From the Conference Chair

ASME 2013 Gas Turbine India Conference Attendees,

On behalf of the ASME International Gas Turbine Institute and CSIR-National Aerospace Laboratories (CSIR-NAL), I would like to welcome you to the ASME 2013 Gas Turbine India Conference. As before, the primary focus of this conference is to bring together those from across India who are working in industry, academia, and government, as they hear and discuss the latest developments in gas turbine technology. Our endeavor has been to provide a platform to share great ideas from within India and other countries in Asia. We welcome participation from around the world and expect the annual GT India Conference to become known as a complement to the annual ASME Turbo Expo conference. Bangalore is now well known internationally for its IT Industries. It is also the aerospace capital of India and hosts several Indian aeronautics and space education, research, design, development and manufacturing organizations. It is home to design and development centers of several multinational businesses engaged in gas turbine and allied technologies. As all these organizations and activities are well-represented in this conference, I expect your participation will prove to be a most rewarding experience.

There are eight tracks this year: Compressors, Turbines, Combustion, Fuels & Emissions, Heat Transfer, Structures & Dynamics, Controls, Diagnostics & Instrumentation, Renewable Energy, and Materials & Manufacturing. Over 100 technical papers that have been subjected to careful review by a broad range of experts worldwide will be presented. Panel presentations will provide summaries of accomplishments and thoughts to engage us for the future. We hope the scheduling will facilitate the best networking opportunities for all participants from industry, academia, and government. Further, I hope that the CSIR-NAL venue will provide the right ambience for this conference.

Finally, on behalf of the ASME International Gas Turbine Institute and CSIR-NAL, we thank all who have supported the GT India conference through generous sponsorship. This event would not be possible without the hundreds of hours spent by the volunteers who served as reviewers, session organizers, and vanguard chairs, coordinated by Prof. Joseph Mathew, Review Chair and Mr. Subhrajit Dey, Technical Program Chair. Our sincere thanks to Dr. Geoff Sheard, Review Chair, ASME, and Mr. Joseph Machnaim, Conference Chair, GT India 2012 for their support and guidance. Finally, much appreciation goes to the ASME staff who pulled everything together in a seamless way. Thank you for attending.

Welcome to Bangalore

Bangalore | India

Welcome to the 2nd annual ASME Gas Turbine India Conference, presented by CSIR-National Aerospace Laboratories (CSIR-NAL).
FEATURE DISPLAY

Presented by Gas Turbine Research Establishment and AneCom AeroTest

This test vehicle simulates the compressor module of an Indian aero-engine, and was previously used as a component test rig to validate the compressor’s aerodynamic performance. See it ONLY at the ASME 2013 Gas Turbine India Conference Exhibit, from December 5 - 6, 2013.
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>8:00 AM – 5:00 PM</td>
<td>Registration</td>
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<tr>
<td>9:00 – 10:00 AM</td>
<td>Keynote</td>
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<tr>
<td>10:00 AM - 2:00 PM</td>
<td>Exhibit Hall Open</td>
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<tr>
<td>10:00 – 10:30 AM</td>
<td>Break</td>
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<tr>
<td>10:30 AM – 12:30 AM</td>
<td>Panel Discussions/Morning Sessions</td>
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<tr>
<td>10:30 – 1:30 PM</td>
<td>Lunch</td>
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<td>1:30 – 3:30 PM</td>
<td>Afternoon Sessions</td>
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<tr>
<td>3:30 – 4:00 PM</td>
<td>Break</td>
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<tr>
<td>4:00 - 6:00 PM</td>
<td>Facility Tour</td>
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<tr>
<td>6:30 PM</td>
<td>GT India Chapter Meeting &amp; Banquet Dinner</td>
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</tbody>
</table>

### Thursday, December 5

**Gas Turbine Engine Technology Initiatives - Indian Perspective**

**Thursday, December 5th | 9:00 – 10:00 AM**

Dr. K.V.L. Rao, Technical Advisor, ADA

The last three decades have ushered in a renaissance of several major Aeronautical and Aerospace programs in India. Design & development of Helicopters, Light Combat Aircraft, Transport Aircraft, Unmanned air vehicles, Intermediate Jet Trainer aircraft are some of the programs initiated during this period, which are now ready for entering into active service. These programs have enabled the establishment of core design & development technology along with the associated manufacturing, test & evaluation capabilities, including flight test capability.

