

# DRDO NEWSLETTER



[www.drdo.gov.in](http://www.drdo.gov.in)

A Monthly Bulletin of Defence Research and Development Organisation

DECEMBER 2023 | VOLUME 43 | ISSUE 12

ISSN: 0971-4391

## FIRING TRIALS OF MOUNTED GUN SYSTEM AT POKHRAN FIELD FIRING RANGES





Editor-in-Chief: Dr K Nageswara Rao  
Associate Editor-in-Chief: Sudhanshu Bhushan  
Editor: Dipti Arora  
Pre-press: Raj Kumar  
Printing: SK Gupta  
Marketing: Tapesh Sinha

43rd Year of Publication



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## LABORATORY CORRESPONDENTS

- Ahmadnagar** : Shri RA Shaikh, Vehicle Research and Development Establishment (VRDE)  
**Ambarnath** : Dr Ganesh S. Dhole, Naval Materials Research Laboratory (NMRL)  
**Chandipur** : Shri PN Panda, Integrated Test Range (ITR)  
Shri Ratnakar S, Mohapatra, Proof & Experimental Establishment (PXE)  
**Bengaluru** : Shri Satpal Singh Tomar, Aeronautical Development Establishment (ADE)  
Smt MR Bhuvaneswari, Centre for Airborne Systems (CABS)  
Smt Faheema AGJ, Centre for Artificial Intelligence & Robotics (CAIR)  
Dr Josephine Nirmala M, Combat Aircraft Systems Development & Integration Centre (CASDIC)  
Dr Sanchita Sil & Dr Sudhir S Kamble, Defence Bioengineering & Electromedical Laboratory (DEBEL)  
Dr V Senthil, Gas Turbine Research Establishment (GTRE)  
Shri Venkatesh Prabhu, Electronics & Radar Development Establishment (LRDE)  
Ms Mita Jana, Microwave Tube Research & Development Centre (MTRDC)  
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: Dr Anuja Kumari, Defence Geoinformatics Research Establishment (DGRE)  
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**Delhi** : Shri Tapesh Sinha, Defence Scientific Information & Documentation Centre (DESIDOC)  
Dr Dipti Prasad, Defence Institute of Physiology & Allied Sciences (DIPAS)  
Shri Santosh Kumar Choudhury, Defence Institute of Psychological Research (DIPR)  
Shri Navin Soni, Institute of Nuclear Medicine and Allied Sciences (INMAS)  
Smt Rabita Devi, Institute for Systems Studies & Analyses (ISSA)  
Shri Ashok Kumar, Scientific Analysis Group (SAG)  
Dr Rupesh Kumar Choubey, Solid State Physics Laboratory (SSPL)  
**Gwalior** : Dr AK Goel, 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 ARC Murthy, Defence Electronics Research Laboratory (DLRL)  
Dr Manoj Kumar Jain, Defence Metallurgical Research Laboratory (DMRL)  
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**Kanpur** : Dr Mohit Katiyar, Defence Materials & Stores Research & Development Establishment (DMSRDE)  
**Kochi** : Smt Letha MM, Naval Physical & Oceanographic Laboratory (NPOL)  
**Leh** : Dr Dorjey Angchok, Defence Institute of High Altitude Research (DIHAR)  
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**Mysuru** : Dr M Palmurugan, Defence Food Research Laboratory (DFRL)  
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**Tezpur** : Dr KS Nakhuru, Defence Research Laboratory (DRL)  
**Visakhapatnam** : Smt Jyotsna Rani, Naval Science & Technological Laboratory (NSTL)



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*director.desidoc@gov.in; drdonl.desidoc@gov.in*  
Contact at: 011-23902403; 23902472; Fax: 011-23819151



# FIRING TRIALS OF MOUNTED GUN SYSTEM AT POKHRAN FIELD FIRING RANGES

Artillery is one of the most important arms of any army and is often the key to many successful operations. The ground warfare is highly influenced by artillery in the sense that it provides the indirect fire support, accurate target acquisition and subsequent destruction of enemies. To provide this distinct advantage to our defence forces, DRDO took up a project of developing a 155 mm/52 caliber Towed Artillery Gun.

After successful trials, the same has been inducted in the Indian Army. To provide necessary mobility to the towed gun so as to meet the challenges of mobile warfare, Vehicles Research and Development Establishment (VRDE), Ahmednagar has undertaken the project – Mounted Gun System (MGS). VRDE has designed & developed MGS based on the developed Towed Artillery Gun System. The system has

been developed on solo 8x8 high mobility vehicle integrated with stabilization system for providing stability during firing.

The state-of-the-art systems like blast resistant cabin, leg type electro-mechanical stabilizers, automatic ammunition handling system, on-board silent electric power system, integrated electronic controller, RLG based navigation system, integrated fire control system, etc., have been

## Technical Specifications of Mounted Gun System

Technical Specifications of Mounted Gun System	
Gun	155 mm X 52 Cal (ATAGS ordnance adapted)
High Mobility Vehicle	<ul style="list-style-type: none"> <li>• 8X8 ,Cross Country (4800 m alt)</li> <li>• Power to Wt : 10 (KW/t)</li> <li>• TCD – 26 m</li> <li>• Fording – 1.2 m</li> <li>• Payload capacity: 17t</li> <li>• Strengthened Chassis</li> <li>• Low ht Cabin , protected against muzzle blast, 06 crew</li> <li>• PAN India movement by Rail</li> </ul>
Arc of Fire	<ul style="list-style-type: none"> <li>• Azimuth - <math>\pm 30^\circ</math></li> <li>• Elevation - <math>0^\circ</math> to <math>72^\circ</math></li> </ul>
Stability(during firing)	<ul style="list-style-type: none"> <li>• Stabilisers system to withstand 45t recoil force (ZONE 7)</li> <li>• Electro-Mech Outriggers (02 no)</li> </ul>
Power Source	<ul style="list-style-type: none"> <li>• APU (Primary)</li> <li>• Vehicle PTO (Redundant)</li> <li>• Can power another MGS</li> </ul>
Drives	All electric drives
PreparationTime	<ul style="list-style-type: none"> <li>• 80 s into &amp; 85 s out of action</li> <li>• Deployed from Cabin</li> <li>• Shoot &amp; Scoot capability</li> </ul>
Ammunition Stowage	24 rds& 150 BMCS

integrated on to the MGS.

The indigenously developed MGS is at par with the contemporary systems available worldwide and can fire 155 mm NATO standard ammunition. After the design and development of the system, to ascertain the mobility parameters, technical

trials were conducted at NCAT (VRDE) and also on beaten dessert track and cross country track at PFFR. All the designed parameters were achieved during these trials.

