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*A new column on some of
the path-breaking projects
& programmes of
DRDO.*



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DECEMBER 2017
VOLUME 37 | ISSUE 12
ISSN: 0971-4391

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FROM THE DESK OF THE CHAIRMAN



Dr S Christopher

CHAIRMAN

Defence Research & Development Organisation

&

SECRETARY

Department of Defence Research & Development

Dear friends,

Achievements in life are related to your vision. Higher the vision so are the achievements. Our mentor Dr APJ Abdul Kalam rightly said that dreams should not let you sleep till you achieve your goals. Dreams are the result of your vision, a far-sighted one, which gives you encouragement to perform better against all odds. True the results may not be as per your expectations initially, you may encounter unexpected roadblocks, but a sustained effort in the direction of your vision brings fruitful results. Remember a child learning how to stand and walk in its infant stage. The joy and satisfaction you get on achieving your aims would motivate you to perform better and optimal in life.

The previous month saw major successes from the stable of DRDO giving us a greater sense of pride. Successful test firing of “Nirbhay-Sub Sonic Cruise Missile” after initial failures brought us to the select League of Nations possessing this cutting edge technology. The Glide Bomb ‘SAAW’ gave a boost to our defence power to strike. The “50 Men Solar heated Oxygenated Shelter for High Altitude Areas (HAA)” brought cheers to our jawans fighting battles in the snow clad areas. Another shot in the arm came when DAC under the aegis of Hon’ble Raksha Mantri Smt Nirmala Sitharaman cleared the Limited Series Production (LSP) of 40 ATAGS. A proud moment for DRDO indeed. ‘Failure is the stepping stone of success’ and these releases have proved that no amount of failure can deter us from achieving the impossible. I am proud of all the team members for their dedicated efforts, restoring faith of the nation in our capabilities. “Well done friends, keep it up”. You still have miles to go. Rejuvenate and move ahead with new energy, new vision and new goals.

DRDO@60 would witness many such laurels. The platinum jubilee year has to go down in the history of DRDO as one of the most successful years. Let the positive vibes motivate you from the word “GO” and rest not till you accomplish your aims and your dreams. Wishing you the very best in all your endeavours.

Jai Hind.

DRDO CONDUCTS FLIGHT TRIAL OF NIRBHAY SUB-SONIC CRUISE MISSILE

Successful test firing of “Nirbhay Sub-sonic Cruise Missile” has brought us to the select league of nations possessing this cutting-edge technology.

DRDO achieved yet another feat on 7 November 2017 with the successful test flight of ‘Nirbhay’ – India’s first indigenously designed and developed Long Range Sub-Sonic Cruise Missile, which can be deployed from multiple platforms. It was successfully test fired from the Integrated Test Range (ITR), Chandipur, Odisha. The missile has the capability to cruise at 0.7 Mach, at altitudes as low as 100 m. The flight test achieved all the mission objectives from lift-off till the final splash.

The missile took-off in the programmed manner and all critical operations, viz., launch phase, booster deployment, engine start, wing deployment and other operational parameters demonstrated through autonomous way point navigation. The guidance, control and navigation system of the missile are configured around the indigenously designed Ring Laser Gyroscope (RLG) and MEMS-based Inertial Navigation System (INS) along with GPS system. The missile majestically cruised for a total time duration of 50 minutes, achieving range of 647 km. The missile was tracked with the help of ground-based radars and its other parameters were monitored by indigenous telemetry stations developed by DRDO.

Raksha Mantri Smt Nirmala Sitharaman, complimented DRDO



scientists for the achievement, and said that successful trial would take India to the select league of nations possessing this complex technology and sub-sonic cruise missile capability.

Chairman DRDO and Secretary Department of Defence (R&D),

Dr S Christopher; DG (Aero) Dr CP Ramanarayanan; Directors of ADE, RCI, ITR and CEMILAC, along with other senior DRDO scientists and user representatives from Army witnessed the launch and congratulated the team ‘Nirbhay’.



R&DE (E) DEVELOPS BLAST CONTAINMENT ENCLOSURE

Research and Development Establishment (Engineers), R&DE(E), Pune, has successfully developed and conducted a series of trials on the Blast Containment Enclosure.

It is an indigenous, first-of-its-kind, one time use, cost-effective containment enclosure to contain the blast effects of a 6 kg improvised explosive device (IED) made with 4 kg TNT and 2 kg shrapnel. Six enclosures have been tested. The trials met all the requirements to withstand the explosive energy and



shrapnel.

A novel sandwich construction is employed to dissipate blast energy through plastic energy absorption. Pressure at 8 m from the enclosure was measured to be within human sustainable limit.

Weight of one enclosure is around 300 kg and its estimated cost is approximately Rs 1.5 lakhs. The trials were witnessed by Principal, Institute of Improvised Explosive Device Management, CRPF, Pune.

DRDO TESTS GUIDED BOMB

Indigenously developed light-weight Glide Bomb, SAAW (Smart Anti Airfield Weapon), was successfully tested from Indian Air Force aircraft in the ranges at Integrated Test Range (ITR), Chandipur, Odisha.

The guided bomb released from the aircraft and guided through precision navigation system, reached the targets at more than 70 km range with high accuracies. Three tests with different release conditions and ranges were conducted successfully.

Tests are major landmark in the indigenous capabilities to develop guided bombs.

The bomb has been developed by Research Centre Imarat (RCI), Hyderabad, along with sister DRDO laboratories and Indian Air Force.

Raksha Mantri Smt Nirmala Sitharaman congratulated DRDO and the Air Force for the successful tests.

Dr S Christopher, Chairman, DRDO, and Secretary Department of Defence R&D, congratulated the team SAAW, and said that the weapon would be inducted soon into the Armed Forces.

SA to RM and Director General, Missiles and Strategic System, DRDO, Dr G Satheesh Reddy, described the successful tests as a major milestone in the indigenous capabilities to develop guided bombs.

DMRL DEVELOPS AND INDIGENIZES SPECIALITY ALUMINIUM ALLOYS FOR ADVANCED DEFENCE SYSTEMS

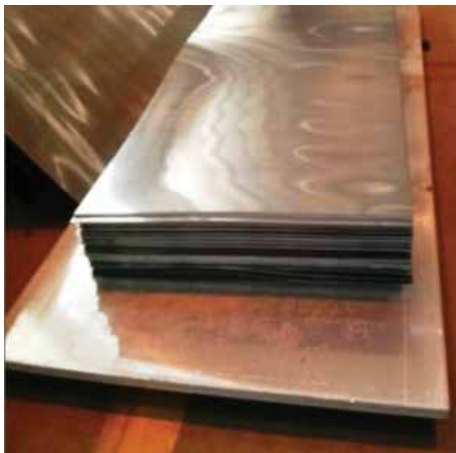
The series production of aluminium alloy intensive F3 section, i.e., the major load bearing section of BrahMos Supersonic Cruise Missile, using indigenous materials has begun at the fabrication centre of Godrej and Boyce Private Limited, Mumbai. Five different grades of wrought aluminium alloys in eight different semi-product forms and nine different heat treatment conditions are utilized in this missile, a majority of which are located in the F3 section. These materials have been developed and produced in eight selected Indian industries under the technical guidance of Defence Metallurgical Research Laboratory (DMRL), Hyderabad, and through co-participation of DMRL and BrahMos Aerospace Private Limited (BAPL), Hyderabad.

The indigenous materials were inspected by Missile Systems Quality Assurance Agency (MSQAA), and the production processes and the quality control procedures were certified by NPOM, Russia, the joint venture partner for BrahMos missile. The indigenous production of aluminium alloys has resulted in substantial cost savings.

DMRL has developed and produced aluminium-magnesium based alloy DMR291A in the form of sheets and plates having thicknesses ranging from 0.9 mm to 30 mm in desired heat treatment conditions

for applications in superstructures of Naval warships. These materials have been produced in Bharat Aluminium Company (BALCO), Korba, and inducted into the Indian Navy.