While an initial batch of Gas turbines which power imported aircraft are imported along with aircraft, subsequent needs have been met with units manufactured in the country under Technology Transfer agreements, for the majority of acquisition over the last four decades. Now, this has been mandated as a requirement in the new Defence Procurement Policy along with Offset.

In parallel, indigenous gas turbine programs to design & develop a 80 KN augmented thrust turbofan (Kaveri) for combat aircraft, a 4 KN small gas turbine (PTAE-6) for UAV and a 110KW Jet fuel starter (JFS) was also initiated during this period as a modest beginning. All these programs have fully matured and have successfully completed the full design, development and flight test cycle. Both PTAE-6 & JFS have been integrated and are flying in service aircraft. Another indigenous 65 HP Wankel engine has been integrated to a UAV and is flying satisfactorily. Kaveri has matured to successfully complete the Flying Test Bed Trials.

Building on this success & establishment of core technology, the country is now poised to initiate full design & development programs for Advanced Medium Combat Aircraft, 20 ton cargo aircraft, advanced variants of Helicopters, Unmanned aircraft and a 100 pax Regional Transport Aircraft. To maximise the indigenous efforts on gas turbine design & production to power these new aircraft, several Technology Enabling Initiatives have been initiated as a joint Government, Industry and University partnership program under DRDO. The projects and programs under these activities initiated, progress achieved so far, and its linkages to various national programs proposed are highlighted in this paper.
Facility Tour
NAL Campus | 4:00 - 6:00 PM
Pick up time is 3:50 pm on Thursday, December 5th in front of the SR Valluri auditorium. NAL will provide multiple buses.

Chapter Meeting
Matthan Hotel | 6:30 PM
All conference attendees are welcome to attend the Gas Turbine India Chapter Meeting, where conference leadership will discuss current and future activities. Banquet Dinner to follow.

Conference Leadership Team

Vanguard Chairs

Emits roughly 94% fewer hydrocarbons than the 2008 regulatory limits.

Uses the first fiber-braided composite fan case in commercial service.

Consumes 15% less fuel than the GE engine it replaces.

The engine is 40% quieter than the GE engine it replaces.
With a deep understanding of the turbo design process, only ANSYS delivers all of the capabilities to support best-practice methods — complete solutions to compress your design process while improving machine performance.

Visit us at Stall no. 01
**Compressors Flow Studies III**

**Session Chair:** Kulaveeran Murugesan, CSIR-National Aerospace Laboratories, Bangalore, India

**Session Co-Chair:** Chaitanya Ongole, GE Aviation, Bangalore, India

**Unsteady Secondary Flow in an Annular Compressor Cascade**

- Georg Hermle, Martin Lawerenz, University of Kassel

**Numerical Investigation of the Effect of Moving Endwall and Tip Clearance on the Losses in a Low Speed Axial Flow Compressor Cascade**

- Mahesh K. Varpe, A.M. Pradeep, Indian Institute of Technology Bombay

**Numerical Studies on Effect of Stepped Tip Clearance Height on the Performance of Single Stage Transonic Axial Flow Compressor**

- Pritam Ratabyal, Dilip B. Alone, CSIR-National Aerospace Laboratories, Sarat Kumar Maharana, Acharya Institute of Technology

**Heat Transfer**

**General GT Heat Transfer II**

**Session Chair:** Sanjeev Jain, GE Power & Water, Bangalore, India

**Session Co-Chair:** N Kulasekharan, Saveetha Engineering College, Chennai, India

**CFD Simulation of Open-Cell Aluminum Metal Foams for Pressure Drop Characterization**


**Inverse Heat Transfer Analysis Of Porous Extended Surface Using Simplex Search Method**

- Rajib Kumar Sengupta, Rangan Das, Arka Bhattacharya, Ramjee Ray, Indian Institute of Technology Kharagpur

