

# PATRONS

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 Dr. Samir V Kamat  
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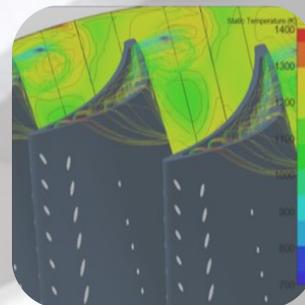
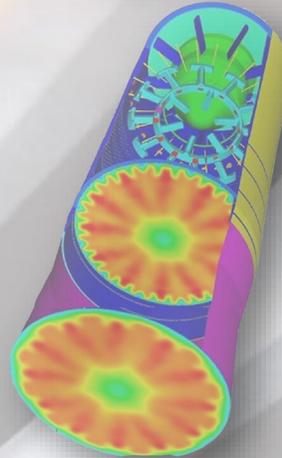
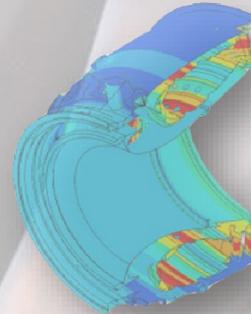
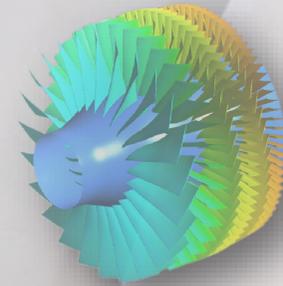
Former Secretary of DRDO and Member of NITI Aayog  
 Scientific Advisor to Raksha Mantri and President AeSI  
 Secretary, Dept of Defence R&D and Chairman DRDO  
 Secretary, Department of Space & Chairman ISRO and  
 President Elect AeSI  
 CMD, Hindustan Aeronautics Limited

# ADVISORY PANEL

Shri M Z Siddique	Chairperson	Director General, Aeronautical Systems, DRDO
Dr. Kota Harinarayana	Member	Former Program Director-LCA, Director-ADA & Chairman, Design Division, AeSI
Prof. Dipankar Banerjee	Member	Former Chief Controller R&D, DRDO and Professor Materials Engineering, IISc
Dr. Girish S Deodhare	Member	Director General, Aeronautical Development Agency, DRDO
Shri Y Dilip	Member	Director, Aeronautical Development Establishment, DRDO
Shri APVS Prasad	Member	Chief Executive, Centre for Military Airworthiness and Certification, DRDO
Dr. D K Sunil	Member	Director, Engineering R&D, Hindustan Aeronautics Limited
Dr. Abhay A Pashilkar	Member	Director, National Aerospace Laboratories
Dr. S V Ramanamurty	Member	Director, Gas Turbine Research Establishment, DRDO
Dr. R Balamuralikrishnan	Member	Director, Defence Metallurgical Research Laboratory, DRDO
Prof. B N Raghunandan	Member	Former Professor, Aerospace Engineering, IISc
AVM Sharad Kumar Jain, VSM (Retd)	Member	Former Assistant Chief of Air Staff, Engineering (Transport and Helicopters), Air HQ.

# ORGANISING COMMITTEE

Dr. K Ramachandra	Chairman	Former Director, GTRE
Prof. V Venkateshwara Rao	Member	Director, DIA-COE (Formerly CoPT), IIT Bombay
Shri K Ramesh	Member	GM, AERDC, HAL
Dr. M Vijayakumar	Member	Former ED, Rotary Wing R&D Centre, HAL
Prof. Rajkumar S Pant	Member	IIT, Bombay
Prof. S R Chakravarthy	Member	IIT, Madras
Prof. Vikram Jayaram	Member	IISc, Bangalore
Dr. L N Raghavendra	Member	Director UAV, Propulsion, A&A, CEMILAC
Dr. Vinayagam A K	Member	TD, Propulsion Systems, ADA
Dr. Soumendu Jana	Member	Chief Scientist and Head Propulsion Division NAL, CSIR
Shri Rakesh Kumar	Member	Scientist, ADE & Hon. Treasurer, DD-AeSI
Shri Vidyadheesh Pandurang	Member	Gas Turbine Research Establishment, DRDO
Dr. T N Satish	Member Secretary	Gas Turbine Research Establishment, DRDO



