

DRDO TRANSFERS 18 TECHNOLOGIES IN DEFENCE-INDUSTRY DEVELOPMENT MEET



CONTENTS

MARCH 2018
VOLUME 38 | ISSUE 3
ISSN: 0971-4391

COVER STORY

04

DRDO transfers 18 Technologies in Defence-Industry Development Meet



TOT

05 SOCIETAL ACTIVITIES 12



FOCUS 13

HRD ACTIVITIES 17

SPORTS ROUNDS UP 19

VISITS 20

DRDO SERIES 21

DRDO IN PRESS 23

DOWN THE MEMORY LANE 24

EVENTS

08

Editor-in-Chief: Dr Alka Suri
Senior Editor: B Nityanand; Editor: Manoj Kumar
Editorial Assistance: Biak Tangpua; Naresh
Multimedia: RK Bhatnagar
Printing: SK Gupta, Hans Kumar; Distribution: Tapes Sinha, RP Singh
For feedback, please contact: director@desidoc.drdo.in
Tel: 011-23902403; 23902474; Fax: 011-23819151

LOCAL CORRESPONDENTS

Ahmednagar: Lt Col. AK Singh, Vehicles Research & Development Establishment (VRDE); **Ambarnath:** Dr Susan Titus, Naval Materials Research Laboratory (NMRL); **Balasore/Chandipur:** Shri Santosh Munda, Integrated Test Range (ITR); Dr AK Sannigrahi, Proof & Experimental Establishment (PXE); **Bengaluru:** Shri Subbukutti S, Aeronautical Development Establishment (ADE); Smt MR Bhuvanewari, Centre for Airborne Systems (CABS); Smt Faeema AGJ, Centre for Artificial Intelligence & Robotics (CAIR); Ms Tripty Rani Bose, Centre for Military Airworthiness & Certification (CEMLAC); Smt Josephine Nirmala M, Defence Avionics Research Establishment (DARE); Shri Kiran G, Gas Turbine Research Establishment (GTRE); Shri KM Veerabhadra, Electronics & Radar Development Establishment (LRDE); Dr Vishal Kesari, Microwave Tube Research & Development Centre (MTRDC); **Chandigarh:** Dr HS Gusain, Snow & Avalanche Study Establishment (SASE); Shri Ashok Kumar Dahiya, Terminal Ballistics Research Laboratory (TBRL); **Chennai:** Shri PD Jayaram, Combat Vehicles Research & Development Establishment (CVRDE); **Dehradun:** Shri Abhai Mishra, Defence Electronics Applications Laboratory (DEAL); Shri JP Singh, Instruments Research & Development Establishment (IRDE); **Delhi:** Shri Ashutosh Bhatnagar, Centre for Personnel Talent Management (CEPTAM); Dr Rajendra Singh, Centre for Fire, Explosive & Environment Safety (CFEES); Dr Dipti Prasad, Defence Institute of Physiology & Allied Sciences (DIPAS); Dr Dolly Bansal, Defence Institute of Psychological Research (DIPR); Shri Navin Soni, Institute of Nuclear Medicine and Allied Sciences (INMAS); Shri Anurag Pathak, Institute for Systems Studies & Analyses (ISSA); Dr Indu Gupta, Laser Science & Technology Centre (LASTEC); Ms Noopur Shrotriya, Scientific Analysis Group (SAG); Dr Rupesh Kumar Chaubey, Solid State Physics Laboratory (SSPL); **Gwalior:** Shri RK Srivastava, Defence R&D Establishment (DRDE); **Haldwani:** Dr Atul Grover, Defence Institute of Bio-Energy Research (DIBER); **Hyderabad:** Shri Hemant Kumar, Advanced Systems Laboratory (ASL); Shri Pramod K Jha, Centre for Advanced Systems (CAS); Dr JK Rai, Advanced Numerical Research & Analysis Group (ANURAG); Shri JP Singh, Centre for High Energy Systems & Sciences (CHESS); Shri ARC Murthy, Defence Electronics Research Laboratory (DLRL); Dr Manoj Kumar Jain, Defence Metallurgical Research Laboratory (DMRL); Dr K Nageswara Rao, Defence Research & Development Laboratory (DRDL); Shri N Venkatesh, Research Centre Imarat (RCI); **Jagdalpur:** Dr Gaurav Agnihotri, SF Complex (SFC); **Jodhpur:** Shri Ravindra Kumar, Defence Laboratory (DL); **Kanpur:** Shri AK Singh, Defence Materials & Stores Research & Development Establishment (DMSRDE); **Kochi:** Shri S Radhakrishnan, Naval Physical & Oceanographic Laboratory (NPOL); **Leh:** Dr Dorjey Angchok, Defence Institute of High Altitude Research (DIHAR); **Mussoorie:** Dr Gopa B Choudhury, Institute of Technology Management (ITM); **Mysuru:** Dr M Palmurugan and Shri NV Nagraj, Defence Food Research Laboratory (DFRL); **Pune:** Dr (Mrs) JA Kanetkar, Armament Research and Development Establishment (ARDE); Dr Vijay Pattar, Defence Institute of Advanced Technology (DIAT); Shri AM Devale, High Energy Materials Research Laboratory (HEMRL); Shri SS Arole, Research & Development Establishment (Engrs) [R&DE (E)]; **Tezpur:** Dr Jayshree Das, Defence Research Laboratory (DRL); **Visakhapatnam:** Dr (Mrs) V Vijaya Sudha, Naval Science & Technological Laboratory (NSTL)



FROM THE DESK OF THE CHAIRMAN



Dr S Christopher

CHAIRMAN

Defence Research & Development Organisation

&

SECRETARY

Department of Defence Research & Development

Dear Friends,

It gives me immense joy and pride when the country applauds the achievements of DRDO time and again. It shows the growing faith, immense confidence and hope, DRDO has garnered in taking the country ahead in research and development of Defence needs. I get sparkles in my eyes visualizing my team achieving higher feats with each passing moment. Display of equipment bearing the stamp of brand DRDO in the Republic Day Parade 2018, witnessed by the Heads of the 10 ASEAN nations, was awe-inspiring.

‘Army Technology Seminar’ held at Manekshaw Centre in January 2018, gave a glimpse of what DRDO has to offer in time to come for our defence forces. ‘Vendor Development Meet’ at Chennai boosted the confidence of our industry in DRDO products as part of ‘Make in India’ initiative of the government. Trials of ‘Agni-V’ and ‘Rustom-2’ made big headlines in national and international media. The steady success by our scientists shows our determination to accomplish bigger things in future and prove to the international community that we are very serious in our R&D efforts.

Friends, you are the strong pillars of this great organisation. It’s our collective responsibility to keep the momentum going. I beseech all of you to keep observing the latest trends in S&T the world over and keep on working untiringly for making a strong nation. So fix the aim and achieve the target you have set for yourself. The invincible aim, sooner or later will lead you to victory. The bright future awaits us.

Jai Hind.

DRDO TRANSFERS 18 TECHNOLOGIES IN DEFENCE-INDUSTRY DEVELOPMENT MEET



Hon'ble Raksha Mantri Smt Nirmala Sitharaman inaugurated a two-day 'Defence Industry Development Meet' organised by the Department of Defence Production, Ministry of Defence, in Chennai on 18 January 2018, to encourage and facilitate participation of private industries especially Micro Small and Medium Enterprises (MSMEs) in Defence manufacturing. Shri Edappadi K Palaniswami, Hon'ble Chief Minister of Tamil Nadu, senior officials from Ministry of Defence, State Government, Services, Chairman OFB, CMDs of DPSUs, senior executives of DPSUs/OFB and private industries were present at the inaugural function.

