2010 Thermal and Fluids Analysis Workshop
Program Summaries

(Listed in Alphabetical Order by Session Title)

Advanced Thermal Desktop: Demo
Presented By: Doug Bell and Tim Panczak, CrTech
Thursday, August 19, 2010, Salon C, 8:30 am to 11:30 am

This will be a demonstration of advanced Thermal Desktop capabilities and techniques. We will also show new features and discuss upcoming features in CRTech applications. If time allows, we will answer usage questions. This session assumes some familiarity with Thermal Desktop.

Aerothermal Integration in Thermal Analysis Panel
Chaired By: Dr. Gerald Russell, U.S. Army Aviation & Missile Research Development & Engineering Center (AMRDEC)

Panel Members: Ruth Amundsen, NASA Langley Research Center
Steve Fitzgerald, NASA Johnson Space Center
James Klett, Oak Ridge National Labs
Dr. John Schmisseur, US Airforce Office of Scientific Research (AFOSR)
Todd White, NASA Ames Research Center
Kathryn Wurster, NASA Langley Research Center
Thursday, August 19, 2010; Amphitheater; Part 1: 1:00 pm to 3:00 pm; Part 2: 3:00 pm to 5:00 pm

This panel discussion will include presentations by experts in the field of coupled aeroheating and in depth thermal analysis. Participants will provide views from both NASA and DoD addressing the needs for enhancing the ability to develop hypersonic flight system designs through modeling and simulation. Time will also be reserved to allow for general discussion on design and analysis methods and techniques, questions on method and theory, and discussion of optimum methodology and tools. In particular, discussion of current and future predictive methods for coupling complex transient aeroheating environments and flow fields with multi-dimensional conduction, decomposition, ablation, mechanical erosion, and structural analysis is anticipated.

Automated Engineering Scientific Optimization Program – STandard ABlation (AESOP-STAB)
Presented By: Dr. Brian Remark and Scott Coughlin, NASA Johnson Space Center
Thursday, August 19, 2010; Waterford; 8:30 am to 11:30 am

The STAB program is a one dimensional modeling code used to size ablative TPS materials. The transient thermal response of both the ablator, which may be decomposing and recessing, as well as any underlying carrier structure stack-up can be modeled. Although the STAB code was initially developed during the Apollo program with Avcoat in mind, models have been produced to predict the response of a

variety of ablative materials such as PICA, Carbon Phenolic, SLA-561v and STA-54. Most recently, STAB was used as the baseline sizing tool for the Orion heatshield. This training session will demonstrate input file setup and program execution for several relevant test cases. Training session participants will compare their results with relevant arc jet test data and calculate required TPS thickness for an atmospheric reentry.

Boundary Layer Transition Flight Experiment Overview
Presented By: Karen Berger, NASA Langley Research Center
Wednesday, August 18, 2010; Amphitheater; 8:30 am to 9:00 am

In support of the Boundary Layer Transition Flight Experiment (BLT FE) Project, a manufactured protuberance tile was installed on the port wing of Space Shuttle Orbiter Discovery for the flights of STS-119, STS-128 and STS-131. Additional instrumentation was installed in order to obtain more spatially resolved measurements downstream of the protuberance. This paper provides an overview of the BLT FE Project. Significant efforts were made to place the protuberance at an appropriate location on the Orbiter and to design the protuberance to withstand the expected environments. A high-level overview of the in-situ flight data is presented, along with a summary of the comparisons between pre- and post-flight analysis predictions and flight data. Comparisons show that predictions for boundary layer transition onset time closely match the flight data, while predicted temperatures were significantly higher than observed flight temperatures.

CFdesign Teaching Demonstration: Flow and Thermal
Presented By: Heath Houghton, CFdesign
Thursday, August 19, 2010; Salon C; 1:00 pm to 2:00 pm

Introduction/Demonstration to CFdesign: CFdesign 2010 is all about doing multi-scenario design studies. If your product development process is CAD-centric, you want the ability to consider a broad spectrum of possibilities to achieve an optimal design, and you're looking to add flow and thermal simulation without being a dedicated analyst, then CFdesign could be a great fit.

> Design Study Environment: The fastest, most flexible environment for setting up single or multi-scenario flow and thermal design studies.
>
> Decision Center: Innovative tools for assessing performance comparatively against competing designs as well as specified critical values. Quickly identify pass-fail then down-select for more focused investigation.
>
> Design Review Center: The ultimate visual design exploration experience built to simplify and sharpen the decision-making process. This is where you will get the money shots – views and knowledge not available from the lab.
>
> Lightweight Scenario Cloning: Instantly create lightweight copies of designs and scenarios to dramatically reduce the load on computer memory and graphics.

