaries such as Chairman HAL, Director General (ECS), Director General (Aeronautics Systems), Director General (PC&SI), Director General (MED&CoS) financial advisers, Service Officers and officers from other agencies were present on the occasion.



Dr G Satheesh Reddy briefing Raksha Mantri about LCA Navy

ARDE, PUNE

Lt Gen Sanjay Verma, PVSM, AVSM, VSM, DG (Weapons) visited Armament Research & Development Establishment (ARDE) on 28 August 2019.

DEBEL, BENGALURU

Air Marshal S Prabhakaran VM, DG (I&S), Air HQ, New Delhi visited Defence Bio-Engineering & Electro Medical Laboratory (DEBEL) on 29 August 2019 for interaction with scientists and to review the development of indigenous Protective Equipment and Flying Clothing (PE&FC) for Indian Air Force. He was welcomed by Director, DEBEL followed by a brief presentation about the overall activities of DEBEL and a detailed presentation on the status of PE&FC development activities. This was followed by a visit to the DEBEL exposition hall.

DIHAR, LEH

One hundred and forty students pursuing BSc in Agriculture and Horticulture from Sher-e-Kashmir University of Agricultural Sciences & Technology (SKUAST), Kashmir, visited Defence Institute of High Altitude Research (DIHAR), Leh. The students along with their faculty members were briefed about the relevance of DIHAR in Ladakh region and the various agro-animal R&D activities being carried out by the laboratory.

HEMRL, PUNE

Shri Apurva Chandra, DG (Acquisition), Ministry of Defence, visited High Energy Materials Research Laboratory (HEMRL) on 30 August 2019. Shri KPS Murthy, OS & Director, HEMRL, briefed him on the activities of HEMRL. Presentation on ongoing research activities and future projects was given by the senior scientists of HEMRL.



Lt Gen Sanjay Verma being briefed about HEMRL activities



Air Marshal S Prabhakaran being briefed about DEBEL products



Shri Apurva Chandra being briefed about HEMRL activities