# Celebrating 75<sup>th</sup> Year of AeSI Second Annual Webinar **AIRCRAFT PROPULSION & GAS TURBINE TECHNOLOGIES IN INDIA**



**(VIRTUAL MODE)**  
 21<sup>st</sup> & 22<sup>nd</sup> July 2023

Organised By:



**The Aeronautical Society of India  
 Design Division**



**Gas Turbine Research Establishment  
 DRDO**



**DIA-COE**  
 (Formerly Centre of Propulsion  
 Technologies)



**(NCABE)**

**National Council for Air  
 Breathing Engines**

## SECOND ANNUAL WEBINAR: AIRCRAFT PROPULSION & GAS TURBINE TECHNOLOGIES IN INDIA

**About Webinar :** The webinar will cover topics such as large fighter aero-engines, small gas-turbine engines, and turbo-shaft engines, with a focus on technology requirements for next-generation aero-engines and technology readiness levels to meet challenges of Next-Gen aero-engines in INDIA. The webinar is being organized jointly by the AeSI Design Division, Gas Turbine Research Establishment, Center of Propulsion Technologies, and National Committee for Air Breathing Engines on aerospace propulsion-related areas. Topics include, but are not limited to the following areas

- Gas Turbine Propulsion
- Compressors, Fans, Turbines
- Engine testing and maintenance
- Combustion, fuels and emissions
- Hybrid and electric propulsion
- Structures and Dynamics
- Materials
- Heat Transfer

### About Design Division, The Aeronautical Society of India :

The Aeronautical Society of India has recently set up a Design Division, which would be the torch-bearer for aerospace design professionals to help them scale professional heights by offering a platform for the inter-organisational exchange of ideas, to report professional contributions, to meet, interact and learn from professionals from across the world, and to update and augment professional knowledge. **[The AeSI is Celebrating its 75<sup>th</sup> Year]**

**Gas Turbine Research Establishment :** One of the pioneering laboratories of the Defence Research & Development Organisation under the Ministry of Defence, Government of India. The main charter of the establishment is to design and develop aero gas-turbine engines for military applications, besides carrying out advanced research work in the area of aero gas turbine subsystems. In addition, the establishment is responsible for establishing requisite testing and prototype manufacturing facilities for components and full-scale engine development.

### DRDO-Industry-Academia Centre of Excellence, DIA-COE

**IIT Bombay (Formerly Centre of Propulsion Technology) :** Established to achieve high international repute and stature amongst professionals and engaged in developing the futuristic propulsion technology through research projects. The centre intends to interface with leading experts from academia and industry across the globe in different research areas beneficial to the defence sector of the country.

**National Council for Air breathing Engines (NCABE) :** The National Council for Air Breathing Engines (NCABE) was founded in 1992 as a trust to provide a forum and stimulus to the R&D activities in the field of aerospace propulsion in the country. The trust has been hosting/co-hosting this major technical event as NCABE / NPC / NAPC at different aerospace institutions across the country and is being well-attended by the Indian aerospace community. NCABE Trust serves as the Indian complement for the International Society for Air Breathing Engines (ISABE).

## Program Schedule:

### DAY – 1 : 21<sup>st</sup> July 2023 – Friday

09:00 am : INAUGURAL SESSION

Inauguration of Webinar : **Dr. Samir V Kamat,**  
and Inaugural Address **Secretary, Department of Defense R&D & Chairman DRDO**

Keynote Address : **Shri MZ Siddique,**  
**Distinguished Scientist & Director General (Aero) DRDO**

- SESSION 1 : INDIGENOUS AIRCRAFT PROPULSION & GAS TURBINE TECHNOLOGIES
- SESSION 2 : ADVANCED GAS TURBINE DESIGN & TECHNOLOGIES
- SESSION 3 : ADVANCED COMPOSITE MATERIALS
- SESSION 4 : STEALTH TECHNOLOGY FOR AERO ENGINE SYSTEMS
- SESSION 5 : PROPULSION RELATED RESEARCH IN ACADEMIC INSTITUTIONS
- SESSION 6 : PANEL DISCUSSION - TURBOPROP GAS TURBINE ENGINES