The objective of the meet was to forge new partnerships with private industry

with the aim of achieving self-reliance in defence production under the 'Make in India' initiative of the Government. The meet focused on indigenization, import substitution and technology infusion.

The defence-industry interface endorsed 18 technology transfers from the DRDO to private enterprises. Many MSMEs were provided technical know how on manufacturing various defence equipment under the "Make in India" programme. In all DRDO transferred technology for manufacturing 35-metre mountain footbridge; technology for making propellant for low thrust motor and high thrust motor of BrahMos; and technology for making advance bullet-proof vest. Apart from that there was a Memorandum of Interest (MOI) between Naval Physical and

Oceanographic Laboratory (NPOL), a premier naval research laboratory of DRDO, and Cochin Shipyard Ltd for manufacturing of indigenous ship based on DRDO technologies.

The event will provide private firms/companies, especially vendors from Tamil Nadu region an overview of the existing defence procurement policy, indigenization and outsourcing procedures of DPSUs/OFB and update them on the recent Government policy initiatives to promote indigenization and outsourcing and the opportunities thereon.

More than 1,000 MSMEs from Chennai, Trichy, Coimbatore, Maharashtra and other places participated in the meet.

CBRN DEFENCE TECHNOLOGIES HANDED OVER TO THE INDIAN ARMY

Chief of the Army Staff General Bipin Rawat inaugurated a workshop and Exhibition on Chemical Biological Radiological Nuclear (CBRN) Defence Technologies on 12 January 2018 at DRDO Bhawan.

Speaking on the occasion General Rawat complimented DRDO and said, “CBRN threat is becoming a reality, particularly from the non-state actors and I am sure that DRDO in its long-term perspective plan in conjunction with integrated perspective plan of the services, has encompassed development of mitigation technologies against such threats.”

The occasion also witnessed the handing over of CBRN Suit Mk-V, CBRN First Aid Kit and Remote Radiation Monitoring and Transmission System (RRMTS) by Dr S Christopher, Chairman, DRDO, and Secretary, Department of Defence

R&D, to General Rawat. CBRN Training Manual, Military Explosives Handling Guidelines, Hiranyagarbha—a trusted network router, and Army Air Defence Deployment Simulator System were also released.

Dr Shashi Bala Singh, Director General, Life Sciences, DRDO, highlighted the contributions of DRDO to the national CBRN Defence Preparedness and Capacity Building and said that more than 68 CBRN products developed by DRDO have already been inducted into the services and 25 more have been realised and ready for induction, made possible due to a large participation of more than 50 industry partners.

The aim of the workshop was to further enhance the level of preparedness and strengthen the partnership among the stakeholders. Besides DRDO, the workshop had participation from the

three Services, Ordnance Factory Board, National Disaster Management Authority, National Disaster Response Force, Ministry of Home Affairs, Central Armed Police Forces, SPG, National Security Guard and several other government/security agencies.

The event provided an opportunity to the stakeholders to interact and understand the requirements of each other and respond in a way to bring coherence in the system for eventually strengthening partnerships and enhance the national preparedness level.

DRDO is working closely with all stakeholders including the Armed Forces and has trained more than 4,000 military and paramilitary personnel towards mitigation of CBRN threats.



DRDO TRANSFERS NAVAL TECHNOLOGIES TO INDUSTRY

DRDO organised a programme to transfer DRDO developed technologies to industry at Naval Science and Technological Laboratory (NSTL), a premier naval systems lab of DRDO at Visakhapatnam, on 16 December 2017. Hon'ble Raksha Mantri (RM) Smt. Nirjala Sitharaman was the Chief Guest of the programme. Dr S. Christopher, Chairman DRDO, and Secretary, Department of Defence R&D handed over the documents related to NSTL developed technologies to heads of industries and Defence Public Sector Undertakings (DPSU), in the presence of RM.

Technology for the Light Weight Torpedo (LWT) was transferred to M/s Bharat Dynamics Limited to facilitate the export order to Myanmar. Technology for technical solutions for Integrated Anti Submarine Warfare (ASW) Defence Suite to M/s Bharat Electronics Limited and M/s L&T Defence; Technical Solutions for Fire Control Systems solution and Torpedo Interface Technologies for ASW Upgrade to M/s L&T Defence; and for Ejection System for GPS Recovery Aid to M/s Avintel Limited was also handed over during the programme.

Complementing the DRDO scientists for the outstanding work in realising

critical defence systems, the Hon'ble RM emphasized the need to showcase the excellent work being done by the DRDO. Exhorting DRDO to help make best systems in India with export potential, she said, "DRDO has a great role to play in realising the 'Make in India' vision of Hon'ble PM, and I am confident that DRDO will rise to the challenge, and transform India into a major exporter of defence systems."

Directors of DRDO labs and DRDO Corporate Headquarters, leaders and representatives of industry, officers and staff of NSTL and other DRDO labs attended the function.



SEE & AADHAAR INTEGRATION ENROLMENT APPLICATION HANDED OVER TO UIDAI

Secure Execution Environment (SEE) and Aadhaar Enrolment Application developed by Centre for Artificial Intelligence and Robotics (CAIR), Bengaluru, was handed over to

Unique Identification Authority of India (UIDAI) for pan-India roll out. The system was formally handed over by Dr S Christopher Chairman, DRDO and Secretary, Department of Defence R&D

to Dr Ajay B Pandey, CEO, UIDAI, at HQ UIDAI on 12 January 2018.

DG (MCC), DG (MED, CoS & CS) and the teams from CAIR and UIDAI were also present on the occasion.



DFRL TRANSFERS TECHNOLOGY OF INSTANT COOKING RICE & WHOLE PULSE

Defence Food Research Laboratory (DFRL), Mysuru, signed License Agreement for Technology Transfer (LAToT) for transfer of instant cooking rice and instant whole pulses and their curries with M/s Goodrich Cereals, Karnal, Haryana. Dr Gopal Kumar Sharma, Officiating Director, DFRL, and Shri Rohit Gupta, Managing Partner, M/s Goodrich Cereals, signed the agreements on 18 January 2018 in the presence of inventors Dr AD Semwal, Sc 'G', Pandit Srihari, TO 'B' and Mr Govinda Raj, TO 'A'. Capt VK Sharma, Vice President,



Projects and Business Development, M/s Goodrich Cereals and Dr M Pal Murugan, Sc 'D', Technology Transfer

Division, DFRL, were also present on the occasion.

INDIGENOUS DEFENCE SYSTEMS SHOWCASED IN REPUBLIC DAY PARADE

DRDO showcased indigenously developed defence systems at the 69th Republic Day parade on 26 January 2018 as it aims towards higher self-reliance in defence manufacturing under the 'Make in India' programme.

The Airborne Early Warning and Control (AEW&C) System fly-past second time this year also. India is only the fourth country to develop such a technology.

The indigenous LCA Tejas, the single-seat, single-jet engine, multi-role fighter indigenously developed by the Aeronautical Development Agency, and produced by Hindustan Aeronautics Limited, was also part of the awesome fly-past of the Indian Air Force.

BrahMos supersonic cruise missile, a joint venture between the DRDO and NPOM of Russia, is capable of being launched from land, sea, sub-sea

and air against surface and sea-based targets. The land attack version of the missile has been operationalised in the Indian Army since 2007. The missile has a range of up to 450 km.

Swathi Weapon Locating Radar -a mobile weapon locating radar developed by the DRDO and Bharat Electronics Limited (BEL), has been handed over to the Indian Army. The counter-battery radar is designed to detect and track incoming artillery and rocket fire to determine the point of origin for counter-battery fire.

