

DRDO NEWSLETTER

A monthly in-house bulletin of Defence Research & Development Organisation ■ Vol. 36 No. 6 June 2016



**Tejas
Real Time
Simulator
ready for
formal
Training**

Visitors to DRDO Labs/Estts

Defence Institute of High Altitude Research

Maj Gen AC Chaudhary, COS, HQ 14 Corps, visited Defence Institute of High Altitude Research (DIHAR), Leh, on 12 April 2016. He applauded DIHAR for its path breaking and innovative research, which is making considerable difference to the defence and local population especially for fresh vegetable and fruits. He wished good luck to the future R&D endeavors of DIHAR and assured support from 14 Corps.



Defence Terrain Research Laboratory

Shri PK Mehta, OS and Director General (ACE), DRDO, visited Defence Terrain Research Laboratory (DTRL), Delhi, on 5 May 2016. Dr MR Bhutiyani, Director, DTRL, gave a detailed presentation on the main activities of the lab along with the infrastructure requirements of the lab. Department heads and senior scientists also gave presentations on research being done in the laboratory and various initiatives taken.



DG (ACE) evinced keen interest in the work carried out in DTRL. He opined that the laboratory has immense potential of taking more extensive work in the field of terrain analysis, which could be very helpful for Armed forces.

DG (ACE) visited Geo Intelligence Lab (GIM), Software Development Lab, Early Warning System (EWS) Lab, Hyperspectral Imaging (HYPEX) Lab and Trafficability Analysis (PISTA) Lab. He met other scientists and technical staff during the visit and discussed various administrative and technical issues pertaining to the lab.

Raksha Mantri visits DRDO stall

Hon'ble Raksha Mantri Shri Manohar Parrikar along with Hon'ble MP Shri Tarun Vijay, visited stalls of Instrument Research and Development Establishment (IRDE) and Defence Electronics Applications Laboratory (DEAL) in exhibition organised at the Bhoomi Pujan ceremony of War Memorial at Dehradun on 30 April 2016. Different types of cooled and uncooled thermal imagers, laser instruments, fire control systems for tanks and naval ships, Long Range (42 km) electro-optical sensors for Unmanned Aerial Vehicles and Aerostats etc., were displayed in the exhibition. Hon'ble Minister was briefed about DRDO products by Dr SS Negi, OS and Director, IRDE.

Shri Shabir Ahmed and his team of scientists, officers and staff of IRDE organized the stall.



Hon'ble Raksha Mantri Shri Manohar Parrikar at IRDE stall in exhibition organised during War Memorial inauguration

**Editor-in-Chief**

Gopal Bhushan

Senior Editor

B Nityanand

Editor

Manoj Kumar

Assistant Editor

Geeta Sharma

Design & Pre-press

Anjan Kumar Das

Multimedia

RK Bhatnagar

Printing

SK Gupta; Hans Kumar

Marketing

Tapesha Sinha, RP Singh

Local Correspondents

Ahmednagar: Lt Col. AK Singh, Vehicles Research & Development Establishment (VRDE); **Ambernath:** Dr Susan Titus, Naval Materials Research Laboratory (NMRL); **Balasore/Chandipur:** Shri PK Mohanty, 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 Faheema AGJ, Centre for Artificial Intelligence & Robotics (CAIR); Ms Tripty Rani Bose, Centre for Military Airworthiness & Certification (CEMILAC); Smt Josephine Nirmala M, Defence Avionics Research Establishment (DARE); Shri Kiran G, Gas Turbine Research Establishment (GTRE); Shri KM Veerabhadra, Electronics & Radar Development Establishment (LRDE); Dr Vishal Kesari, Microwave Tube Research & Development Centre (MTRDC); **Chandigarh:** Shri HS Gusain, Snow & Avalanche Study Establishment (SASE); Shri Ashok Kumar Dahiya, Terminal Ballistics Research Laboratory (TBRL); **Chandipur:** Shri Santosh Munda, Interim Test Range (ITR); **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 KP Mishra, Defence Institute of Physiology & Allied Sciences (DIPAS); Shri Ram Prakash, Defence Terrain Research Laboratory (DTRL); Shri Navin Soni, Institute of Nuclear Medicine and Allied Sciences (INMAS); Smt Anjana Sharma, Institute for Systems Studies & Analyses (ISSA); Dr Indu Gupta, Laser Science & Technology Centre (LASTEC); Shri Sanjay Pal, Recruitment & Assessment Centre (RAC); Smt Kamini Malhotra, 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); 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); **Jodhpur:** Shri Ravindra Kumar, Defence Laboratory (DL); **Kanpur:** Shri Ashok Kumar Gautam, Defence Materials & Stores Research & Development Establishment (DMSRDE); **Kochi:** Shri S Radhakrishnan, Naval Physical & Oceanographic Laboratory (NPOL); **Leh:** Dr Dorjey Angchok, Defence Institute of High Altitude Research (DIHAR); **Mussoorie:** Dr Gopa Choudhury, Institute of Technology Management (ITM); **Mysore:** Dr M Palmurugan and Shri NV Nagraj, Defence Food Research Laboratory (DFRL); **Pune:** Dr (Mrs) JA Kanetkar, Armament Research and Development Establishment (ARDE); Shri AM Devala, High Energy Materials Research Laboratory (HEMRL); Shri SS Arole, Research & Development Establishment (Engrs) [R&DE (E)]; **Tezpur:** Dr Jaysree Das, Defence Research Laboratory (DRL); **Visakhapatnam:** Dr (Mrs) V Vijaya Sudha, Naval Science & Technological Laboratory (NSTL)