### DAY – 2 : 22<sup>nd</sup> July 2023 – Saturday

- SESSION 7 : DESIGN AND DEVELOPMENT OF SYSTEM ACCESSORIES & LRUs
- SESSION 8 : USE OF AI/ML IN PROGNOSTICS /DIAGNOSTICS OF GAS TURBINE ENGINES
- SESSION 9 : ADVANCED MANUFACTURING & MATERIALS TECHNOLOGIES
- SESSION 10 : STRUCTURAL DESIGN AND OPTIMIZATION
- SESSION 11 : OPERABILITY AND PERFORMANCE TESTING OF AERO-ENGINES
- SESSION 12 : START-UP EFFORTS IN AEROSPACE PROPULSION
- SESSION 13 : CHALLENGES OF CERTIFICATION
- SESSION 14 : PANEL DISCUSSION: TRL OF FLYING TEST BED FOR SMALL /LARGE

For Detailed program details, topics of discussion, speaker profile

Visit us at : [www.aerosocietyindia.co.in/Events/UpcomingEvents](http://www.aerosocietyindia.co.in/Events/UpcomingEvents)

**TO REGISTER:** Fill the online registration form. **REGISTER HERE** OR  
Participants are requested to send their name, e-mail address and employer details and identity proof to [aerogasturbineindia@gmail.com](mailto:aerogasturbineindia@gmail.com) for registration.

**Please Note :**

**No registration fee is charged.**

**Last date for registration - 15<sup>th</sup> July 2023.**

**For Queries, feel free to contact us at :**

**Dr. T N Satish (9448013380 / 080-25040501)**

**Shri Vidyadheesh Pandurangi (9845667544 / 080-25040081)**

# Second Annual Webinar: 21<sup>st</sup> & 22<sup>nd</sup> July 2023 (Virtual Mode)

## Aircraft Propulsion & Gas Turbine Technologies in INDIA

Organised By: Design Division of Aeronautical Society of India (AeSI), Gas Turbine Research Establishment (GTRE), DIA-COE (Formerly Centre of Propulsion Technologies ) and National Council for Air breathing Engines (NCABE)

### PROGRAM SCHEDULE

DAY-1: 21<sup>st</sup> JULY 2023 (FRIDAY)

### INAUGURAL SESSION

Time	Duration	Program	Speaker
09:00am to 09:10am	10 mins	Welcome Address	Dr. K Ramachandra, Former Director, GTRE - DRDO
09:10am to 09:35am	25 mins	Inauguration of Webinar and Inaugural Address	Dr. Samir V Kamat, Secretary, Dept of Defense R&D and Chairman DRDO
09:35am to 10:00am	25 mins	Keynote Address	Shri M Z Siddique, Distinguished Scientist, Director General (Aero), DRDO
10:00am to 10:10am	10 mins	The Webinar Overview	Dr. T N Satish, Scientist 'G', GTRE-DRDO

### SESSION 1: INDIGENOUS AIRCRAFT PROPULSION & GAS TURBINE TECHNOLOGIES IN INDIA

SESSION CHAIR: Dr. K Ramachandra  
Former Director, GTRE-DRDO

10:10am to 10:30am	20 mins	Hybrid and Electric Propulsion for Aircraft	Dr. Kota Harinarayana, Former Program Director-LCA, Director-ADA and Chairman Design Division AeSI
10:30am to 10:50am	20 mins	Indigenous Efforts in Technologies of the Next Generation Gas Turbines	Dr. S V Ramanamurty , Outstanding Scientist & Director, GTRE-DRDO
10:50am to 11:10am	20 mins	Academia-Industry Collaboration: Driving Innovation in Gas Turbine Development in India and a Sneak-Peek into Global Models	Prof. V Venkateswara Rao, Director, DIA-COE (Formerly CoPT), IIT Bombay
11:10am to 11:30am	20 mins	Harnessing Skills and Experience in Advanced Gas Turbine Technologies in the Country	Prof. B N Raghunandan, Chairman, NCABE
11:30am to 11:50am	20 mins	Electric Propulsion Efforts at NSTL	Shri Basam Venkata Rao, Scientist 'E', NSTL-DRDO