Bridge Layer Tank T-72 provides capabilities to negotiate natural and man-made anti-tank obstacles to an advancing tank column. It can lay its bridge instantly and recover the same from the far bank, after the entire tank column has crossed over.

The medium-range mobile surface-to-air missile defence system, Akash

Missile System, has been inducted into the Indian Air Force. This medium-range mobile developed by the DRDO is produced by Bharat Dynamics Limited (BDL) and Bharat Electronics (BEL). The missile system can target aircraft up to 30 km away, at altitudes up to 18,000 meters.

Nirbhay Missile System, indigenously designed and developed by Aeronautical Development Establishment, is a long-range Sub-Sonic Cruise Missile. Nirbhay, has been tested successfully by the DRDO. Powered by a solid rocket motor booster developed by the Advanced Systems Laboratory, the missile has an operational range of 1,000 km. Nirbhay can travel with a turbofan or turbojet engine and is guided by a highly advanced inertial navigation system indigenously developed by the Research Centre Imarat (RCI), Hyderabad.





RAISING DAY CELEBRATIONS

CABS, BENGALURU

Centre for Airborne Systems (CABS), Bengaluru, celebrated its Raising Day on 3 February 2018. Chairman DRDO graced the occasion as Chief Guest along with DG Aero, DRDO. As part of the Raising Day celebrations, DRDO laboratory-level Awards were presented to the meritorious employees.

CAIR, BENGALURU

Centre for Artificial Intelligence and Robotics (CAIR), Bengaluru, celebrated its Lab Raising Day and Karnataka Rajyotsava on 22 December 2017. Dr G Athithan, DS and DG (MED, CoS and CS), DRDO HQ, was the Chief Guest on the occasion and Shri NP Ramasubba Rao, Ex Director, Electronics and Radar Development Establishment (LRDE), Bengaluru, was the Chief Guest for Karnataka Rajyostava. Smt Manimozhi Theodore, Director, CAIR, in her welcome address, highlighted various achievements and future programmes of CAIR. Laboratory-level DRDO Awards were distributed to the meritorious employees by the Chief Guest. The session concluded with a vote of thanks by Dr Subrata Rakshit, Sc 'H'. An Exhibition showcasing CAIR technologies was organised to mark the occasion.

DARE, BENGALURU

Defence Avionics Research Establishment (DARE), Bengaluru, celebrated its Raising Day on 24 December 2017. Dr S Christopher, Chairman, DRDO, and Secretary, Department of Defence R&D was the Chief Guest and Ms J Manjula, DS and DG (ECS) was the Guest of Honour. DG (Aero), Directors from MTRDC and GTRE, CE-CEMILAC, EMO, and other distinguished guests also graced the occasion. Director DARE in his address touched upon various technical, managerial and administration milestones achieved in the year 2017.





Ms Manjula, emphasized on indigenous development and congratulated the officers and staff of DARE for their commending contributions in spite of limited manpower.

Dr S Christopher, in his address, shared the success story of induction of AEW&C system. He also distributed laboratory-level DRDO Awards to the meritorious employees.

DLRL, HYDERABAD

Defence Electronics Research Laboratory (DLRL), Hyderabad, celebrated its 56th Annual Day on 10 December 2017 amidst great zest and elation. Dr S Christopher, Chairman, DRDO, and Secretary, DDR&D, was the Chief Guest. Dr CP Ramanarayanan, DS and DG (AERO) and Ms J Manjula, DS and DG (ECS), were the Guest of Honour of the inaugural function. Directors and the senior officials of Hyderabad-based DRDO laboratories, former DG, CC R&D, and Directors were also present on the occasion. Shri N Srinivas Rao, OS, welcomed the august gathering. The Chairman and the Vice Chairman, Works Committee, reported the activities carried out by the Works Committee of the DLRL. Presidents of CEU and Karmik Sangh also addressed the gathering. Dr AK Singh, OS and Director, DLRL, highlighted the achievements of DLRL during the past year and motivated the scientists to work hard and take DLRL to the new heights.

Dr S Christopher, in his address, congratulated DLRLians for pioneering work in the field of electronics and for delivering EW systems for diverse range of platforms. He also appreciated DLRL's contribution to AEW&C system programme.

Ms J Manjula, in her address, outlined the growth story of DLRL and the challenges faced for induction of major Integrated EW systems. Dr CP Ramnarayan, appreciated the efforts of DLRL in developing state-of-the-art EW system for airborne platforms.

Dr S Christopher, distributed the laboratory-level DRDO Awards to the meritorious employees. Mementos



to the employees who completed 25 years of services and Merit-cum-Means Scholarships to employee's children were given away by the DG (Aero) and the DG (ECS), respectively. A classical dance on 'Brahmanjali' and a colourful fancy dress show by children of employees were the highlight of the function.

LRDE, BENGALURU

Electronics and Radar Development Establishment (LRDE), Bengaluru, celebrated its Laboratory Raising Day and DRDO Day on 1 January 2018 with great enthusiasm.

Shri SS Nagaraj, Director, LRDE,

presided over the function and unveiled LRDE Logo commemorating its 60 Anniversary. He presented laboratory-level DRDO Awards, DRDO Cash Awards to the employees and presented Educational Awards to the meritorious students.

NMRL AMBERNATH

Naval Materials Research Laboratory (NMRL), Ambernath, celebrated its 65th Raising Day with great zeal and fervour on 5 January 2018. Dr M Patri, Director, NMRL, in his welcome address, highlighted the overall growth and achievements of the





laboratory. Dr R Krishnan, the Chief Guest, Dr PC Deb, Dr J Narayana Das and Dr RS Hastak elucidated about futuristic research in the naval science and motivated the NMRL fraternity to achieve greater heights in their mission to provide latest technological solutions to the Defence forces.

The Chief Guest presented the laboratory-level DRDO Awards and Cash Awards to the employees for their outstanding and meritorious performance. A cultural programme was organised to mark the occasion.



REPUBLIC DAY CELEBRATIONS

OFFICE OF THE DG (AERO) BENGALURU

The Office of Director General Aeronautical Systems, Bengaluru, celebrated 69th Republic Day with great fervour. Dr S Christopher, Chairman DRDO, and Secretary, DDR&D, was the Chief Guest of the event. The occasion was commemorated

by hoisting the national flag. Dr CP Ramanarayanan, DS and DG (Aero) was also present. In his address, Dr S Christopher expressed his happiness over the recent and notable achievements of DRDO. He congratulated the entire DRDO community for their contribution towards building a strong nation. He urged to continue the relentless effort,

so as to enable our armed forces with cutting-edge defence technologies.

LRDE, BENGALURU

69th Republic Day was celebrated in the Electronics and Radar Development Establishment (LRDE) with zeal. Shri SS Nagaraj, Director, LRDE hoisted the national flag and addressed the gathering.



DESIDOC PARTICIPATES IN THE WORLD BOOK FAIR

Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, participated in the World Book Fair held at Pragati Maidan, New Delhi, to showcase DRDO's research/academic endeavours and to connect with the young students, research community and common public. Dr Hina Gokhale, OS and DG (HR), DRDO, inaugurated the DESIDOC stall in the presence of Dr Alka Suri, Director, DESIDOC. Dr Gokhale evinced keen interest in DRDO's various in-house publications. The stall was a big hit with the youngsters, especially the students, who showed great enthusiasm in DRDO technologies and a career in DRDO.



