

# DRDO NEWSLETTER

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# Glimpses of DRDO Exhibition at Parliament





DRDO showcased Indigenous Defence Products & Technologies in Parliament

4



MoD Commemorates 1st Death Anniversary of Dr Abdul Kalam

6



DFRL transfers Puff & Serve Chapatias Technology

7

Prof. DS Kothari Birth Centenary Celebration

8



DESIDOC celebrates 46th Raising Day

9

Manpower Development Activities

10

Personnel News

12

DRDO: Harnessing Science for Peace and Security

13

Visitors to DRDO Labs/Estts

15

EMU R&D gets top Awards in the 70th Independence Day Horticulture & Flower Show

15

DRDO in Press

16

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## DRDO showcased Indigenous Defence Products & Technologies in Parliament



India's premier research institution Defence Research and Development Organisation (DRDO) organised an Exclusive Exhibition in the Parliament premises to showcase various Defence products and Technologies developed indigenously in India.

Lok Sabha Speaker Sumitra Mahajan inaugurated the three-day event on 3 August 2016 organised at Parliament Library Building. Hon'ble Raksha Mantri Shri Manohar Parrikar and Deputy Speaker M Thambi Durai attended the inaugural event.

The aim of the exhibition was to provide the members of Parliament a firsthand account of the mammoth amount of work undertaken by the DRDO. A number of state-of-the-

art defence technologies, products and systems developed by various laboratories of DRDO was displayed in the exhibition. The exhibits included cruise missile BrahMos, MBT Arjun, Airborne Early Warning and Control (AEW&C) System, Multi Barrel Rocket Launcher Pinaka, Remotely Operated Vehicle, NBC Recce Vehicle, Wheeled Armoured Platform, Laser Ordnance Disposal System, Varunastra Torpedo, Mobile Automatic Robotic System, and various types of radars and other products.

DRDO also organised a virtual reality display of Arjun, BrahMos, AEW&C System and LCA Tejas.

Established in 1958, the DRDO and its network of 52 dedicated defence laboratories all across

the country have been engaged in developing critical defence technologies covering a wide array of disciplines like missiles, aeronautics, armaments and combat systems, life sciences, microelectronic devices, cyber technologies, electronics and communication systems radars, laser technologies, naval systems material technologies for the Indian Armed Forces.

The research agency has also tied up with several academic institutions, national science and technology agencies, public and private sector undertakings to carry out research and development work and fulfilling its foremost objective of making India fully self-reliant in defence technology design and production.







## MoD commemorates 1st Death Anniversary of Dr APJ Abdul Kalam



To commemorate the first death anniversary of former President Dr APJ Abdul Kalam, DRDO, with which Dr Kalam had a long association as Secretary, Department of Defence R&D and DG DRDO, organised a grand function at Peikarumbu in Ramaeswaram, Tamil Nadu, on 26 July 2016. Foundation stone for a National Memorial was laid unveiling his life-size statue and a 3-D model of the memorial during the function by the Union Minister for Urban Development and Information and Broadcasting Shri M Venkaiah Naidu and Raksha Mantri Shri Manohar Parrikar.

An exhibition named "Mission of Life" depicting the life of Dr Kalam and his achievements towards nation building was also a part of the event. A host of dignitaries including Ministers of the Government of Tamil Nadu and local Member of Parliament

were present on the occasion. A large number of school and college students also gathered to pay tribute to Dr Kalam at his burial site.

Prime Minister Shri Narendra Modi paid glowing tribute to Dr Kalam and said, "Dr Kalam will live forever in our minds and hearts. His thoughts continue to be with us all the time." In a tweet the Hon'ble Prime Minister said, "Its been a year since our beloved Dr APJ Abdul Kalam left us and created a void that is irreplaceable. My tributes to this great personality."

The Government of India has also announced inclusion of Dr Kalam's hometown Rameswaram under Atal Mission for Rejuvenation and Urban Transformation (AMRUT) as a tribute to the 'People's President' and projects with an investment of about 48 crore has been approved for development under AMRUT scheme.

Advanced Systems Laboratory (ASL), and Integrated Test Range (ITR), Hyderabad and Chandipur-

based DRDO laboratories, also observed the 1st Death Anniversary of Dr Kalam with due solemnity. A bust of Dr Kalam was unveiled at ASL followed by a Science Council. Dr Avinash Chander, former Secretary, Department of Defence R&D, SA to RM, and DG DRDO was the Chief Guest of the function and recalled his association with Dr Kalam. Dr Tessy Thomas, OS and Director, ASL and RCI described the occasion a proud moment and remembered Dr Kalam as a noble soul, an academican, and a great human being.

Shri K Rama Rao, former Associate Director, DRDL and classmate of Dr Kalam at MIT, Chennai; Shri MSR Prasad, Director, DRDL, all former Directors and senior scientists of ASL and many eminent dignitaries were present during the ceremony to pay their homage to Dr Kalam.

To mark the moment, Dr K Vijaya Raju, Sc G, ADA, Bengaluru,





delivered an invited talk on 'Application of SMART Materials Technology for Aerospace'.