<b>SESSION 2: ADVANCED GAS TURBINE DESIGN &amp; TECHNOLOGIES</b>			<b>SESSION CHAIR: Shri Debabrata Roy Outstanding Scientist ,GTRE- DRDO</b>
11:50am to 12:10pm	20 mins	Variable Cycle Gas Turbine Engines and Challenges	Shri Sivaramakrishna G , Scientist 'G', GTRE - DRDO
12:10pm to 12:30pm	20 mins	Influence of Intake Aerodynamics on Aero-Engine Performance	Shri Ajay Pratap, Scientist 'G', GTRE - DRDO
12:30pm to 12:50pm	20 mins	Challenges of Development of Turbo-Shaft Engine System	Shri Nilesh Adlak, Chief Manager (Design), HAL
12:50pm to 01:00pm	10 mins	Conclusions and Way Forward: Session Chair	Shri Debabrata Roy, Outstanding Scientist ,GTRE- DRDO
<b>Lunch Break 01:00pm to 1:20pm</b>			
<b>SESSION3: ADVANCED COMPOSITE MATERIALS</b>			<b>SESSION CHAIR: Dr. Soumendu Jana Chief Scientist and Head Propulsion Division, NAL</b>
01:20pm to 01:40pm	20 mins	High Temperature Materials Research at DMSRDE	Dr. Suresh Kumar, Scientist 'F' ,DMSRDE-DRDO
01:40pm to 02:00pm	20 mins	High Temperature Titanium Alloys and Titanium Aluminides-Processing Challenges for Gas Turbine Applications	Prof. Satyam Suwas , IISc
02:00pm to 02:20pm	20 mins	Ceramic Metal Matrix Composites (Sic-Sic)	Dr. A Udaykumar , Senior Principal Scientist , NAL
02:20pm to 02:30pm	10 mins	Conclusions and Way Forward: Session Chair	Dr. Soumendu Jana, Chief Scientist and Head Propulsion Division, NAL
<b>SESSION 4: STEALTH TECHNOLOGY FOR AERO ENGINE SYSTEM (Focus on Technology Readiness Levels in Advanced Aero Engine Stealth Systems)</b>			<b>SESSION CHAIR: Prof B N Raghunandan Chairman, NCABE</b>
02:30pm to 02:50pm	20 mins	IR Signatures of Engine-Embedded Rear Fuselage Skin & its Emissivity Optimization	Prof. Shripad P Mahulikar, IIT Bombay
02:50pm to 03:10pm	20 mins	Challenges of Engine Intake and Exhaust Design from Stealth Criteria	Dr. N N S S R K Prasad , Outstanding Scientist , ADA
03:10pm to 03:30pm	20 mins	Thermal IR Signatures of Aero Engines from Stealth Perspective	Dr. R Nagarajan, Scientist 'F', DLJ-DRDO
03:30pm to 03:40pm	10 mins	Conclusions and Way Forward: Session Chair	Prof. B N Raghunandan, Chairman, NCABE

<b>SESSION 5: PROPULSION RELATED RESEARCH IN ACADEMIC INSTITUTIONS (Focus on Industrial Research in Academic Institutions with Start-Ups)</b>			<b>SESSION CHAIR: Shri Kailash Kumar Pathak Scientist G &amp; Director DFTM, DRDO</b>
03:50pm to 04:05pm	15 mins	Non-Axisymmetric End-wall Contouring of Turbine Stator	Dr. Nagabhushana Rao Vadlamani, IITM
04:05pm to 04:20pm	15mins	Effect of Inflow and Surface Irregularities on Turbomachinery Performance	Prof. A M Pradeep , IITB
04:20pm to 04:35pm	15 mins	Characterization of Selective Laser Melted Inconel 718 and Ti-6Al-4V	Dr. Ravi Sankar Kottada, IIT Madras
04:35pm to 04:50pm	15mins	AR&DB Strategies for Seeding of Innovation and Technology in Tier II Academic Institutions	Dr. Vikas Kumar Saxena, Chairman, Steering Committee, AR&DB
04:50pm to 05:10pm	20 mins	Sustainability Impact of Aviation Fuels	Dr. Jayant Sabnis, Senior Lecturer, Massachusetts Institute of Technology
05:10pm to 05:20pm	10mins	Conclusions and Way Forward: Session Chair	Shri Kailash Kumar Pathak, Scientist G & Director DFTM, DRDO
<b>SESSION 6 : PANEL DISCUSSION :TURBO-PROP GAS TURBINE ENGINE (Focus on Preparedness to Launch Turbo-Prop Engine Development in the Country )</b>			<b>SESSION CHAIR: Dr. Kota Harinarayana Former Program Director-LCA, Director-ADA and Chairman -Design Division AeSI</b>
05:20pm to 05:30pm	10 mins	Technology Readiness in India: Turbo-Prop Engine Development	Shri Prathapanayaka R, Senior Principal Scientist , NAL
05:30pm to 05:40pm	10 mins	Challenges in Design of Propellers for Turbo-Prop Engines	Prof. Abhishek , IIT Kanpur
05:40pm to 05:50pm	10 mins	Challenges in Design of Turbo-Prop Engines in INDIA	Dr. Ramachandra S, Scientist 'G' , GTRE (Retd)
05:50pm to 06:00pm	10 mins	Technology Readiness in India and Experience in Turbo-Prop Engine Testing	Wing Commander B Biju, IAF
06.00pm to 06:10pm	10 mins	Preparedness to Launch Turbo-prop Engine development	Shri Ravindra Kumar, Addl. General Manager (Design), HAL
06:10pm to 06:20pm	10 mins	Participant Interaction, Way Forward & Recommendations	Dr. Kota Harinarayana, Former Program Director-LCA, Director-ADA and Chairman -Design Division AeSI.