A further source of production for DMR291A materials in thin gauges has successfully been established at Hindustan Aluminium Company (HINDALCO), Hirakud, to the satisfaction of the Indian Navy.





THE AIRBORNE EARLY WARNING AND CONTROL SYSTEM (AEW&C)

Commencing from this issue, DRDO Newsletter will cover some of the path-breaking projects & programmes of the DRDO.



The saga of development of indigenous AEW&C system as a mission mode programme commenced with appropriating Centre for Airborne Systems (CABS), Bengaluru, as the nodal agency for developing three AEW&C systems with two to be delivered to IAF and one to be retained with DRDO for further research, development, up-gradation, etc.

The development was taken up based on operational requirements evolved jointly by a team of DRDO and IAF team. The platform for the development was specified by the IAF as EMB-145 executive jet manufactured by M/s Embraer of Brazil. After the sanction of the programme, IAF revised the

operational requirements in tune with their emerging war fighting scenario. The revised operational requirement necessitated building of an AEW&C system on a small aircraft with all the systems and functionalities similar to that of the bigger AWACS being procured by IAF. DRDO took up the challenge and has made the systems a reality.

The AEW&C aircraft is a derivative of Embraer ERJ-145 extensively modified and customized to house the indigenous mission systems developed in India. The complete integration of the mission system and its flight evaluation has been carried out in India. One of the main features of the aircraft is that it is the Embraer executive jet aircraft to have air to air

refuelling. The indigenous AEW&C system on EMB-145 aircraft consists of 10 major mission systems, most of them developed indigenously, namely

- ✧ Airborne active electronically scanned antenna based primary radar system, a first of its kind and fully developed within the country.
- ✧ Fully indigenous, electronically scanned antenna based MK-XII(S) and mode 4 capable Identification Friend or Foe (IFF) System.
- ✧ Communication support measure (CSM) system
- ✧ Electronic support measure system (ESM)
- ✧ Self-protection Suite (SPS) consisting of UV-based Missile Approach Warning Sensor



AEW&C Cockpit



AEW&C Control Room



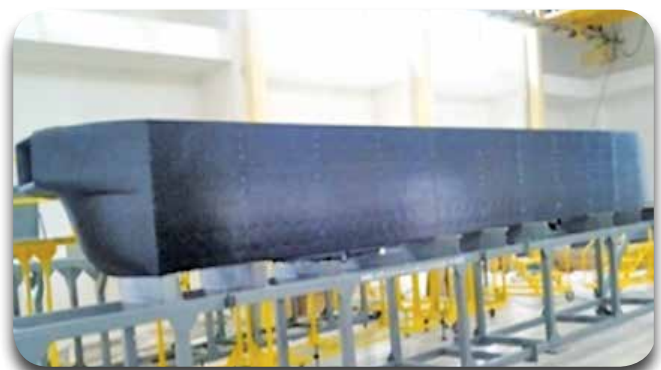
AEW&C Refuelling



AEW&C Ground Exploitation Station-Operator Shelter



Self-protection—Chaff firing from AEW&C



AEW&C Active Electronic Array Antenna

- (MAWS) and Radar Warning Receiver (RWR).
- ✘ Satellite-based Non Line-of-Sight Communication and Data Link.
- ✘ C band Line-of-Sight Communication and Data Link.
- ✘ V/UHF voice only communica-

tions system.

- ✘ Mission Computer, and
- ✘ Reconfigurable Operator Work Stations.

All the above systems are electrically and functionally integrated through a high speed

LAN and complete suite of tactical software fully developed in house. This software provides functionalities such as multi sensor tracking and data fusion, multi target tracking, identification and classification, system control and monitoring,



PARTNERS IN DEVELOPMENT

The Development of AEW&C is a dedicated effort by several laboratories of DRDO, partnering with the user IAF.

CABS has been the nodal agency in the overall sphere-heading of the over all programme. In addition CABS also has carried out, the over all system engineering, design, programme management, system integration, system certification, test and evaluation. CABS also has developed several key technologies which include the Active Array Antenna Unit for primary Radar & IFF system, Identification Friend or Foe system, Mission Communication System, Operator Work Stations, Mission Computer, Racks, radomes,

etc. CABS also has developed all the ground systems. The tactical software suite for Mission Computer, HMI, Battle Management, etc., have been developed in-house at CABS.

The other DRDO labs that have contributed are LRDE (Primary radar), DARE (Integrated RWR & ESM system), DEAL (Data Links), and DLRL (CSM System). CEMILAC has provided the overall certification and DGAQA the complete Quality Assurance.

IAF has been fully involved in all aspects of the programme from requirements to release of the system. The complete flight evaluation has been carried out by dedicated IAF teams from ASTE, AFPT at CABS, Mission Operators from IAF bases, etc. Towards

this, multiple batches of operators have been trained at Operator Work Station at CABS, and Bhatinda.

India has become one of the select countries to have established an indigenous airborne surveillance capability. Several private, public sector industries from India, and other global industries participated in making the AEW&C programme a major success.

With the induction of the indigenous AEW&C into the Indian Air Force, DRDO will move forward to the next generation system development for the Services, for which preliminary technology initiatives are already well underway.

interception and battle management functions, all of which are developed in house. A comprehensive Human Machine Interface, again developed in house, projects the real-time air situation picture, into five reconfigurable consoles, in a manner required by the individual operators.

In addition to the airborne complement, five major ground systems supporting all aspects of planning, training, maintenance, and integration with IAF Command and Control Centre also have been developed fully indigenously. These are:

- (a) Mission Planning and Analysis Station (MIPAS), which enables multiple operators to plan their mission on AEW&C simultaneously. Additionally a laptop-based mobile MIPAS also have been configured and provided.
- (b) Ground Exploitation Station, receives the information from the aircraft and communicates the

information to the IAF Command and Control Centre.

- (c) Operator Training Station, which enables up to 8 operators to be trained simultaneously on all aspects of operation of the AEW&C.
- (d) Automated Test Equipment, which enables first level of maintenance through automated test process.

On the historic day of 14 February 2017, the first indigenous AEW&C system was formally cleared for induction into the Indian Air Force in an initial operational clearance configuration. As of now the first AEW&C has been deployed in one of the Indian Air Force air base and will be operational exploited. AEW&C is a truly and fully network centric command and control system.

- (e) Mission Software Support Facility, a software repository to maintain the software versions through life of AEW&C.

All of these are backed by a regular post development support project taken by CABS to enable operational and maintenance support to the IAF for a period of three years.

The AEW&C system has undergone extensive flight evaluation flying close to 1500 hrs (700+ sorties). These include flying at Bengaluru, evaluation campaigns at various IAF bases such as Jamnagar, Bhatinda, Jodhpur, Gwalior, Agra, Chabua to state a few. Evaluation of the system also includes evaluation through conduct of Large Fleet Engagement exercise (more than 25 of them) to evaluate the complete performance capabilities of the AEW&C command, control, battle management, etc. The AEW&C system is being integrated with the IAF's Command and Control System.

DIPAS ORGANISES THREE-DAY INTERNATIONAL CONFERENCE – ‘FIPSPHYSIOCON 2017’

Defence Institute of Physiology and Allied Sciences (DIPAS), Delhi, organised three-day International Conference ‘FIPSPHYSIOCON 2017’ at Vallabhbhai Patel Chest Institute (VPCI), University of Delhi during 5-7 November 2017. The objective of the conference was to update the scientific community about the recent advances in human Physiology in Extreme Environments, Neuroscience, Yoga, Sport Physiology and translational research.