As an apt prelude to this sombre occasion, ITR conducted essay writing, extempore speech and poster design competitions, which brought to fore the reverence of ITR community to the venerated soul through the prism of art and culture.

Dr BK Das, OS and Director, ITR, in his ode to the icon, recollected the colossal contributions of the multi-faceted genius to the cause of ITR, DRDO and the Nation. He delineated the pioneering roles played by Dr Kalam during his epoch-making stints as the first Director of ITR, SA to RM and DG DRDO, Principal Scientific Advisor to Gol and the President of India. Dr Kalam's virtues, par excellence as a human being, as a scientist, as

a technologist, as a manager, as a mentor, as a leader, as a motivator and as the People's President who goaded innumerable blooming citizens to weave dreams into reality, were articulated by Dr Das in his speech. While recalling the poignant memories of Dr Kalam's

intense association with ITR at various stages of his life, even after demitting office, he called upon the audience to emulate the legendary figure and carry forward his legacy as the best form of paying homage to his eternal soul.

Shri MV Bhaskarachary, Associate Director, ITR, also recollected his long association with the legendary personality and inspired people to work hard and follow the footsteps of the great leader and realize his dream about the range.

An audio-visual documentary conceptualized in-house was screened as a mark of respect to Dr APJ Abdul Kalam. On this occasion, the first issue of ITR Newsletter, Sagar: The Saga of the Range was also released.



## DFRL transfers Puff & Serve Chapaties Technology

Defence Food Research Laboratory (DFRL), Mysuru, signed a Memorandum of Understanding (MoU) for technology transfer of Puff and Serve Chapaties with M/s Daddy's Food Products, Thrissur, Kerala. Dr Rakesh Kumar Sharma, Director, DFRL and Shri Noble Varghese Kannathu, Managing Director, Daddy's

Food Products, signed the agreement on 1 July 2016 at DFRL, Mysuru. The inventor, Dr GK Sharma, Sc G, Additional Director, Dr AD Semwal, Sc G, Head, Technology Transfer Division, Shri Pandit Srihari, Technical Officer and Shri Joby, Shri Valsan and Shri Shaju, Managing Partners, Daddy's Food Products





were present during the occasion. The Daddy's Food Products, a startup enterprise, manufacture traditional foods of Kerala in hygienically packaged form.

The Puff and Serve Chapaties, developed to meet short-term requirement of Armed Forces during field operations, are partially baked and stabilized by incorporating anti mycotic, anti-staling and softening agents. Baking over a hot flame or hot plate puffs them ready to be served. The process is fairly simple and adaptable by any small scale entrepreneur. The paraphernalia of operations entailing traditional kitchen drudgery stand has been eliminated for preparing the Chapati.

DFRL has also transferred this technology to Hindustan Unilever, Godrej Pillsbury Ltd, Mumbai, ITC-Agro Tech Ltd, Secunderabad, Real Contract Private Ltd, New Delhi, Sanfoods, Mysore, Chacra Foods, Madurai, etc.

## Prof. DS Kothari Birth Centenary Celebration

The 110<sup>th</sup> Birth Centenary of Prof. DS Kothari, the first SA to RM and founder of Defence Laboratory Jodhpur (DLJ), was celebrated on 6 July 2016. To commemorate the fond memory of Prof. DS Kothari, his bust established at the entrance gate of New Technical Complex of the laboratory, was unveiled by Dr K Kasturirangan, former Chairman, ISRO and Chancellor of JLN University. Prof. CVR Murty, Director IIT, Jodhpur, Dr SR Vadera, OS and Director, DLJ, family members of Prof. DS Kothari, officers and staff of DLJ and many other important dignitaries of Jodhpur were also present on the occasion.



Dr K Kasturirangan also delivered the XXIVth Prof. DS Kothari Memorial Oration. Dr SR Vadera, welcomed the guests and briefed about the history behind the celebration of Prof. DS Kothari Memorial Oration. He also elaborated contributions made by Prof. Kothari in the field of science and education. Prof. Murty in his address enumerated dedication of Prof. DS Kothari for country's overall technological development by means of his scientific achievements.

Dr K Kasturirangan delivered his oration on "A Vision of Contemporary India through the Prism of

Science". He started his oration with economic growth profile of India with the emphasis on environment available for sustainable growth of economy with good quality employment opportunities based on size, population and resources driving its S&T growth. He stressed upon integration of innovation with national

S&T set up. Dr Kasturirangan also gave an overview of the five decades of growth of ISRO to self-reliance and talked about capabilities and findings of Chandrayan-I and Magalyan. He concluded his oration with the need of mega science projects in future and emphasized on India's increasing and multiple demands with limited resources, making it necessary to integrate innovation with the S&T policy for ensuring sustainability and inclusivity

On this occasion, 'Utkrisht Sewa Samman' for the meritorious contributions and Vikas Purashkar for the R&D work and technology development were given to the deserving employees. Shri Ravindra Kumar, Sc G, Chairman of the Organising Committee proposed the vote of thanks.