SOCIETAL ACTIVITIES

SWACHHTA PAKHWADA

Advanced Numerical Research and Analysis Group (ANURAG), Hyderabad, organised Swachhta Pakhwada during 1-15 January 2018 as part of the DRDO Day. Dr JVR Sagar, Director, ANURAG, addressed the employees on the occasion. Documentaries were shown on Swatch Bharat Abhiyan.

Naval Physical and Oceanographic Laboratory (NPOL), Kochi, organized Swachhta Pakhwada during 1-15 January 2018. Shri S Kedarnath Shenoy, OS and Director, NPOL, inaugurated the abhiyan and emphasized the relevance of periodical cleaning for a healthy atmosphere in the campus. The two-week long drive helped in sensitizing employees about the responsibility of maintaining a clean workplace and its benefits.



Swachhta Abhiyan at NPOL

BREAST CANCER AWARENESS CAMP

Defence Electronics Applications Laboratory (DEAL), Health Centre, organised a breast cancer awareness camp for the employees and their family in association with

“Canprotect Foundation” on 14 January 2018. The camp was inaugurated by Smt Usha Pundir wife of Dr RS Pundir, Director, DEAL. Dr Sumita Prabhakar along with Dr Deepika and Dr Shruti

Narang examined over 140 ladies. The participants were apprised about examination techniques and were provided awareness pamphlets.



AKASH WEAPON SYSTEM

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

Akash, the indigenous supersonic short-range surface-to-air missile (SAM) system, is one of the five missile projects of Integrated Guided Missile Development Programme (IGMDP) of the DRDO. The objective of the project Akash was to develop critical and sophisticated technologies for a ground system and a missile system and integrate these technologies into a state-of-the-art SAM air defence system capable of destroying multiple aerial targets simultaneously.

Akash is a very potent supersonic mobile multi-directional multi-target point/area air defence system that can simultaneously engage several air threats like aircraft, helicopters and unmanned aerial vehicles up to a maximum range of 27 km up to an altitude of 18 km using sophisticated multifunction phased array and surveillance radars

in a fully autonomous mode. Built-in ECCM features of Akash facilitate normal function in intense jamming environment.

THE SYSTEM DEVELOPMENT

Three sets of combat elements of weapon systems like Battery Level Radars, Battery Control Centres and Self-propelled Launchers were made on BMP-I, BMP-II and T-72 chassis with modifications on hulls suitable to fit the equipment. All these systems were used in demonstrating the performance of the weapon system during development and user trials.

A total of 38 vehicle-based systems were developed on both tracked and wheeled vehicles and were used to demonstrate the capability of the system through flight testing of 61

Akash missiles.

THE SYSTEM TRIALS

Interception of moving aerial targets with Akash missile system was demonstrated through various flight tests in different mission profiles like: (a) interception of far boundary targets, (b) near boundary targets, (c) high altitude targets, (d) crossing and receding targets, (e) ripple mode firing on approaching and receding targets, (f) multiple target interception, (g) low altitude far boundary interception, and (h) low altitude and near boundary interception.

The system was also subjected to Electronic Warfare (EW) trials for proving the system resistance in intense jamming environment. Flight tests were conducted with deliverable production equipment of the Indian Army and IAF



Akash Air Defence System

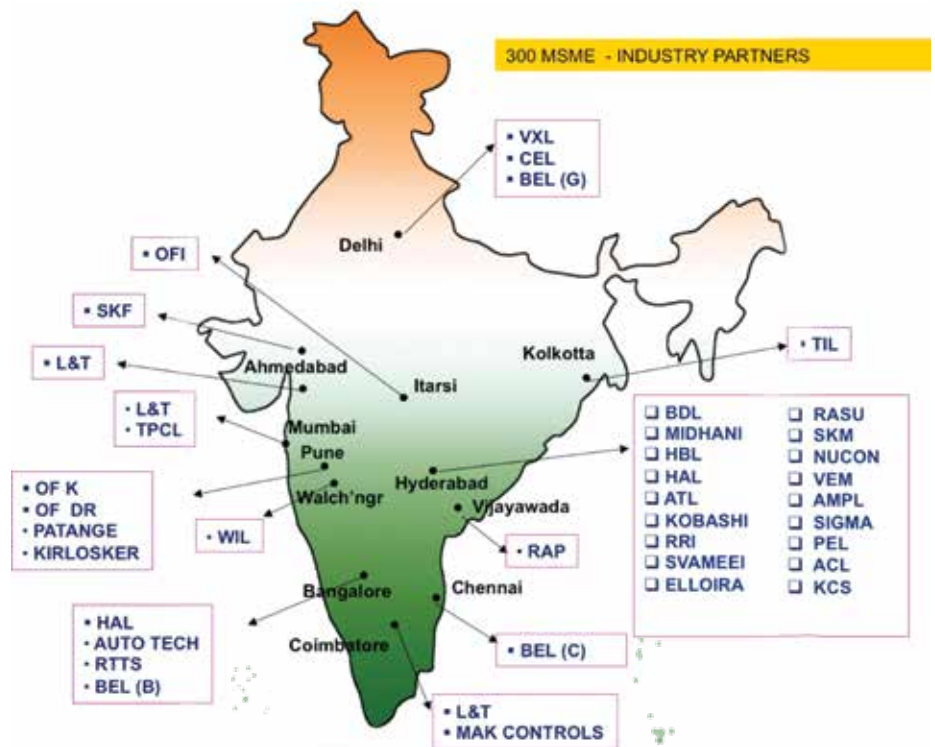


General Dalbir Singh Suhag, the then CoAS, with the Akash System

demonstrating target interceptions at low altitude near boundary UAV and precision guided bomb SPICE 2000 earning the satisfaction of the users.

PARTNERS IN DEVELOPMENT

Akash system is the outcome of successful partnership of Defence Research and Development Laboratory (DRDL), the nodal DRDO laboratory, along with 13 other DRDO laboratories; 19 Public Sector Units (PSUs) including Bharat Dynamics Limited (BDL), Bharat Electronics Limited (BEL), Hindustan Aeronautics Limited (HAL), Electronics Corporation of India Limited (ECIL), Heavy Vehicles Factory (HVF), Central Electronics Limited (CEL); major Private Industries like Tata Power SED, L&T; six Ordnance Factories, viz., Itarsi, Khamaria, Bhandara, Medak, Chanda and Dehu Road; three national laboratories; six academic institutions,



Akash—Partners in Development



viz., IIT Delhi, IIT Madras, IIT Mumbai, IIT Kharagpur, IISc Bangalore and Jadavpur University; and more than 265 private sector industries across the country.

TECHNOLOGICAL BREAKTHROUGHS

Some of the indigenous technologies developed by DRDO during the programme are: integral ram rocket propulsion system, multifunction phased array radar system, multi beam 3D surveillance radar system, C4I system hardware and software for air defence application, command guidance system, dual control digital autopilot and PN guidance, digitally coded radio proximity fuze, electrical servo drive system, frequency hopping communication system, switchable guidance antenna system, built-in ECCM features for guidance, digital coded guidance schemes for multiple missile tracking, end game techniques for maximizing effectiveness of kill,

SALIENT FEATURES

- ☑ Mobile, multiple target engagement
- ☑ Autonomous/centralized mode of operation
- ☑ Secured wireless communication links; built-in ECCM
- ☑ Target interception capability from a low altitude of 30 m to a high of altitude 18 km and from slant ranges (3 km to 27 km)
- ☑ High performance pre-fragmentation warhead
- ☑ Digital radio proximity fuze coupled with five-level safety arming mechanism
- ☑ Supersonic missile powered by solid integral ramjet rocket propulsion system that maintains the speed of 2 Mach till intercept
- ☑ Modular and mountable on wheeled truck or trailer or track mounted
- ☑ Wider no escape zone due to high average velocity (27 km in 36 seconds)
- ☑ High single shot kill probability (>88%)

multi-radar tracking and fusion of tracks, five-stage safety arming mechanism, dual frequency generating power supply system, digital signal processing techniques, software algorithms for automatic controlling of weapon system and simulators and training aids to demonstrate capability of system.