Dr S Christopher, Chairman DRDO and Secretary, Department of Defence Research and Development inaugurated the conference. Speaking of the occasion, Dr Christopher emphasised on the importance of quality research and its application for tangible products and solutions to major problems. He

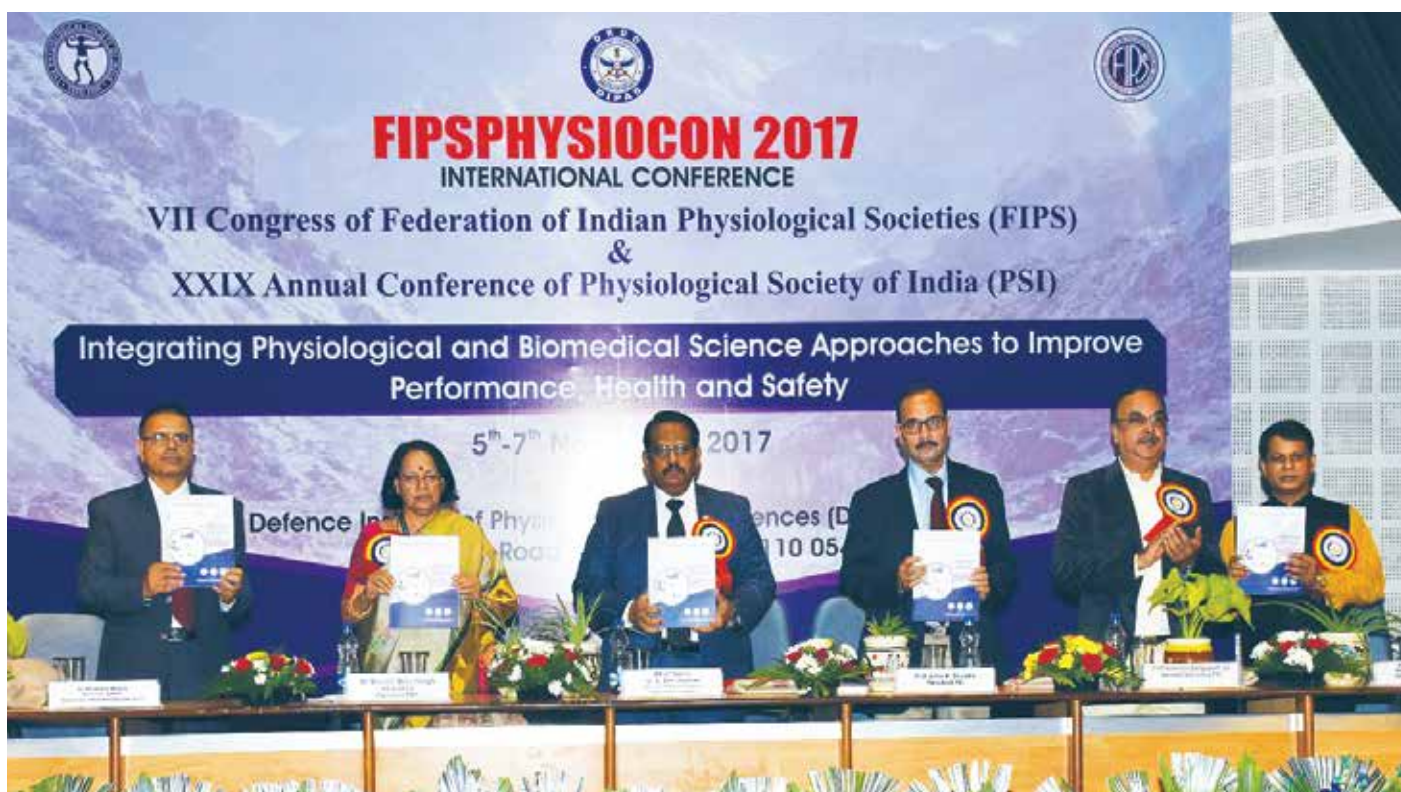
highlighted the importance of Yoga and other approaches to improve human capabilities in difficult environmental conditions and terrains and urged scientific community to utilise the facilities like highest altitude research station established by DRDO at Changla (17,660 ft), Ladakh in Jammu and Kashmir.

Director, DIPAS, and Convener of the Conference Dr Bhuvnesh Kumar, in his welcome address, deliberated on the theme Integrating Physiological and Biomedical Science Approaches to Improve Performance, Health and Safety. Three hundred delegates from India, USA, UK, Kyrgyz Republic and Malaysia attended the conference.

President of PSI, Prof. Amar K Chandra, in his presidential address highlighted the necessity of the

formation of the Federation of Indian Physiological Societies by combining PSI, SAPI, APPI, ISCAP and its role to facilitate the scientific interaction between physiologists of this country with their international counterparts.

Dr Shashi Bala Singh, Distinguished Scientist and DG Life Sciences, DRDO, President, FIPS, in her address, elucidated optimisation of physical performance with interdisciplinary approaches. She also cited the unique mechanism of human body system by emphasising on different important aspects like sophisticated neural processing and energy requirements of human brain. She highlighted the collaborative approaches not only within the physiological sciences but also in a broader spectrum involving physical sciences and engineering.





RM VISITS CVRDE

Smt Nirmala Sitharaman, Hon'ble Raksha Mantri, visited Combat Vehicles Research and Development Establishment (CVRDE), Avadi, Chennai, on 14 October 2017. Dr S Christopher, Chairman, DRDO, and Secretary, Department of Defence R&D, and Dr P Sivakumar, Distinguished Scientist and Director, CVRDE, briefed the RM about the achievements of the establishment and ongoing national programmes on combat vehicles and technologies at CVRDE.

The occasion was marked by the handing over of the first prototype of Arjun Armoured Recovery and Repair Vehicle (ARRV) by Shri Deepak Kumar Hota, Chairman and Managing Director, Bharat Earth Movers Limited (BEML) to Dr P Sivakumar. Dr Sivakumar handed over one set of 'Landing Gear' and CEMILAC Certification to Shri MVKV Prasad, DS and Director, Aeronautical

Development Establishment (ADE), Bengaluru, and one set of 'Power Take-off Shaft' to Shri MZ Siddique, OS and Director, Gas Turbine Research Establishment (GTRE), Bengaluru. Besides, a '180 hp Engine' was also handed over by Maj Gen Ajay Gupta, Director, Vehicle Research and Development Establishment (VRDE), Ahmednagar to Director, ADE.

Hon'ble RM visited various technology centres and witnessed the products and systems/technologies developed by CVRDE. She evinced keen interest in the advanced systems like Arjun MBT Mk-II, Arjun Armoured Recovery and Repair Vehicle (ARRV), Arjun Catapult, Unmanned Ground Vehicles, Sub-systems of Light Combat Aircraft Tejas, Landing Gear, 180 hp engine for Rustom-II, 1000 hp Engine for T-72 and 400 hp for BMP-II, besides Bridge Layer Tank (BLT-72). The respective project leaders highlighted

the uniqueness and specialities of the systems to the RM.

Hon'ble RM launched the webpage, 'DRDO Robotics & Unmanned Systems Exposition (<https://rac.gov.in/druse/>)' for inviting young and talented minds of engineering community from all over the country to take part in challenging defence applications.

Smt Sitharaman released a book titled 'Arjun MBT — An Indian Success Story'. The book has accentuated the entire journey, from conception to realisation, of Arjun MBT Mk-I. She also released a book on 'Achievements of CVRDE'.

Hon'ble RM congratulated DRDO fraternity, in particular CVRDE, for their efforts and contributions in making the nation self-reliance in cutting-edge defence technologies and expressed that DRDO will strive hard to empower the nation further with 'Make in India' initiative of the Hon'ble Prime Minister.



DRDO ESTABLISHES SOLAR HEATED OXYGENATED SHELTER AT GIAGONG

Dr Shashi Bala Singh, DS and DG (LS), DRDO, handed over 50-men solar heated oxygenated shelter established by DIPAS at 16,000 ft at Giagong (North Sikkim) to 33 Corps on 12 October 2017. Dr Bhuvnesh Kumar, Director, DIPAS, and Dr Sanjeev Kumar Sharma, Sc 'F' and PI, of the project were present on the occasion.