Design Study Manager: Clean and simple way to set up and manage comprehensive flow and thermal design studies involving multiple designs and scenarios within your CAD environment.

Blue Ridge Numerics, Inc**.** is the fastest growing CFD company in the world. Since 1992 our CFdesign software has put comprehensive fluid flow and heat transfer simulation upfront in the product development process where it creates tremendous value for small, medium, and large companies around the world.

Data Parallel Line Relaxations (DPLR) Code Training
Presented By: Todd White, NASA Ames Research Center
Wednesday, August 18, 2010; Baccarat; 8:30 am to 11:30 am

The DPLR software package is a suite of Computational Fluid Dynamics tools for the computation of supersonic and hypersonic flows in chemical and thermal non-equilibrium that is used to simulate the extreme environments when spacecraft enter an atmosphere. It is able to run in real time during spaceflight and was even used on STS-114 to determine that a protruding gap filler was a threat to the Space Shuttle Discovery during re-entry. DPLR can also be adapted for use in other planetary atmospheres where it will be a major contributor in the future for both robotic and manned missions to Mars and beyond. This training session will demonstrate how the code supports implicit boundary conditions, generalized multi-block topologies, and generalized chemical kinetics and thermodynamic property databases.

Designing a Smart Suit for the Moon, Mars, and Beyond
Presented By: Dr. L. H. Kuznetz, PhD NASA Johnson Space Center
Tuesday, August 17, 2010; Salon B; 5:00 pm to 6:00 pm

How analyzing the metabolic rate of an astronaut and enhancing thermoregulatoin can improve EVA and re-entry space suit design and help avoid the close calls that happened on Apollo. The new suit unitizes Lunar Exploration Guidance Algorithm and Consumables Integrator (LEGACI) and Voice Initiated Operator for Lunar Exploration Tracking (VIOLET) for better EVA monitoring. These improvements include increased performance, safety, and overall comfort. Also includes effects of poor thermal control on the human body and how spinoffs of this space suit technology can be used to improve lives on Earth.

Extending the Capabilities of 3-D flow/thermal/stress simulation (Computational Fluid Dynamics) using STAR-CCM+
Presented By: James Ruiz, Cd-Adapco
Thursday, August 19, 2010; Salon C; Demonstration: 2:00 pm to 4:00 pm
Friday, August 20, 2010; Waterford; Hands-On: 1:00 pm to 5:00 pm

This workshop is designed to introduce individuals, who are not familiar with STAR-CCM+, to the benefits of using this toolset in their design process. Through tutorials, trainers will demonstrate the complete analysis process starting with the import of CAD geometries, preparation of models (surface wrapping), meshing principles, physics set-up, through to post-processing examples for results visualization.

Femap Thermal/Flow Products: On-orbit Heat Transfer Plus Computational Fluid Dynamics (CFD) Training Workshops using Femap
Presented By: Maya Heat Transfer Technologies
Thursday, August 19, 2010; Waterford; 1:00 pm to 5:00 pm

The Siemens Femap Thermal Advanced software is a space industry application leveraging the entire range of numerical capabilities found within the TMG solver from MAYA (www.mayahtt.com). It provides a comprehensive set of tools to simulate orbital heat transfer phenomena within the Femap environment. Siemens Femap Flow software leverages the ESC computational fluid dynamics (CFD) solver, also from MAYA. Combined with Femap-Thermal, it is an effective tool for simulating coupled heat-transfer and fluid flow phenomena. This workshop will provide hands-on tutorials for the attendees to simulate transient on-orbit articulated spacecraft using Femap Thermal Advanced, as well as complex heat transfer within an electronics box using Femap Thermal/Flow.

FIAT Material Response and Ablation Modeling
Presented By: Frank Milos, NASA Ames Research Center
Tuesday, August 17, 2010; Baccarat; 8:30 am to 11:30 am

This training is an introduction to the Fully Implicit Ablation and Thermal Analysis (FIAT) Program. FIAT is a NASA-developed computer program for simulation of one-dimensional thermal energy transport in a multilayer stack of isotropic materials and structures, which can ablate from the front surface and decompose in depth. The short course will include background on the modeling physics and instructions on how to set up and run an analysis.