Firing trials of MGS were carried out at Pohran Field Firing Ranges (PFFR), during September 2023. Various tests viz. Minimum

and Maximum Range Firing, Series I & II – Consistency Firing, Arc of Fire, and Direct Firing were carried out during the trials at various Sectors of PFFR. All the tests were conducted considering various firing angles in elevation & azimuth and also all Zones of firing.

Comparison with Contemporary Systems					
Product Name	ATMOS	CEASER	ZUZANA	NORA	MGS
Country of Origin	Israel	France	Czech Republic	Serbia	INDIA
Gun	155 mm/52 cal				
Power to Weight ratio (kW/ton)	8.09	9.88	9.45	9.59	10.15
Maximum Range (km)	30-41	42-55	41	41.2	45
Maximum Fire Rate (rds/min)	4-9	6	5-6	4	6
Maximum Speed (km/hr)	80	90	80	80	90

## CYBER SWACHHATA DIWAS SAMAROH

### DRDO HQrs, New Delhi

Defence Research and Development Organizations (DRDO), HQrs, Delhi, organized the Cyber Swachhata Diwas Samaroh on 25 October 2023 during the celebration of Cyber Swachhata Week (23-27 Oct 2023). The event was part of the cyber hygiene campaign to increase awareness at the mass level, which was coordinated by the office of the National Cyber Security Coordinator under the National Security Council Secretariat, Govt. of India. The event, held at DRDO Bhawan, Delhi, brought together



Cyber Swachhata Diwas Samaroh at DRDO HQrs, New Delhi



a diverse group of scientists, academicians, industry experts, and defence experts for a day of discussions and provided insights into the ever-evolving world of cyber security.

## DEBEL, Bengaluru

Cyber Swachhata Abhiyan was observed in Defence Bioengineering & Electromedical Laboratory (DEBEL), Bengaluru during 01-31 October 2023 by conducting various activities for the benefit of DEBELites. Director, DEBEL addressed the gathering and brought out the importance of cyber security awareness by emphasizing safety measures to be taken while using Internet and computer resources. Further, to increase cyber security awareness, a booklet received from Indian Computer Emergency Response Team (CERT-In) was circulated via Intranet to all the employees.



Cyber Swachhata Diwas Samaroh at DIPAS, Delhi

## DIPAS, Delhi

Defence Institute of Physiology & Allied Sciences (DIPAS), Delhi, celebrated National Cyber Security Awareness Month by conducting various events. A cyber pledge event was organised and all officers and staff, along with the Director,

DIPAS participated in the pledge event. A lecture was also organised to celebrate the Cyber Swachhata Abhiyan: Cyber Hygiene Campaign on 31 October 2023, to increase awareness at the mass

level. To celebrate the occasion, Shri Manoj Kumar Meena, IPS DCP (North District), and Shri Pawan Tomar, SHO Cyber, North PS, delivered a lecture on 'Cyber Hygiene Practice'.

# RUN FOR UNITY

## ASL, Hyderabad

Advanced Systems Laboratory (ASL), Hyderabad organized 'Run for Unity' on 31 October, 2023. Shri BV Paparao, DS & Director, addressed the gathering and gave tribute by remembering the contributions of Sardar Vallabhbhai Patel on his Birth Anniversary. Shri Neil Dubey,

Sc 'F', DOMS highlighted the importance of the Day.

Smt R Sheena Rani, OS & Programme Director AGNI & Associate Director, Dr Manoj Kumar Buragohain, OS & Associate Director, along with senior scientists, officers, and staff have participated in the 'Run for





Unity'. Shri U Suresh Babu, Sc 'F', Sports Officer thanked all the participants for taking-part in the event and making it a grand success.

### CVRDE, Chennai

To celebrate the birth anniversary of Sardar Vallabhbhai Patel, a 'Run for Unity' was organised at Combat Vehicles Research and Development Establishment (CVRDE), Chennai, on 31 October 2023. The day is also known as National Unity Day or Rashtriya Ekta Diwas.

Shri J Rajesh Kumar, Director, CVRDE, flagged off the event. Speaking on the occasion, the Director, CVRDE, recalled the contributions of Sardar Vallabhbhai Patel, especially in uniting the nation.



### DEBEL, Bengaluru

Run for Unity-2023 was organised in the Defence Bionengineering and Electro-medical Laboratory (DEBEL), Bengaluru on 31 October 2023.

The run was inaugurated by Dr TM Kotresh, OS & Director, DEBEL. Enthusiastic personnel participated in the event and ran for a stretch of 3 km within the campus. It was a true picture of unity and peace as all the personnel ran in white T-shirt with Run for Unity Logo and the Indian Flag.

### DESIDOC, Delhi

A 'Run for Unity' event was organised at Defence Scientific Information & Documentation Centre (DESIDOC), Delhi on 31 October 2023. Dr K Nageswara Rao, Director, DESIDOC, flagged off the run. The Unity Day pledge was administered and all officers and staff took part in the event.



### DGRE, Chandigarh

Defence Geoinformatics Research Establishment (DGRE), Chandigarh, organised 'National Unity Day' on 31 October 2023. Dr PK Satyawali, OS & Director, DGRE, on National Unity Day addressed the DGRE gathering and said that Sardar Patel ji was instrumental in national integration, and it is our duty to follow his steps and work towards strengthening the unity of the country and flagged off the unity run of DGRE to Sectors 37 and 38 of Chandigarh to uphold the integrity of the nation.



'Run for Unity' at DMRL, Hyderabad



### DIPAS, Delhi

The 'Run for Unity' was organized at Defence Institute of Physiology & Allied Sciences (DIPAS), Delhi, on 31st October 2023, to celebrate the birth anniversary of Iron Man of India Sardar Vallabhbhai Patel. All officers and staff wholeheartedly participated in the event.



### DMRL, Hyderabad

In view of the birth anniversary of Sardar Vallabhbhai Patel, Defence Metallurgical Research Laboratory (DMRL), Hyderabad observed 'Rashtriya Ekta Diwas' on 31 October 2023, and organised 'Run for Unity'. Several DMRL employees participated enthusiastically in the event.



## EMU, Hyderabad

Officers and staff of EMU (R&D), Hyderabad and CCE (R&D) Estates South, Hyderabad, jointly observed 'Rastriya Ekta Diwas'.