Website: <http://www.drdo.gov.in/drdo-nl>E-mail: director@desidoc.drdo.in; drdonl@desidoc.drdo.in

Tel: 011-2390 2474; Fax: 011-2381 9151

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Tejas Real Time Simulator ready for formal Training

LCA Tejas Real Time Simulator (RTS) has been upgraded to a full mission simulator. The formal assessment of upgraded RTS was carried out by National Flight Test Centre (NFTC) test-pilots in co-ordination with IAF-Programme Management Team (IAF-PMT), ADA-Integrated Flight Control Systems, and Centre for Military Airworthiness and Certification (CEMILAC). Fully configured upgraded RTS is ready for training and will be offered to IAF-PMT to provide training to the squadron pilots.

A formal event to declare the readiness was held on 18 April 2016 at ADE, Bengaluru. Dr K Tamilmani, DS and DG (Aero), was the Chief Guest of the function. Director NAL, Director ADA, GM (LCA), HAL and other dignitaries from ADA, IAF-PMT, etc., participated in the event, along with ADE fraternity. Shri MVKV Prasad, Director, ADE, welcomed the august gathering and highlighted the importance of simulators as a training device.

Shri BP Shashidhara, Group Director, presented the evolution of flight simulators at ADE, starting from the development of Kiran simulator during 1980s to LCA mission simulator. He highlighted the challenges faced, especially during US sanctions, various technology components used, meeting the user requirements, lessons learnt, expertise acquired, etc. He also acknowledged the immense support extended by various stakeholders towards the development of the Full Mission Simulator.

Dr K Tamilmani, DG (Aero), DRDO, handed over the relevant documents to Director ADE and Air Marshal Rajesh Kumar, VM, Director IAF-PMT, and declared the readiness of LCA Tejas RTS for formal training of IAF pilots. During his address, DG (Aero) appreciated the efforts put in by the team ADE to upgrade the RTS and highlighted the need for development of more full mission simulators for other operating units. He emphasized the need for evolving a formal mechanism for version control in line with aircraft modifications and also to retain the talent in the country and create a knowledge base. He wished ADE to continue to be the Centre of Excellence for Flight Simulation.

Air marshal Rajesh Kumar in his address highlighted the challenges ahead in terms of Radars, EW suites and other latest weapon configurations for LCA and



appealed to meet these challenges within the timeliness for full mission simulator at Sullur. He also added that the RTS available at ADE would meet the initial training needs of IAF squadron pilots.

This simulator would be extensively used for training of IAF pilots on basic missions of LCA-AF Mk-I. The existing nine meter diameter dome-based facility at ADE is being upgraded to Full Mission Simulator to meet the *ab initio* training requirements of the IAF pilots under both normal and emergency flying conditions. The RTS cockpit has been replaced by a cockpit closer to production standard aircraft of LCA. Real pilot controls have been used and all the synthetic displays and the cockpit panels have been replaced by actual systems to the extent of their availability. The avionics systems are a combination of real LRUs and simulated LRUs.

The visual cueing systems used in the RTS are retained. Aural cues are based on actual digital recording of the LCA sound as perceived in the cockpit for various throttle settings and is rendered in real time during the simulator sorties. A 5-DoF G-seat/suit combination is integrated with the Martin Baker Seat of LCA (MK IN 16G) to simulate various acceleration (limited motion) cues. The simulation of avionics systems in the upgrade is being carried out in phases. In the first phase, the avionics systems required for basic mission training has been simulated. An Instructor Operator Station for remote operation, control and monitor is also part of the training simulator set up. Instructor has the facility to take over in case of emergencies. A timestamped history of the entire flight sortie is also incorporated for effective debriefing post flight.