The inauguration was jointly done by teleconferencing from HQ 33 Corps by DG (LS) and GOC 33 Corps Lt Gen Pradeep M Bali, VSM. The ceremony was attended by GOC 27 Mt Div, Maj Gen Sarbjit Singh Deusi, VSM; Brig S Dahiya SM, Cdr 112 Mt Bde, and other senior officers from 33 Corps and DIPAS.

The shelter, 24 m x 7 m, is self-sustainable as it utilizes solar energy for heating and power generation. The extra heat energy harvested during day time is stored in the PCM for use during evening hours. For power generation 10 solar panels of 200 watts have been installed along with lithium ion batteries for storing this power.

The shelter is having provision for 20 persons in the sitting room and for 32 persons in the two dormitories. All these rooms have separate sensors and controllers for oxygen and carbon dioxide. Besides, this shelter has indirect heating system, heat traced plumbing system to prevent freezing of water in the pipes, state-of-the-art oxygen concentrator, cylinder filling

system, DG set as a backup and sewage treatment plant. Dr Sanjeev Sharma briefed about the salient features of the system with the help of a virtual tour.

Dr Shashi Bala Singh, in her address, highlighted that DIPAS have put their best efforts to create this facility for the Army and requested them to provide regular feedback for further improvement in the system. The facility would be utilized for the rapid induction of soldiers, short duration visit of VIPs and treat the acute mountain sickness patients.

Lt Gen Pradeep M Bali, appreciated DRDO establishing this world-class facility and ensured its maximum utilization for rapid induction of the troops.



DR CHRISTOPHER INAUGURATES POINTS-21 PROGRAMME AT DIAT

The inauguration ceremony of the POINTS-21 Programme for newly inducted DRDO scientists was held at Defence Institute of Advanced Technology (DIAT), Pune, on 22 October 2017. Dr S Christopher, Chairman, DRDO, and Secretary, Department of Defence R&D, was the Chief Guest of the function.

The Post Induction Training School (POINTS) Programme is an initiative of DRDO to impart integrated training to the newly inducted DRDO scientists.

The 14-week Programme introduces the scientists to all the activities of the DRDO, which are essential for them to know before joining their respective laboratories. The Programme covers General Organizational Orientation Training (GOOT), General Techno-Management Orientation Training (GTOT), two-week Tri-Service/Field attachments and four-week intense cluster-wise training. In all, 170 scientists are participating in the POINTS-21 Programme.

Dr S Christopher, in his inaugural address, elucidated the main DRDO activities and opportunities for young scientists. Dr Surendra Pal, Vice Chancellor, DIAT (DU) introduced the various academic and research activities of DIAT (DU). Dr Hina Gokhale, OS and Director General (HR), DRDO, spoke on human resource issues and role and responsibilities of scientists in DRDO. Dr Pralhada, Director POINTS, presented details of the 14-week training programme.



RAISING DAY CELEBRATIONS

ASL, Hyderabad

Advanced Systems Laboratory (ASL), Dr APJ Abdul Kalam Missile Complex, Hyderabad, celebrated its 16th Annual Day on 21 October 2017. Dr S Christopher, Chairman, DRDO and Secretary,

Department of Defence R&D, was the Chief Guest and Dr G Satheesh Reddy, SA to RM and DG (MSS), DRDO, was the Guest of Honour on the occasion. Shri S Bhaskar, Sc 'H', Chairman, Organizing Committee, welcomed the august gathering. Shri SK Sharma,

Sc 'F', DOMS, presented the Annual Report of ASL. Dr Tessa Thomas, DS and Director, ASL, in her address highlighted various achievements and future programmes of ASL.

Dr G Satheesh Reddy, appreciated the dedicated work done by all employees of ASL and elucidated

about futuristic technologies. Dr S Christopher, appreciated the excellent work done by ASL and emphasized on the quality of the systems.

Laboratory-level DRDO Awards and Mementos to employees, who completed 20, 25 and 30 years of service, were presented by the Chief Guest. Dr APJ Abdul Kalam Merit Awards and Dr APJ Abdul Kalam Welfare Awards were also given to children of ASL employees. A cultural programme was organized by the in-house talents.

A Book titled “Composite Structures: Design, Mechanics, Analysis, Manufacturing, and Testing” written by Dr MK Buragohain, Sc ‘G’, ASL, was released by the Chief Guest. Shri AK Singh, Sc ‘F’, proposed the vote of thanks.

DMRL, Hyderabad

Defence Metallurgical Research Laboratory (DMRL), Hyderabad, celebrated its 54th Raising Day on 25 October 2017. Various sports events and cultural activities including tree plantation were organised. A cultural programme was also organized on 24 October 2017. Smt Poonam Saxena, the first lady of DMRL, graced the occasion as the Chief Guest. As a part of DRDO’s ‘Go Green Save Green’ campaign, programme of tree plantation in DMRL campus by each employee of the laboratory was initiated and Dr Vikas Kumar, OS and Director, DMRL, along with senior scientists, planted saplings in the complex. The grandiose celebration was graced by the Chief Guest Dr Debasis Deb, Executive Director, HAL, Koraput. The function started with a welcome address by Shri JS Yadav, Sc ‘G’ and Chairman, Organising Committee.

Dr Vikas Kumar in his address retraced the glorious past of the laboratory and gave a brief account of the current projects and the major achievements of the laboratory during the past one year. He also outlined the



future activities and mentioned about several awards and honours received by DMRL employees during the year.

Dr Debasis Deb, in his address, praised the laboratory’s past and present achievements. He recounted his association with the laboratory. Chief Guest also stressed on working as a team and encouraged the young scientists for achieving the set targets.

Dr Vikas Kumar distributed mementoes and certificates to the employees who completed 25 years of service in DMRL. Many awards

including DRDO lab-level awards, cash awards and awards for sports and cultural events were given by Dr Debasis Deb and Dr Vikas Kumar. Shri A Sambasiva Roa, Sc ‘F’, proposed the vote of thanks.

A tree plantation programme was also organised in which former Directors of DMRL Dr G Malakondaiah and Dr AM Sriramamurthy; Directors of DLRL, RCMA (Missiles) and RCMA (Materials) planted the saplings. The event concluded with a lunch for all employees and their families.





ISSA, Delhi

Institute for Systems Studies and Analyses (ISSA), Delhi, celebrated its 58th Raising Day on 21 September 2017. Dr Chitra Rajagopal, DS and DG (SAM), DRDO, Chief Guest at the inaugural function, inaugurated the event along with Shri SB Taneja, Director, ISSA. Shri Taneja highlighted the initiatives taken by ISSA in the areas of wargaming, modelling, simulation, strategic planning and system analysis and reflected upon the progress made by the institute during the last year. He also gave an overview of the recent initiatives of ISSA for development of modelling and simulation systems.

Dr Chitra Rajagopal appreciated the efforts made by ISSA in the area of System Analysis, Wargaming and Simulation. She elucidated the growing role of system analysis and shared her



views on importance of modelling and simulation for evaluation of weapon systems. She also emphasised various other efforts to shape the Combat

Process besides the weapon systems. Dr Rajagopal and Shri Taneja distributed lab-level DRDO Awards and Cash Awards.

VIGILANCE AWARENESS WEEK

DESIDOC, Delhi

Vigilance and Security Awareness Week 2017 was organised by Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, during 30 October 2017 to 3 November 2017. Dr Alka Suri, Director, DESIDOC, inaugurated the event and elaborated on the theme of the event “My Vision-Corruption free India” and importance of public participation in eradicating corruption. A vigilance pledge was administered to the employees. They were sensitized about eliminating security breaches, vigilance and security.