## DESIDOC celebrates 46th Raising Day

Defence Scientific Information and Documentation Centre (DESIDOC), Delhi, celebrated its 46th Raising Day and National Librarian Day on 12 August 2016. Dr Surendra Pal, Vice Chancellor, Defence Institute of Advanced Technologies (DIAT), Pune, was the Chief Guest of the function and Dr KG Narayanan, former Chief Advisor, DRDO, was the Guest of Honour. Directors from DRDO HQ and from sister DRDO laboratories based in Metcalfe House and Timarpur Complex, members of the DESIDOC Research Council, former Directors and employees of DESIDOC and senior scientists from DRDO HQ attended the function.

The Chief Guest also inaugurated a Book Exhibition to celebrate the National Library Day. Shri Gopal Bhushan, Director, DESIDOC, gave the inaugural oration and paid glowing tribute to Dr SR Ranganathan, father of Library Science in India. The greatest tribute to Dr Ranganathan would be to inculcate the habit of book reading in our own and among the young scientists, he said. Presenting the

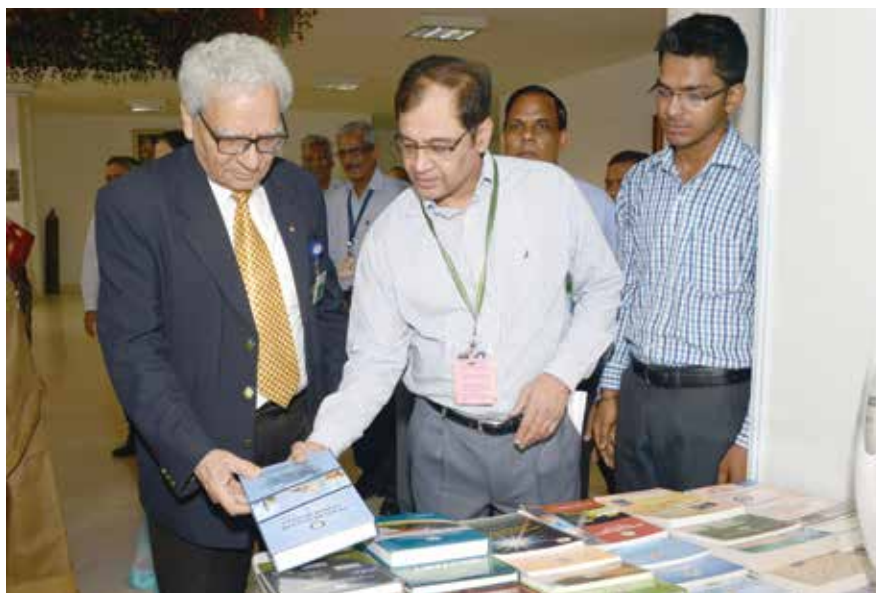


achievements of the DESIDOC in the past year, he said, the Centre has a pre-eminence position and its contributions have been acknowledged by one and all in DRDO and promise to carry forward this legacy for which all of us will have to work together and walk that extra mile to make all the difference. Elaborating the future roadmap for DESIDOC, Shri Bhushan said, "DESIDOC has to embrace itself with advance technologies and also the perception of the users and

necessarily and consciously built its brand among DRDO laboratories by contributing the knowledge capacity, knowledge capability and knowledge economy of the country." Director DESIDOC also suggested the VC to encourage DIAT students to contribute in the DESIDOC publications and scheduling orientation courses on management and administration of library and information sciences in the DIAT programmes.

Dr KG Narayanan recalled his association with DESIDOC in the past and appreciated its achievements in the area of information technology and new initiatives taken by it. He advised young scientists to be more inquisitive and not just content with their present assignments.

Dr Surendra Pal appreciated information services provided by the DESIDOC since last four decades and half. Citing examples Dr Pal said, documentation and dissemination is an important part of defence S&T. Present day knowledge-based society depends upon data and that is where institution like DESIDOC comes into picture.





## Manpower Development Activities

### Conferences/Seminars/Symposia/Training Courses/Meetings

#### Technical Workshop on Situational Awareness & Analysis System

Defence Terrain Research Laboratory (DTRL), Delhi, organized a two-day workshop on GIS: As Force Multiplier during 21-22 July 2016. The objective of the workshop was to popularize Situational Awareness and Analysis System (SAAS) software developed by DTRL among Paramilitary Forces and Police Departments in the field of biodiversity and disaster management. Shri PK Mehta, OS and DG (ACE) and Maj Gen VP Srivastava graced the occasion as Chief Guest and Guest of Honour, respectively. The workshop was inaugurated by Shri PK Mehta.

Dr MR Bhutyani, Director, DTRL, welcomed the dignitaries and the participants. He requested the participants to use this software and share their experiences so that further improvements could be done.

Shri Mehta congratulated Director, DTRL and his team for successfully development of SAAS software and deliberated on rising popularity of open source software and GIS. Maj Gen Srivastava reviewed the development story of SAAS and his involvement in its development since initial stages.

Lectures and hands-on training on use of SAAS were imparted during the workshop. Thirty-five officers participated in the workshop. In the valedictory session,



Dr Manoj Bali, Director, Low Intensity Conflicts, DRDO HQ, emphasized on the diverse use of this software, apart from military applications. Dr BG Prusty, Division Head, GSAD, requested the participants to use the software and give their feedback for its updation. Ms Munmun, Sc C, was the coordinator of the workshop. Shri Vivek Saxena, Sc E presented the vote of thanks.