Indian Army successfully test fires Akash Missiles

Indian Army test fired Akash surface-to-air missiles successfully with the inducted Akash Weapon System during 11-13 April 2016 as a part of conversion firings (post induction) from Interim Test Range (ITR), Chandipur. Six Akash missiles were tested on six moving and tow-body targets. All the six targets were comprehensively brought down under the influence of warhead detonation in proximity. The velocity of missiles at intercept of targets was above Mach 2.1.

The missiles were picked up by the Missile System Quality Assurance Agency (MSQAA) from regular production lots. Some of the missile sub-systems were sourced from industry partners. All the preparations, deployment and operations were carried out by Indian Army personnel as per the combat configurations. Some of the firings were carried out by Army Jawans demonstrating the ease of operation and user friendly features of the system.

The flight tests were witnessed by Lt Gen Rajiv Bhatia, AVSM, DG Army AAD; Lt Gen AK Sahagal, VSM, Col Commandant, Army AD College; Maj Gen N Hundal, MG AD HQ Western Command and senior Army officers. Weapon System Readiness Review was conducted on 10 April 2016 and was chaired by Dr BK Das, OS and Director, ITR.

Dignitaries from BDL, BEL, partner Industry and DRDO scientists witnessed the firings. The firings were conducted under the supervision of Shri G Chandramouli, Mission Director, Shri GN Rao, Deputy Project Director, Shri G Viswam, System Manager, LRDE and other team of Scientists and Technical Officers.

Akash missile could kill the moving targets in far-boundary low altitude, near-boundary low altitude, crossing at far range, and mid range approaching profiles consistently. PD Akash, described the achievement of designing a very accurate surface-to-air missile system and introduced the same in to Indian Army as remarkable.

Dr Satish Kumar, DS, DG (MSS) congratulated all the stakeholders for the grand success and said that intercepting the moving target consistently proves the robustness of the system.

Dr S Christopher, Secretary, Department of Defence R&D and DG DRDO congratulated the participating teams from Indian Army, Production agencies, Industry Partners and DRDO Scientists for demonstrating the capability and strength of Akash Missile System by convincingly killing all the six small sized moving targets in different mission configurations.

Thermal Assisted Friction Stir Welding Machine established at NMRL

A 100 kN thermal assisted Friction Stir Welding Machine was inaugurated by Dr SB Singh, OS and Director, Naval Materials Research Laboratory (NMRL), Ambarnath. The machine is a Make in India initiative and is jointly designed and developed by NMRL and RV Machine Tools, Coimbatore, under development contract. The facility will be used for welding wide range of both ferrous and non-ferrous alloys for Naval, Aerospace and Defence applications like torpedo shell, rocket motor casing, missile nose cone and body, ship, aircraft and unmanned aerial vehicle structural portions.

Salient Features

- Load Capacity: 100 kN (z axis), 50 kN (Y & X axis)
- X-axis Travel: 1500 mm (weld length)
- Spindle Speed: 100-3000 rpm
- Induction Heater: 10 kW
- Tool Holder: Liquid cooled with temperature telemetry system (Megastir ®)
- Joint Configurations: Circumferential Seam and Longitudinal Seam, T Joint, Lapp Joint, Fillet Joint, Butt Joint
- Alloy Group and Thickness: Aluminium (2-50 mm), Magnesium (2-50 mm), Titanium (2-12 mm), Steel (2-25 mm)



Manpower Development Activities

Conferences/Seminars/Symposia/Training Courses/Meetings

Workshop on Poultry Rearing at High Altitude

A workshop on Poultry Rearing at High Altitude Cold Desert was organized on 11 April 2016 at **Defence Institute of High Altitude Research (DIHAR)**, Leh, for development of climate resilient poultry farming in high altitude. The aim of the workshop was to discuss and deliberate on issues related to promote poultry rearing in this region to boost the availability of animal proteins for Armed forces as well as for the civil population. In addition to the officials from State Animal Husbandry Department, various other stakeholders, farmers, service officers and jawans from Armed Forces, Scientists and Staff of DIHAR, and Research Scholars participated in the workshop, which was chaired by Dr Bhuvnesh Kumar, Director, DIHAR, and co-chaired by Shri Prasanna Ramaswamy G, Deputy Commissioner, Leh. Other dignitaries who graced the occasion were Dr Mohmad Iqbal, Chief Animal Husbandry Officer, Kargil; Col Ajay Kumar, Director, RVS, 14 Corps; Col VP Singh, OC FSD, Leh; and Dr Stanzin, Poultry Development Officer, Leh.

The workshop concluded with open house discussion and stakeholders meeting with focus on activation of poultry co-operative society, making available day old adapted chicks, feed, medicines and vaccines with

assured marketing to boost poultry development in Leh-Ladakh.