**Thermal Based Optimum Design of Tapered Roller Bearing Through Evolutionary Algorithm**

- Rajiv Tiwari, Rahul Chandran, Indian Institute of Technology Guwahati

**Structures & Dynamics**

**Bearings & Seals**

**Session Chair:** Soumendu Jana, CSIR-National Aerospace Laboratories, Bangalore, India

**Session Co-Chair:** Jay Ramachandran, GE Aviation, Bangalore, India

**Metal Temperature Correlations in Tilting Pad Journal Bearings**

- Manish Thosar, Brian Pettinato, Elliott Group, Pranabesh Dechoudhury, Pran RDA Consulting Inc.

**Development of Foil Bearings for Small Rotors**

- Sadanand Kulkarni, Soniya Naik, Sarosh Kumar K, Radhakrishna M, Soumendu Jana, CSIR-National Aerospace Laboratories

**Monitoring & Diagnostics I**

**Session Chair:** Amitava Datta, Jadavpur University, Kolkata, India

**Troubleshooting of Vibration Problems in Gas Turbines with Proximity and Seismic Probes**

- Pankaj Kumar Sharma, Padmanabhan Gopalakrishnan, GE India Industrial Pvt Ltd

**Flutter and Forced Vibration Characteristics of a Turbo Fan Bladed Disk Rotor**

- Mudhavan Srinivasan, Sankar Kumar Jeyaraman, Rajeev Jain, Gas Turbine Research Establishment, Sujatha Chandramohan, Ananda Rao Seshadri Sekhar, Indian Institute of Technology Madras

**Controls, Diagnostics & Instrumentation**

**Room ACD**

**Room KTMD**

**Room CSSD**

**10:30**

- Unsteady Secondary Flow in an Annular Compressor Cascade
- CFD Simulation of Open-Cell Aluminum Metal Foams for Pressure Drop Characterization
- Metal Temperature Correlations in Tilting Pad Journal Bearings

**10:30**

- Inverse Heat Transfer Analysis Of Porous Extended Surface Using Simplex Search Method
- Thermal Based Optimum Design of Tapered Roller Bearing Through Evolutionary Algorithm
- Development of Foil Bearings for Small Rotors

**11:00**

- Numerical Investigation of the Effect of Moving Endwall and Tip Clearance on the Losses in a Low Speed Axial Flow Compressor Cascade
- Inverse Heat Transfer Analysis Of Porous Extended Surface Using Simplex Search Method
- Troubleshooting of Vibration Problems in Gas Turbines with Proximity and Seismic Probes

**11:00**

- Numerical Studies on Effect of Stepped Tip Clearance Height on the Performance of Single Stage Transonic Axial Flow Compressor
- Development of Foil Bearings for Small Rotors
- Flutter and Forced Vibration Characteristics of a Turbo Fan Bladed Disk Rotor

**12:30 - 1:30 PM**

- Lunch

**12:30 - 1:30PM**

- Lunch
Session Chair: Kalaveeran Murugesan, CSIR-National Aerospace Laboratories, Bangalore, India
Session Co-Chair: Chaitanya Ongole, GE Aviation, Bangalore, India

Numerical Studies on the Effect of Design Trim on Aerodynamic Performance of a Micro Propeller for MAV Application
GTINDIA2013-3671
Quamber Naqpurwala, Sagar R., S. Subbaramu, M. S Ramaswamy School of Advanced Studies

Design Work of a Compressor Stage From High-to-Low Speed Compressor Transformation
GTINDIA2013-3306
Chenkai Zhang, Jun Hu, Zhiqiang Wang, Xiang Gao, Nanjing University of Aeronautics and Astronautics

Effect of Different Turbulence Models on the Numerical Analysis of Axial Flow Turbine Stage of a Typical Turbofan Engine
GTINDIA2013-3355
Seepana Ramana, Kishore Kumar, Gas Turbine Research Establishment