#### Hindi Workshops

✧ A one-day Hindi workshop was organized at Defence Metallurgical Research Laboratory (DMRL), Hyderabad, on 29 June 2016. Thirteen employees participated in the workshop. Shri Ram Singh Shekhavat, Hindi Professor, Hindi Teaching Scheme, was invited as a trainer for the workshop. In his lecture, he emphasised using the right spelling of Hindi words while writing in Hindi.

Shri JS Yadav, Sc G, Secretary and Coordinator, Official Language Implementation Committee (OLIC), DMRL, also addressed the participants. He outlined the various incentive schemes for the employees to work more and more in Hindi. Participants actively interacted with the invited speaker.



✧ Research Center Imarat (RCI), Hyderabad, organised Hindi workshop on 29 July 2016. Shri T Narasimha Rao, ScG, Vice Chairman, OLIC, inaugurated the workshop. Shri N Venkatesh, Sc F, Member OLIC, briefed about the achievements of Rajbhasha Division.

Shri Kazim Ahmed, Senior Translator, RCI, delivered a lecture on Official Language Policy: Provisions



and Implementation. Smt Archana Pandey, Senior Translator, Defence Research and Development Laboratory (DRDL), Hyderabad, delivered a lecture on effective implementation of Hindi at the laboratory. Twenty-five participants attended the workshop. Shri Pankaj Rawat, Junior Translator, proposed the vote of thanks.



## NPOL-VARUNA Merit Evening 2016

Naval Physical and Oceanographic Laboratory (NPOL), Thrikkakara, Kochi, organized NPOL-Varuna Merit Evening – 2016 on 4 July 2016 to felicitate and honour the academic excellence of Bhavan's Varuna Vidyalaya (BVV), a joint venture of NPOL and Bharatiya Vidya Bhavan (BVB).

Shri VS Shenoi, Chairman, School Management Council (SMC), highlighted the consistent academic excellence of BVV over the years. Dr K Sudarsan, Officiating Director, NPOL, appreciated the outstanding performance of the students of class X<sup>th</sup> and XII<sup>th</sup>. He emphasized that being a decade of innovation declared by the Government of India, it is appropriate that senior secondary students be given a chance to explore their hidden talents and bring out new ideas and concepts



by way of mini science projects, which can be suitably rewarded and recognized.

The Chief Guest of the function, Dr A Ramachandran, Vice Chancellor, Kerala University of Fisheries and Ocean Studies (KUFOS), presented mementos to the stream toppers of CBSE XII<sup>th</sup> Board Examinations and those who have secured admission to institutions of national importance. He lauded the young sparks as well as their parents and teachers who acted as crucial driving forces behind their success. He pointed out the current trends in higher education and the need for hard work, perseverance and innovative thinking on the part of students for academic and career prospects

Shri E Ramankutty, Director, BVB, Kochi Kendra, and Smt K Usha, Principal, BVV, offered felicitations on the occasion. Smt Sinchu P, Vice Chairman, SMC proposed the vote of thanks.

## Research Council Meeting

Proof and Experimental Establishment (PXE), Chandipur, organised its Research Council Meeting on 22 July 2016. The meeting was chaired by Prof. Sankar Dhar, Jadavpur University, and attended by external members from IIT, BBSR, former scientist of ISRO and DRDO officials from High Energy Materials Research Laboratory, Armaments Research and Development Establishment and Combat Vehicles Research and Development Establishment along with scientists of PXE.

Progresses of R&D activities along with proposals for new R&D initiatives were discussed. Important test and evaluation activities of 2015-16 and achievements were presented during the deliberations.





## Personnel News

### Appointment

#### DG Missiles & Strategic Systems, DRDO



Dr G Satheesh Reddy, Distinguished Scientist, DRDO, and Scientific Advisor to Raksha Mantri, has assumed the charge of Director General, Missiles and Strategic Systems, DRDO.

He is renowned for his significant R&D contributions in Missile Systems and sustained efforts towards advancement of aerospace technologies and industries in India. With his technology leadership spanning over three decades, Dr Reddy has made pioneering contributions and spearheaded the design, development and delivery of diversified Navigation Systems for various Defence programmes of the country.

As Director, Research Centre Imarat (RCI), Hyderabad, he led the design and development of avionics technologies in critical areas for Indian missiles and other defence programmes. As Programme Director, he steered the development of Medium Range Surface-to-Air Missile (MRSAM) successfully and as Project Director, paved the way for realization of country's first Guided Bomb with extended range. Dr Reddy has led numerous technology developments, and mission mode and S&T projects realizing state-of-the-art systems and sub-systems for multiple projects.