Dr Rajeev Vij, Associate Director, DESIDOC, spoke about the need of vigilance and security awareness in handling official work. An invited talk was delivered by Brig. MK Hada, Director, Vigilance and Security, DRDO HQ. Giving examples, he emphasized that security has a universal domain

and requires intrinsic and active contribution by all irrespective of their rank or nature of work.

Various activities such as poster making, quiz competition, etc., on

importance of vigilance and security and use of IT in combating corruption were conducted. The winners of various activities were awarded by the Director, DESIDOC.



ITM, Mussoorie

In terms of Central Vigilance Commission directives Vigilance Awareness Week 2017 was observed from 30 October 2017 to 4 November 2017 at Institute of Technology Management (ITM), Mussoorie on the theme “My Vision-Corruption Free India”. The banners prominently mentioning the theme of the Vigilance Awareness Week were put at various places. All the officers and staff of the institute were administered integrity pledge. The officers of undergoing Advance Course on Technology Management, also took the pledge.



NPOL, Kochi

Naval Physical and Oceanographic Laboratory (NPOL), Kochi, observed ‘Vigilance Awareness Week’ from 30 October to 4 November 2017 with the theme “My Vision—Corruption Free India.” An integrity pledge on anti-corruption was taken by the employees. Slogan and cartoon competitions on the theme were conducted both in NPOL and in Bhavan’s Varuna Vidyalaya. Winners were given prizes. Posters on the significance of vigilance and corruption free practices were displayed at prominent places on the campus. Dr T Mukundan, Sc ‘G’, Group Director, Vigilance and Security coordinated all the activities.



RCI, Hyderabad

Research Centre Imarat (RCI), Hyderabad, celebrated Vigilance Awareness Week from 30 October 2017 to 4 November 2017. As part of Vigilance Week Essay Writing Competition on Role of Employee in fight against Corruption; Elocution Competition on Preventive Vigilance—Need of the Hour; a marathon walk and the oath on importance of Vigilance 2017 were conducted.

In the concluding session, Shri BHVS Narayana Murthy, OS and Director, RCI, stressed on key points of vigilance in all Divisions of RCI.





NATIONAL CONFERENCE ON AERIAL DELIVERY & AIRBORNE SURVEILLANCE SYSTEMS FOR NATIONAL SECURITY

National Conference on “Aerial Delivery and Airborne Surveillance Systems for National Security” – ADASS 2017 was organized by Aerial Delivery Research and Development Establishment (ADRDE), Agra, on 10 October 2017. The Conference was inaugurated by the Chief Guest Dr S Christopher, Chairman DRDO and Secretary Department of Defence Research and Development. Dr CP Ramanarayanan, DS and DG (Aero), Shri Debasish Chakraborti, Director, ADRDE; Air Officer Commanding-in-Chief Air Cmde MV Aserkar and officers from Armed Forces, scientists, Directors and officers from DRDO, PSU’s, and professors from prestigious academic institutions including IIT’s, Dayalbagh Educational Institute, etc., were present during the occasion.

Shri Debasish Chakraborti welcomed the august gathering. Dr CP Ramanarayanan, highlighted the need of such seminars to bring together experts in relevant field and give indigenous boost to state-of-the-art systems for the Armed Forces. He



stressed on developing quality systems.

Dr S Christopher in his inaugural address, highlighted the need for innovation and systems with incremental changes towards state-of-the-art technologies in future. The

upgraded Auditorium of ADRDE, Ambar Bhawan, the venue of the conference and the New Entrance Gate of ADRDE were inaugurated by Chairman DRDO. Tree plantation was also carried out on the occasion.

WORKSHOP ON QUALITY RELIABILITY & SAFETY FOR NAVAL SYSTEMS & MATERIALS

Directorate of Quality, Reliability and Safety (DQRS), DRDO HQ conducted a workshop on Quality Reliability and Safety for Naval Systems and Materials (NS&M) cluster labs on 16 October 2017. The workshop was hosted by Defence Metallurgical Research Laboratory (DMRL), Hyderabad. The aim of the workshop

was to update the participants with the latest developments in the field of quality, reliability and safety issues related to Indian Navy and DRDO. Dr JS Yadav, Sc ‘G’, DMRL, and coordinator of the workshop welcomed the participants. The inaugural address was delivered by Dr Vikas Kumar, OS and Director, DMRL. He shared his

views on continuous evolution of the philosophy of Quality Management in DRDO. Commodore Shri S Nandula, Director, QR&S, DRDO HQ, highlighted the initiatives taken by DQR&S. There were seven lectures in the workshop by eminent speakers including open discussion at the end. The highlight of the workshop was a lecture on “ZED Defence



and QCI Role and Responsibility” by Dr Ramanand Shukla, Director, ZED, Quality Council of India, New Delhi. He explained the concept of ZED (Zero Defect—Zero Effect) underlining

the need to manufacture goods in the country with zero defects and to ensure that the goods have zero effect on the environment. Sixty senior scientists from DMRL, DMSRDE, DLJ, NSTL,

NMRL, NPOL, RCMA (Materials), DRDL, DG (NS&M), DG (M&SS) and DQR&S participated in the workshop.



COURSE ON FINANCE & MATERIAL MANAGEMENT

A five-day training programme covering various areas of Material and Finance Management was conducted in TTC, Bengaluru, by Directorate of Finance and Material Management (DFMM),

DRDO HQ, for the local DRDO labs and to enhance their knowledge spectrum in the area of finance and material management.

Dr AK Bhateja, OS and Director, DFMM, inaugurated the programme and

gave keynote address on the importance of Material Management and Finance in DRDO. Thirty participants were trained about the key areas of material and finance management covering the latest updates on the subject.





COURSE ON SOFT SKILLS FOR LIS PROFESSIONALS

Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, organised a three-days CEP on Soft Skills for Library and Information Science (LIS) Professionals during 9-11 October 2017. Smt Sumati Sharma, Sc 'F', Course Director, explained the objective of the CEP.

Dr Alka Suri, Director, DESIDOC, inaugurated the CEP and elucidated the importance of the need-based courses. Dr HK Kaul, Director, DELNET, delivered the keynote address. Dr Rajeev Vij, Sc 'G' and Course Coordinator, asked participants to be more interactive with the faculty.

Topics covered during the course included: Interpersonal skills, team work, motivation, communication skills, problem solving skills, etc.

The course comprised lectures, demonstrations and hands-on training. Twenty-five participants from different DRDO labs/estts attended the course.



NATIONAL CONFERENCE ON SEABUCKTHORN

To boost the development of Seabuckthorn in Ladakh, DIHAR in collaboration with LAHDC, Leh and Seabuckthorn Association of India organised a National Conference on 'Seabuckthorn for Improving Health and Sustainable Development of Himalayan Region' during 22-24 September 2017 at DIHAR, Leh.

Delegates from various premier institutes across the country updated the participants about the new initiatives being undertaken for sustainable development of Seabuckthorn in the Himalayan region.

Shri Tsering Wangdus, Hon'ble EC (Ag), LAHDC, and Shri Nawang Rigzin Jora, Hon'ble MLA, Leh, praised DIHAR for commendable work in developing Seabuckthorn as a premier resource of Ladakh and emphasized on the immense scope to cash upon



Seabuckthorn to help its natives develop in a sustainable way. Dr OP Chaurasia, Director, DIHAR, assured DIHAR's

commitment to evolve technologies for the overall development of the Ladakh region.