The Rastriya Ekta Diwas Pledge was administered, followed by 'Run for Unity'. Students from the defence laboratories school in Kanchanbagh and Kendriya Vidyalaya in Kanchanbagh also participated in the event. Dr Anil Khurana, Sc 'G' & CCE, informed that the day is celebrated to reinforce our commitment to strengthen the unity, integrity, and security of the nation.

Dr Shaik Ghouse Mohiddin, Addl. CCE & Estate Manager, appealed to all the participants to work with the spirit of unification of our country and strive hard to spread the message among fellow countrymen.



## ITM, Mussoorie

Rashtriya Ekta Diwas was celebrated at the Institute of Technology Management (ITM), Mussoorie, on 31 October 2023 on the birth anniversary of Sardar Vallabhbhai Patel.

The event commenced with the gathering of all the employees. Dr DK Panda, Sc 'G' & Officiating Director, administered the Rashtriya Ekta Diwas Pledge to all ITM employees. Thereafter, a

'Run for Unity' was also organised on this occasion inside the ITM residential area.



## NMRL, Ambernath

Rashtriya Ekta Diwas was celebrated on the occasion of the birth anniversary of Sardar Vallabhbhai Patel on 31 October 2023, at the Naval Materials Research Laboratory (NMRL), Ambernath. The celebration started with a pledge administered to the NMRL employees by Shri VP Deshmukh, Sc 'G' & Asso. Director, for reinforcing commitment to strengthen the unity, integrity, and security of the nation.

'Run for Unity' was also organised at NMRL on the same occasion. About 50 NMRL employees participated in the event with great enthusiasm.



## NPOL, Kochi

Naval Physical and Oceanographic Laboratory (NPOL) celebrated Rashtriya Ekta Diwas on 31 October 2023, to commemorate the birth anniversary of Sardar Vallabhai Patel as well as to reinforce our commitment to strengthen the security, unity, and integrity of our country.

Dr Ajith Kumar K, OS & Director, NPOL, addressed the gathering and explained the importance of the celebration of Rashtriya Ekta Diwas. He has also administered the Rashtriya Ekta Diwas Pledge along with NPOL officers and staff.

A mass 'Run for Unity' was conducted after the pledge. Director, NPOL, flagged off the run.



Run for Unity at NPOL, Kochi

# WORLD QUALITY WEEK-2023

## ACEM, Nasik

World Quality Week-2023 was celebrated at the Advanced Centre for Energetic Materials (ACEM), Nasik, during 06-10 November 2023. The theme of World Quality Week for this year was 'Quality: Realizing Your Competitive Potential'. Shri TV Jagadeeswar Rao, GM, ACEM, during his welcome address stressed the importance of quality and continuous improvement for R&D organizations.

A technical talk 'Quality Management' by the Chief Guest, Dr Anil Kumar Khurana, Sc 'G', CCE (R&D) Estates South, Hyderabad, was also delivered. The event was organised by Shri Ravi Shankar, Sc 'E', and his team.



## DEBEL, Bengaluru

World Quality Week-2023 was celebrated in Defence Bioengineering and Electromedical Laboratory (DEBEL), Bengaluru during 06-10 November 2023. A quiz competition was conducted on 'Quality: Realizing Your Competitive Potential'. A total of 50 participants took part in the competition and the top 3 scorers were awarded prizes.

An invited lecture by Dr V Dillibabu, Sc 'F', GTRE, Bengaluru was also organised. Dr Dillibabu

in his lecture brought out the benefits of transferring the lessons learnt to strategic development partners, Q&R at the drawing table, people focus, concept of quality democracy, effective communication, Q&R training and also on the future trends in QMS.



## DGRE, Chandigarh

World Quality Week-2023 was organised at Defence Geoinformatics Research Establishment (DGRE), Chandigarh during 06-10 November 2023, to raise the awareness of quality management profession and reliability aspects with reference

to DGRE. Quiz competitions based on quality & reliability and essay writing competition on 'Importance of failure analysis reporting with respect to quality & reliability and customer satisfaction and quality-an important relation' were organised. The event was organised by Shri Vivek Saxena, Associate Director, DR&QA, and his team.

## ITM, Mussoorie

The World Quality Week-2023 was celebrated at the Institute of Technology Management (ITM), Mussoorie, during 6-10 November 2023. During his address, Shri Sunil Bhandari, TO 'B', touched upon the historical background and significance of the day.

Shri Amarnath Kosgi, Sc 'E' delivered a lecture on quality system'. He emphasized that quality is not a destination; rather, it is a journey of continuous improvement.



World Quality Week at DGRE, Chandigarh



### SFC Jagdalpur

Quality week was celebrated at SFC Jagdalpur from 06-10 November 2023. Quality awareness campaign and quiz competitions were organised as part of the event. During the

inaugural, Dr MVL Ramesh, Sc 'G' GM, SFC appreciated the efforts made by all working team in

processing and timely delivering quality SRM.



## VIGILANCE AWARENESS WEEK-2023

### DEBEL, Bengaluru

Vigilance Awareness Week was conducted at Defence Bioengineering and Electromedical Laboratory (DEBEL), Bengaluru during 30 October to 05 November 2023. Dr R Ramani, Sc 'F' & Vigilance Officer, gave a brief introduction and significance of the occasion and elaborated on the theme 'Say No to Corruption: Commit to the Nation'.

All the officers and staff took the integrity pledge. Dr TM Kotresh, OS & Director, DEBEL urged DEBELites to be constantly vigilant while carrying out day-to-day activities. As a part of preventive vigilance, to bring awareness regarding filing complaints against corruption under Public Interest Disclosure and Protection of Informers (PIDPI) resolution, a brief video was shown.



### NMRL, Ambernath

Vigilance Awareness Week was organised at the Naval Materials Research Laboratory (NMRL), Ambernath, during 30 October 2023 to 5 November 2023. Shri PT Rojatar, OS & Director, NMRL, administered the integrity pledge to NMRL employees. Information banners on Public Interest Disclosure & Protection of Informer Resolution (PIDPI-2004) were displayed in NMRL to create awareness among the employees. As a part of the

event, Shri Ravindra Sengaonkar, IPS & Sp. IGP (Retd.), was invited as a Guest Speaker to enlighten the NMRL employees on 'Say No to Corruption; Commit to the Nation'.



### NPOL, Kochi

Naval Physical and Oceanographic Laboratory (NPOL), Kochi observed 'Vigilance Awareness Week' during 30 October 2023 to 03 November 2023 with the theme 'Say No to Corruption; Commit to the Nation' to promote awareness and relevance of vigilance against



corruption. The Vigilance Integrity Pledge was administered by Dr Ajith Kumar K, OS & Director, NPOL, to all NPOL personnel.