Dr Satheesh Reddy graduated in Electronics and Communication Engineering from Jawaharlal Nehru Technological University (JNTU), Anantapur, and received his MS and Doctorate from JNTU, Hyderabad. He has also been conferred with Honorary degrees of Doctor of Science by Amity University Noida, and many other universities of the country. As an Indian Defence and Aerospace Scientist, he holds the distinction of being inducted as Fellow of Royal Institute of Navigation, London (FRIN), Royal Aeronautical Society, UK (FRAeS) and has been awarded the Full Member Diploma as a Foreign Member of the Academy of Navigation and Motion Control, Russia. He is an Honorary Fellow of Computer Society of India (Hon. FCSI) and Fellow of Indian National Academy of Engineering (FNAE), Aeronautical

Society of India (FAeSI), Institution of Engineering and Technology (FIET), UK, Associate Fellow of American Institute of Aeronautics and Astronautics (AFAIAA), USA and many other professional/scientific bodies in the country and abroad. He is also an Hon. member of Automatic Control Dynamic Optimization Society (ACDOS), and the national member Organization of International Federation of Automatic Control (IFAC) in India.

For his significant lifetime contributions to Defence Science and Technology, Dr Reddy received the prestigious Indian Science Congress Association Homi J Bhabha Memorial Award from Hon'ble Prime Minister of India. Acknowledging his vital contributions towards promotion of aerospace technologies in India, Royal Aeronautical Society, London honoured him with a Silver Medal. He has also been selected for the first IEL (India) and IEEE (USA) joint award for Engineering Excellence.

Dr Reddy is also a recipient of the National Systems Gold Medal, Aeronautical Society of India Dr Biren Roy Space Science Design Award, Systems Society of India Vikram Award, Astronautical Society of India Rocket and Related Technologies Award, DRDO Agni Award for Excellence in Self Reliance, IETE BV Baliga Memorial Award, DRDO Pathbreaking Research Award, FAPCCI Outstanding Engineer Award and many other honours/recognitions.

### Awards



Dr RK Sharma, OS and Director, Solid State Physics Laboratory (SSPL), Delhi, has been awarded Materials Research Society of India (MRSI) Medal for his outstanding contribution toward development of Semiconductor Materials Technologies.



Dr Chandra Prakash, Sc G, SSPL, has been listed among top 10 researchers in the field of Materials Science in the country in a bibliometric analysis, titled International Comparative Performance of India's

Research Base (2009-14), conducted by DST. The report has been published by Elsevier.

# **DRDO: Harnessing Science for Peace and Security-VII**

## **Chapter 1: The Beginning — Defence Science**

*The article is Seventh 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).*

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### **Post-Independence Scenario**

#### **Report of Professor PMS Blackett**

He specifically excluded at that point of time, research and development of conventional weapons which were not intended for manufacture in the country as well as new weapons and equipment that demanded a very high level of technology and which would not be suitable for use by the Indian Armed Forces, such as the guided missiles, high performance aircraft, supersonic aircraft, chemical, bacteriological and atomic warfare, millimetre wave radar, large ships, and so on. He was of the opinion that, "considerable advantage would result if a few carefully selected Service Officers were attached for a year or two to the scientific staff". He wanted the scientists of the Defence Science Organisation to apply their analytical skills to the study of any military operation in progress in Kashmir. "Unless this study is carefully organised and carried out by trained team of operational research workers, many valuable lessons will be lost".

With respect to aeronautics, Professor Blackett commented that "even though India has not the resources to make it worthwhile to embark on a large programme

of aerodynamics research, she has adequate resources to make possible successful Indian design of simple types of aircraft, provided the available resources are properly used and the collaboration between the design staff and aerodynamics department is close". He suggested that "probably an aeronautical research and development establishment will be needed if India is to develop an air industry".

However, in other technology areas related to defence weapons, he urged the Government to strengthen and expand the existing technical/ defence development establishments so that the special problems of applying modern techniques to the manufacture, modification of military vehicles and weapons may be adequately dealt with. However, he did not suggest the merging of the TDEs with the Defence Science Organisation but instead wanted the Scientific Adviser to be consulted in respect of their research programmes and in the appointment of the scientific staff. He left open the merger of these two organisations by stating, "In a few years' time, when the Scientific Adviser has staff adequately trained in the different branches of defence science, the position could be reviewed".

Professor Blackett's opinions, as expressed in this report, also influenced the thinking of the first Scientific Adviser. Professor Blackett later indicated that his effort from the beginning was, "to prevent India from unnecessary and costly introduction of weapons and strategies, which would not have practical value, and to focus

attention on the military risks which India did face". He elaborated it further to state that he was preparing India for war with a country the size and force of Pakistan and not with Russia or a Western Power.

### **The First Scientific Adviser**

#### **The Search is On**

Even as Professor Blackett was visiting India, the machinery of the Government was once again set in motion for the selection of a scientist to fill the post of the Scientific Adviser to the Defence Ministry. The selection of the scientist for the post went through careful scrutiny and consideration, before Professor Daulat Singh Kothari, Dean of the Faculty of Science of Delhi University, was requested in May 1948 to be the first Scientific Adviser. In July 1948, at the age of 42, he assumed charge of his office. Like most Indians of that period, he had very little knowledge of defence and therefore several factors might have weighed in his mind before he would have taken his decision.