TRAINING ON CAMOUFLAGE FOR E-CAM-47

Training on Camouflage for E-CAM-47 course for Service Officers was organised during 3-6 October 2017 at Defence Laboratory, Jodhpur. The course was attended by 20 officers from Army, Navy and Air Force. Ms Anjali Bhatia, Officiating Director, DLJ, inaugurated the course. Lectures covering various aspects of camouflage were delivered during the Course. Practical training on Sigma Mk II software was also given to the participants. Visits to various Divisions of the laboratory were organised including field visits to Data Processing Centre (DPC), CHAFF Production Facility and Near Field Diagnostic Radar



Cross-section Measurement Facility (NFDRF) at Air Force Station, Jodhpur, were arranged. Shri NK Agarwal,

Sc 'G', was the Course Director and Shri RK Khatri, Sc 'E', was the Course Coordinator.

COURSE ON ROLE OF TECHNICAL SUPPORT SERVICE IN TEST RANGE

A CEP course on "Role of Technical Support Service in Test Range" was organized at ITR, Chandipur during 23-27 October 2017. Dr BK Das, Outstanding Scientist and Director, ITR, inaugurated the course.

The course was aimed to give the participants an overall and detailed overview of the role of technical support

service in the Range and update the knowledge on the latest developments in this area. Technical Support Service in the Test Range during Pre-Mission, Mission and Post-Mission activities were explained to the participants.

Various topics like Ground Safety, Flight Safety, Fire Fighting, Logistic Support, Communication,

etc., were covered during the course. Distinguished faculty and experts delivered the lectures. Twenty-eight participants attended the course. Twenty apprentices were also trained during the programme. The course was organised by Shri CR Ojha, Sc 'F', and Shri Santosh Munda, Sc 'D'.





COURSE ON MIXED SIGNAL ASIC DESIGN

Naval Physical and Oceanographic Laboratory (NPOL), Kochi, conducted a three-day course under the Continuing Education Programme (CEP) on “Mixed Signal ASIC Design,” during 11-13 October 2017 to update the knowledge of the participants on the trends, technologies and tools in the domain of signal design. Shri S Kedarnath Shenoy, OS and Director,

NPOL, inaugurated the course. It was followed by a keynote address on “A Practical Approach to migration from FPGA-based design to ASIC” by Shri Krishnakumar Rao, Deputy Director, CDAC, Thiruvananthapuram.

The topics covered in the course included: Mixed Signal IC Design, Miniaturization of Product Design, ASIC for Sonar Front End System, Digital ASIC Design, Analogue Design, Data

Converters, SIC/ADC Design, Tools for ASIC Design and Demo of EDA Tools. The faculty consisted of scientists from NPOL, ANURAG, Hyderabad, C-DAC and renowned companies, viz., Cadence and Mistral Solutions, Bengaluru.

Smt M Hema, Sc ‘G’ and Shri Abi K Krishnan, Sc ‘E’, were the Course Director and Deputy Course Director, respectively.



COURSE ON CARBIDES & NITRIDES

Solid State Physics Laboratory, Delhi conducted a CEP on “Carbides & Nitrides: Growth and Devices” during 9-13 October 2017. The aim of the course was to enlighten the participants about futuristic Power

semiconductor materials and Devices. Dr Vikram Kumar delivered the keynote address on An Overview of HEMT Device Physics. Thirty participants from different labs/estts/Dtes attended the course. The subject experts were invited

from IITs, DRDO labs, CSIR labs, and Universities to deliver the talks. Dr Sushil Kumar Singh, Sc ‘E’, and Dr Rupesh Kumar Chaubey, ‘Sc E’, were the Course Coordinators.



AS9100D AWARENESS & INTERNAL AUDITOR TRAINING PROGRAMME

Research Centre Imarat (RCI), Hyderabad, organised a training programme on AS9100D Awareness and Internal Auditor Training Programme during 1-2 November 2017. Shri MVYS Ravi Kumar, Sc 'G', Director, R&QA, inaugurated the programme.

Shri KVBV Rayudu, Sc 'F', gave broad overview of AS9100D. Twenty participants attended the course. The training programme covered important aspects of AS9100D, Quality Management System, Documentation and Internal Auditor Requirements.



SOCIAL ACTIVITY

SWACHHTA HI SEVA

CAS, Hyderabad

Centre for Advanced Systems (CAS) conducted "Swachhata Hi Seva" Pakhwada with zeal and enthusiasm. To provide effective messaging of the significance of the campaign, banners were displayed in the Centre. To further elucidate the campaign, an oath taking ceremony was organised on 26 September 2017.

Dr V Venkateswara Rao, OS and Director, CAS, administered the oath. Dr MRM Babu, OS and PD, Agni, and Cmde Veerander Kumar, DDG, SSQAG, were present on the occasion. The staff of CAS was sensitised about the importance of cleanliness. Cleaning of offices and open areas, arrangement of items and sorting of waste into blue and green waste bins were meticulously carried out. The campaign culminated on 2 October 2017 by paying homage to father of the nation and rededicating CASians to Rashtra Nirman.

NMRL, Ambernath

Naval Materials Research Laboratory (NMRL), Ambernath, celebrated 'Swachhata Hi Seva' Pakhwada with full zeal from 15 September 2017 to 2 October 2017. Dr M Patri, Director, NMRL, stressed on the pivotal role to

be played in the Swachhata Mission and reiterated that Swachhata has to become our Swabhav. He also pointed out that one has to take lead in preserving and maintaining cleanliness. This spirit was highlighted throughout the celebration of the Pakhwada. Oration, slogan writing, lecture on 'Plastic Waste' were organised during the Pakhwada.





SECRETARY DDR&D INAUGURATES TECHNICAL PLANNING & MANAGEMENT CENTRE AT ASL

Dr S Christopher, Chairman DRDO, and Secretary Department of Defence R&D, inaugurated Technical Planning and Management Centre at Advanced

Systems Laboratory (ASL), Hyderabad, on 21 October 2017. The centre comprises Technical Information Centre, Seminar Hall and an Exposition Hall. Dr G Satheesh

Reddy, SA to RM and DG (MSS), Dr Tessy Thomas, DS and Director, ASL, and Dr K Radhakrishna, CCE (R&D), South, were present on the occasion.



DR CHRISTOPHER INAUGURATES UNMANNED AERIAL VEHICLES LAB

Dr S Christopher, Chairman, DRDO and Secretary Department of Defence R&D inaugurated Unmanned Aerial Vehicles (UAVs) Laboratory developed by the Department of Aerospace Engineering (DAE), DIAT, Pune, on 22 October 2017. Dr Surendra Pal, Vice Chancellor, DIAT, Dr Hina Gokhale, DG (HR), DRDO, Dean (T), Registrar and faculty members of the DAE were present on the occasion.

Dr Christopher also inaugurated stilt accommodation at POINTS Hostel and laid foundation stone for DIAT Girls Hostel.





APPOINTMENT



Dr Alka Suri, Sc 'G', has joined as Director, Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, on 5 October 2017.

Dr Suri obtained BE (Hons) in Electrical and Electronics Engineering from BITS, Pilani, MTech in Radar and Communication Engineering from IIT Delhi and PhD in Strategic Management from AMU, Aligarh. She has vast experience of scientific, administrative and managerial projects and programmes. She is the recipient of DRDO's Technology Group Award in 2003 and Best Techno-Managerial Services/Popular Science Award in 2011. She is a life member of AAIMA, IETE, and Women in Science and Engineering.

AWARDS

DG (LS), Delhi

Dr KP Mishra, Sc 'E', Office of the DG (LS), DRDO HQ, has been awarded Prof. BK Aikat Oration Award for 2014 for his outstanding contributions in the area of tropical diseases. The award was presented by Smt Anupriya Patel, Hon'ble Minister

of State for Health and Family Welfare in ICMR Annual Award Ceremony on 11 October 2017.

DMRL, Hyderabad



Dr AK Mukhopadhyay, OS and Associate Director, has been awarded Technological Excellence Award for his initiatives in developing aluminium alloys for critical defence applications by the Indian Non-ferrous Industries.



