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# DRDO Newsletter

## डीआरडीओ न्यूज़लैटर



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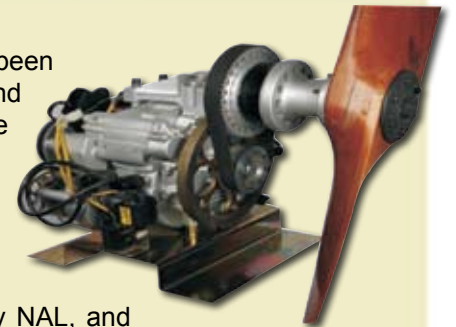


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## Maiden Flight of Indigenous Wankel Rotary Engine on *Nishant* UAV

The Wankel Engine has been indigenously designed and developed for the first time. The development of rotary engine project initially originated from Vehicles Research and Development Establishment (VRDE), Ahmednagar, and has been jointly executed by NAL, and ADE, Bangalore.



The provisional flight clearance for the first indigenous prototype engine was accorded by the certifying agency, Regional Centre for Military Airworthiness (RCMA) during a ceremony held at the launch pad. The engine was cleared for flight after rigorous ground and endurance test-runs. First ever successful test-flight of an indigenous Rotary Engine-powering Unmanned Aerial Vehicle (UAV), *Nishant*, was carried out at ADE, Bangalore.

The flight took-off at 1157 hrs in the morning of 31 March 2009 and reached an altitude of 1.8 km effortlessly before cruising for 35 min. The air vehicle was recovered safely at the intended place after a flight of 40 min. The event was witnessed by Shri PS Krishnan, Director ADE; Dr CL Dhamejani, Director, VRDE; and Dr AR Upadhyaya, Director, NAL.



## Flagging-off Ceremony of Armoured Engineer Recce Vehicle (AERV)



Maj Gen Syed Noorula Shah, ADG (ES) Flagging-off the AERVs. Maj Gen Umang Kapoor, VSM, Director C-TEC, Brig PN Awasthi, Controller CQA (ICV), Dr CL Dhamejani Director VRDE and Shri NM Kandaswamy, Controller CQA(V) are also seen.

Indian Army had placed an order with Vehicles Research and Development Establishment (VRDE), Ahmednagar for Limited Series Production (LSP) for 16 nos. for Armoured Engineer Recce Vehicles (AERV) for their Corps of Engineers. The AERV is designed to carry out terrestrial and riverbed surveys to facilitate construction of assault bridges across water obstacles.

The equipment is based on tracked BMP-II amphibious infantry combat vehicle, which allows the

vehicle to operate both on land and on water bodies.

Maj Gen SN Shah, ADG (ES) on 10 April 2009 flagged-off the 15 and 16 AERVs from LSP-1B. Maj Gen Umang Kapoor, VSM, Director C-TEC; Brig PN Awasthi, Controller CQA (ICV); and Shri NM Kandaswamy, Controller CQA(V) were also present during the event.

The visiting dignitaries were briefed on the ongoing projects and project vehicles displayed on the occasion.

## DRDO Establishes Periodic Poling Technology

DRDO has established state-of-the-art Periodic Poling Technology (a guarded and protected technology world over) for the first time in the country and fabricated Periodically Poled Lithium Niobate (PPLN) chips by domain engineering. These PPLNs find a large number of applications in Optical Parametric Oscillators (OPO), Second Harmonic Generators (SHG), and nonlinear waveguide-based devices. In recent years, these sources have been widely used for countermeasures and in sensing the chemical/ biological agents. The domain engineering process involves application of very high electric field pulses ( $>24$  kV/mm) across very thin ( $500 \mu\text{m}$ ) lithium niobate wafer. For proper application of e-field an application-specific poling circuit was designed in conjunction with an arbitrary poling waveform, programmed to achieve uniform poling across the entire surface of lithium niobate wafer.

Fabrication has been achieved for both fanned as well as multi-grating PPLN chips (with period varying from  $25.5$  to  $31.5 \mu\text{m}$ ) in length of  $50$  mm. There is a critical requirement for the development of OPOs which generate tunable output ( $2-5 \mu\text{m}$ ) wavelength for Infrared Countermeasure (IRCM) applications.