From Early Stage to Game Changing Technology
Presented By: Steven Gonzalez, NASA Johnson Space Center
Wednesday, August 18, 2010; Salon A; 1:00 pm to 2:00 pm

The talk will focus on the new Office of the Chief Technologist (OCT) and the opportunities that will be available to the research and development community to support their technology investigations. The overview will cover the three new OCT initiatives: 1) Early-Stage Innovation: Creative ideas focused on future NASA systems and/or solutions to national needs; 2) Game Changing Technology: Aimed at proving the feasibility of novel, early-stage ideas that have potential to revolutionize future NASA missions and/or fulfill national needs; and 3) Crosscutting Capability Demonstrations: Focused on the maturation to flight readiness of cross-cutting capabilities that advance multiple future space missions, including flight test projects where in-space demonstration is needed before the capability can transition to direct mission application.

GFSSP (Generalized Fluid System Simulation Program) Training Course
Presented By: Alok Majumdar and Andre Leclair, NASA Marshall Spaceflight Center
Tuesday, August 17, 2010; Waterford; Part 1: 8:30 am to 11:30 am, Part 2: 1:00 pm to 5:30 pm

GFSSP is a general-purpose computer program for analyzing steady state and time-dependent flowrate, pressure, temperature and concentrations in a complex flow network. The program is capable of modeling phase changes, compressibility, mixture thermodynamics, conjugate heat transfer and fluid transient. GFSSP has been developed at Marshall Space Flight Center for flow analysis of Rocket Engine Turbopump and Propulsion System. This 1-Day course will teach the use of Graphical User Interface to develop, run and interpret the results of thermo-fluid system models. The participants will also learn the specific capabilities, and mathematical framework of the code. Here is the course outline:

Part 1: Morning

1. Introduction
2. Pre and Post Processors : VTASC & WINPLOT
3. Resistance, Fluid and Circuit Options
4. Tutorial on Compressible Flow (Converging-Diverging Nozzle)
5. Tutorial on Fluid Transient (Water hammer)

Part 2: Afternoon

1. Mathematical Formulation
2. Advanced Modeling Options
    a. Pressurization and Control Valve
    b. Conjugate Heat Transfer
    c. Pressure and Flow Regulator
3. Tutorial on Pressurization and Control Valve
4. Tutorial on Chilldown of Cryogenic Transfer Line

Home Energy Efficiency Improvements
Presented by: Mark Flahaut and Stephen Miller, NASA Johnson Space Center
Wednesday, August 18, 2010; Amphitheater; 9:30 am to 10:30 am

Energy usage in our country has come under closer scrutiny in the last decade. This was particularly more acute in the months following Hurricane Katrina (September 2005) when energy prices greatly increased due in part to short supplies. Since that time, some states, California in particular have experienced power outages and rolling black-outs. This was due to demand overcoming supply of energy to the electric grid. JSC passive thermal engineers will present several aspects of home energy efficiency. Several years of electricity usage data are presented to show performance data for before and after efficiency upgrades. Upgrades for the homes include home HVAC replacement, addition of attic radiant barriers, added attic insulation, upgrading windows, weather stripping, and compact fluorescent light bulbs. Data normalization will be discussed to scientifically compare year over year performance even though outdoor weather varies.

Hypersonic Analysis Using Concurrent CFD
Presented by: Travis Mikjaniec, Mentor Graphics
Monday, August 16, 2010; Salon A; 1:00 pm to 2:00 pm
Monday, August 17, 2010; Baccarat; 1:00 pm to 2:00 pm

A showing of two specific tools, a CAD-embedded solution for general purpose CFD and a tool used specifically for high-end electronics cooling applications. From external aerodynamics to electronics cooling, Mentor's thermal design software is empowering aerospace and defense companies to deliver better products in less time, at a higher quality, and for less cost. Mentor's software solutions serve not just OEMs and external aerodynamics applications, but suppliers concerned with the performance of components such as valves, rocket motors, cooling of on-board and ground based electronics and avionics products, and passenger comfort.