Shri Umashanker Gupta, Sc 'D', was awarded 'Young Engineer of the Year Award-2017' on 5 September 2017 by Institution of Engineers, Telangana State Centre.

ISSA, Delhi



Shri S Chandramouli, Sc 'G', Institute for Systems Studies and Analyses (ISSA), Delhi, has been awarded GOC-in-C, ARTRAC Commendation.

Higher Qualification Acquired

DMRL, Hyderabad



Shri Jalaj Kumar, Sc 'E', has been awarded PhD in Metallurgical and Materials Engineering from the Indian Institute of Technology, Madras, Chennai for the thesis entitled "Analysis Modelling and Simulation of Ambient Creep-Fatigue Phenomenon in Ti-6AL-4V Alloy."

ISSA, Delhi



Shri Sumant Mukherjee, Sc 'G', Institute for Systems Studies and Analyses (ISSA), Delhi, has been awarded PhD by IIT Delhi for the thesis entitled "Collaborative Urban Sensing: Bio-inspired Approach."

ISO 9001:2015 Certification to DLRL

Defence Electronics Research Laboratory (DLRL), Hyderabad, has been re-certified new Management System Standards of ISO 9001:2015 by

the Certification body M/s DNV - GL Business Assurance, Hyderabad, with effective from 2 September 2017 for three years.



READERS' FEEDBACK

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

Please send your suggestions to:

The Editor, DRDO Newsletter
DESIDOC, Ministry of Defence
Metcalf House, Delhi-110054



hindustantimes

Fri, 03 Nov, 2017
(Online)

IAF, DRDO successfully test indigenous 'glide' bomb, to be inducted soon

The guided bomb is developed by the Research Centre Imarat, Defence Research and Development Organisation, along with other laboratories of the DRDO and the Indian Air Force.

The government said on Friday that an indigenously developed light weight 'Glide' bomb has been successfully tested in Chandipur in Odisha, marking a major milestone in developing such weapons.

The bomb -- SAAW (Smart Anti Airfield Weapon) -- was dropped from an Indian Air Force aircraft at the Integrated Test Range (ITR) in Chandipur on Thursday.

"The guided bomb released from the aircraft and guided through precision navigation system, reached the targets at greater than 70 km range, with high accuracies," the defence ministry said in a statement.

It said a total of three tests with "different release conditions" and ranges were conducted and were all successful.

दैनिक जागरण

Mon, 06 Nov, 2017

परीक्षण के लिए तैयार निर्भय मिसाइल

नई दिल्ली, आइएनएस : भारत की डिफेंस इंस्टीट्यूट फिजियोलॉजी एंड घातक सबसॉनिक क्रूज मिसाइल 'निर्भय' एलायड साइंसेज की ओर से आयोजित अपने पांचवें ट्रायल के लिए तैयार है। फिफ्साफीजोर्कॉन-2017 को संबोधित डीआरडीओ के प्रमुख एस. क्रिस्टोफर करते हुए रविवार को डीआरडीओ प्रमुख ने बताया कि पिछली बार दिसंबर 2016 क्रिस्टोफर ने कहा कि जिन खामियों में इस मिसाइल का परीक्षण विफल रह की वजह से दिसंबर, 2016 का ट्रायल था। अब अगले हफ्ते इस मिसाइल का विफल हुआ था उन्हें दूर कर लिया गया परीक्षण संभावित है। समझा जाता है कि यह मिसाइल भारत-रूस तत्वावाधान में बनी सुपरसॉनिक मिसाइल के विकल्प के तौर पर विकसित किया जाएगा।

Defence Research and
Indian Air Force.

THE NEW
INDIAN EXPRESS

Thu, 02 Nov, 2017
(Online)

DRDO to develop module for reducing stress in armed forces

By Hemant Kumar Rout

Bhubaneswar: The Defence Research and Development Organisation (DRDO) is working on a model to monitor and reduce stress and depression that are largely affecting the armed forces deployed at very high and extreme conditions. The Defence Institute of High Altitude Research (DIHAR) is developing a module-based modules that include indoor farming which would not only help to enhance agro productivity but also relieve stress among defence personnel.

"We have started researching on certain innovative interventions that will provide us inputs on the mood and performance of armed forces in remote locations. Basically, we want to see the effect of indoor farming on the mood of soldiers in isolated posts. If the module works, it will be a great achievement for stress management," said a scientist involved in the project.

DIHAR is a research wing of DRDO, which aims at evolving novel inputs, with focused R&D in cold storage and agro-animal technologies for enhancing agro-animal productivity and availability of fresh foods for troops in high altitude, the most difficult terrain of the world.

The defence personnel are exposed to various kinds of stress due to their unique nature of duties and conditions for which they are trained to stand away from family for long periods being in the theatre area.

THE NEW
INDIAN EXPRESS

Sat, 04 Nov, 2017
(Online)

Retd scientists from DRDO, ISRO to mentor VTU pupils

By Rashmi Belur

Bengaluru: Retired scientists and engineers from ISRO and DRDO will now mentor students and the teaching faculty of Visvesvaraya Technological University (VTU), Belagavi. The Bengaluru chapter of National Academy of Engineering (NAE) has offered its services to VTU and two rounds of meetings have been held in this regard.

Dr V K Atre, chairman of NAE's Bengaluru chapter said, "We will offer our expertise and mentor VTU students get exposure beyond their curriculum and in a month." Atre has served as head of Defence experts will help teachers in writing research each programmes. We will also provide service to added.

They are already taking help of NAE experts to the mentoring project will cover only Bengaluru engineering colleges in Bengaluru and as 50 per cent of we will be starting the mentoring programme with



Sun, 05 Nov, 2017
(Online)

Inauguration of Three-Day International Conference - 'FIPSPHYCIOCON 2017'

"FIPSPHYCIOCON 2017", Conference on Human Physiology - VII Congress of Federation of Indian Physiological Societies (FIPS) along with XXIX Annual Conference of the Physiological Society of India (PSI) organised by Defence Institute of Physiology and Allied Science (DIPAS) of DRDO was inaugurated at Vallabhbhai Patel Chest Institute (VPCT), University of Delhi today.

The objective of the conference is to update the scientific community about most recent advances in human Physiology in extreme environments, Neuroscience, Yoga, Sport Physiology and translational research. Speaking on the occasion, Chairman DRDO and Secretary, Department of Defence Research & Development Dr S Christopher emphasised on the importance of quality research and its application for tangible products and solutions to major problems. He highlighted the importance of Yoga and other approaches to improve human capabilities in difficult environmental conditions and terrains. In this context he urged the entire scientific community to utilise the facilities like highest altitude research station created by DRDO at Changla (17,660 ft), Ladakh in Jammu and Kashmir.



DRDO HARNESSING SCIENCE FOR PEACE AND SECURITY- XXII

CHAPTER 2: TRANSFORMATION—DEFENCE RESEARCH AND DEVELOPMENT ORGANISATION (1958-1969)

The article is 22nd 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).

CONSOLIDATION

Human Resources Management

The human resource at the time of incorporation of the DRDO was a motley crowd with diversity in the recruitment procedures, service conditions, training, promotional opportunities and advancement.