'WALKATHON 2023', a mini-rally by a team of NPOL employees to spread awareness of the importance of vigilance among the public, was organized on 01 November 2023. An invited talk by Shri Sudarsan KS, IPS, SP



of Vigilance and Anti-Corruption Bureau, Ernakulam, was organised on 02 November 2023. Shri Jose Kurian, Sc 'F', Group Director, V&S coordinated the event.

### NSTL, Visakhapatnam

Naval Science & Technological Laboratory (NSTL), Visakhapatnam, celebrated Vigilance Awareness Week 2023 during 30 October 2023 to 05 November 2023 with the theme 'Say No to Corruption; Commit to the Nation'.

As part of the event, NSTL conducted various activities like the distribution of pamphlets, briefings for the schoolchildren, and elocution competitions for

NSTL employees and students of Ramanath Secondary School. The integrity pledge was also taken by all the employees during the occasion.

A lecture by Prof. Y Satyanarayan, Ex-Vice Chancellor, Damodar Sanjeevayya National Law University, Visakhapatnam, was also conducted as part of the event.



## ANNUAL DAY CELEBRATIONS AT DMRL

The Defence Metallurgical Research Laboratory (DMRL), Hyderabad, celebrated its 60th annual day on 19 October 2023. Dr Samir V Kamat, Secretary DD R&D & Chairman, DRDO, was the Chief Guest, and Dr Y Sreenivasa Rao, DS & DG (NS&M) was the Guest of Honour. Shri Anil Rohidas Burde, Joint Secretary, Works Committee; Shri C Prabhakar, General Secretary, DEFMETLAB Workers National Union; and Shri M Reetesh, General Secretary, DMRL Karmika Sangh presented the reports, followed by an address by Dr R Balamuralikrishnan, OS & Director, DMRL, who highlighted the progress of several project activities as well as briefed about the upcoming projects. The Guest of Honour and the Chief Guest, while addressing the gathering,



highlighted the importance of DMRL in terms of its contributions to the nation.

As a part of the 60th anniversary celebrations, former directors of DMRL were felicitated, and a short audio-visual on the former

directors was presented. Former directors of DMRL shared their experiences during their tenure at DMRL. Commendation certificates were presented to the employees who had completed 20 years of service at DRDO.



## SCDPM 3.0 AND SWACHHATA PAKHWADA

### NPOL, Kochi

The Government of India has launched a Special Campaign on Disposal of Pending Matters (SCDPM 3.0) and Cleanliness Drive 2023 during the period 02-31 October 2023. As part of the Pakhwada, 'Swachhhata Hi Sewa', a campaign was also conducted at the UARF Test Facility in Idukki.

The laboratory weeded out around 2298 physical files during this campaign. As a part of the easing of the process, the NPOL cloud facility was launched by Dr Ajith Kumar K, OS & Director,



NPOL, to the employees as a part of this SCDPM 3.0.

### NSTL, Visakhapatnam

Naval Science & Technological Laboratory (NSTL), Visakhapatnam, conducted the 'Special Campaign for Disposal of Pending Matters (SCDPM 3.0)' during 02-31 October 2023. The laboratory organized cleanliness campaigns, beautification of office complexes and residential complexes, weeding out files, disposal of scrap, and pest control.

Dr Abraham Varughese, OS & Director, NSTL, expressed happiness over the enthusiastic support received from the employees as well as their family members. The event was driven by Sri CHV Satya Srinivas, Sc 'G' & Group Director (Works & Estate), and Lt. Col. Rahul Dixit, Division Head (Works & Estate).

## NATIONAL AYURVEDA DAY-2023

National Ayurveda Day 2023 was celebrated at the Institute of Technology Management (ITM), Mussoorie. All the personnel of ITM and their family members were invited. A lecture on various facts, benefits, and importance of Ayurveda was presented by Shri Anmol, JRF. In addition, a medical team from Pantanjali Vidyapeeth, Haridwar, was invited, who carried out on-the-spot consulting and prescribed ayurvedic medicines. Pantanjali also helped in putting up a stall of ayurvedic medicines and other supplements for the benefit of ITM personnel.



## VISIT OF CAPFS AND NDRF OFFICERS

Directorate of Low Intensity Conflicts (DLIC), DRDO HQrs organised a visit of CAPFs and NDRF officers to Delhi-based DRDO laboratories, viz. CFEES, SSPL, and DIPAS on 06 Nov 2023. Officers from CRPF, SSB, BSF, NSG, ITBP, CISF, NDRF, and Assam Rifles attended the meeting. The visit started from CFEES where presentation and demonstration on CFEES developed products were made. Subsequently, the guests visited SSPL where presentation on SSPL developed e-Nasika, n-Nasika, and Acoustic Emission Sensors were given. This was followed with discussion on PIDS by STAR-C.

Director, SSPL explained how DRDO is installing Avalanche & Landslide detection systems in different parts of the country. Affirmative assurance on help towards installing the same on

new locations from local CAPFs units was given by CAPFs officers.

In the third phase of the visit, guest visited DIPAS where laboratory-developed equipment were discussed.



# COURSES AT ASL, HYDERABAD

## Symposium on Emerging Disruptive Technologies

Advanced Systems Laboratory (ASL), Hyderabad, organised a symposium on Emerging Disruptive Technologies in Long-range Range Strategic Systems on 26 September 2023, on the occasion of the silver jubilee of the AGNI program. General Anil Chauhan PVSM, UYSM, AVSM, SM, VSM, Chief of Defence Staff, was the Chief Guest, and Dr Samir V Kamat, Secretary, DD R&D & Chairman, DRDO, was the Guest of Honour. A coffee-table book titled 'An Odyssey to Self-reliance 1998–2023' was released to mark the occasion. Former directors and program directors, Dr RN



Agarwal, Dr Avinash Chander and Dr VG Sekaran were facilitated along with retired Programme

Directors, senior scientists, panelists, and experts from all associated cluster laboratories.

## Course on Enabling Technologies & Developments in Solid Propulsion Systems

ASL organised three-day course on 'Enabling Technologies & Developments in Solid Propulsion Systems' during 20-22 September 2023. The Chief Guest, Shri BV Paparao, DS & Director, ASL, inaugurated the course and addressed the participants. Shri M Rathnam, Sc 'G', Technology Director, SPSC, & Course Director, welcomed the august gathering and highlighted the solid propulsion technologies developed and new technologies being developed by ASL. Shri M Venkanna, Sc 'G', Technology Director, CLSMC & Deputy Course Director, briefed about the course. Dr. Manoj Kumar Buragohain, OS & Associate Director, graced the occasion and addressed the participants.