Fanned grating PPLN chip

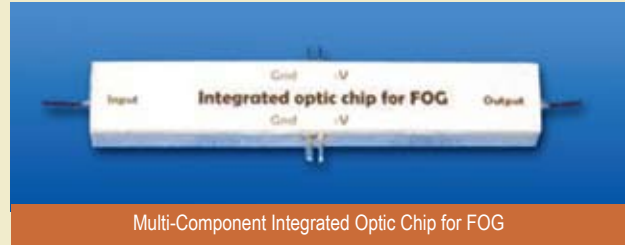


Multi grating PPLN chip



## MIOC for Fibre-Optic Gyroscope Designed and Fabricated by DRDO

For the first time in the country, DRDO has designed and fabricated a Multi-Component Integrated Optic Chip (MIOC) for Fibre-Optic Gyroscope (FOG). DRDO has established state-of-the-art facilities to design and develop optical chip level technology for various integrated optic components and devices. In this MIOC, a polariser, 3-dB splitter, and a phase modulator have been integrated on a single lithium niobate (LN) chip.



Multi-Component Integrated Optic Chip for FOG

The MIOC is an important component of the FOG. Presently, FOG's are made-up of discrete components, which are bulky. However for missile type applications, compactness is an important requirement. The MIOC-based FOG's are compact and lightweight, consume less power, and are reliable in comparison to

conventional all fibre FOGs. The MIOC was fabricated on a LN wafer using a combination of photolithography (PLG), diffusion, metallisation and proton exchange technique. For realising the complete MIOC, a three-layer PLG was done in class 100 environment.

## DRDO Celebrates National Technology Day



Inaugural session of National Technology Day Celebration in progress

DRDO celebrated National Technology Day on 11 May 2009 to mark the 12<sup>th</sup> Anniversary of Pokhran Nuclear Tests, the day our country became self-reliant in this critical technology on 11 May 1998. DRDO HQrs and Delhi-based DRDO labs/estts celebrated the occasion in a function organised by the Defence Science Forum at the Bhagavantam Auditorium, Metcalfe House, Delhi. Dr Ravi Kashyap, Convener, Defence Science Forum welcomed the audience. Dr W Selvamurthy, Distinguished Scientist and CC R&D (LS & HR), Chief Guest of the function said that it is an occasion to take stock of today's technology and explore what we ought to do for the country to emerge as a technology power. Chief Controllers R&D, Technical and Corporate Directors from DRDO HQrs, and the Directors of Delhi-based labs/estts graced the occasion.

As part of the celebrations, the authors of the three selected papers of Technology Day Orations gave presentations, these were: Advances in shaped charge warhead technology, by Shri S Harikrishnan, Sci 'E', ARDE, Pune; Development of indigenous armour technologies by Dr T Balakrishna Bhat, Sci 'G', DMRL, Hyderabad; and 'Technology development in heat capacity disk laser for tactical weapon application' by Shri Anup Lal Shah, Sci 'E', LASTEC, Delhi.

Dr Selvamurthy, gave away Technology Day certificates and medals to the three orators beside scientists of the Delhi-based labs/estts who made presentations in their respective labs/estts. He also gave away prizes to winner of DRDO Science Day Quiz and DRDO Essay Writing Competition. Dr Ravi Kashyap, Convener, Defence Science Forum, proposed the vote of thanks.

## DRDO-Army Conclave on Low Intensity Conflict at Tezpur

The second DRDO-Army Interactive Workshop between the Commanders and Officers of the Indian Army deployed in the Low Intensity Conflict (LIC) areas of the North-East region and the Scientific Community of DRDO, especially working in Life Sciences field, was organised at Tezpur on 18 April 2009 at HQrs, Gajraj Corps. The initiative to organise the Workshop was taken up jointly by the HQrs 4 Corps and the DRDO to bring the scientists and soldiers onto a single platform to understand the ground-level operational hardships of the latter and to find out long-term, indigenous, and cost-effective solutions for the same. The workshop was inaugurated by Lt Gen KT Patnaik, YSM, GOC, Gajraj Corps. Dr RC Sawhney, Director of Life Sciences, DRDO HQrs, Delhi, led the team of DRDO scientific community which included experts from various strategic disciplines like Armaments, Combat Vehicles, Electro-optic and Night-vision devices and Life Support Systems, etc.

Lt Gen Patnaik, during his Inaugural Address said that the Indian Army is currently encountering challenges of different sort like psychological tampering of soldiers and terrorism in their most heinous forms especially in areas of Low Intensity Conflict (LIC) in NE region, in particular and throughout India in general. He also emphasised that there is an urgent need for 'enhanced partnership' between Army, DRDO, Industries and academia as well for GSQR/Product up gradation and achieving better logistic support etc. Dr RC Sawhney, during his address, highlighted how the range of state-of-the-art technologies/products developed by DRDO are supporting the Indian Army in various strategic fields with special reference to LIC areas and stressed for more active participation by Army in its future ventures.