Development of Pyro Igniter for Gas Turbine Engine Application
GTINDIA2013-3317
Jayaraman Kandasamy, VE tech Technical University

Turbulent Behaviour in a Low Aspect Ratio Dump Combustor at Low Swirl Number
GTINDIA2013-3734
N.P. Yadav, Bunderkhand Institute of Engineering and Technology, Abhijit Kesharwani, Indian Institute of Technology

Computational Study on Pressure Side Film Cooling and Flow Structure
GTINDIA2013-3696
Radheesh Dhansasegaran, Girish Venkatapalumputh, Nagarajan Ganasekaran, SSN College Of Engineering

Experimental and Numerical Investigation of Effect of Blowing Ratio on Film Cooling Effectiveness and Heat Transfer Coefficient Over a Gas Turbine Blade Leading Edge Film Cooling Configurations
GTINDIA2013-3352

Experimental Study on the Effect of Freestream Turbulence on the Development of an Inflow Boundary Layer from the Semi-Circular Leading Edge of a Flat Plate
GTINDIA2013-3629
Subrata Sarkar, Samson Ratnakumar Annaparedi, Indian Institute of Technology

Enhancing Gas Turbine Operation With Heavy Fuel Oil
GTINDIA2013-3767
Vikram Murudhande, GE Power & Water, Matthieu Vierling, GE Energy Products Europe

Effect of Film Cooling Hole Area Ratio on Adiabatic Film Cooling Effectiveness Over a Flat Plate
GTINDIA2013-3629
Felix J., Giridhara Babu Yeperi, Vinod Kumar, CSIR-National Aerospace Laboratories, Jim Alen J., Siva Kumar P., JJ College of Engineering & Technology

Identification of Multiple Fault Parameters in a Rigid-Rotor and Flexible-Bearing-Coupling System: An Experimental Investigation
GTINDIA2013-3774
Rajiv Tiwari, Mohit Lal, Indian Institute of Technology Guwahati

Enhanced Fuel Flexibility and Emissions Compliance for Gas Turbines Through Model Based Controls Technology
GTINDIA2013-3587
Ranjith Malapati, Suresh MVJ, GE Power & Water

Turbojet Engine Performance Tuning With A New Turbine Map Adaptation Concept
GTINDIA2013-3533
Juanliqui Alberto Misté, Ernesto Benini, University Of Padova

A Design Environment for Performance Modeling and Analysis of Aero Engine Lubrication Systems
GTINDIA2013-3542
Muralidhar Manavlan, Bommala Balasubramanian, Prashat Mahendiran, Aditya S. Rao, Honeywell Technology Solutions

Comparative Study Between In Situ Measured Vibration Data at Bearing and BTT on A LP Turbine Last Stage Blades in a Steam Turbo-Generator Set
GTINDIA2013-3614
Wolfgang Hahn, J.E. UK, Jyoti Sinha, University Of Manchester

Flexible-Bearing-Coupling System: Identification of Multiple Fault Models on the Numerical Analysis Of Axial Turbine and Instability of Two Spool Aero Gas Turbine Rotor System
GTINDIA2013-3582
Narayanay Payyoor, Mayank Tiwari, GE Aviation, Kshitij Gupta, Indian Institute of Technology

Modal Analysis of Multi Layer Viscoelastic Rotors Considering Higher Order Model
GTINDIA2013-3670
Saurabh Chandraker, Haraprasad Roy, Gaurav Maurya, National Institute of Technology

Effect of Hole Shape On Film Cooling Effectiveness Over A Flat Plate
GTINDIA2013-3628
Felix J., Giridhara Babu Yeperi, Vinod Kumar, CSIR-National Aerospace Laboratories, Harshavardhana N., Rajanna D., Adichunchanagiri Institute of Technology

Enhanced Fuel Flexibility and Emissions Compliance for Gas Turbines Through Model Based Controls Technology
GTINDIA2013-3587
Ranjith Malapati, Suresh MVJ, GE Power & Water