# BRAINSTORMING WORKSHOPS FOR TECHNOLOGY VISION 2047

As a precursor to the Technology Vision 2047, being made by Technology Information, Forecasting and Assessment Council (TIFAC), Directorate of Systems and Technology Analysis (DSTA), DRDO HQrs is lionising with TIFAC for the formulation of Technology Vision 2047 for defence sector.

The collaborative efforts are being made through a series of brainstorming workshops conducted in association with the esteemed Defence Innovation and Assessment Centre of Excellence (DIA-CoE).

The workshops brought together a diverse cohort of experts from various domains, including scientists, academicians, service officers, research associates, think tanks, and industry representatives. Each workshop focused on critical dimensions of future defence technologies. The workshops conducted were as:

## Advanced Sensors and Imaging, at DIA-CoE IIT-Delhi

DRDO scientists, IIT faculties, think tanks, armed forces personnel participated in the event. Director, IIT-Delhi highlighted the R&D infrastructure and ongoing research activities in sensors and imaging technology including at DIA-CoE. The workshop unveiled a spectrum of breakthroughs, from digital array radar and quantum radar to miniaturised radar. Addressing modern challenges, the discussions delved into drone-centric dynamically reconfigurable antenna arrays, hypersonic target tracking, and the integration of photonics in radar systems. The emphasis on ubiquitous low probability of intercept radars, foliage penetrating radar, and multi-frequency radar highlighted the versatility needed in defence

applications. The outcomes of the workshop echo a resounding call for continued exploration and innovation in the ever-evolving field of advanced sensors and imaging for defence applications.

## Space Warfare and Space-based Capabilities, at DIA-CoE IIT-Hyderabad

Dr BK Das, DS & DG (ECS) inaugurated the workshop in presence of Prof. BS Murthy, Director, IIT Hyderabad.

The workshop provided a comprehensive view of the evolving landscape in defence technology. Delving into predictive battlefields and C5ISR, the discussions explored cutting-edge topics like hyper-spectral imaging, electromagnetic spectrum operations, and cognitive radar. The workshop highlighted advancements in 5G quantum communication, high-resolution SAR, and high-power pulsed lasers. Space-based Directed Energy Weapons (DEW), including laser, microwave, and EMP particle beams, were key focus areas.

The workshop also addressed space mining, space junk utilization, intelligent debris management, self-healing electronics technology, and innovative energy solutions beyond Li-ion batteries, signalling a forward-looking approach to space-based challenges.



Advanced Sensors and Imaging, at IIT Delhi, on 6 September 2023



Dr B K Das, DS & DG (ECS) during Workshop on Space Warfare and Space-Based Capabilities, at Hyderabad, on 22 September 2023

### Next-Generation Communications and Networking, at DIA-RCoE-IISc Bengaluru

Dr Subrata Rakshit, DG (TM & SAM) provided his perspectives during the inaugural session. The workshop unfolded a vision of transformative advancements in military communication

strategies. The discussions traversed a spectrum of topics, from ubiquitous connectivity and immersive communication with high precision positioning to joint communication and sensing. The integration of terrestrial and non-terrestrial networks emerged as a key focus, along with the fusion of Artificial Intelligence (AI) and communication through



Dr N Ranjana during Workshop on Next-Generation Communications and Networking, at IIT-Bengaluru, on 27 September 2023

semantic communication via runtime feature extraction and transmission. The workshop also explored information centric networks, visible light communication, digital twin for sensing, and the internet of senses, showcasing a commitment to cutting-edge technologies such as self-configurable and self-healing networks, deep sea communication, quantum internet, terahertz communication, and advanced network slicing.

### Battle Scenario 2047 - Unconventional Threats and Asymmetric Warfare, at MP-IDSA, Delhi

Amb. Sujan R Chinoy, DG MP-IDSA and Dr Subrata Rakshit, DG (TM & SAM) participated in the discussions along with scientists, think tanks, representatives of Armed Forces, industry and research fellows to visualise the technologies for future battlefields.

The discussions navigated the trajectory of conventional and sub-conventional challenges, paving the way for a forward-looking defence strategy. Addressing threats in the land, sea, air, space and cyber-domains, the workshop explored countermeasures and niche technologies to maintain strategic balance. The focus on industry gap analysis, and the pursuit of self-reliance (Atm Nirbharta) underscored the need for a robust defence ecosystem. The workshop concluded with a panel discussion summing up the key takeaways, solidifying the importance of proactive strategies in the face of evolving security landscapes.



**Battle Scenario 2047-Unconventional Threats and Asymmetric Warfare, at MP-IDSA Delhi, on 12 October, 2023**

**Defence Advanced Materials, Manufacturing Technologies, and 3D Printing, at DIA-RCoE IIT-Madras**

Dr Y Sreenivasa Rao, DG (NS&M) provided important perspectives during the inaugural session. DRDO scientists, academia from IITs, NITs, state universities and industry working on materials and manufacturing participated actively and provided inputs for futuristic vision.

The workshop explored the long-term outlook of materials in defence, emphasizing ceramic fibre technology based composites, MEMS sensors and nano-material applications. Examples like 3D-printed rotating nozzles showcased practical innovations.

A panel discussion delved into advances in 3D printing for defence, culminating in a

futuristic outlook on materials and additive manufacturing processes, setting the stage for transformative developments in defence technology by 2047.

**Advanced Propulsion Technologies for 2047, at DIA-CoE IIT-Bombay**

Shri U Raja Babu, DG (MSS) and Prof. S Sudarshan, Actg. Director, IIT-Bombay provided important perspectives during the inaugural session. Scientists, faculties from IISc and IITs, think tanks, reps of armed forces, industry and research scholars discussed the advanced propulsion technologies to draw important directions for deriving the technology vision.

Discussions encompassed rocket propulsion, aero engine propulsion, hypersonic propulsion, electric propulsion, green propulsion, and innovations in propulsion materials. The workshop delved into advanced propulsion for deep space missions, highlighting the role of AI and autonomous systems. Bio-inspired propulsion methods were also explored, emphasizing



**Defence Advanced Materials, Manufacturing Technologies, and 3D Printing, at DIA-RCoE, IIT-Madras on 14 October 2023**



a holistic approach to propel defence technology into the future with efficiency, sustainability, and cutting-edge innovation.

The insights and perspectives shared during these collaborative sessions provided insights into the cutting-edge technologies, trends, and their applications in defence, which are being compiled to bring out the defence security vertical of Technology Vision 2047. This knowledge will lay the foundation for crafting future defence strategies, empowering us to address complex challenges and harness the limitless opportunities.

