Thermal and Fluids Analysis Workshop 2012

Jet Propulsion Laboratory

Proceedings of a workshop hosted by the Jet Propulsion Laboratory at the Westin Pasadena Hotel
Pasadena, California
August 13 – 17, 2012
Passive Thermal Paper Sessions

Chairs:  John Sharp, NASA – Marshall Space Flight Center
        Callie McKelvey, NASA – Marshall Space Flight Center

Session #1

TFAWS2012-PT-01  Thermal Optimization and Assessment of a Long Duration Cryogenic Propellant Depot
                   Ryan Honour, Robert Kwas, Gary O’Neil, NASA - Kennedy Space Center
                   Bernard Kutter, United Launch Alliance

TFAWS2012-PT-02  Development of the GPM Observatory Thermal Vacuum Test Model
                   Kan Yang, Hume Peabody, NASA - Goddard Space Flight Center

TFAWS2012-PT-03  Return to Mercury: An Overview of the MESSENGER Spacecraft Thermal Control System Design and Up-to-Date On-Orbit Flight Performance
                   Carl J. Ercol, The Johns Hopkins University Applied Physics Laboratory

TFAWS2012-PT-04  Method for Importing Multiple Nastran Composite Layups into Thermal Desktop Accounting for Through-Panel Radiation
                   Matt Garrett, Victoria Harris, Alanna Koser, ATA Engineering, Inc.

TFAWS2012-PT-05  Thermal and Fluid Modeling of the Cryogenic Orbital Testbed (CRYOTE) Ground Test Article (GTA)
                   David Piryk, Paul Schallhorn, Laurie Walls, NASA - Kennedy Space Center
                   Bernard Kutter, United Launch Alliance
                   Noah Rhys, Yetispace Inc. (NASA - Marshall Space Flight Center)
                   Mark Wollen, Innovative Engineering Solutions

TFAWS2012-PT-06  Modeling of Heat Transfer and Ablation of Refractory Material due to Rocket Plume Impingement
                   Michael F. Harris, QinetiQ
                   Dr. Bruce T. Vu, NASA - Kennedy Space Center

TFAWS2012-PT-07  Cube Flux Method to Generate Spacecraft Thermal Environments
                   Siraj A. Jalali, Oceaneering Space Systems

Session #2

TFAWS2012-PT-08  A Design Overview of the Thermal Control System for the Earth Orbiting SMAP Mission
                   Nickolas Emis, Eug Kwack, Rebecca Mikhaylov, Danford Lau, Jennifer Miller, Gordy Cucullu, NASA - Jet Propulsion Laboratory
TFAWS2012-PT-09  **Thermal Analysis Using Assembly FEMs in Teamcenter, NX and Space Systems Thermal**  
Robert Krylo, NASA - Jet Propulsion Laboratory

TFAWS2012-PT-10  **Review and Assessment of JPL’s Thermal Margins (AIAA San Diego, CA, 42nd ICES Conference)**  
George Siebes, Arturo Avila, Michael Blakely, Christine Farguson, A. Hoffman, Cynthia Kingery, K. Man, Jeffrey Nunes, Mark White, NASA - Jet Propulsion Laboratory

TFAWS2012-PT-11  **Conductive White Thermal Control Polyimide Films with Atomic Oxygen Durability**  
Garrett D. Poe, NeXolve Corp.

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**Active Thermal Paper Sessions**

*Chairs:  Ryan Stephan, NASA Johnson Space Center*  
*Rubik Sheth, NASA Johnson Space Center*

**Session #1**

TFAWS2012-AT-01  **Variable Conductance Heat Pipes for Variable Thermal Links**  

TFAWS2012-AT-02  **Loop Heat Pipe with Thermal Control Valve for Variable Thermal Conductance**  
Kara L. Walker, John R. Hartenstine, Andrew Slippey, Calin Tarau, William G. Anderson  
Advanced Cooling Technologies, Inc.