Hindi Pakhwada

An Official Language (OL) Workshop on Utility and Availability of Fresh Food in Ladakh was organized at **DIHAR HQ**, Leh, on 30 April 2016. The function was presided by Dr Bhuvnesh Kumar, Director, DIHAR. Shri Tsewang Phuntsog, Chief Horticulture Officer, Leh and other officers of the institute also attended the workshop. In his welcome address, Dr Narendra Singh, OL Officer, presented a glimpse of the achievements of the last year and aims of the present financial year.

In his presidential address, Dr Bhuvnesh Kumar emphasized on organizing such workshop on a regular basis. He said Hindi is the language spoken by major population of the country and such type of events, along with dissemination of OL ensures enhancement of technical knowledge.

Workshop comprised four presentations made respectively by Col Kulkarni on appropriate breeds and latest technique to increase availability of fresh meat, milk and eggs in Ladakh, by Shri Ranvijay Singh on the problems of Fresh Foods for the Para Military Forces posted in border areas, by Dr T Stobdan on how to face Problems of Fresh Food for increasing population in Ladakh and its Possible Solutions, and by Dr N Singh on how the Army and Paramilitary Forces posted in remote areas of Ladakh can be helped with regard to fresh food availability by producing micro greens in their bunkers.

In-house Hindi magazine **Sindhu Darshan** was released on the occasion by Dr Bhuvnesh Kumar.





CEP on Multi Target Instrumentation Radar

A course on Multi Target Instrumentation Radar was organized in **Interim Test Range (ITR)**, Chandipur, during 18-22 April 2016 under the Continuing Education Programme (CEP) of DRDO. Dr BK Das, OS and Director, ITR inaugurated the course. Professors from IIT Kharagpur, NIT Patna, IIT Bhubaneswar and experts from BIT Mesra, ISRO, LRDE and industrial faculties from M/s Astra Microwave and L&T delivered lectures covering advanced topics in the field of radar technologies. Thirty-two participants attended the course.

DRDO celebrates Ambedkar Jayanti

Centre for Artificial Intelligence & Robotics

Centre for Artificial Intelligence and Robotics (CAIR), Bengaluru, celebrated Baba Saheb Dr BR Ambedkar's 125th Jayanthi on 14 April 2016. On this occasion, blood donation camp was organized by Rotary Bangalore TTK Blood Bank. Thirty-eight CAIR employees and their family members donated blood.



was the Guest of Honour on the occasion. Mrs Pallavi, Member, Executive Body, DMRL SC and ST Employees Welfare Association, welcomed the Chief Guest and the Guest of Honour. Shri M Satyanarayana, President and Shri J Anil Kumar, General Secretary, DMRL SC and ST Employees Welfare Association addressed the gathering.

Dr G Appa Rao, Sc G and Liaison Officer, briefed about the exemplary work done by both Dr BR Ambedkar and Babu Jagjivan Ram for upliftment of the people especially from the downtrodden community. Dr Kamat highlighted the important contributions made by Dr Ambedkar and Dr Jagjivan Ram in social, economical and political revolution in India. Shri PSN Murthy, stressed on equality, fraternity and abolition of caste system prevailing in India. The function ended with the vote of thanks by Shri C Prabhakar, Vice President, DMRL SC&ST Employees Welfare Association.

Defence Metallurgical Research Laboratory

Defence Metallurgical Research Laboratory (DMRL), Hyderabad, celebrated 125th birth anniversary of Babasaheb Dr BR Ambedkar and 109th birthday of Babu Jagjivan Ram on 27 April 2016 at Tamhankar Auditorium. Dr Samir V Kamat, OS and Director, DMRL, was the Chief Guest and Shri PSN Murthy, IDAS (VR)

Naval Science and Technological Laboratory

Naval Science and Technological Laboratory (NSTL), Visakhapatnam, celebrated Dr BR Ambedkar's 125th Birth Anniversary on 14 April 2016 in a festive manner. Chief Guest Dr CD Malleswar, OS and Director NSTL, inaugurated the celebrations. The Guest of Honour Dr C Pradgna, Associate Professor, GITAM University, Visakhapatnam; Prof. (Dr) V Sreemannarayana Murthy, Assistant Professor, Center for SAARC Studies, Andhra University, Visakhapatnam; Shri ChV Satya Srinivas, Sc F, Chairman, Celebration Committee; Shri D Appa Rao, Sc F, Liaison Officer and Shri G Raja Rao, Honorary President, NSTL SC&ST Employee's Welfare Association were also present on the occasion.