## PANEL DISCUSSION ON ADVANCED MATERIALS AND MANUFACTURING TECHNOLOGIES

Driving the frontier of knowledge acquisition, DSTA actively participated in 29th PFAM- Processing and Fabrication of Advanced Materials conference conducted by IIT-Tirupati.

DSTA organised a panel discussion during the conference on 'Advance Material and Manufacturing Technologies for Applications in Defence Sector' on 8 September 2023, in collaboration with TIFAC.

The panel discussion provided a comprehensive exploration of advanced materials and manufacturing, serving as a precursor to the Technology Vision 2047 being prepared by TIFAC.

Key points of discussion included challenges in adopting additive manufacturing technologies, the importance of indigenous development and manufacturing of advanced



manufacturing feedstock, and potential breakthroughs for next-generation weaponry.

Panelists emphasized crucial actions like increased research investment, capacity building,

international collaboration, and cross-industry partnerships, particularly with aerospace and automotive sectors, to harness materials innovation for robust defence systems.



## INDUSTRY INTERACTION MEET-2023

Defence Metallurgical Research Laboratory (DMRL), Hyderabad, organised a one-day DMRL-Industry Interaction Meet (DIIM) on 18 October 2023, with the aim of bringing all the defence industries, including major industries, MSMEs, and start-ups, on one platform for understanding their concerns and increasing awareness of various industry-friendly initiatives and policies of DRDO. The DIIM was inaugurated by Dr VK Saraswat, Hon'ble Member, NITI Aayog, & Former SA to RM, Chairman, DRDO, and Secretary, DD R&D, with befitting opening remarks.

Presentations on Transfer of Technology (ToT), SAMAR, and



the Technology Development Fund were made by invited speakers from the DRDO HQrs and the Quality Council of India. A panel

discussion chaired by Dr U Raja Babu, DG (MSS), was conducted on Strengthening the Industry: DRDO Interactions.

## COURSE ON APPLICATIONS OF INDUSTRY 4.0

Naval Science & Technological Laboratory (NSTL), Visakhapatnam, conducted a five-day course on Applications of Industry 4.0 during 09-13 October 2023. The course had advanced modules such as smart manufacturing, additive manufacturing and robotics, the Internet of Things, augmented reality, etc., which were delivered by eminent personalities from IITs, universities, and industries. The course emphasized the importance of adopting Industry 4.0 elements to develop world-class weapons and bridging the technology gap with advanced nations.

Dr Y Sreenivas Rao, DG (NS&M), attended the valedictory function as Chief Guest. He highlighted that Industry 4.0



concepts are very much required to progress towards atmanirbharata and suggested all the employees hone their skills in advanced concepts to contribute positively

to the development of DRDO and the nation.

Course Director, S. Madhu Kiran, Sci 'F', imparted training on Industry 4.0 concepts.



## INTERNATIONAL WORKSHOP ON HEM

High Energy Material Research Laboratory (HEMRL), Pune, organised XVIII International Workshop on High Energy and Special Materials (HEMs-2023) in association with Tomsk State University and the Federal Research & Production Centre, Russia, during 2-3 November 2023, in Pune. The workshop was inaugurated by Dr Samir V Kamat, Secretary DD R&D & Chairman DRDO. HEMRL organised the international workshop for the first time in India, which

provided a platform for scientists, technocrats, and researchers to share knowledge, experience, and technological advancements made in the recent past. About 250 delegates from countries like Russia, Germany, France, India, etc. attended the workshop. Various DRDO and ISRO laboratories, academic institutes, and industries also participated in the workshop. HEMs-2023 aimed to discuss, deliberate, and share new developments in the recent past in high-energy materials and

allied technologies. The conference aimed to strengthen global collaboration among scientists and researchers in developing new articles on high energy and special materials.

The International Workshop on HEMs was started in 2004 and thereafter regularly organised by Russia with international collaborators like Politecnico di Milano, Italy; Airbus Safran Launchers (Ariane Group); Universite Lyon 1, France; and JAXA, Japan.

## DGRE PARTICIPATION IN HPSDMA EXHIBITION

To mark the celebration of International Day for Disaster Risk Reduction (IDDR), an exhibition was organised by Himachal Pradesh State Disaster Management Authority (HPSDMA), Govt of Himachal Pradesh at Historical Ridge in Shimla during 13-15 October 2023 with the banner of 'SAMARTH' to create mass awareness, promotion of safe practices, community involvement and showcasing of technological advancement in the field of disaster management. On request, DGRE participated in the said event of HPSDMA. Hon'ble Chief Minister of Himachal Pradesh, Shri Sukhvinder Sukhu inaugurated the exhibition. DGRE officials interacted with Hon'ble CM and showcased DGRE capability through 3D model of integrated avalanche mitigation, snow avalanche prediction in Himalayas, avalanche hazard



mitigation using control structures and avalanche and snow cover modeling and simulation in the exhibition area. Various VIP's and administrative heads of different Govt. departments, industries, educational and vocational

institute, general public and students from different Industrial Training Institute of Himachal State visited the exhibition. Visitors were also informed about DRDO, various research activities and products of the organization.



## DRDO ADMIN CONCLAVE-2023

DRDO Admin Conclave on 'Strategies for Effective Administration' was held during 12-13 October 2023, at the Aeronautical Development Establishment (ADE), Bengaluru. The two-day conclave was jointly organised by Dte of Personnel, DRDO HQrs and ADE. The conclave was inaugurated by Dr Sameer V Kamath, Secretary DD R&D & Chairman DRDO, who emphasized the simplification of procedures and processes in the government so as to make the entire system transparent and faster and to create a system where administration and good governance are run without unnecessary interference, keeping in line with the directives of



the Hon'ble PM for 'Minimum Government, Maximum Governance'. More than 100 participants participated in the conclave, which had sessions on APAR, reservations, issues related to disciplinary proceedings,

security, handling of court cases, compassionate appointments and medical issues, allowances, and 'SPARSH'. Director HRD and Director CEPTAM also presented and discussed issues related to their areas of functioning.

## TRAINING ON DRDO RECORDS MANAGEMENT

The two-day training programme on DRDO Records Management for Bengaluru-based laboratories was jointly organised by the Gas Turbine Research Establishment (GTRE), Bengaluru, the Directorate of Parliamentary Affairs, Rajbhasha, and Organisation & Methods (DPARO&M) during 21-22 September 2023.