PRODUCTION

Based on the performance of system demonstrated through user evaluation trials, user field trials and flight tests, the system was formally inducted into Indian Army on 5 May 2015 and into the IAF on 10 July 2015. Production order worth Rs 20,000 crore was placed



Handing Over of Akash Missile System to the Indian Air Force

by the IAF and the Indian Army. Seeing the performance of Akash radars, Indian Armed Forces also placed orders for Akash offshoot products like Rohini, Revathi and the Weapon Locating Radars.

Akash missile system is produced by nodal production agency Bharat Electronics Limited (BEL), Bengaluru for IAF and Bharat Dynamics Limited (BDL), Hyderabad, for Indian Army. Radars and radar-related equipment are being produced by BEL. While missiles and their related equipment are being produced by BDL, the launchers are being produced by Tata Power SED and M/s L&T. The control centres are produced by ECIL.

About 300 MSMEs are involved in continuous production of components/sub-systems/modules for Akash Missile System. The programme has ensured that the industry partners involved in development were also given preference for production. Additional industry partners were developed in some cases where the rate of production was required to be enhanced.

During the production, DRDO revamped radars, control centres, launchers with re-engineering of system on trailers and high mobility (Tatra) vehicles as per the requirement indicated by the IAF and the Indian Army. Some performance enhancement features, which were demonstrated through flight testing, were added on deliverable production version equipment. Since, for the first time production of an indigenous SAM system of this magnitude was being attempted, DRDO guided all the stakeholders (DRDO labs, BEL, BDL, OFs, inspection agencies, industries and the users) towards successful production, inspection, testing, and validation.

CURRENT SCENARIO

Production of Akash missiles for

DRDO has achieved a major milestone by successfully accomplishing the stages of design, development, technology transfer, production, validation testing and induction of the Akash SAM system into the Indian Armed Forces meeting the Air Defence needs of the country.

Indian Army are being continuously monitored by the Project Group. Order worth Rs 5,500 crore for seven Squadrons (14 FUs) of Akash is expected by March 2018. Request for Proposal for two more Regiments of Akash Weapon System (with RF seeker missiles) worth about Rs 10,000 crore is also expected from the Indian Army.

Eight (8/8) Squadrons of Akash missile system and six (6/12) Troops have been delivered to the IAF and the Indian Army, respectively. Infrastructure was created at user's sites for storage, deployment, operation and maintenance of the system through

lead production agencies. Supply chain for a special surface-to-air weapon system elements like surveillance radars, missile guidance radars, launchers, control centres, missile sub-systems, ground support systems, etc., have been established with stringent aerospace/military grade requirements. Realization of missile guidance radars (28/28), launchers (112/112), control centres (28/28), surveillance radars (22/22) has demonstrated DRDO's commitment to the 'Make in India' initiative of the government.

The DRDO created a revenue of about Rs 38,000 crore through Akash missile system and its offshoot products, which is a commendable achievement for indigenous design and development. DRDO has also gained the experience of generating technology transfer documents for manufacturing, inspection, testing, and integration of the surface-to-air weapon system. DRDO also gained the experience of handling and guiding all the stakeholders at various critical stages of production, inspection, integration and acceptance. The Akash Missile System is today proudly safeguarding important defence assets of the country.



Akash—Launch from Air Force Launcher



RAJBHASHA TECHNICAL SEMINAR/WORKSHOP

HINDI WORKSHOP

Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, organized a one-day Hindi Workshop on “Conduct Rules for Government Employees” on 25 Jan 2018. Dr Rajeev Vij, Sc G, who organised this event, briefed the participants about the need and the purpose of this workshop. Smt Sumati Sharma, Sc ‘F’, gave an overview of the Hindi Cell activities during the year.

Dr Alka Suri, Director, DESIDOC, in her address stressed on need of implementation of Hindi at DESIDOC.

Dr Sunil Sharma, Director, Rajbhasha and O&M, inaugurated the workshop and spoke about the various incentive schemes being given by the DRDO to encourage use of the Rajbhasha in day-to-day working. Shri Sethu Ramalingam from Central Pollution Control Board, New Delhi, and Ms Anjum Siddiqui, from DoP, DRDO HQ, delivered informative lectures with examples on “Conduct Rules for Government Employees” for benefit of the participants.

Research Centre Imarat (RCI), Hyderabad, organised 3rd Hindi Workshop on 30 January 2018. Twenty-five participants attended the workshop. Shri T Narasimha Rao, Sc ‘G’, Vice Chairman, OLIC, inaugurated the workshop. Dr RN Awasthi, Hindi Officer, ECIL, delivered a lecture on



Hindi Workshop at DESIDOC



Hindi Workshop at RCI

functionality of Hindi in scientific organizations. Shri Kazim Ahmed, Senior Translator (Hindi), delivered

a lecture on “Role of Translation in Government Organizations.” Shri GK Mahto proposed the vote of thanks.

DFRL ORGANISES UTKARSH-2018

A two-day cluster level “All India Rajbhasha Technical Seminar—Utkarsh-2018” was organized by Defence Food Research Laboratory (DFRL), Mysuru, on behalf of Bengaluru-based DRDO laboratories during 24-25 January 2018. Dr GK Sharma, Associated Director,

DFRL, welcomed all the dignitaries and participants.

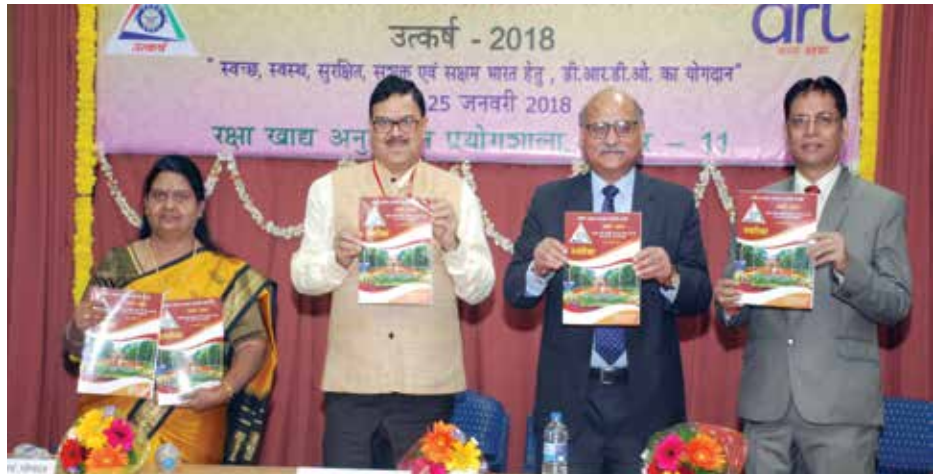
Chief Guest Dr DC Pandey, former Outstanding Scientist, Electronics and Radar Development Establishment (LRDE), inaugurated Utkarsh. In his presidential address, Dr Pandey

stressed the importance of Rajbhasha, in unification of the nation.