The compartmentalisation that existed between academicians and the technical personnel engaged in defence work, the perception that scientific work in defence is only of applied nature, the sharp distinction that was sought to be made in academic circles between pure and applied research with disadvantage to the latter ("a distinction nearly as sharp as the distinction between a gentleman and a liar at large") and the interruption that would be caused in his research and teaching activities, were some of the negative factors against acceptance, while



his interaction with Professor Blackett, whose opinion was being sought by the Government, would have been the single most positive factor. By his own account, when he accepted to become the Scientific Adviser and take up the work of creating and building a science organisation in defence, he had said to himself that he would take it up only for three years.

## Dr Kothari as Scientist

Dr DS Kothari was a theoretical physicist who had come under the influence of Dr Megnadh Saha at the Allahabad University during his studies in physics for his baccalaureate and masters degrees. After he had completed his studies at Allahabad, Professor Megnadh Saha encouraged the young physicist to pursue advanced studies at the University of Cambridge, in UK, which was the mecca for nuclear scientists all over the world. At the university, he came to know Lord Rutherford, Peter Kapitza, RH Fowler, and Subramanyam Chandrasekhar who later migrated to University of Chicago and attained fame for his contributions to astro physics. He maintained an unbroken lifelong friendship and research interactions with Professor Chandrasekhar. Dr Kothari worked in the area of quantum statistical mechanics and its applications to degenerate stars and planets. In particular, during his stay at the University of Cambridge, his research interests were focused on the effects of pressure ionisation in cold compact objects and he was able to show that bodies having masses greater than that of Jupiter would be unstable against collapse. He returned to India in 1933 and soon after joined the University of Delhi at Professor Saha's insistence, as Reader in the Department. He continued his research at the Delhi

University and under his guidance, soon the University of Delhi came to be recognized as the leading centre in the country in the field of quantum mechanics and quantum field theory, nationally and internationally. University of Delhi was the only university for several years to teach the methods of quantum mechanics and quantum mechanical theory at the master's degree level. In 1942, he was made Professor along with Dr VKRV Rao, who had founded the Delhi School of Economics and played a major role in the overall growth of the University and in enhancing its reputation as a centre of learning. By the time the country attained independence, Professor Kothari had established his reputation as a person of intellect and a fine human being. Simplicity and humility coupled with a rare sense of duty and service were his main characteristics. He had an extraordinary memory for names and in spite of his busy teaching and research schedule, he was approachable by one and all, high or low, in the University.

## The Framework

Along with the creation of the post of Scientific Adviser, the Government of India had constituted an Advisory Board with the objective of formulating a science policy in relation to defence. Within four days of his assuming charge of his office, the first meeting of the Board with the Defence Secretary as the Chairman, and comprising Dr HJ Bhabha, Dr SS Bhatnagar, and Dr KS Krishnan as members, was held, to make known to the newly appointed Scientific Adviser, the views of the members of the Advisory Board about the objectives and formation of an organisation for bringing science to bear on defence matters. Before its second meeting was held on 18 August 1948, the

membership of the committee was enlarged to include the three Service Chiefs and the Financial Adviser (Defence) and was renamed as the Defence Science Policy Board. The main areas of concern for the Board were, wider aspects of defence science and policy, integration of military and scientific thought and planning defence research and development as a whole, taking into account the industrial resources of the country. In addition to the Defence Science Policy Board, a Defence Science Advisory Committee was constituted with the Scientific Adviser as the Chairman and with fourteen members comprising Director General Armed Forces Medical Services, Master General of Ordnance, Engineer-in-Chief, Director of Technical Development, Director of Weapons and Equipment, Army Headquarters; Director of Technical Services, Air Headquarters; Director of Naval Engineering, Naval Headquarters; Scientific Adviser, Navy; Director General of Ordnance Factories, representatives from CSIR and Ministry of Commerce and Industry; and Deputy Chief Scientific Officers—Army, Navy and Air Force. The broad functions of the Committee were to consider the technical and scientific aspects of Service requirements, to keep in close contact with research and development in the Services technical establishments, to initiate research and development in the Service laboratories, and to keep in touch with the scientific and industrial work in the national laboratories, universities, and other scientific and technical institutions in the country. Specialised panels and subcommittees under the Committee were also formed for subjects such as electronics, ballistics, and explosives.

*To be continued...*

## Visitors to DRDO Labs/Estts

### Armament Research & Development Establishment

Dr S Christopher, Secretary, Department of Defence R&D and DG DRDO visited Armament Research and Development Establishment (ARDE), Pune on 10 July 2016. During the visit he reviewed important projects of ARDE, HEMRL, R&DE (Engrs), Pune and VRDE, Ahmednagar. Demos of 5.56 x 30 mm Joint Venture Protective Carbine and silent demos of other weapons such as Corner Shot Weapon System, Multi Calibre Rifle, 5.56 mm Assault Rifle, 40 mm UBGL, 40 mm Air Burst Grenade, instrumentation used for technical evaluation of small arms were given to the Secretary.



### Proof & Experimental Establishment

Dr S Christopher, Secretary, Department of Defence R&D and DG DRDO visited Proof and Experimental Establishment (PXE), Chandipur, on 12 July 2016 along with Shri PK Mehta, DG (ACE), and Ms J Manjula, DG (ECS). He inaugurated the ICSS Tower at Chandipur and also witnessed trial firings of ATAGS, BMCS Ammunition, TB Ammunition, RHA Plate penetration and ER-SAR Naval Rocket. Secretary appreciated Proof officers and staff for their sincere, time bound and dedicated efforts for completion of various trials regularly without jeopardizing the safety aspects.