Shri Sivarama Krishna M, Associate Directorate, GTRE, inaugurated the event. Shri Udey Shankar from the National Archives of India, Shri Chandra Prakash Meena, Shri Jagat Singh from DPARO&M, and Shri Chenna Raidu from CVRDE delivered various lectures related to records management,



SCMOP, record room setup, the DRDO Archival and Retrieval System, etc. The programme was overwhelmed by more than 70 participants across Bengaluru-based laboratories. Dr. Ravindra

Singh, OS & Director, DPARO&M, delivered the valedictory address and handed over the certificates to the participants. The programme was coordinated Dr V, Senthil, Sc 'F'.



## COURSE ON WELDING TECHNOLOGIES AT NMRL

Naval Materials Research Laboratory (NMRL), Ambernath, organised a course on 'Welding Technologies for Defence Application' during 11-15 September 2023. Shri PT Rojatkar, OS & Director, NMRL, inaugurated the course. Speakers from various IITs, DRDO laboratories, L&T, MIDHANI, GRSE, MDL, and CSL delivered lectures during the course. A visit was also arranged for the participants to Mazagon Dock Shipbuilders Ltd., Mumbai, to understand the welding practices being followed for the construction of submarines. A



total of 39 participants from Indian Navy and Naval Dockyard different DRDO laboratories in the Mumbai attended the course.

## WORKSHOP ON INFORMATION WARFARE AT DIPR

Defence Institute of Psychological Research (DIPR), Delhi organised a one-day workshop on 'Information Warfare' for senior officers of Indian Army on 13 November 2023. Dr Arunima Gupta, Director, DIPR while addressing the participants highlighted the key emerging challenges in the domain of information warfare including perception management, influence operations, negotiating with conflict environment, identification of vulnerabilities, narratives and counter narratives. Dr JK Singh, Sc 'F', Head, Strategic Behaviour (SB) Group, Dr Swati Mukherjee, Sc 'F', SB Group along with other team members conducted various sessions and activities sharing their insights with the participants during the



engaging discussions.

The sessions were held on wide range of topics including applicability of perception management in conflict environment, the major facilitators and inhibitors, models to negotiate with conflict environment,

narratives and counter narratives and understanding individuals and groups in conflict environment.

Thirty four senior officers from Indian Army including the ranks of Brigadier & Colonel, enthusiastically participated in the workshop.

## HON'BLE CM SHRI DHAMI, HONOURING DIRECTOR, IRDE

The Hon'ble Chief Minister of Uttarakhand, Shri Pushkar Singh Dhama, honoured Dr Ajay Kumar, OS & Director, Instruments Research & Development Establishment (IRDE), Dehradun, on 26 August 2023 for significant contribution of IRDE in the field of optics and electro-optics.

The CM was honouring scientists at the Indian Institute of Remote Sensing from various scientific and technical institutions in Dehradun and Mussoorie. Dr Ajay Kumar thanked Hon'ble Chief Minister Shri Pushkar Singh Dhama for this honour.



## CORROSION AWARENESS AWARD 2023

The Association for Materials Protection and Performance (AMPP), presented the Corrosion Awareness Award 2023 to Dr R Balaji Naik, Sc 'E', of NMRL, Ambarnath, for his meritorious contribution to corrosion science and technology. The award was presented by Hon'ble Vice Chancellor, Prof. AB Pandit, Institute of Chemical Technology, Mumbai, on 26 October 2023, during the CORCON International Conference and Expo on Corrosion at Mumbai.



### DMRL, Hyderabad

A patent, 'A Method of Synthesis of Tungsten Powders from Scrap' (Patent No. 413559), has been granted, for which Dr SS Kalyan Kamal, Dr P K Sahoo, Smt J Vimala, and Dr L Durai are the inventors.

A Patent 'Rare Earth-free Nanocomposite Permanent Magnet and Method of Producing the Same' (Patent No. 441712), has been granted, for which Dr P Saravanan is the inventor.



## COURSE ON ADVANCE TECHNIQUES FOR SNOWPACK CHARACTERIZATION

Defence Geoinformatics Research Establishment (DGRE), Chandigarh, organised five-days course on 'Advance Techniques for Snowpack Characterization and Stability Evaluation' during 09-13 October 2023. The course was aimed to provide technical know-how on various techniques used for characterization of snowpack properties and its stability evaluation-an important component for avalanche prediction. During his inaugural address, Dr PK Satyawali, OS & Director, DGRE, emphasized the need of learning fundamentals of snow science and characterization techniques that are essential for operational avalanche forecast in snow bound Himalaya. The participants



also visited to the advance Field Research Station Dhundi (alt. 3050 m) for familiarization with avalanche prone terrain and field

instrumentation. Dr Prem Datt, Sc 'F' was the Course Director and Dr YC Nagar, Sc 'F' was the Deputy Course Director.

## DESIDOC PARTICIPATION IN READIT-2023

Defence Scientific Information & Documentation Centre (DESIDOC), Delhi, took part in the 2nd International Conference on REcent ADvances in Information Technology (READIT-2023) held at Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam during 22-23 November 2023. The theme for the conference was 'Emerging Trends & Innovations in Libraries'.

Dr K Nageswara Rao, Director, DESIDOC, was the Chief Guest for the inaugural event. He spoke on 'Technical Issues and Concerns for Long Term Preservation of Digital Documents'.

The conference was jointly organised by IGCAR, Kalpakkam and Madras Library Association. The conference was aimed to

focus on the emerging trends and innovations in libraries and improve the quality of library services in the digital era.





## HINDI WORKSHOP AT DMRL

Defence Metallurgical Research Laboratory (DMRL), Hyderabad, organized a one-day Hindi workshop on 30 October 2023. A total of 33 scientists participated in the workshop.

Shri Santosh Kumar, Assistant Director, Hindi Teaching Scheme, Hyderabad, conducted the workshop. He delivered a lecture on various important rules related to the official language and described the use of Unicode for Hindi typing, voice typing, and various smart tools related to Hindi typing.



## SANYUKT RAJBHASHA VAIGYANIK EVAM TAKNIKI SANGOSHTHI

Sanyukt Rajbhasha Vaigyanik evam Takniki Sangoshti 'SRISHTI-2023' was organized during 02-03 November 2023 in Defence Food Research Laboratory (DFRL), Mysuru. The main theme of the seminar was, 'Role of DRDO R&D in Building a Self-reliant India'. The Chief Guest of the seminar was Dr Ravinder Singh, Director, DPARO&M.

Dr Ravinder Singh encouraged all the participants to do as much work as possible in Hindi. Dr Anil Dutt

Semwal, Director, DFRL, said that organisation of S&T seminar in official language Hindi encourages

the scientists and technical officers to use Hindi in their routine R&D work.