1st Row from Left – Lt Gen KT Parnaik YSM, GOC, 4 Corps (Extreme left), Dr RC Sawhney, Director of Life Sciences, DRDO HQrs, Delhi (2nd from left) & Dr Manas K Mandal, Director, DIPR, Delhi (4th from left) and Senior Army Officers at the Army-DRDO interactive Workshop held at Gajraj Auditorium, HQ 4 Corps, Tezpur.

Dr BR Gandhe, Director of Armaments; Dr Manas K Mandal, Director, DIPR; Dr Bhuvanesh Kumar, Addl Director of Life Sciences, and Shri SS Sundaram, Director, IRDE, Dehradun, made presentations depicting how technologies/products developed by DRDO are supporting the Armed Forces in LIC areas and preparedness of the organisation to take up the emerging challenges on the subject in future. Besides the above dignitaries, Directors of DFRL, DIPAS, INMAS, DEBEL and Senior Scientists/Service Officers from DRDE; INMAS; DIBER; DIPR, and DRL attended the workshop. Brig R Sahgal, DDMS, HQ 4 Corps; Col Sarvesh Sharma CO, 46 Assam Rifles, and Maj VG Sharma from the Army side put forth their requirements for LIC Operations. Col SR Verma, DRL, Tezpur, was the Coordinator for the workshop.

The meet was attended by around 100 officers from various formations of Indian Army operating in LIC areas of the region. They interacted with DRDO scientists/experts during panel discussion. Brig Arun Kumar, Chief Signal Officer, HQrs 4 Corps, proposed the vote of thanks.

## HEMRL is ISO 9001:2008 Certified

High Energy Materials Research Laboratory (HEMRL), Pune, was recently audited and subsequently certified for ISO 9001:2008 by TUV Management Services GmbH trading as TUV South Asia Pvt Ltd. The scope of certificate is "Research, design, and development of formulation & technologies in the area of high energy materials covering solid/liquid propellants, high explosive, pyrotechnics and allied chemicals, their testing and performance evaluation".

This certification helps the laboratory to maintain

and monitor the quality of the products to be supplied to the Services, as per national and international standards. Management Representative Shri SC Aglawe, Deputy Director, HEMRL has played a vital role in getting this certification under the able guidance of Dr A Subhananda Rao, OS & Director, HEMRL. Earlier, the Laboratory was certified for ISO 9001:1994 in August 1999 and subsequently, for ISO 9001:2000 in September 2002, and re-certified in September 2005.

## Manpower Development Activities

### Courses/Seminars

#### CEP on Computer-aided Quality Control

A Continuing Education Programme on Computer-aided Quality Control was organised during 16–20 March 2009 at TBRL Range, Ramgarh. Twenty two participants from TBRL and four participants from sister DRDO labs participated in this programme. Besides 10 faculty members from TBRL, faculty members from IIT, Kanpur; NRTC, Parwanoo; DRDL, Hyderabad, delivered their expert talks. The topics covered were design for quality, computer-aided testing, surface and form metrology, total quality management, non-destructive testing, geometric modelling techniques, statistical quality control, advances in coordinate metrology, non-contact metrology, etc.

#### Lecture delivered

Dr Manas K Mandal, Director DIPR, Delhi, delivered a talk on “Understanding Behavioural and Motivational Aspects in Scientific Workplace for Improving Productivity in R&D” on 15 April 2009 at DIPR, Delhi.

#### Oration at Velammal Institute of Technology, Chennai

Dr AK Sikder, Joint Director HEMRL, Pune, was invited by Velammal Institute of Technology (VIT), Chennai, as Chief Guest for the First Annual Day Celebrations of the institute held on 28 March 2009. He distributed the Prizes and Appreciation Certificates to the winners of various competitions and events.

On this occasion, Dr Sikder gave an oration on, “Role of Engineers to Socio-Economy Development of the Country”, highlighting the importance of professional manpower in the development of a nation. He elaborated the participation of engineering institutes in the important R&D programmes of nation such as Defence and Aerospace applications. He also emphasised the requirements of engineers/technologists in DRDO/Services to become super power in the near future.