### EMU R&D gets top Awards in the 70th Independence Day Horticulture & Flower Show

Estate Management Unit R&D (EMU R&D), CV Raman Nagar, DRDO, Bengaluru, bagged 60 First Prizes in the 70th Independence Day Horticultural Show organized by the Mysore Horticulture Society, Government of Karnataka, at Lalbagh. EMU has also been awarded "A Special Outstanding Trophy and Rolling Shield" by the Mysore Horticulture Society for overall performance, maintenance and upkeep of the arboriculture assets at DRDO. The unit has also been awarded two "Special Silver Mementos" for the recognition of their outstanding performance.



Dr S Christopher, Secretary, Department of Defence R&D and DG DRDO congratulated Shri Ajay Singh, Chief Executive, DCWE, and his entire team for winning the prizes.



# DRDO in Press

## THE ECONOMIC TIMES

Monday, 1 August 2016

### We are making our own AIP Systems with DRDO: Admiral Sunil Lanba

Mumbai: Navy Chief Admiral Sunil Lanba today said India is indigenously building AIP-enabled submarines.

"We are making our own AIP (air independent propulsion) indigenous system with DRDO. At present, project definition is going on. Prototypes based plant is being constructed and once it is ready, it will be fitted in the Kalvari-class submarines," Admiral Lanba said during his first media interaction after taking over as Navy Chief.

To a query if Pakistan's acquisition of submarines fitted with AIP system from China was a threat to India, he said, "The submarines have capabilities. But we have system in place and operation in place which we can look after that."

The Naval chief said the force was committed to building indigenous ship in line with the 'Make in India' initiative and at present, 46 ships and submarines were being built in the country.

The Navy has been focused on indigenisation right from the beginning. We have been building ships in India for over decades and 200 naval ships

have been built in India till date. At the moment, 46 ships and submarines are under construction and are all being built in Indian shipyards," he said.

"We work closely with DRDO and other private sector industries to ensure our weapons and sensors are titled with India. We are focused and committed to make in India," Lanba said. Talking about India's stand after China rejected an international tribunal ruling on the disputed waters of the South China Sea, he said rule of law should be followed.

"As far as South China Sea goes and arbitration which has been done and decision which has been taken, India's stand has always been that disputes should be resolved on the basis of laws, there should be freedom of navigation and rule of law should be followed," he said.

The Hague tribunal backed the Philippines in a case on the disputed waters of the South China Sea, ruling that rocky outcrops claimed by China-some of which are exposed only at low tide-cannot be used as the basis of territorial claims.

## The Tribune

VOICE OF THE NATION

Tuesday, 2 August 2016

### A first: DRDO exhibition at Parliament

The Defence Research and Development Organisation (DRDO) would, in an unprecedented move, set up an exhibition on the Parliament premises to showcase various products for the benefit of elected representatives and visitors to the House.

Lok Sabha Speaker Sumitra Mahajan would on August 3 inaugurate the three-day event, to be organised at Parliament Library Building. Numerous state-of-the-art technologies, products and various DRDO laboratories would be put on display.

These would include the BrahMos missile, the Arjun main battle tank, airborne early warning and control system, multi-barrel rocket launcher 'Pinaka', remotely operated vehicle, NBC reconnaissance vehicle, wheeled armoured platform, laser ordnance disposal system, Varunastra torpedo, mobile automatic robotic system and various kinds of radars and other products.

The Members of Parliament from both Lok Sabha and Rajya Sabha are expected to visit the exhibition to get a first-hand account of the huge work undertaken by defence body and their successful implementation.

## THE HINDU

Friday 12 August 2016

### Work on DRDO Vessel begins at Shipyard

The cutting of the first steel plate, the initial step in the construction of a ship, took place at the Cochin Shipyard Limited (CSL) for Ship No. 20 of the Defence Research and Development Organisation (DRDO) on Thursday.

Y. Sreenivas Rao, scientist and project director of the Ship No.20 project, DRDO, Hyderabad, cut the first steel plate by switching on the plate cutting machine. The ceremony was conducted in the hull shop of the yard. Madhu S. Nair, chairman and managing director, directors, officers, supervisors and workmen of the CSL, were present. Senior representatives from the Indian Register of Shipping and DNV-GL, the classification societies for the vessel, also attended the ceremony, said a release.

The ship with a length of 118.4 metre, width of 20 metre and draft of 7.1 metre and having a weight of 3,900 tonne, was contracted in last August. The CSL is currently building a barge for the National Petroleum Construction Company, Abu Dhabi. The shipyard has started the design work for two vessels of "1,200 passenger cum 1,000 tonne cargo" capacity and another two "500 passenger cum 150 tonne cargo" capacity vessels for the Andaman and Nicobar Administration. The shipyard has already delivered 18 of the 20 Fast Patrol Vessels built for the Coast Guard and the remaining two vessels are getting ready for delivery. The Ro-Ro vessels for the Kochi Corporation are also scheduled to be delivered soon.