Prof. V Sreemannarayana Murthy explained in detail how the Indian Constitution was initiated by Dr BR Ambedkar and how he dreamt of a cast-free society. Dr C Pradgna described the similarities

between Dr Ambedkar and Lord Budha and stressed the necessity of 'Ambedkarism' in the present society. She explained the differences between Ambedkar's social freedom and political freedom and exemplified how Ambedkar's researchers can be utilized in achieving social equality.

Smt Kamalamalini Malleswar, the first lady of NSTL, distributed Rs 5000 worth sarees to poor women. DrCDMalleswaron behalf ofNSTLSeva Samithi, donated Rs 10000 to HELP Blind School, Visakhapatnam. Prizes were distributed to the winners of various competitions conducted on this occasion.

Shri Amitava Das, Sc G and Principal Associate Director, NSTL; Shri ChV Satya Srinivas, Sc F, Chairman, Celebration Committee; Shri K Eswara Rao, President and Shri U Urban Kumar, Sc C, Secretary of NSTL SC&ST Employee's Welfare Association; Members of NSTL Civil Employees Union; Members of NSTL Works Committee; Members of JCM; Scientists, Officers and staff of NSTL participated along with their families.



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Personnel News

Appointment

Director, DFRL



Dr Rakesh Kumar Sharma, Sc G, has assumed the charge of Director, Defence Food Research Laboratory (DFRL), Mysore, with effect from 15 April 2016. Dr Sharma did his Masters in Pharmaceutical Chemistry from Panjab University and acquired PhD from University of Delhi. He joined DRDO on 8 February 1983 at Defence Research and Development Establishment (DRDE), Gwalior, and subsequently served at Defence Research Laboratory (DRL), Tezpur, and Institute of Nuclear Medicine and Allied Sciences (INMAS), Delhi. During 2001-02, he worked as Associate Professor (Senior MR Scientist) at Max-Planck-Institute for Biological Cybernetics, Tuebingen, Germany. Since February 2005, he is appointed as Adjunct Professor at Jamia Hamdard in the Department of Pharmacognosy and Phytochemistry, Faculty of Pharmacy.

Dr Sharma has made significant contributions in development of new drugs, novel drugs delivery systems, radioprotectors and biothreat mitigators. His other interest includes Nuclear Medicine, Radiopharmacy, Pharmacoscintigraphy, Radiopharmacology, Nuclear Magnetic Resonance Spectroscopy, Toxicology, Pharmaceutical Technology, Biotechnology, Stem Cell Technology, Nanotechnology, Molecular Biology, Biochemistry, Medical Electronics and Health Informatics, Nutraceuticals and Herbal Technology. Recently, he has patented six technologies for radiological decontamination devices, products and systems. Dr Sharma has attended 17 work-related advanced training courses in Administration, ICT and Management including one at IIM, Ahmedabad. He has also attended Multi-Agency Gold (Strategic) CBRN Command Course at National Police CBRN Centre, Coventry, UK, in March 2012.

He is the recipient of many prestigious honours/awards including Young Scientist Award (1993),

Laboratory Scientist of the Year Award (2001), INMAS Technology Group Awards for the years 2003, 2004, 2011 and 2015, Chandra Kanta Dandiya Prize in Pharmacology (2004), Dr NN Dutta/Jaipur Prize (2005) of the Indian Pharmacological Society, ICMR International Fellowship Award for Senior Biomedical Scientist (2008) tenured at Swedish Rescue Services Agency, Sweden on 'Civil Protection for CBRN Accidents and Events' during 28 November to 12 December 2008, AAPS PharmSciTech Outstanding Manuscript Award (2008) and Acharya PC Ray Memorial Gold Medal Award (2013) for his outstanding contributions to the profession of Pharmacy.

Dr Sharma has filed 13 patents and has 272 publications in high impact journals to his credit besides contributing 49 chapters in books. As Member, Scientific Body of Indian Pharmacopoeia Commission and Chairman, Expert Group on Radiopharmaceuticals he contributed a General Chapter on Radiopharmaceutical, and 32 radiopharmaceutical monographs in Indian Pharmacopoeia 2014. Seven technologies developed by him have been successfully transferred to Industry and are at the production or final stages of trials. His papers are well cited (citations as on date 3761 with h-Index of 33 and i10-index of 82). He has guided nine students for the award of PhD and 5 scholars are presently enrolled.

He is an elected Fellow of Indian College of Nuclear Medicine, Society of Pharmaceutical Education and Research, Indian Association of Biomedical Scientists and Institution of Chemists (India).

Dr Sharma has been Coordinator/Member of five National Core Group/Steering Committee of National Disaster Management Authority, New Delhi. Member of four National Committees of Department of Science and Technology, Ministry of Science and Technology, two National Expert Groups of Indian Council of Medical Research and Drug Controller General of India on Biomedical Devices and Member, Working Group on R & D in Medical Electronics and Health Informatics of Ministry of Communication and Information Technology.