Our simulation software, consultancy and training services are widely used by the Aerospace and Defense industries to accelerate and optimize product design, eliminate mistakes, and reduce weight and cost by reducing the number of prototypes needed to finalize the design. For more information please visit: http://www.mentor.com/products/mechanical/industries/aerospace-defense

HYTHIRM Project: Flight Thermography of the Space Shuttle during Hypersonic Re-entry
Presented By: Karen Berger, NASA Langley Research Center
Wednesday, August 18, 2010; Amphitheater; 9:00 am to 9:30 am

High resolution calibrated infrared imagery of the Space Shuttle was obtained during hypervelocity atmospheric entry of five Shuttle missions and has provided information on the distribution of surface temperature and the state of the airflow over the windward surface of the Orbiter during descent. On three of these five Space Shuttle missions, NASA flew a specially modified thermal protection system tile on Discovery that included an instrumentation package to monitor heating effects from boundary layer transition during re-entry. Boundary layer transition occurs when the smooth, laminar flow of air close to the shuttle's surface is disturbed and becomes turbulent – resulting in surface temperature increases. On STS-119, the windward airflow on the port wing was deliberately disrupted by a four-inch wide and quarter-inch tall "speed bump" built into the modified tile. In coordination with this flight experiment, a US Navy NP-3D Orion aircraft was flown 25-35 nautical miles below Discovery and remotely monitored surface temperature of the Orbiter at Mach 8.4 using a long-range infrared optical package referred to as Cast Glance. The thermal imagery complemented the data collected with an onboard instrumentation package consisting of 10 surface thermocouples.

The asymmetric nature of this turbulent zone resulted in small but measurable increments of drag and lift on the starboard wing, with telemetry showing the guidance system's corrections to compensate. The post landing inspections were not successful in identifying a source of roughness at the apex of the zone that could account for the asymmetric boundary layer transition pattern on the starboard wing. Over the time span of the next year, the Hypersonic Thermodynamic Infrared Measurement (HYTHIRM) team was successful in capturing quantitative global surface temperatures on four additional Shuttle reentries (STS-125/May 2009; STS 128/Sept 2009; STS-131/April 2010; STS-132/May 2010). These imaging observations were conducted from either the Navy P-3 or in the case of STS-131, from a land based optical asset. Collectively, the spatially resolved global thermal measurements made during the Shuttle's hypersonic re-entry are intended to provide critical flight data for reducing the uncertainty associated

with present day ground-to-flight extrapolation techniques and current state-of-the-art empirical boundary-layer transition or turbulent heating prediction methods. Laminar and turbulent flight data is considered critical for the validation of physics-based, semi-empirical boundary-layer transition prediction methods and to stimulate the validation of laminar numerical chemistry models and the development of turbulence models supporting NASA's next-generation spacecraft designs.

Inclusion and Innovation at JSC Keynote
Presented By: Deputy Director Dr. Ellen Ochoa, NASA-JSC
Wednesday, August 18, 2010; Marina Plaza Ballroom; 11:30 am to 1:00 pm

Dr. Ochoa will speak on the steps JSC is taking to encourage innovation through teamwork, emphasizing benchmarking, collaborations, and special Center events and teams that highlight our commitment to innovative practices.

Introduction to C&R Thermal Desktop®: Hands on
Presented By: Doug Bell, CrTech
Wednesday, August 18, 2010; Waterford; 8:30 am to 11:30 am

This session will be an opportunity to be introduced to the functionality of Thermal Desktop. The attendees will have the opportunity to create geometric models using different techniques, add boundary conditions, add radiation and environmental heating using RadCAD®, and solve for temperatures. This session will be for people new to Thermal Desktop.

Introduction to Thermal Workshop™: Hands on
Presented By: Doug Bell and Tim Panczak, CrTech
Wednesday, August 18, 2010; Waterford; 1:00 pm to 5:00 pm

This session will be an introduction to a new product by CRTech. Thermal Workshop captures the thermal analysis process for reuse by linking the Thermal Desktop model to the Cad geometry. By marking, or tagging, geometry features, changes to the geometry can be analyzed with little or no rework of the thermal model. This link to the geometry allows the thermal model to keep pace with design changes. Attendees will have the opportunity to use a pre-built process to make changes in a CAD package and see the changes in Thermal Desktop. While we will be using Thermal Desktop in conjunction with Thermal Workshop, usage will be minimal allowing Thermal Desktop novices to participate.