August 15, 2016

### Formidable BRAHMOS buttresses India's military might

Its induction into all three services is a game-changer

India, facing the challenges of an increasingly volatile neighbourhood and a swiftly changing world order, has made its intentions clear of strengthening its Armed Forces by equipping them with the most advanced defence platforms, weapons and systems.

As a major Asian power, India has dealt with war in the past and is now preparing itself well to face any kind of eventuality. Among the most advanced equipment the country's Armed Forces are acquiring, the induction of the BRAHMOS supersonic cruise missile system in all three wings of the Services has certainly empowered the country to take on an adversary without fear.

As the world's fastest supersonic cruise missile system, BRAHMOS has established its credibility as a deadly tactical weapon capable of destroying any kind of enemy target and vital installations in the shortest possible time. The missile, having land-attack and anti-ship capabilities, has been deployed in the Indian Army, Navy and Air Force. For the Army's artillery division, BRAHMOS has formed the backbone, having been deployed in all strategic areas of the country.

While three BRAHMOS regiments consisting of the advanced Block III configuration with supersonic steep dive capability have made their way into the Army, the government has also cleared a fourth BRAHMOS regiment for deployment in the country's Eastern sector.

Two successful test firings of the missile by the Army in May 2015 had revalidated the superiority of BRAHMOS as a tactical strike weapon capable of knocking down enemy targets even in the most difficult and hidden terrains without any collateral damage.

As for the Navy, 10 of its frontline warships have been armed with the lethal, state-of-the-art weapon, while many futuristic naval platforms are also going to deploy

BRAHMOS. The missile has also proved its underwater firing capability and can equip the Navy's submarines in the near future.

Similarly, the Indian Air Force has operationalised the mobile land-attack variant of the missile. And in yet another recent development, the missile's air-to-ground version, BRAHMOS-A, has successfully undergone its maiden demonstration flight test from the IAF's long-range strike fighter Sukhoi-30MKI a first-in-the-world feat. The maiden sortie of the IAF fighter carrying the formidable BRAHMOS air-launched cruise missile (ALCM) achieved a perfect take-off and landing at HAL, Nashik during the test flight conducted on June 25, 2016.

The entire world is keeping a close watch on this development because never before in the world has such a powerful weapon been tested by such a heavy, long-range strike fighter of an air force.

The BRAHMOS-A missile programme has been a very challenging one since the beginning and involved several technical modifications both in the missile as well as in the Russian-built air platform of Sukhoi-30.

The successful culmination of this ambitious project promises to not only multiply the tactical combat potential of the Indian Air Force but also make BRAHMOS an ultimate "game-changer" in modern-day's complex battlefields and conflict scenarios.

The successful deployment of BRAHMOS ALCM is set to complete the tactical cruise missile triad by it being launched from land, sea and air—again a capability not achieved by any country other than India.

The BRAHMOS thus continues to and will continue to take India's military might to incredible heights, making its adversary reluctant to attempt any misadventure against its sovereignty and territorial integrity.

## दैनिक जागरण

22 अगस्त 2016

### रडार की पकड़ से बाहर रहेंगे टैंक और अन्य हथियार

जागरण संवाददाता, बनारस : अब सेन के टैंक व दूसरे हथियारों को दुश्मन रडार तकनीक से धीरे-धीरे देख पाएंगे। विशेष मैटीरियल स्टोर्स रिजर्च एंड डेवलपमेंट इन्स्टीट्यूट (वीएफएसआरआई) बनारस ने इसकी पुष्टि व्यवस्था कर दी है। मोबाइल कैम्पेसिंग सिस्टम का निर्माण शुरू हो गया है। इसे बनाने के लिए सेना ने धीरे-धीरे प्रकल्प आरंभ दिया है।

अब तक सेना पर सड़कों के दोहन सेना के टैंक और दूसरे हथियार दुश्मन रडार के जाल में फँस जाते हैं। लेकिन अब ऐसा किन्तु नहीं होगा। इसके लिए वीएफएसआरआई ने मोबाइल कैम्पेसिंग सिस्टम विकसित किया है। इसका इस्तेमाल टैंक व दूसरे हथियारों में किया जाएगा, जिससे रडार टैंक नहीं कर पाएंगे। सेना ने

इसका वृद्ध उत्पादन करने का आरंभ दिया है। वीएफएसआरआई ने इस पर काम धीरे-धीरे कर रहा है।

मोबाइल कैम्पेसिंग सिस्टम न्यूनतम 2.6 से 4.2 किलोमीटर के क्षेत्रफल में काम करेगा। इस बीच दुश्मन के रडार हथियारों को टैंक नहीं कर सकेगा। सिस्टम में मोटर लीडिंग की सुविधा होगी जिसका विकास एक घंटे तक लेगा।

इसे क्या करेगा सिस्टम : मोबाइल कैम्पेसिंग सिस्टम जाल सरोखा लेगा है। इसे टैंक 90 सेकेंड्स टैंक और अन्य हथियारों पर बिना देता है, रडार टेक्नीक से होने के कारण इसे विच्छेद हो हथियार रज बंद हो देगा। असे से दुश्मन टैंक का अन्य हथियारों को पकड़ नहीं पाएंगे।