## CENTRAL ZONE FOOTBALL TOURNAMENT-2023

SF Complex, Jagdalpur, organized the Central Zone Football Tournament 2023-24 during 03-06 October 2023. A total of nine teams from various DRDO laboratories from the central zone participated. The tournament was inaugurated by Dr MVL Ramesh, GM, SFC, in the presence of all scientists, staff, and playing team members. DMRL, Hyderabad, won the final match by scoring 5-1. The SFC Jagdalpur team received the 'Fair Play' award.



## CENTRAL ZONE TT TOURNAMENT-2023

Naval Science & Technological Laboratory (NSTL), Visakhapatnam, organised the DRDO Central Zone Table Tennis Tournament on in November 2023. Dr Abraham Varugheese, OS & Director, NSTL, inaugurated the tournament as Chief Guest. Advanced Systems Laboratory (ASL), Hyderabad, won the team championship, and Research Centre Imarat (RCI), Hyderabad, stood as the runner-up of the tournament.



## SOUTH ZONE TT TOURNAMENT-2023

Table Tennis team of Centre for AI & Robotics (CAIR), Bengaluru, participated in South Zone Table Tennis tournament conducted at Combat Aircraft Systems Development & Integration Centre (CASDIC), Bengaluru, during 16-18 October 2023. CAIR team secured second position and Mrs Sheela became Runner up in Women Doubles event.



# VISITORS TO DRDO LABS

## CAIR, Bengaluru

- Lt Gen JB Chaudhari, DCOAS (CD&S) visited Centre for Artificial Intelligence & Robotics (CAIR), Bengaluru on 05 September 2023. There was a briefing by Dr Rituraj Kumar, OS & Director, CAIR followed by discussion and demonstration of technologies developed by CAIR in the area of GIS.
- Vice Admiral Sanjay Vatsayan, DCIDS (OPS) visited CAIR on 15th September 2023. There was a briefing by Dr Rituraj Kumar, OS & Director, CAIR, followed by discussion and demonstration of various technologies developed by CAIR in the area of intelligent systems & robotics, command control systems and GIS.
- Lt Gen JP Mathew, CISC HQ IDS visited CAIR on 06 October 2023. There was a briefing by OS & Director, CAIR Dr. Rituraj Kumar followed by discussion and demonstration of various technologies developed by CAIR in the area of Intelligent Systems & Robotics, Command Control Systems and GIS.



Lt Gen JB Chaudhari, DCOAS (CD&S) during his visit at CAIR, Bengaluru



Lt Gen JP Mathew, CISC HQ IDS during his visit at CAIR, Bengaluru

## DMRL, Hyderabad

Dr VK Saraswat, Hon'ble Member, NITI Aayog & Former Chairman DRDO & Secretary DD (R&D) visited Defence Metallurgical Research Laboratory (DMRL), Hyderabad on 18 October 2023. He visited several groups including Enabling Technology Centre, Advanced Magnetics Group and Advanced Materials Characterization Centre. He took a keen interest in DMRL developed technologies and the facilities established.



Dr VK Saraswat with Director, DMRL and other senior scientists of DMRL

## IRDE, Dehradun

Dr BK Das, DS & DG (ECS) visited Instruments Research & Development Establishment (IRDE), Dehradun on 08 September 2023. Dr Das reviewed various projects of IRDE. Dr Ajay Kumar OS & Director, IRDE, explained him about the progress of these projects. Dr Das interacted with the scientists and appreciated the efforts of IRDE for successful development of these products.



Dr BK Das, Dr Ajay Kumar along with senior officers of IRDE, Dehradun

## VRDE, Ahmednagar

Maj Gen Sanjay Hooda, SM, CSO (LV), HQ SFC, along with his team of officers visited Vehicle Research and Development Establishment (VRDE), Ahmednagar on 30 October 2023. During his visit, Director presented the projects being handled by VRDE and also discussed the current status of projects related to ground support equipments being undertaken by VRDE. After the discussion, demonstration of vehicles developed by VRDE were shown to him. The dignitary also visited Integrated Weapon Test Facility (NCAT).



Product Demonstration during the visit of Maj Gen Sanjay Hooda, SM, CSO (LV), HQ SFC

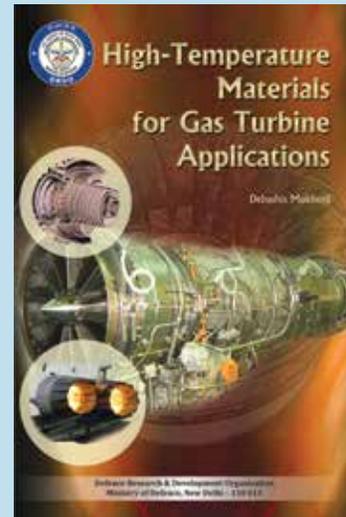


# LATEST RELEASE OF DRDO MONOGRAPHS

## High-Temperature Materials for Gas Turbine Applications *Debashis Mukherji*

The monograph discusses gas turbine materials (with emphasis on Ti-alloys and Ni-superalloys). It is essentially a book on material science. However, due to the complexity of gas turbines and their wider appeal, it is of equal interest for both the material scientists and the mechanical/aeronautical engineers involved in gas turbine development and maintenance. The monograph begins with a historical perspective of turbine development and covers some basic principles of jet propulsion and material science. However, the main emphasis remains on the high temperature gas turbine materials – their manufacturing from alloy to components, as well as their development and applications.

Pages : 476  
Price: ₹ 1800/-  
US \$36  
UK £31



## Test Range: Evolution and Role in Weapon Development *PK Mahapatra*

This monograph introduces weapons with the necessary details to comprehend range functioning. It covers weapon types, complexities, payload delivery, propulsion systems, target neutralisation, safety, reliability, life cycle, performance in extreme climates, and high-speed impacts. The book explores the attributes of an ideal Range and discusses qualitative and quantitative methods for assessing weapon performance. It delves into Range infrastructure, techniques, and the establishment of the Proof & Experimental Establishment (PXE), supported by visual aids such as photographs, tables, case studies, and anecdotes.

This monograph serves as a valuable resource for scientists, engineers, and professionals engaged in weapon design, development, production, quality assurance, and Range operations. It is equally informative for individuals interested in national defence, providing comprehensive insights into the critical aspects of weapons and Ranges, illuminating their interconnectedness in safeguarding the nation's defence.

Pages: 676  
Price: ₹ 2900/-  
US \$53  
UK £44