Langley Aerothermodynamic Upwind Relaxation Algorithm (LAURA 5) Training Class
Presented By: Dr. Alireza Mazaheri, NASA Langley Research Center, Analytical Mechanics Associates (AMA)
Wednesday, August 18, 2010; Baccarat; 1:00 pm to 5:00 pm

LAURA 5 is a structured-grid, multi-block, computational aerothermodynamic simulation code. LAURA 5 has been developed to support current and future NASA missions through aerothermodynamic analysis of

entry vehicles such as the Space Shuttle Orbiter, Orion Crew Exploration Vehicle (CEV), and Mars Science Laboratory (MSL). This presentation will explain the role of these analyses in the design of entry vehicles and will address some of the difficulties associated with computational modeling of hypersonic vehicles. LAURA 5 is principally a fluid-dynamics simulation code, but has several unique features, such as the ability to model surface ablation and flowfield radiation, have been included in the LAURA 5 code and these advanced capabilities will be demoed with some in-class exercises using the LAURA 5 built-in grid generation capability.

MSC Thermal Tools for Spacecraft Thermal Design
Presented by: Shekhar Kanetkar, MSC Software
Tuesday, August 17, 2010; Baccarat; 2:00 pm to 3:00 pm

- Demonstration using Patran with Thermica to build a spacecraft thermal model
    - Electronic Box inside the satellite in 'Thermal Contact'
    - Electronic Box has Thermostatically Controlled Power
    - Use of Coatings and MLI
    - Solar and Albedo Fluxes are calculated by Thermica and used by Sinda in Transient Thermal Analysis of the Satellite
- Enhanced GUI of Thermica V4 will be demonstrated using following three models:
    - Solar Panel Deployment
    - Mars Express
    - Lunar Mission
- Using SimXpert modeler with MD Nastran and Thermica to build spacecraft thermal model

Modeling and Simulation of Thermal Protection Systems for Hypersonic Flight
Presented By: Dr. Deborah Levin and Dr. Evgeny Titov, Pennsylvania State University
Monday, August 16, 2010; Amphitheater; 1:00 pm to 2:00 pm

The talk presents a multi-scale computational technique aimed at the prediction of TPS (Thermal Protection System) survivability during the harsh reentry environment into Earth and other planetary atmospheres. A discussion of our RCC/Shuttle damage assessment predictions as well as new results for a charring ablator will be presented. Arcjet as well as modeling of a TPS performance for a flight trajectory will be discussed. In the latter case, the flow modeling into Earth's atmosphere begins at an altitude of 120 km using the kinetic approaches and continues to lower altitudes as long as the baseline statistical approach, the DSMC (Direct Simulation Monte Carlo Method) is still computationally feasible. The procedure continues with the CFD approaches as the flow becomes dense enough to assume a state of local equilibrium. The boundary conditions at the TPS-flow interface include nitridation and oxidation of its surfaces as well as the estimate of blowing rates due to thermal ablation. The blowing rate of pyrolysis gases is predicted based on a heat conduction model that also accounts for the heat of pyrolysis and the char transpiration cooling occurring in the inner layers of the TPS material. Particular attention is paid to the cracked TPS modeling to account for the potential degradation of the TPS integrity.
Solutions of practical cases as well as the theoretical background related to the DSMC and ES/BGK methods will be presented.

Nanotechnology Innovations
Presented By: Eric Malroy, NASA Johnson Space Center
Wednesday, August 18, 2010; Salon A; 3:00 pm to 4:00 pm

Nanotechnology is rapidly affecting all engineering disciplines as new products and applications are being found and brought to market. This session will present an overview of nanotechnology and let you learn about the advances in the field and how it could impact you. Some of the areas touched upon will be nanomaterials with their multifunctional capabilities, nanotechnology impact on energy systems, nanobiotechnology including nanomedicine, and nanotechnology relevant to space systems with a focus on ECLSS. Also, some important advances related to thermal systems will be presented as well as future predictions on nanotechnology.

NX Thermal/Flow Products: On-orbit Heat Transfer Plus Computational Fluid Dynamics (CFD) Training Workshops using NX
Presented By: Chris Blake, Maya Heat Transfer Technologies
Monday, August 16, 2010; Waterford; 1:00 pm to 5:00 pm

The Siemens NX Space Systems Thermal software is a space industry application leveraging the entire range of numerical capabilities found within the Thermal Model Generator (TMG) thermal solver from MAYA (www.mayahtt.com). It provides a comprehensive set of tools to simulate orbital heating problems within the NX Advanced Simulation environment. As it is tightly integrated with CAD, the NX interface helps resolve thermal engineering challenges early in the design process within a concurrent engineering environment. Because of strong CAD-CAE associativity, design changes in CAD propagate to the analysis model, automatically updating meshes, loads, and boundary conditions. NX Space Systems Thermal is an indispensable tool for understanding the physics of orbital heat transfer for all space-bound as well as interplanetary-bound vehicles. It is ideal for modeling orbital vehicle applications with complex geometry.