**DAY-2: 22<sup>nd</sup> JULY 2023 (SATURDAY)**

<b>SESSION 7: DESIGN AND DEVELOPMENT OF SYSTEM ACCESSORIES &amp; LRUs.</b>			<b>SESSION CHAIR: Dr. C Venugopal GM HAL , Lucknow</b>
09:00am to 09:20am	20 mins	System Requirements & Challenges of LRUs for Next Gen Aero Engines	Shri Vaman Kulkarni , Freelance Consultant, Ex Director , Honeywell Technology Solutions
09:20am to 09:40am	20 mins	Challenges in Design and Development of Fuel System and its LRU for Helicopter Engine	Shri K Lingamoorthy , Chief Manager , HAL ( Design- Engine Systems)
09:40am to 10:00am	20 mins	Indigenous Design and Development of Advanced FADEC System	Dr. Viswanatha Rao AN, Scientist 'G', GTRE
10:00am to 10:10am	10 mins	Conclusions and Way Forward: Session Chair	Dr. C Venugopal, General Manager ,HAL , Lucknow
<b>SESSION 8: USE OF AI/ML IN PROGNOSTICS / DIAGNOSTICS OF GAS TURBINE ENGINES</b>			<b>SESSION CHAIR: Dr. Viswanatha Rao AN Scientist 'G', GTRE</b>
10:10am to 10:30am	20 mins	AI Based Advanced Health and Usage Monitoring System for Next Gen Engines	Dr. Sundar Krishnaswami, GE Aviation
10:30am to 10:50am	20 mins	Insights into Digital Twin Technology	Dr. Seema Chopra, Boeing
10:50am to 11:10am	20 mins	Prognostic Health Management of Aircraft Systems	Shri Seshadri Venkatadri ,Collins Aerospace
11:10am to 11:20am	10 mins	Conclusions and Way Forward: Session Chair	Dr. Viswanatha Rao AN, Scientist 'G', GTRE
<b>Coffee Break 11:20am to 11:30 am</b>			
<b>SESSION 9: ADVANCED MANUFACTURING &amp; MATERIALS TECHNOLOGIES</b>			<b>SESSION CHAIR: Shri K Ramesh General Manager , HAL (AERDC)</b>
11:30am to 11:50am	20 mins	Linear Friction Welding for Gas Turbine Blisk Manufacturing	Prof. Satish V Kailas , IISc
11:50am to 12:10pm	20 mins	Large Size Titanium Castings/ Next Gen Single Crystal Blade Manufacturing Infrastructure and Developmental Technologies in India	Dr. B Saha, PTC Industries
12:10pm to 12:30pm	20 mins	Technological Gaps in the Advanced Manufacturing and Materials Technologies for Gas Turbines in India	Shri Debashis Deb, Former ED, HAL Koraput
12:30pm to 12:50pm	20 mins	Advanced Materials for Aero Engines	Dr. Swati Biswas, Scientist 'F', GTRE-DRDO
12:50pm to 01:00pm	10 mins	Conclusions and Way Forward: Session Chair	Shri K Ramesh, General Manager , HAL (AERDC)