#### Emergency Response and Care Training Programme

Safety Engineering Division, TBRL, Chandigarh, organised Emergency Response and Care Training programme on 12 March 2009 focusing on Life Saving Techniques and Trauma Management to save human lives during ‘The Golden Hour’ by Safety Circle Training Centre, National Safety Council. Shri Manpeet Singh, Sci ‘F’ delivered the welcome address. Introduction about the course was given by Shri BPS Bakshi, MD, Safety Circle. The training was given to the TBRL employees in batches of 25 persons each. The training programme included basic life support cardiopulmonary resuscitation (CPR), life-saving techniques, trauma management module, rescuing and moving victims, blast injury management, overview of fire safety, ergonomics and postures stress management. An exclusive Health Safety Training Programme for Officers’ Wives at BOMI, TBRL Guest House was also organised on 14 March 2009.

## Patents Granted

#### CFEES, Delhi

Indian Patent Office, New Delhi granted a patent on ‘A process for preparation of an Intumescent fire retardant paint composition’ jointly to CFEES, Delhi and NMRL Ambernath. The inventors for the patent are Hukam Singh Kaparwan and Kiran Pal from CFEES, Delhi, and Yadendra Pal Singh Nirvan, Padmavathy Sivasankar Das, and Susheel Shantaram Pawar from NMRL, Ambernath.

#### DMRL, Hyderabad

Indian Patent Office, New Delhi granted a patent on ‘A process for production of metal-matrix composite billets reinforced with silicon carbide and process thereof’ (Patent no. 230895) to Defence Metallurgical Research Laboratory (DMRL), Hyderabad, w.e.f. February 2009. Inventors of the patent are Dr K Sivakumar and Dr T Balakrishna Bhat of DMRL, Hyderabad.



INTERNATIONAL WOMEN'S DAY CELEBRATIONS

**HEMRL, Pune**

The FEM-Transcend, High Energy Materials Research Laboratory (HEMRL), Pune celebrated International Women's Day on 30 March 2009, with the theme 'A Sound Mind in a Sound Body'. The objective of the celebration was to focus on health and to create health awareness in the present scenario. Dr Alka Pawar, Director, Maharashtra Institute of Mental Sciences, was the Chief Guest who inaugurated the function. Dr Pawar brought out the need to empower the mindset in our existing environment where culture restrictions are quite strong. Prof (Dr) Girija Wagh Head, Bharti Vidyapeeth, Guest of Honour, appealed to the Women that having empowered ourselves with our rights and duties, it is time to empower ourselves with health awareness.

Dr A Subhananda Rao, OS & Director, HEMRL appreciated all the activities carried out by the Women's Council of HEMRL and motivated them to empower themselves in every field. On this occasion, the Chief Guest released the special CD showcasing glimpses of activities of the women of HEMRL. As part of the Women's Day Celebrations, a blood donation camp by *Jankalyan* Blood Bank was organised by the Women's Council in HEMRL. The Chief Guest gave away prizes to winners of several competitions held as part of the celebrations. The function was compared by Ms Sanchita Sil, Secretary, FEM-Transcend.

**TBRL, Chandigarh**

International Women's Day was celebrated at TBRL Range, Ramgarh on 9 March 2009. Dr Satish Kumar, Director TBRL delivered the welcome address on the



Ms H K Pannu, FA (DS), Chief Guest on the Occasion giving inaugural address at TBRL

occasion. Ms HK Pannu, FA (DS) was the Chief Guest and delivered the inaugural address.

Prof. Neharika Vohra, IIM, Ahmedabad; Prof LK Dhaliwal, HOD, Obst. & Gynae, PGIMER; and Ms. G Rohini Devi, Technology Director, ASL, Hydrabad delivered their invited talks.



Prof. Neharika Vohra of IIM Ahmedabad delivering her talk

CVRDE signs MoU with Anna University

A Memorandum of Understanding (MoU) was signed between the Combat Vehicles Research and Development Establishment (CVRDE), Avadi and Anna University on 28 February 2009 during the inauguration of a three-day exhibition of Combat Vehicles and Engineering at Anna University. Shri S Sundaresh, Director, CVRDE and Shri Mannar Jawahar, Vice-Chancellor, Anna University signed the documents. Dr A Sivathanu Pillai, DS, and CC R&D (NS&ACE) and Chief Executive, BrahMos Aerospace presided over the function. This MoU will facilitate the sharing of infrastructure and expertise between the two institutions on track vehicle dynamics, sensors and sensor systems, experimental stress analysis, and other areas.



The MoU being signed in the presence of Dr Sivathanu Pillai

## SBMT-Industry Interaction

The Defence Bio-Engineering and Electromedical Laboratory (DEBEL), Bangalore, is the coordinating agency for the Society for Biomedical Technology (SBMT). It is an inter-ministerial initiative to promote healthcare in India by making available indigenous medical devices and technologies to the common man at affordable prices.