DRDO: Harnessing Science for Peace and Security-IV

Chapter 1: The Beginning — Defence Science

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

Professor Hill strongly advocated that research should bring about national development and suggested that an amount equivalent to one per cent of the national income should be spent on scientific research. He recommended a central organisation for scientific research under the Member of Viceroy's Executive Council, responsible for planning and development. The central organisation for scientific research would comprise six separate boards, one each for medical research, agricultural research, engineering research, industrial research, war research and survey, and natural resources. Each of these boards would be functioning under the direction of a distinguished scientist in the concerned area, who not only was the principal officer of his board but he was also a member of the other five boards. The function of the Directors of the separate boards was to organise and initiate research in their respective areas on a nationwide basis and they also had a number of advisory committees that would assist them in various aspects of their work and in the allocation of grants for research activities. A joint estimates committee under the Member Planning would coordinate these estimates. Once the estimates were approved, the boards had autonomy in conducting their business.

The Member Planning would be advised by a scientific consultative committee having six directors of the boards and six other eminent scientists, one from each of the areas as members. The follow up of scientific research into development was left to a development consultative committee consisting of representatives of industry and the professions. While this arrangement provided a communication channel between industry and science, the utility of the scientific research or the sponsoring of scientific research activities arising out of the needs of the industry were largely left to the initiative of the users.

Professor Hill's report also contained his observations with respect to the organisation of research activities undertaken for the armed forces in India. Commenting on the war research activities carried out in India, he stated that the scientific/technical organisation under the MGO was being mainly devoted to inspection, and was fully extended owing to the enormous increase of war production in India. He went on further to state: "it was not designed for the contingency of India being the base for major military, naval, and air operations. The plan for improvements in the arrangement for research in connection with the Services should be done not only for purposes of present war, but in view of the future necessity of an Indian Government taking responsibility for the military, naval and air defence of India for the design and manufacture of her own war material and for devising the technical methods of her defence. The scientific knowledge

and experience required for modern war cannot be improvised quickly, nor can it be purchased from others. A proper scientific organisation must be built up within the War Department itself."

He highlighted the sense of intellectual isolation of scientists in India in his statement, "India and Indian scientists were not clear about what is being done, or has been done in war research in UK, USA, and the Dominions. There is a corresponding lack of knowledge in UK of the scientific resources of India, in men, equipment, and facilities, and of the scientific aspects of war requirements for operations for which India is or will be the base." He attributed that this ignorance was due to lack of personal contacts between the scientists of the two countries and to the absence of an organisation in UK that could provide Indian scientists the particulars of war research undertaken in UK. Professor Hill concurred with proposal of the MGO for the creation of a new post of Scientific Adviser to the Commander-in-Chief to coordinate all scientific activities under GHQ in India, including extramural work. The Scientific Adviser (SA) would also assist the Operations Research Organisation under the SEAC (South East Asia Command). He would have a board (War Research Board) consisting of scientists, engineers, both officials and non-officials, belonging to various disciplines along with representatives from the Services. The work of scrutiny, selection, and monitoring of projects would be carried out by adequate number of committees under the chairmanship



of different members of the Board. The whole organisation of the SA to C-in-C would be similar but on a smaller scale, to that of the Advisory Council (for Scientific Research and Technical Development) in the Ministry of Supply in UK. To ensure greater coordination between the civil and military requirements of scientific research, the War Research Board was made a part of the proposed Central Research Organisation. In particular, he pointed out that the specific human problems of health fitness and adaptation, both physical and mental, in fighting personnel in relation to their activities such as flying, diving, jungle warfare, and prolonged work in environment such as in armoured vehicles, airborne and sea/submarine-based environments, would be of considerable value in civil life and industry. In his opinion, in the event India is given the autonomy to organise its own defence within the framework of the British Empire, with War Minister of cabinet rank, then the SA would be a member of the War Council on the same level as the Service members of the War Council. He averred that such a step would ensure that India in future would not make the mistake of underrating the importance of scientific research and technical development in modern war.

In making his recommendations, Professor Hill drew upon the British experience of the organisation of research. While he might not have been unaware of the important differences between the two countries, he was silent about the validity of the British model to the Indian situation. The Hill Report and the Report of the Industrial Research Planning Committee of the CSIR (headed by Mr Shanmukham Chetty) contributed to the pattern of organising scientific research in India in the civilian sector. It appears that

Professor Hill's recommendations with respect to the organisation of scientific research in defence were not taken up by the Government of India as there was no perceptible change in the working of the Inspectorates in the Services after 1944 till the country gained independence. This view gains support from Mr SS Khera, who wrote about Indian defence in that period: "Scientists (prior to independence) had not much to do with the structure and work of the Indian military apparatus. The scientific services, such as they were limited to test the quality of stores and materials of different kinds, to ensure adherence to specifications. During World War II, there were perhaps small bits and pieces of somewhat elementary efforts, occupied with the substitution of locally available materials for those in short supply or things like that. Of true scientific research associated with the military apparatus as such, there was little or none".