Identification of Multiple Fault Parameters in a Rigid-Rotor and Flexible-Bearing-Coupling System: An Experimental Investigation
GTINDIA2013-3774
Rajiv Tiwari, Mohit Lal, Indian Institute of Technology Guwahati

Model Based Crack Identification Using Full-Spectrum
GTINDIA2013-3756
Rajiv Tiwari, Shrivankumar Chandrasekaran, Indian Institute Of Technology Guwahati
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
<th>Abstract</th>
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<tbody>
<tr>
<td>9:30</td>
<td><strong>Combustion Modeling</strong> General GT Heat Transfer I</td>
<td>Room ACD</td>
<td>Session Chair: KVL Rao, Aeronautical Development Agency, Bangalore, India. S. Ashok, Sudhakar, Indian Institute of Science, Bangalore, India.</td>
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<tr>
<td>10:00</td>
<td><strong>Heat Transfer</strong> General GT Heat Transfer I</td>
<td>Room FMCD</td>
<td>Session Chair: Santosh Hemachandra, Indian Institute of Science, Bangalore, India. Session Chair: Kesavanan V., Gas Turbine Research Establishment, Bangalore, India.</td>
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<tr>
<td>10:30 - 10:45 AM</td>
<td><strong>Break Time</strong></td>
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<td>10:30 - 10:45 AM</td>
<td><strong>Break Time</strong></td>
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**Session Chair:** Quamber Nagpurwala, M S Ramiah school of Advanced Studies, Bangalore, India.
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<th>Session Title</th>
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<tr>
<td>10:45</td>
<td>Aeroderivative Gas Turbine Coupling Genera Redesign</td>
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<td>11:15</td>
<td>Comparative Study of Flange-to-Seal Contact Couplings With Bolt Relaxation</td>
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<td>Under Creep Condition</td>
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<tr>
<td>11:45</td>
<td>Life Prediction of Directionally Solidified Air Cooled HPT Gas Turbine Blade</td>
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<td>Using in a Supersonic Aircraft Using FEM</td>
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<tr>
<td>12:15 - 1:15</td>
<td>Lunch</td>
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</table>

**Lecture Session**

**Session Chair and Lecturer:**

- **Aspi Wadia,** GE Aviation

**The lecture will review the evolution of aircraft engine fan aerodynamics in the last quarter century. Starting from the development of fan blades with part span shrouds, the lecture will show the key milestones in fan technology, including wide chord fan blades, swept fan blades, and open rotors.**

**Room ACD**

**Investigations on the Effect of Aspect Ratio Into the Performance of Savonius Rotors**

**Session Chair and Lecturer:**

- **Sukanta Roy,** Ujjwal K. Saha, Indian Institute of Technology Guwahati

**The lecture will analyze the effect of aspect ratio into the performance of Savonius rotors.**

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- If you cannot remember your SSO password, you will be able to reset your password by using the link below the log-in button called “Retrieve Your Password” on the my.asme.org page. **If you are not already a member, simply go to go.asme.org/IGTI and click “Join Group.” You will have to create a free account to become a participant.**

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For questions, please contact:

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Norcross, Georgia 30092 USA
Tel: +1-404-847-0072
Fax: +1-404-847-0151
Email: igtiweb@asme.org
December 6, 2013

Session Chair: Kalveeran Murugesan, CSIR-National Aerospace Laboratories, Bangalore, India
Session Co-Chair: Chaitanya Ongole, GE Aviation, Bangalore, India

COMPRESSORS
Session Chair: A.M. Pradeep, Indian Institute of Technology Bombay, Mumbai, India

1:15
A Study of Existing Multistage Transonic Axial Compressor Design for Surge Margin Improvement
GTINDIA2013-3616
Baljeet Kaur, Ajay Pratap, Nitin Balsaraf, Gas Turbine Research Establishment

1:45
Experimental Studies on Stall Behavior in a Single Stage Transonic Axial Flow Compressor
GTINDIA2013-3620
Dilip B. Alone, S Satish Kumar, Shobhavathy M Thrimmaiah, Janaki Rami Reddy M, Venkat S Iyengar, Ramamurthy S, CSIR-National Aerospace Laboratories, A.M. Pradeep, Indian Institute of Technology Bombay