SBMT-Industry Interaction Workshop was organised at DEBEL, Bangalore on 7 March 2009. The objective of the workshop was to identify potential medical care industries along with academic and R&D institutions to be partners in the 'product development cycle' being funded by SBMT. There was an overwhelming response to the invitations sent to healthcare industries and nearly 40 representatives from about 26 companies participated.

Dr VC Padaki, Director, DEBEL and CEO, SBMT welcomed the gathering and gave a brief introduction of the SBMT, its history, and activities. He emphasised the extent of imports in the field of biomedical devices and the need for indigenous products. Dr VK Aatre,

Chairman, SBMT Advisory Council and former SA to RM, inaugurated the workshop and the DEBEL-SBMT exhibition. Dr Aatre in his inaugural address covered the evolution of science and technology in the history of mankind and how it is benefiting the human race in almost all fields. He emphasised the strengths of this country in areas like materials, computer simulation, software and available expertise in institutions such as DRDO, IITs, IISc and other academic institutions.

The Keynote Address was delivered by Dr W Selvamurthy, DS and CC R&D (LS&HR) and Co-Chairman, SBMT Advisory Council, on the activities of SBMT since its inception. The vast market for biomedical products in this country in terms of volume and profit was brought to the fore for awareness of the industry representatives. The delegates went round the exhibition in which products developed by DEBEL along with those developed under the aegis of SBMT were displayed. This was followed by demonstration of various products and a panel discussion.

## Fire Services Week

Proof & Experimental Establishment, Chandipur, observed 'Fire Services Week' during 15-20 April 2009 in a befitting manner. This is observed every year in memory of the 66 fireman of Bombay Fire Brigade, who lost their lives while fighting the fire in a ship, carrying explosives and ammunitions, which later exploded at Victoria Dock, Mumbai on 14 April 1944 with total loss of 740 lives. Forty-one staff of PXE participated this year in the training capsule on 'Fire fighting duties and casualty evacuation' organised during this week by Lt Col A Mukherjee, Senior Security Officer. Col S Samantaray, Joint Director (MA&TS) distributed prizes and certificates to successful participants during the valedictory function.



Rescue demonstration wearing protection dress

## Award

Shri K Jayaprakash Rao, Regional PRO (South), Bangalore has been awarded the *Best Active Member Award* 2008 by the Public Relations Council of India during 3-4 April 2009 at Bangalore for his long association in the public relation field and active involvement in public service.



## Sports Round-up

### Cricket Tournament

Terminal Ballistics Research Laboratory (TBRL), Chandigarh, organised DRDO North Zone Cricket Tournament during 4-6 March 2009 and DRDO National Cricket Tournament during 17-19 March 2009 at Ramgarh, Chandigarh. Dr Satish Kumar, Director TBRL, and Chairman North Zone Sports Council Chandigarh inaugurated the tournament. In North Zone tournament 7 teams were made by clubbing different Labs. In North Zone Cricket Tournament winning team consisted of players from SSPL, DIPR, DIPAS, CFEES, and RAC and the runners team consisted of players from LASTEC, SAG, DTRL, ISSA.

In the DRDO National Cricket Tournament, Central Zone was the winner while North Zone was the runners-up.



Dr Satish Kumar, Director, TBRL being introduced to the players by Dr Manjit Singh, Vice Chairman, DRDO North Zone Sports Council

## Visits to DRDO Labs/Estts

### DLRL, HYDERABAD

Dr R Sreehari Rao, CC R&D (ECS) visited on 24 April 2009.



Shri G Boopathy, Director, DLRL and Shri B Vittal, Sc 'G' briefing him about different activities related to Army Programmes/Projects.

### HEMRL, Pune

Dr PS Goel, Chairman, RAC, Delhi, visited on 16 April 2009.

Maj Gen (Retd) Ravi Khetarpal, VSM, Chairman & Managing Director, BDL, Hyderabad visited on 28 April 2009.

### LRDE, Bangalore

Smt M Himabindu, IA&AS, Director Audit, Air Force visited on 21 April 2009.

The Director Audit was briefed by the Director LRDE about the ongoing projects and activities of LRDE.

### MTRDC, Bangalore

Dr R Sreehari Rao, CCR&D (ECS) visited on 3 April 2009.

Dr PS Goel, Chairman, RAC, Delhi, alongwith Dr Surendra Pal, OS, ISRO visited on 4 April 2009.

### VRDE, Ahmednagar

Dr PS Goel, Chairman, RAC visited on 17 April 2009.



Maj Gen (Retd) Ravi Khetarpal, evincing keen interest in exhibits at HEMRL

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