Aftermath of the World War II

Post-War R&D in UK

In the immediate aftermath of the World War II, the organisation of R&D effort in the UK underwent a change. The Scientific Advisory Committee to the War Cabinet with eminent scientists as members, who had played a prominent advisory role in the matters relating to radars, jet engines, atomic energy, and major weapon development programmes, was replaced in January 1947 by the Advisory Council on Scientific Policy with the function of advising the Lord President in the exercise of his responsibility in the formulation and execution of Government civil scientific policy. The counterpart in the Defence Ministry was the Defence Research Policy Committee to the Minister for Defence, its role also

being advisory. Even though these committees gave an impression to the outside world of strong central coordination, in reality, the decision-making remained widely dispersed among several departments, with each individual ministry continuing to build up their own competence in S&T. In the Defence Ministry also, decision-making was fragmented among the Ministry of Supply, the Admiralty, and the Air Ministry. The newly created Ministry of Defence was restricted to a minimal coordinating role.

The expenditure on R&D which was about nine million pound sterling in 1938, had burgeoned to more than seventy-five million pound sterling in 1947-48, of which the share of defence spending was about sixty million. Most of the Government spending in aviation and defence was in the industry. By the end of the 1950's, there was considerable debate in UK about the high cost of research, especially in the fields of space, high energy physics, and radio astronomy and about the wisdom of non-directed approach of successive Governments to the various research councils administering the civil R&D and their relation to the rest of the fairly elaborate Government R&D system. The country was spending nearly half of its R&D resources in defence-related activities in spite of the fact that UK was no longer a world power. Worsening economic conditions, a growing debate about the role S&T should play in the modernisation of the economy compelled the Government, which came into being after the elections to create the office of the Ministry of Science in 1959, more to reduce political pressure than to fulfil an administrative need.

To be continued...

DRDO in Press

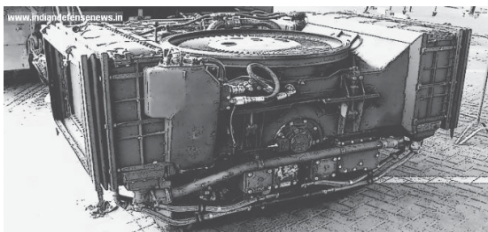


INDIAN DEFENCE NEWS

Global Defence, Aerospace & Security

ARMY GOES GREEN, TO PRODUCE BIO-FUEL FOR BATTLE TANKS

WEDNESDAY, MARCH 16, 2016 BY INDIANDEFENCE NEWS



MTU MB 838 Ka-501 Diesel Engine of the Arjun MBT will use Bio-Fuels in the future

Speaking to Express, Dr S Elumalai, head, Department of Biotechnology, University of Madras, the only scientist from academia to be working with the Army, said the Indian Army was going green and is aiming to reduce its dependency on conventional fossil fuels. Defence Institute of Bio-energy Research (DIBER) in Haldwani in Uttarakhand along with eight other defence research laboratories are carrying out extensive research on different microalgae systems to extract bio-fuels. There is also a field research station located in Pithoragarh at an altitude of 12,000 feet in the eastern Himalayan region of Uttarakhand, where the research is going on.

The Indian EXPRESS

Armed Forces: New selection process for officers soon



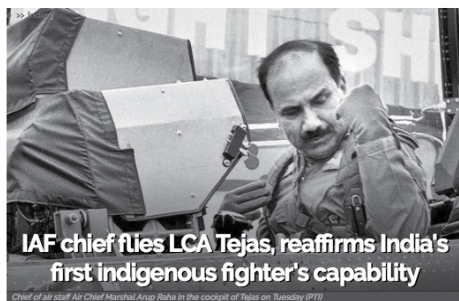
The new selection system, once approved, is likely to be implemented from 2019.

Indian armed forces are trying out a new system of officer selection to bring the selection process in tune with the changing job requirement of a modern military officer, while allowing them to better assess the newer generation of aspirants. The new selection system, once approved, will be implemented from 2019.

The existing Services Selection Board (SSB), in vogue since 1948, is a five-day long process for officer selection which includes an interview, group testing and psychological testing of the aspirants. Candidates who are called for the SSB without having passed a UPSC written exam are administered a screening test on the first day. Qualifying on the screening test is mandatory for the candidates to take further tests.