Service Officers

There were two main streams namely, the personnel from the Armed Forces and the civilian stream consisting of scientists/technologists, scientific/technical assistants, skilled workers and personnel for manning administration. Of the three Services, most of the personnel were from the Indian Army who had come into the DRDO through the TDEs. At the time the DRDO was formed, the value of these Service personnel to the Organisation was in their familiarity and knowledge about the usage of current military equipment and about the immediate future requirements of the Armed Forces. In addition, there were specialists from the Armed Forces in aeronautics, explosives and medicine whose expertise was valuable for initiating R&D activities in these areas. The bulk of the Service personnel were Commissioned Officers who moved into the equipment-oriented laboratories either as heads of the laboratories or as heads of divisions with the civilian technologists at lower levels. At the time of formation of DRDO, they were on deputation and since their services were required, those who wanted to continue had their deputation period

extended. By 1964, it was decided to have a complement of Service officers permanently seconded to DRDO and they were permitted to retain the service conditions and ranks of the military instead of being absorbed into the DSS. The induction of Service Officers into the DRDO on a permanent basis was also finalised. It required these officers to come on tenure in the first instance and on completion of tenure go back to their parent Service. It is only after completing at least one posting after their return to the parent Service that these officers were eligible for consideration of permanent absorption by the DRDO. Since it was envisaged that Service Officers would be needed for a long enough period into the future, a cadre of permanent Service Officers Cadre was created with adequate career advancement opportunities to attract the brighter and younger officers from the three services. The number of posts for the cadre was approximately 20 per cent of the total number of Class I Gazetted Officers sanctioned for DRDO with a disproportionate number of posts being at levels higher than Principal Scientific Officer [Scientist D]. Thus, within the DRDO, for similar responsibilities and work there would be two types of service conditions.

The DSS Cadre

The civilian qualified scientists and engineers of the newly formed DRDO were already part of the Defence Science Service (DSS) which had been constituted in 1953. The DSS contained both Class I and Class II Gazetted Officers posts and a permanent strength of 342 posts. These covered all "appointments in various establishments under the Ministry of Defence connected with scientific research and development or teaching"⁴⁰. Thus, when the DRDO was

formed in 1958, the personnel of the DSS were now distributed into the DRDO, the organisation of the Director General of Inspection (DGI) and the teaching institutions of the Services not directly under the DRDO. Mobility in and out of the DRDO for the DSS cadre had to be provided. As each new laboratory was set up, on promotion, civilian scientists belonging to the DSS cadre and working in organizations other than DRDO could move into it just as it would be in Indian Administrative Service or in any other similar Service. Unfortunately, as the specific skills needed in R&D are highly differentiated, the experience of those who had been serving the Inspection organization or in teaching devoid of research component was not necessarily useful in the higher job positions within DRDO where guiding, directing and managing R&D activities was paramount.

After 1958, posts higher than the Deputy Chief Scientific Officer (DCSO) were added to the DSS cadre and it was designated as Class I service so that talented scientists and technologists could be attracted to DRDO. These additional posts were aimed at getting scientists and engineers of eminence to head the laboratories, LRDE, DMRL, ADE, ARDE, and DRL (stores), DSL & Weapons Evaluation Group (later became DRDL). However, till 1970s, four out of the seven higher posts were occupied by the Service Officers. By 1965, the strength of the DSS was about 1200 mainly because as each new laboratory was formed, a Peace Establishment (PE) was sanctioned for manning it. The component of civilian scientists were made part of the DSS cadre.

When the DSS cadre rules were promulgated in 1953, it was brought under the purview of the Union Public Service Commission (UPSC) for direct



recruitment and for departmental promotions of the civilian scientists and technologists. As the UPSC was the agency that was charged with the recruitment for all Class I services of the government of India, it had a very busy schedule and asked the government departments to supply the necessary information several months in advance for scheduling the examinations and interviews for selection. The agency had its hand full with recruitment drives for such major All India Services as IAS, IPS, ITS and accommodated relatively smaller cadres such as DSS in the lull periods between their major recruitment activities. The result was a time delay of several months between the declaration of vacancies by the laboratories and the holding of the interviews by UPSC. Several more months would expire before appointment orders would reach the selected candidates as each of them had to be subjected to security clearance by the police of the state in which the candidate is resident. In 1965, there were as many as 400 posts vacant out of a total of 1200 posts in the DSS cadre. In such rapidly expanding fields as electronics, solid state physics, aerospace, several organizations within the Government as well as private sector were competing for the services of the same set of personnel and the time delay in the DRDO resulted in more than half of the selected candidates finding employment elsewhere.

The serrated pyramid (SP) system based on the fact that skills gained in the process of R&D are highly differentiated and specific science/ technological skills in one field (microwave engineering) are not of much use in many others (automobile engineering), was introduced around 1962 for departmental promotions. Each scientist belonging to the DSS was allotted a specific science or technology field such as physics, chemistry, electronics and so on depending on his qualifications and experience and his promotion to higher posts would be in the same pyramid. It created greater disparity in promotional chances of civilian scientists belonging to different science and technology streams. The disparity arose because in fast growing technology sectors such as electronics and aerospace, scientists jumped ahead of their counterparts with SP subjects such as chemistry, mathematics and life sciences. Within

two years of the adoption of the SP system, DRDO set up a Committee of Directors to re-examine the question of SP subjects in all its aspects. The Committee's main recommendation was to rationalize the promotion policy of the DSS by proposing a unified salary scale from Junior Scientific Officer to Principal, Scientific Officer with time scale promotions and with provision for accelerated promotion for really talented scientists up to the level of Principal Scientific Officer. However, the recommendations were turned down by the Ministries of Defence and of Finance on the grounds that there might be repercussions on other S&T organizations.

The concept of Peace Establishment for each of the DRDO laboratories was adopted from the military services where during long periods of peace a small standing army was maintained. During the periods of conflict or war which would always be short compared to the periods of peace, the small standing army could be expanded several folds as was done during World War II for the Indian Armed Forces. In the case of DRDO, it meant that each laboratory be staffed with a small complement of personnel who have permanent service and form the core. When major projects were undertaken, additional manpower had to be added for the duration of the projects. There were two disadvantages. First, it discouraged many talented scientists and engineers to join DRDO and prefer other S&T organizations such as the Departments of Atomic Energy and Space where permanent positions were available. Second, in most cases as the duration of major projects was of the order of seven to ten years, the additional manpower hired for the projects could not be laid off. The laboratories were required to go through another round of paper work to continue them on another set of projects until they were made permanent and absorbed. The concept borrowed from the Armed Forces of the peace establishment had to be given up in the 1980's. The handicap of being part of the government set up is very much evident in the delays and denials experienced by the DRDO in many of the new processes essential for building an innovative environment. In the eyes of qualified scientists and engineers, the personnel policies of DRDO appeared

to be static, rigid and less enlightened in comparison to those of the Departments of Atomic Energy and of Space.

The Non-Gazetted Cadre

The DRDO inherited two streams of technical assistants, the Foreman downwards from the erstwhile TDEs and the Senior Scientific Assistants downwards from the Defence Science Organisation. These two streams could not be merged at the time of formation of DRDO because the qualifications, the pay scales and the conditions for departmental promotions were not the same. In the newly formed institutions which were called establishments (for example CVRDE, VRDE) the Foreman stream was introduced while in those institutions which were called laboratories (for example, DLRL, SPL), the non-gazetted technical stream was mostly formed of Scientific Assistants. There was no transfer of posts or personnel between the two streams and even in each stream, movement of personnel from one laboratory to another was possible only with mutual consent of the two heads of the establishments/laboratories. Since there was no centralised recruitment, each head of the laboratory/ establishment was authorised to advertise, recruit and appoint the non-gazetted personnel. In the early years of the DRDO, across the science/technical disciplines and depending on the location of the laboratory/establishment there were variations in the procedures and qualifications of the personnel who were recruited. Hence, a common procedure was evolved in 1968, which laid down the qualifications for direct recruitment, eligibility for promotion and the procedure for recruitment.⁴² While this was an attempt to streamline the method and qualifications for the recruitment and promotion of the NGO cadre in the organisation, it did not fully address the problems faced by personnel wanting to move from one laboratory to another or the inter se seniority at the time of promotion in both streams to the Junior Scientific Officer post.

To be continued...



Nobel Laureate Prof. PMS Blackett (left), who made a study on Indian Defence requirement with Prof. DS Kothari, the first Scientific Advisor to the Ministry of Defence



Prof. DS Kothari with Pt Jawahar Lal Nehru and Shri VK Krishna Menon