TFAWS2012-AT-03  **High Accuracy Liquid Propellant Slosh Predictions Using an Integrated CFD and Controls Analysis Interface**  
Brandon Marsell, David Griffin, QinetiQ North America  
Dr. Paul Schallhorn, Jacob Roth, NASA - Kennedy Space Center

TFAWS2012-AT-04  **Numerical Investigation of Aerodynamical Performance of Damaged Low-Reynolds Airfoils for UAV Application**  
Ali Doosttalab, Mohammad Mohammad, Ali Ashrafizadeh, K.N.Toosi University of Technology, Iran  
Mehdi Doosttalab, Nordex Energy GmbH, Germany

TFAWS2012-AT-05  **Active Solar Array Thermal Control System for the Solar Probe Plus Spacecraft**  
Carl J. Ercol, The Johns Hopkins University Applied Physics Laboratory  
Greg Gayette, Wei-Lin Cho, Hamilton Sundstrand Space Systems

TFAWS2012-AT-06  **Mechanically Pumped Fluid Loops: Components and Systems for Space Application**  
Michael Brown, Pacific Design Technologies, Inc.
TFAWS2012-AT-07  **Environmental Control and Life Support System on Spacecraft**  
*Divya Krishnamoorthy, Mailam Engineering College*

Session #2

TFAWS2012-AT-08  **Performance of Nanofluids in Microchannel Heat Exchangers**  
*Debendra Das, Ravikanth S. Vajjha, University of Alaska Fairbanks*

TFAWS2012-AT-09  **Efficient Thermally Conductive Strap Design for Cryogenic Propellant Tank Supports and Plumbing**  
*J.P. Elchert, R. Christie, NASA - Glenn Research Center*  
*P. Gebby, Vantage Systems, Inc.*  
*A. Kashani, Atlas Scientific*  
*C. Opalach, Lewis Educational and Research Collaborative Internship Program*

TFAWS2012-AT-10  **The Transport of Mass, Energy, and Entropy in Cryogenic Support Struts for Engineering Design**  
*J.P. Elchert, NASA - Glenn Research Center*

TFAWS2012-AT-11  **A Re-Entry Vehicle Reaction Control System Thermo-Fluidic Analysis Approach**  
*Lorenzo Andrioli, Savino De Palo, Thales Alenia Space*

TFAWS2012-AT-12  **IV & V of Orion Active Thermal Control System (ATCS) Dynamic Models**  
*Xiao-Yen Wang, NASA - Glenn Research Center*

TFAWS2012-AT-13  **A Scaling Tool For Modeling Single Stage Reverse Turbo-Brayton Cycle Cryocoolers with a Broad Area Cooling System for Cryogenic Propellant Tanks**  
*Monica C. Guzik, Thomas M. Tomsik, NASA - Glenn Research Center*

TFAWS2012-AT-14  **Overview of OCT's Game Changing Solicitation for Variable Heat Rejection Technologies**  
*Rubik Sheth, NASA - Johnson Space Center*
Aerothermal Paper Session

Chairs: Karen Berger, NASA – Langley Research Center
       Eric Grob, NASA - Goddard Space Flight Center

Session #1

TFAWS2012-AE-01 Sizing and Margins Assessment of the Mars Science Laboratory Aeroshell Thermal Protection System (AIAA San Antonio, TX, 41st Thermophysics Conference)
Mike Wright, Robin A.S. Beck, David Driver, Helen H. Hwang, NASA - Ames Research Center
Karl T. Edquist, NASA - Langley Research Center
Steven A. Sepka, Anthony DeCaro, Eloret Corporation
Eric M. Slimko, NASA - Jet Propulsion Laboratory
William H. Willcockson, Lockheed Martin Space Systems

TFAWS2012-AE-02 A Simplified Plume and Aerothermal Heating Analysis for LDSD
Mike Pauken, NASA - Jet Propulsion Laboratory