<b>Lunch Break 01:00 to 1:30pm</b>			
<b>SESSION 10: STRUCTURAL DESIGN AND OPTIMIZATION</b>			<b>SESSION CHAIR: Dr K RAMACHANDRA Former Director, GTRE</b>
01:30pm to 01:50pm	20 mins	Multiphysics Design Constraints of Transonic Compressor	Shri Sankar Kumar J, Scientist 'F' ,GTRE- DRDO
01:50pm to 02:10pm	20 mins	Computational Approaches in Damage Tolerance Lifting of Aerospace Components	Dr. Venugopal Rao, Scientist 'G', DMRL- DRDO
02:10pm to 02:20pm	10 mins	Conclusions and Way Forward: Session Chair	Dr. K Ramachandra, Former Director, GTRE
<b>SESSION 11: OPERABILITY AND PERFORMANCE TESTING OF AERO ENGINES</b>			<b>SESSION CHAIR: Dr. S Kishore Kumar Scientist 'G' GTRE -DRDO ( Retired)</b>
02:20pm to 02:40pm	20 mins	Operational Experience of the Newly Inducted Aero Engines	Group Captain K Giri, IAF
02:40pm to 03:00pm	20 mins	MRO and LIFE Extension Activities of Aero Engines.	IAF-Rep
03:00pm to 03:20pm	20 mins	Testing and Evaluation of Gas Turbine Engines. (Flying and Mobile Test Bed)	IAF-Rep
03:20pm to 03:30pm	10 mins	Conclusions and Way Forward: Session Chair	Dr. S Kishore Kumar , Scientist 'G' , GTRE -DRDO (Retired)
<b>SESSION 12: START UP EFFORTS IN AEROSPACE PROPULSION</b>			<b>SESSION CHAIR: Prof. Arindrajit Chowdhury, IITB</b>
03:30pm to 03:45pm	15 mins	Green Propulsion System for Space Applications	Shri Tushar Jadhav, Manstuspace
03:45pm to 04:00pm	15 mins	How to Reduce an Entire Rocket Engine to be a Single Piece of Hardware?	Shri Srinath Ravichandran, Agnikul
04:00pm to 04:10pm	10 mins	Conclusions and Way Forward: Session Chair	Prof. Arindrajit Chowdhury, IITB
<b>SESSION 13: CHALLENGES OF CERTIFICATION</b>			<b>SESSION CHAIR: Shri APVS Prasad Outstanding Scientist &amp; CE CEMILAC-DRDO</b>
04:10pm to 04:25pm	15 mins	New CEMILAC Document DDPMAS for Ab-Initio Aero Engine Certification	Shri L N Raghavendra, Director of Propulsion, CEMILAC-DRDO
04:25pm to 04:40pm	15 mins	Challenges of Certification of Private Industry Development Agencies. TDF Perspective	Smt Nidhi Bansal, Scientist 'G' & Director , DTDF- DRDO
04:40pm to 04:50pm	10 mins	Conclusions and Way Forward: Session Chair	Shri APVS Prasad, Outstanding Scientist & CE CEMILAC-DRDO

<b>SESSION 14: PANEL DISCUSSION: TECHNOLOGY READINESS LEVEL OF FLYING TEST BED FOR SMALL/ LARGE AERO ENGINES.</b>			
<b>SESSION CHAIR : AVM Sharad Kumar Jain VSM (Retd)</b>			
04:50pm to 05:00pm	10 mins	Need and Status of Flying Test Bed for the Next Generation Aero Engine Programs	Dr. S V Ramanamurty, Outstanding Scientist & Director ,GTRE- DRDO
05:00pm to 05:10pm	10 mins	A Flying Test Bed for Small Gas Turbine Engines	Shri Y Dilip, Outstanding Scientist & Director, ADE-DRDO
05:10pm to 05:20pm	10 mins	Technical Challenges of Realizing FTB Vehicle for the Large Engine Program	IAF-Rep
05:20pm to 05:30pm	10 mins	Flying Test Bed a Case for Major Indigenization and Certification Program	Shri APVS Prasad, Outstanding Scientist & CE CEMILAC-DRDO
05:30pm to 05:50pm	20 mins	Participant Interaction, Way Forward & Recommendations	Session Chair : AVM Sharad Kumar Jain ,VSM (Retd)
05:50 to 06:00pm - Vote of Thanks, Shri Vidyadheesh Pandurangi, Scientist 'F', GTRE			