The new 'De Novo Selection System', which has been designed by DRDO's Defence Institute of Psychological Research (DIPR) lab over five years, will accomplish the SSB testing in three days. The new system is being trialled at an SSB at Bangalore for two years, running in parallel with the existing tests. According to DRDO, testing trials in the first year will focus on the sub-systems while integration checks will be run in the

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IAF chief flies LCA Tejas, reaffirms India's first indigenous fighter's capability

Chief of air staff Air Chief Marshal Arup Raha in the cockpit of Tejas on Tuesday (18)

DEEPAKAR ANAND | Wed, 18 May 2016-07:55am, New Delhi, dra

India's first home grown fighter jet, the Light Combat Aircraft (LCA) Tejas found a fresh stamp on its capability and suitability for being inducted in the Indian Air Force (IAF) on Tuesday when the Chief of Air Staff Air Chief Marshal Arup Raha himself flew in it.

Designed by the Aeronautical Development Agency (ADA) and produced by Hindustan Aeronautics Limited (HAL), Raha, accompanied by Group Captain M Rangachari took a 30-minute sortie over Bengaluru skies after taking off from the HAL airport. Besides maneuvers, twin-seater trainer aircraft, the IAF chief, who is an ace ace fighter pilot himself, carried out simulated air to air and air to ground attacks in the twin-seater trainer version of the aircraft.

The Statesman

PEOPLE'S PARLIAMENT, ALWAYS IN SESSION

INDIA

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DRDO scouts for partners to develop defence tech

thestatesman.com | New Delhi | 25 March, 2016



Representational Image (Getty Images)

Parikar and the theme this year is "Rise of Futurism".

DRDO's participation in this event is marked with the live demo of star products for first time which includes Airborne Early Warning & Control System (AEW&C), Light Combat Aircraft Tejas, Arjun MBT Mk II & 1 tanks, AKASH Air Defence System, Pinaka multi barrel rocket launcher, etc. besides, static display of other outdoor exhibits such as quick deployable mobile communication terminal, advanced torpedo defence system, remote operated vehicle -- Deeksh, etc.

The DRDO participation will provide a platform for collaboration with industry, academia and research institutes towards indigenous development of defence systems and technologies.

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State of the art military systems and technologies to promote 'Make in India' will be displayed prominently at this year's Defence Expo in Goa with the Defence Research & Development Organisation (DRDO) hoping to forge new partnerships with industry and academia to develop indigenous advanced defence systems and platforms.

To be held between March 28 and 31, the ninth edition of the biennial land, naval and internal homeland security systems exhibition will be inaugurated by Defence Minister Manohar

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DECCAN HERALD

Monday 23 May 2016

Indigenous jets showcase fighting abilities

Kalyan Ray



The indigenous Tejas fighter jets and light combat helicopter (LCH) on Friday showcased their war fighting capabilities in an air exercise involving 180 aircraft, where Astra and Akash missiles were also fired.

Tejas dropped a laser guided bomb on a target whereas LCH fired 70 mm rockets, days after integration of these rockets were successfully demonstrated in a test in Jaisalmer.

The Army and Air Force (IAF) require 179 of these armed choppers that are being manufactured by the Hindustan Aeronautics Limited.

The weapon delivery of the homegrown fighter jet and armed chopper at the IAF Chandan range near the India-Pakistan border is probably an indication of Tejas and LCH getting ready for induction into the IAF, decades after they were conceptualised.

The R-73 missile fired by Tejas, however, missed the simulated target, which was a flare attached to a parachute. IAF officials said in reality targets would be bigger with higher radar cross section. This is the first time indigenous Astra and Akash missiles were fired before a civilian audience.

Among the audience for the "Exercise Iron Fist 2016" were President Pranab Mukherjee, Prime Minister Narendra Modi and Defence Minister Manohar Parikar, who are responsible to find out a solution for the IAF's depleting squadron strength because which the force admits its inability to take on China and Pakistan simultaneously.

THE HINDU

BDL, DRDO to produce missile

HYDERABAD, May 1, 2016

Bharat Dynamics Limited (BDL) and Defence Research and Development Organisation (DRDO) have signed a memorandum of understanding (MoU) for joint development and production of the indigenous Quick Reaction Surface-to-Air Missile (QRSAM).

The missile will be designed and developed by DRDO and will be manufactured by BDL, the Ministry of Defence nominated production agency, for supply to the Indian Army.

The MoU was signed by V. Udaya Bhaskar, BDL Chairman and Managing Director, and K. Jayaraman, Director of DRDL, on Friday at DRDL.

QRSAM has an advanced RF seeker with multiple target handling capability. It is canister launched and has a range up to 30 km, according to a DRDL press release.