TFAWS2012-AE-03 Numerical Modeling of Solid Rocket Motor Plumes
Manish Mehta, NASA - Marshall Space Flight Center
Brandon Williams, Computational Fluid Dynamics Research Corporation
Gabriel C. Putnam, All-Points-Logistics
Sheldon D. Smith, Jacobs ESTS Group - Plmetech

TFAWS2012-AE-04 A Plume Impingement Test for Code Validation
Jason Mishawy, NASA - Marshall Space Flight Center

TFAWS2012-AE-05 Space Launch System Base Convective Heating Test: Preliminary Design Analyses and Test Improvements
Manish Mehta, C. Mark Seaford, NASA - Marshall Space Flight Center
Brandon L. Mobley, Robert D. Kirchner, Brian C. Kovarik, Carl D. Engel, Jacobs - Qualis

TFAWS2012-AE-06 Interfacial Design of Composite Ablative Materials
Dr. Tapan Desai, Advanced Cooling Technologies, Inc.
Dr. John Lawson, NASA - Ames Research Center
Prof. Pawel Keblinski, Rensselaer Polytechnic Institute

TFAWS2012-AE-07 Space Shuttle Boundary Layer Transition Flight Experiment Overview
Karen Berger, NASA - Langley Research Center
Brian P. Anderson, Charles H. Campbell, Michael T. Garske, NASA - Johnson Space Center
Gerald R. Kinder, The Boeing Company
Ann Micklos, United Space Alliance
Interdisciplinary Paper Session

Chairs: Hume Peabody, TMD, LLC
       Kevin Anderson, NASA - Jet Propulsion Laboratory

Session #1

TFAWS2012-IN-01 Computational Fluid Dynamics (CFD) Analysis of Optical Payload for Lasercomm Science (OPALS) Sealed Enclosure Module
Dr. Kevin R. Anderson P.E., NASA - Jet Propulsion Laboratory, California State Polytechnic University at Pomona
Daniel Zayas, Daniel Turner, NASA - Jet Propulsion Laboratory

TFAWS2012-IN-02 Regeneratively Cooled Rocket Nozzle CFD Cooling System Analysis
Matt Devost, California State Polytechnic University at Pomona

TFAWS2012-IN-03 Thermal Vacuum Testing: Methods of Thermal Conditioning in a Vacuum Environment
Michael McCullar, NASA - Johnson Space Center

TFAWS2012-IN-04 Dawn Thermal Challenges While Operating at Vesta
Eric Sunada for Dr. Juan Cepeda-Rizo, NASA - Jet Propulsion Laboratory

TFAWS2012-IN-05 Opals Mission Thermal Design Study
Daniel Zayas, NASA - Jet Propulsion Laboratory

TFAWS2012-IN-06 Thermal and Alignment Analysis of the Instrument-Level ATLAS Thermal Vacuum Test
Heather Bradshaw, NASA - Goddard Space Flight Center

TFAWS2012-IN-07 A System Analysis Demonstration Using Cielo
Mike Chainyk, Greg Moore, NASA - Jet Propulsion Laboratory
Short Courses

Thermal Test Requirements, Design and Examples Course
John W. Welch, The Aerospace Corp.
Charles Phillips, NASA - Jet Propulsion Laboratory
Romain Peyrou-Lauga, ESTEC, European Space Agency

Active Thermal Control: Mechanically Pumped Fluid Loops Course
Pradeep Bhandari, NASA - Jet Propulsion Laboratory
David Bane, NASA - Jet Propulsion Laboratory
Tony Paris, NASA - Jet Propulsion Laboratory

Aerothermodynamic and Thermal Protection System Aspects of Entry System Design Course
Michael Wright, NASA - Ames Research Center
John Dec, NASA - Langley Research Center

Form Factors, Grey Bodies and Radiation Conductances
Steven L. Rickman, NASA - Engineering and Safety Center