2:15
Stage by Stage Modeling of Surge in Centrifugal Gas Compressors
GTINDIA2013-3655
Rozhin Saboori, Kaveh Ghorbaniian, Sharif University of Technology

TURBINES
Session Chair: Rakivirshna R. V., Indian Institute of Science, Bangalore, India

1:15
Design and Analysis of a High Pressure Transverse Turbine Using Computational Methods for Small Gas Turbine Application
GTINDIA2013-3606

1:45
Numerical Investigation of Transverse Jet in Cross-Flow Using CFD Techniques
GTINDIA2013-3516
Pushpender Rathore, Rajagopal Thundil Karuppa Raj, IIT Bombay

2:15
Graph Theoretic Analysis of Advancement Combined Cycle Power Plants Alternatives With Latest Gas Turbines
GTINDIA2013-3760
Nikhil Dev, Rajesh Attri, YMC University of Science and Technology, Gopal Krishan Gayal, Bhawani Institute of Technology & Science, Naresh Kumar, B RcM College of Engineering & Technology

ATOMIZATION & SPRAY I
Session Chair: Gaurav Dhruvan, Indian Institute of Technology Guwahati

1:15
Numerical Simulations of Liquid Jet Breakup in a Crossflow
GTINDIA2013-3690
Mohit Jain, R Suryaprakash, Gaurav Tomar, Ravikrishna R. V., B. N. Raghunandan, Indian Institute of Science Bangalore

1:45
Health Monitoring of Gear Elements Based on Time-Frequency Vibration Data by Support Vector Machine Algorithms
GTINDIA2013-3772
Rajiv Tiwari, Dhruva Jyoti Bordoloi, Indian Institute of Technology Guwahati

2:15
Numerical Simulations of Liquid Jet Breakup in a Crossflow
GTINDIA2013-3690
Mohit Jain, R Suryaprakash, Gaurav Tomar, Ravikrishna R. V., B. N. Raghunandan, Indian Institute of Science Bangalore

COMBUSTION, FUELS & EMISSIONS
Session Chair: Avijit Bagchi, Indian Institute of Technology Guwahati

1:45
Numerical Simulations of Jet Breakup in Crossflow of Swirling Air Stream
GTINDIA2013-3624
Tushar Sikroria, Abhijit Kushari, Indian Institute of Technology Kanpur

2:15
A Study on Bird Impact Damages on Shrouded Fan Blades of an Aero-Engine
GTINDIA2013-3804
Raghu Prakash, Indian Institute of Technology Madras, Anandavel Kalyaperumal, Hitheesh Channegowda, Infotech Enterprises Ltd

AERO- THERMODYNAMIC MODELLING AND GAS PATH SIMULATION FOR A TWIN SPOOL TURBO JET ENGINE

1:15
Design and Experimental Validation of a Radial Air Turbine Wheel of an Air Starter for Fighter Aircraft Application
GTINDIA2013-3526
Amar Singh, Joseph Shibu K., Hindustan Aeronautics Ltd, R. K. Mishra, Center for Military Airworthiness and Certification

1:45
Aero-Thermodynamic Modelling and Gas Path Simulation for a Twin Spool Turbo Jet Engine
GTINDIA2013-3643
Thenavarajan S, Brijeshkumar Shah, Balaji Sankar, Vijayendranath Vanam, Soumendu Jana, Ramamurthy S, CSIR-National Aerospace Laboratories, Radhakant Satpathy, Center for Military Airworthiness and Certification, Satish K Yadav, Hindustan Aeronautics Ltd

2:15
Effect of Inflow Conditions on Wind Turbine Blade Performance
GTINDIA2013-3377
Kiran Kumar, Sudhakar Piragalathalwar, Jitendra Bijlani, Jesper Madsen, LM Wind Power Technologies