Dr Rakesh Kumar Sharma, Director, DFRL, released the seminar souvenir and requested all the participants to inculcate habit of using Hindi in day-to-day activities. Thirty-three scientific and technical papers and



10 Rajbhasha papers were presented by scientists, officers and staff from Bengaluru cluster laboratories, Institute of Nuclear Medicine and Allied Sciences (INMAS), Delhi, and Naval Science and Technological Laboratory (NSTL), Visakhapatnam, on the theme “Contribution of DRDO in Clean, Healthy, Protected, Powerful, Self-Reliance for Competent India.” The function ended with vote of thanks proposed by Dr Bhargavi R Gopal, Assistant Director (Rajbhasha), DFRL.



DESIDOC ORGANISES ROAD SHOW

Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, organized 3rd Training-cum-User Awareness/ Interaction Programme at Targeted Training Centre (TTC), Bengaluru, on 23 January 2018. Forty-five scientists/officers from Bengaluru-based DRDO laboratories participated in the programme, which aimed at increasing user awareness of the various services provided by the DESIDOC. An exhibition

of DESIDOC services was arranged in TTC premises, which was inaugurated jointly by Dr KG Narayanan, former DS and Chief Advisor, DRDO, and Dr Alka Suri, Director, DESIDOC.

Dr Rajeev Vij, Sc ‘G’ and organiser of the event, briefed the participants about DESIDOC’s book collection and services. Dr Alka Suri, informed the participants about the new initiatives taken and roadmap of DESIDOC.

Dr KG Narayanan, through his scintillating address, exhorted participants to use DESIDOC services and facilities.

Dr Rajeev Vij, Smt Alka Bansal, Smt Kavita Narwal and Shri Anranya Yadav from DESIDOC briefed the participants about the various information services being provided by the DESIDOC. Dr Alka Suri awarded best three participants at the valedictory function.





DRDO SOUTH ZONE CRICKET TOURNAMENT

Centre for Artificial Intelligence and Robotics (CAIR), Bengaluru won the DRDO south zone cricket tournament 2017-18 organized by Combat Vehicle Research and

Development Establishment (CVRDE), Chennai, during 8-12 January 2018. Total 10 teams from south zone participated in the tournament. Aeronautical Development Agency

(ADA), Bengaluru, was the runner-up. Smt Manimozhi Theodore, Director, CAIR, praised the efforts of players.



DRDO SOUTH ZONE VOLLEYBALL TOURNAMENT

Naval Physical and Oceanographic Laboratory (NPOL), Kochi, hosted the DRDO South Zone Volleyball Tournament during 22-24 January 2018. Five DRDO laboratories, viz., CVRDE, Aeronautical Development Establishment (ADE), Gas Turbine Research Establishment (GTRE), DFRL and NPOL participated in the event.

Shri S Kedarnath Shenoy, OS and Director, NPOL, inaugurated the tournament and presented trophies, medals and certificates to the winners. NPOL team won the Championship. CVRDE was the runners-up. Shri Jose Kurian, Sc 'E', was the Chairman, Organising Committee, of the tournament.



VISITORS TO THE DRDO LABS/ESTTS

DEAL, DEHRADUN

Vice Admiral Bimal Verma, AVSM, ADC, CINCAN, visited Defence Electronics Applications Laboratory (DEAL), Dehradun on 11 January 2018. He was apprised of various projects, viz., Rustom-2, Software Defined Radio (SDR), GSAT-6 Integrated Coastal Surveillance System (ICSS), Tropo-scatter Communication, VLF Communication, Satellite Imagery Software Exploitation development, etc. Demonstration of the various system and products was also given to the Vice Admiral.



LRDE, BENGALURU

Maj Gen Subodh Kumar, ADG, AAD, visited Electronics and Radar Development Establishment (LRDE), Bengaluru, on 19 January 2018. Shri Gampala Viswam, Outstanding Scientist, welcomed the guest. Project presentations on ADFCR, ADTCR and Radars for Quick Reaction Surface-to-Air Missile (QRSAM) were made. The ADG also visited the display area of Radar technologies.



DFRL, MYSURU

Dr Surendra Pal, Vice-Chancellor, Defence Institute of Advanced Technology, (Deemed University) visited Defence Food Research Laboratory (DFRL), Mysuru, on 29 January 2018. He was welcomed by Dr Rakesh Kumar Sharma, Director, DFRL. Dr T Anand, Sc 'E', Head, Academic Division, made presentation about the on-going MSc Course in Food Technology at DIAT. Vice-Chancellor assured DIAT will provide all sort of help in successful conduct of the course. He also expressed interest for establishing incubation centre at DIAT in collaboration with DFRL. Prof. (Dr) P K Khanna, Dean, Applied Sciences, DIAT, accompanied the VC, DIAT.





DRDO HARNESSING SCIENCE FOR PEACE & SECURITY- XXV

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

The article is 25th 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).

INTRODUCTION

When 1970 dawned, DRDO was without a head as the appointment of an eminent scientist/technologist as Scientific Adviser to the Defence Minister had not been made. The uncertainty persisted even as eight months passed and June 1970 approached. It was common knowledge that many eminent scientists were reluctant to take up the post because it did not carry the same authority and powers as the heads of the other two scientific departments, namely Atomic Energy and CSIR. Further, it was well-known in the scientific circles that after the exit of Shri Krishna Menon, Dr Bhagavantam had experienced difficulties in pushing new initiatives and projects. Dr V Ranganathan, who was the Deputy Chief Scientist during Dr Bhagavantam's tenure, reminisced that early in 1970, Dr BD Nag Chaudhuri, one of the top scientists who was Member (Science) Planning Commission, enquired of him about the problems and the challenges faced by Dr Bhagavantam as the SA. The possibility of Dr Nag Chaudhuri being appointed as the Scientific Adviser was soon talked about within DRDO and the delay in the announcement of his appointment was understood by most of us to be due to his reluctance to accept the responsibility without the post being vested with the powers of the Secretary to the Government of India. The 13th Annual R&D Conference was held in May 1970 at Pune, with the uncertainty about the appointment of the Scientific Adviser very much in the minds of the Directors. There was anxiety and concern about the forces at work that would attempt to deny

the post of the Scientific Adviser the authority and powers of the Secretary to the Government. There was also hope and confidence that Smt Indira Gandhi, the Prime Minister of India would rule in favour of the head of the DRDO being at par in power and in authority to the Secretary to the Government of India. Finally, the uncertainty ended with the announcement that Dr BD Nag Chaudhuri, would be the next Scientific Adviser to the Defence Minister, Director General DRDO, and would have the ex-officio status of Secretary to the Government of India. He assumed charge on July 1, 1970.

DR BD NAG CHAUDHURI- THE SCIENTIFIC ADVISER

Dr Basanti Dulal Nag Chaudhuri obtained his BSc (Hons) degree from the Banaras Hindu University in 1935 and Master's degree from the Allahabad University, in 1937. He proceeded abroad to the University of California, USA for continuing his studies in nuclear physics under the Nobel Laureate Professor Ernest O Lawrence, the inventor of cyclotron during the period 1938-1941, and was awarded the doctorate degree. On his return to India, he joined the University of Calcutta in 1942 and continued his work as leader of the Cyclotron Project. In 1947-48 he returned to the University of California as a post-doctoral fellow to pursue research work in his area of interest. In 1953, he was offered the Professorship at the University of Calcutta as successor to Professor M N Saha. He was appointed as the Director of the Saha Institute of Nuclear Physics, in 1956, a post he held with distinction

till 1967. The Saha Institute of Nuclear Physics during his tenure as Director, expanded its activities and grew up into a pioneer research institute in Nuclear Physics in the Country. The work of the Institute as well as the research activities of Dr Nag Chaudhuri in Cerenkov radiation gained national and international recognition.

In 1967, he was invited by the Government of India to join the Planning Commission as Member (Science). In addition to science and scientific research, he was also entrusted with the subjects of education, health, social welfare, housing and urban development technology. In a short period of time, he was also offered the Chairmanship of the Committee on Science and Technology, which had the responsibility for policy making and coordinating all efforts aimed at the advancement of science and technology in the country. During his tenure as Member of the Planning Commission, he acquired a very good understanding of the working of the Government of India and the process of decision-making within the Government. In addition, he had the rare opportunity as a scientist to gain insight into the management and utilization of science and technology in the service of society and to understand in depth the innovation chain starting with research at academic institutions and ending with a product utilizing the industrial infrastructure.

Dr Nag Chaudhuri had a wider view of the potential of R&D and the role it had played in the developed countries in ushering an era of unprecedented economic expansion. He was aware that the uninterrupted economic growth



experienced in the developed nations for nearly two decades was showing signs of abatement in the form of slowing down of capital investment for new plant and machinery for industrial expansion. Consequently in those countries, more resources were being diverted to industry to incremental innovations with shortened time horizons. In effect, it meant that in product R&D, industry was beginning to concentrate more on improvements and widening the applications and in process R&D, the focus was on increasing efficiency. R&D managers were being made aware of the importance attached by management to return on investment, higher accountability, and short-term results. In effect, efforts were on in those countries to align short-term R&D activities with the current business and products. A new R&D management paradigm came into existence with the objective of integrating technology with business strategy. He was also cognizant of the crucial role that the Department of Defence in the USA was playing in accelerating the pace of technologies in the electronic and aerospace industries for establishing military superiority over their Cold War rivals.

INITIAL STEPS

When Dr Nag Chaudhuri assumed his Office, there was a heightened sense of expectation within the DRDO of enhancing the scope of development activities, of greater freedom for keeping pace with technological changes and advancements. As the 13th Annual R&D Conference had been held earlier in May 1970, he did not have the opportunity to meet the heads of laboratories to ascertain their views. Therefore, he took upon himself to visit some of the major laboratories to interact with the Directors and other scientists of the laboratories. The purpose was twofold. Firstly, like any scientist he wanted to obtain firsthand information from other scientists and technologists about their work and working conditions. Secondly, he wanted to signify his break from the hierarchical mould on which DRDO had been patterned. The visit of the Scientific Adviser to the laboratories

at such a short notice and the way he put the scientists and others at ease and invited their suggestions during meetings with him, paved the way for better communication. He also made it a point to meet the heads of the public sector industries and of the ordnance factories to ascertain their views and opinions for collaboration with DRDO for the major system projects that would be accorded higher priority for development in the Organisation.

His immediate attention was drawn to the type and nature of activities undertaken by the Organisation and to its personnel policies. He assessed that the Organisation had been busy in providing response to short-term needs of the Services which enabled the scientists to learn the profession of equipment development and also to gain credibility with their customers. In this process, the hardware/engineering-oriented laboratories had acquired a good understanding of the working as well as the technologies of existing equipment so that modifications, improvements, and substitutions could be handled with confidence and assurance. In some cases where technological advances were rapid, equipment and systems were made modular in architecture, substitution also led to improvements in performance, such as higher reliability, lower power, and lesser cooling needs, and so on. He was convinced that DRDO had to graduate from these short-term responses to systems development' to achieve self-reliance in defence equipment. However, the leap to system development would only be successful if the Organisation could take the route of technology development of subsystems and acquire competence to configure not one system, but a wider range of systems. The evolutionary approach that he had in mind, envisaged continuity from the current-generation to the next-generation systems. It followed then, that prior to undertaking next generation systems development, building competence in the technologies of major subsystems/modules would be necessary. Each of the newly developed subsystem would be substituted in the current system, and by this process,

the knowledge on trade-off would be understood and built up. The starting point would be the infrastructure building, for which investments would have to be made and because of budget limitation, prioritising the technology areas would be necessary if DRDO was to make a greater impact. Therefore immediately after assuming the Office, he changed the budgetary allocations earlier made for the laboratories for 1970-71 and apportioned about 60 per cent of the budget to the thrust areas of aeronautics, electronics, missiles and submarine technology. The priorities for electronics and aeronautics reflected the national concern for undertaking R&D for self-reliance. The missiles, in his opinion, were efficient and cost-effective weapon systems that could provide a superior force-multiplier effect so that fewer number of fighting men could be effective against aircraft, tanks and so on. The message was clear that system development in these thrust areas would have the priority in the coming years.

The Scientific Adviser envisaged that the laboratories in the thrust areas would be the nodal laboratories responsible for systems development and that other laboratories of the Organisation working in allied science and technology fields would take up activities related to development of components/subsystems that would fall in their areas of specialisation. This would mean pooling of the available resources and expertise within the Organisation through a large number of inter-laboratory projects. Thus, multiple specialist laboratories would be involved in any weapon system development so that development time was reduced and the optimum use of the infrastructure and skills would be possible. He, therefore, made it known that if the laboratories specialising in other technology areas, which are allied to electronics, missiles, aeronautics and naval technologies, orient their activities to match the needs of the laboratories in the thrust areas, these could expect higher funding levels.

To be continued...



The Tribune

Sun, 04 Feb, 2018



General David L. Goldfein, Chief of Staff of the US Air Force, in Jodhpur on Saturday. PHOTO COURTESY: TWITTER/IAF

US Air Force Chief takes sortie in Tejas

Jodhpur: US Air Force Chief General David L. Goldfein flew a sortie in indigenous Light Combat Aircraft Tejas on Saturday at the IAF station in Jodhpur. Goldfein arrived in India on Thursday, on a visit to boost defence ties between the two nations. In November last year, the

THE HINDU

Mon, 19 Feb, 2018

'Future weapon systems will be smart, complex'

DRDO chief addresses seminar

Futuristic weapon systems would be smart, intelligent, complex and technologically advanced, said S. Christopher, Chairman of DRDO and Secretary, Department of Defence R&D.

He was speaking at the Third International Federation of Automatic Control (IFAC) International Conference on Advances in Control & Optimisation of Dynamical Systems (ACDOS-2018) organised by DRDO.

G. Satheesh Reddy, Scientific Adviser to Raksha Mantri and Director General, Missiles and Strategic Systems, said synergetic efforts of R&D institutes, academia and industries have enabled India to achieve self-reliance on many technological fronts. "Technologies have been evolving quickly and we need to focus on smart, adaptive learning systems to make our aerospace vehicles cost-effective and state of the art," he said.

Frank Allgower, President of IFAC Austria highlighted the activities of the IFAC and complimented efforts of ACDOS, India, in that direction.

Ramkalyan Ayyagari, President of ACDOS India (NIT, Trichy), B.N. Suresh, President of Indian National Academy of Engineering, M.S.R. Prasad, Director of DRDL, Tessa Thomas, Director of ASL and B.H.V.S. Narayana Murthy, Director of RCI were among those who spoke at the international conference.

The Statesman

Sat, 03 Feb, 2018

ITR & PXE showcase strength through its products

The Integrated test range (ITR) the missile test range and Proof and Experimental establishment (PXE), two major units of DRDO, based at Chandipur have showcased their products at the defence stalls which drew huge crowds at the District level Industrial Expo and Pallisaboo mela here.

The models of missiles, tanks and guns displayed attracted children as well as the older generation. Besides the mighty fire power they are showcasing the shielding mechanism, against any enemy attack, of India. The live video clips of launch of missiles were a treat to watch.

The DRDO personnel were keen on explaining every aspect to visitors. The Defence research and development organizations (DRDO) pavilion has been the key attraction for the visitors. For the locals here they have the opportunity to see technological advancement in the field of missile for India, about which they otherwise read in papers and watch in televisions.