2:45 - 3:00 PM
Break

ROOM CSSD
Session Chair: Parag Acharya, GE, Hyderabad, India

1:15
Bearing Failure Investigation of Turbomachinery Test Rig
GTINDIA2013-3611
Veena Sesh Kumar C, Dileep Kumar B Alone, Janaki Rami Reddy M, Manickam Jayaraman, CSIR-National Aerospace Laboratories, Vijay Tijare, SRF Technologies India

2:15
GTINDIA2013-3816
Jaikumar Loganathan, Anindya Sengupta, Ashok Gopinath, GE

RENEWABLE ENERGY
Session Chair: Venkataramakrishnan, CSIR-National Aerospace Laboratories, Bangalore, India
Session Co-Chair: Jitendra Bijlani, LM Wind Power Technologies, Bangalore, India

1:15
Numerical Investigations on the Effect of Limiting Eddy Viscosity on Flow
GTINDIA2013-3816
Jaikumar Loganathan, Anindya Sengupta, Ashok Gopinath, GE

2:15
Effect of Inflow Conditions on Wind Turbine Blade Performance
GTINDIA2013-3377
Kiran Kumar, Sudhakar Piragalathalwar, Jitendra Bijlani, Jesper Madsen, LM Wind Power Technologies

2:45 - 3:00 PM
Break
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<tr>
<th>Time</th>
<th>Room ACD</th>
<th>Room FMCD</th>
<th>TECHNOLOGY BLOCK 2</th>
<th>TECHNOLOGY BLOCK 1</th>
<th>Room KTMD</th>
<th>Room CSSD</th>
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<tbody>
<tr>
<td>3:00</td>
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<td>Exit Blade Angle and Roughness Effect on Centrifugal Pump Performance</td>
<td>Influence of Pre-history and Leading Edge Contouring on Aerodynamic Performance of a 3D Nozzle Guide Vane</td>
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<td>Sayed A.I. Bellary, Abdus Samad, Indian Institute of Technology Madras</td>
<td>Ranjan Saha, Jens Fridh, Björn Laumert, Torsten H. Fransson, KTH Royal Institute of Technology, Boris I. Mamarev, Siemens</td>
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<td>4:00</td>
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<td>Effect of Trailing Edge Crenulation on the Performance and Stall Margin of a Transonic Axial Compressor</td>
<td>Influence of Different Rib Height on Heat Transfer Augmentation in Rectangular Convergent/Divergent Channels With Continuous Ribs on Bottom Surface</td>
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<td>Qumber Nagpurwala, S. Subbaramu, A.T. Sriam, M S Ramaiah School of Advanced Studies</td>
<td>Sivakumar Karthikeyan, Natarajan Elumalai, Anna University N Kalsekhharan, Savetha Engineering College</td>
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<td></td>
<td>Design and Testing of a Can Compressor for a Small Gas Turbine Application</td>
<td>Cooling Efficiency Enhancement Using Impingement Cooling Technique for Turbine Blades</td>
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<td>KVL Narayana Rao, Mookiah Devathathan, Ravikumar N, Ramesha Ganganna, Hindu- stan Aeronautics Ltd</td>
<td>Keerthivasan Rajamani, Madhu Ganesh, PSG College of Technology, Balanurman Senivasan, Karthikeyan Paramanandam, Chandran Jayasumugan, Senthilnathan Narayanan, Honeywell Technology Solutions, A Chandran Jain University</td>
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<td>Performance Evaluation of Gear Pump by 2d Unsteady CFD Analysis</td>
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<td>Session Chair: Bhaskar Roy, Indian Institute of Technology Bombay, Mumbai, India</td>
<td>Session Chair: Sanjeev Jain, GE Power &amp; Water, Bangalore, India</td>
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<td>K Anil Kumar, N Balamuralikrishnan, Gas Turbine Research Establishment</td>
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<td>Sourabh Bhat, University of Petroleum and Energy Studies, R.K. Sullerey, Indian Institute of Technology Rourkela</td>
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<td>S. Esakkil Mathu, Sukjum Somanthampay, Dileep S., Hindustan Aeronautics Ltd, R. K. Mishra, Centre for Military Airworthiness and Certification</td>
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