THE TIMES OF INDIA

Mon, 19 Feb, 2018

'Innovation backbone for defence'

By Syed Akbar

Hyderabad: Dr S Christopher, chairman of Defence Research and Development Organisation (DRDO), said on Sunday futuristic weapon systems will be intelligent and complex. Integrated, miniaturized avionics, smart sensors etc., will be the backbone for future aerospace and defence systems.

Dr Christopher, who is also secretary of DRDO, told a conference on Advances in Control and Optimization of Dynamical Systems that control, guidance form the crucial technologies that find widespread applications in civil, defence sectors. Developments in areas of control, guidance and dynamical systems brought in a paradigm shift in research and development capabilities of India.

Referring to futuristic weapons, he said Tejas, the light combat aircraft of Aeronautical Development Agency of the DRDO, is a longitudinally unstable airframe. "Any disturbance will magnify in a short time. So, it becomes difficult to control the vehicle, but Tejas has the finest handling capability even under extreme conditions," he added.

Dr G Satheesh Reddy, scientific adviser to Raksha Mantri and director-general, Missiles and Strategic Systems, said, "Synergetic efforts of research and development, academia and industries enabled the country to achieve self-reliance on many technological fronts."

the pioneer

Thu, 22 Feb, 2018

Night trial of Prithvi-II missile successful

India on Wednesday successfully conducted a night trial of its indigenously developed nuclear capable Prithvi-II missile with a strike range of 350 km, from a test range in Odisha.

The surface-to-surface missile was test-fired from a mobile launcher from launch complex-3 of the Integrated Test Range at Chandipur near here around 8.30 pm, as part of a user trial by the Army, defence sources said.

The perfect test launch came after successful trial of the Agni-5 missile on January 18, Agni-1 on February 6 and Agni II on Tuesday from the Abdul Kalam Island off the Odisha coast.

Prithvi II missile was also successfully test-fired earlier on February 7 from the ITR at Chandipur. The state-of-the-art Prithvi-II missile is capable of carrying 500 to 1,000 kg of warheads and is thrust by liquid propulsion twin engines.

The sophisticated missile, which has a strike range of 350 km, uses advanced inertial guidance system with manoeuvring trajectory to hit its target, they said.

The missile was randomly chosen from the production stock and the entire launch activities were carried out by the specially formed Strategic Force Command (SFC) of the Army, and monitored by the scientists of the Defence Research and Development Organisation (DRDO) as part of training exercise, the sources said.

दैनिक जागरण

Thu, 08 Feb, 2018

परमाणु हथियार ले जाने में सक्षम पृथ्वी-2 मिसाइल का परीक्षण

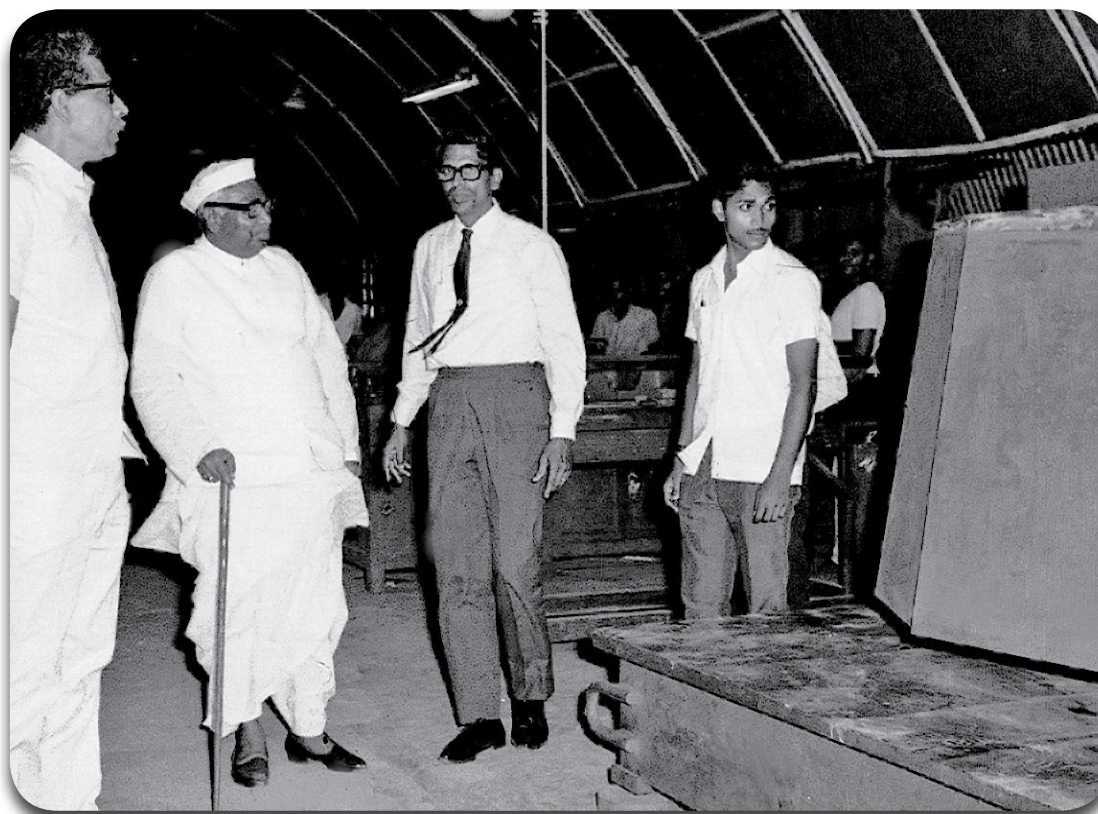


बातसार : परमाणु हथियार ले जाने में सक्षम बैलिस्टिक मिसाइल पृथ्वी-2। इसका बुधवार को सफल परीक्षण किया गया।

जारा, बातसार : भारत ने बुधवार को परमाणु हथियार ले जाने में सक्षम बैलिस्टिक मिसाइल पृथ्वी-2 का परीक्षण किया। भारतीय सेना के सामरिक कमांड बल ने इस मिसाइल का सुबह 11:30 बजे ओडिशा में अखटुल कलाम द्वीप (खीलर द्वीप) स्थित इंटीग्रेटेड टेस्ट रेंज (आइटीआर) से परीक्षण किया। यह मिसाइल दुश्मन की मिसाइल को रोकना दे सकती है। सतह से सतह तक मार करने वाली इस मिसाइल की मारक क्षमता 350 किलोमीटर है। स्वदेश निर्मित नौ मीटर लंबी इस मिसाइल का वजन 4600 किलोग्राम है और यह

500 किलोग्राम तक विस्फोटक दाने की क्षमता रखती है। यह जल एवं टोप दानों प्रकार के ईंधन से संचालित होती है। इंटीग्रेटेड राइडेड मिसाइल टेक्नोलॉजी प्रोग्राम (आइजीएमटीपी) के तहत विकसित उच्चतम प्रथम बैलिस्टिक मिसाइल दोहरे इंजन से संचालित होती है। इस मिसाइल के परीक्षण के दौरान प्रक्षेप पथ पर अत्याधुनिक रडारों से नजर रखी गई। परीक्षण के मौके पर टीआरडीओ (रक्षा अनुसंधान एवं विकास संगठन) और आइटीआर से जुड़े वैज्ञानिक एवं अधिकारियों का दल मौजूद था।

DOWN THE MEMORY LANE



The then Raksha Mantri Shri Jagjivan Ram evincing keen interest in DRDO Products.