The Siemens NX Flow software leverages the electronic system cooling (ESC) computational fluid dynamics (CFD) solver from MAYA (www.mayahtt.com) to accurately and efficiently simulate fluid flow phenomenon. It can be used to simulate various CFD phenomena of interest to the space community, notably the cooling of electronic equipment which can be addressed using NX Electronic Systems Cooling - a specialized product that couples together the thermal and flow solvers.

This workshop will feature hands-on tutorials for attendees to simulate a transient on-orbit spacecraft (with solar panel deployment) using NX Space Systems Thermal. New features of the NX7.5 interface will be emphasized. Hands-on tutorials will also illustrate to attendees how to conduct coupled CFD and heat transfer analyses using NX Thermal/Flow.

Patran, Sinda, and Thermica
Presented by: Shekhar Kanetkar, MSC Software
Friday, August 20, 2010; Waterford; 8:30 am to 12:30 am

- Create a Satellite, launch a space mission and calculate thermal behavior – Patran / Sinda w Thermica Generated Solar Fluxes
- Parametric Study of a PCB with electronic components in Patran/Sinda
- Steady State Radiation Analysis using SINDARAD
- Transient Analysis and Use of Thermal Studio

Robust Design Method Orientation Seminar
Presented By: Dr. Matthew C. Carroll, Texas A & M University at Galveston
Thursday, August 19, 2010; Amphitheater; 8:30 am to 11:30 am

The Robust Design Method, pioneered by Dr. Genichi Taguchi of Japan, is a method of design optimization for performance, quality, and cost. The main focus is to make product or process performance insensitive to variation in raw material properties, manufacturing parameters, or operating environments rather than reducing the variations themselves. This seminar is most beneficial to those who have had little or no experience with Robust Design, in that a brief description with examples is given of the method's basic components, including quadratic loss functions, orthogonal arrays, analysis of means (ANOM), analysis of variance (ANOVA), and verification procedures. After two hours, the participants will work through an actual problem involving the setting of operating parameters for the primary loop of a (fictitious) pressurized water reactor plant.

Thermal Testing/Facilities Panel
Chaired By: Chris Madden, NASA Johnson Space Center

Panel Members: Dan Butler, NASA Goddard Space Flight Center
Karen Berger, NASA Langley Research Center
Mary Cerimele, NASA Johnson Space Center
Steven Del Papa, NASA Johnson Space Center
Eric Grob, NASA Goddard Space Flight Center
Andrew Holguin, NASA Dryden Flight Research Center
Kaitlin Liles, NASA Langley Research Center
Dr. George Raiche, NASA Ames Research Center
Dr. Eugene Ungar, NASA Johnson Space Center
Greg Schunk, NASA Marshall Space Flight Center
Laurie Walls, NASA Kennedy Space Center
Monday, August 16, 2010; Amphitheater; Overview: 2:00 pm to 3:30 pm; Part 1: 3:30 pm to 5:00 pm;
Wednesday, August 18, 2010; Amphitheater; Part 2: 3:30 pm to 5:00 pm

This panel will include presentations and discussion by experts representing a variety of different thermal facilities. The session will begin with overviews of the types of facilities at NASA, as well as a more detailed explanation of several of these facilities. This will be followed by an exchange of views regarding test design, best practices, effective screening techniques, general test requirements, instrumentation, validation & verification strategies, and other related topics. Discussion will be tailored towards the development of a strategy to infuse technology into the test facilities while developing cooperative efforts among the testing centers

Thermal Uncertainty Panel
Chaired By: Tom Squire, NASA Ames Research Center

Panel Members: Angel Alvarez-Hernandez, NASA Johnson Space Center
Robin Beck, NASA Ames Research Center
Dan Butler, NASA Goddard Space Flight Center
David Gilmore, The Aerospace Corporation
Eric Grob, NASA Goddard Space Flight Center
Andy Hong, NASA Johnson Space Center
Virgil Mireles, NASA Jet Propulsion Laboratory
Jim Yuko, NASA Glenn Research Center
Wednesday, August 18, 2010; Amphitheater; Part 1: 10:30 am to 11:30 am;
Wednesday, August 18, 2010; Amphitheater; Part 2: 1:00 pm to 3:30 pm

The purpose of this panel discussion is to discern the thermal control and thermal protection analytical uncertainty approaches employed across the NASA centers and The Aerospace Corporation. The NASA thermal design & analysis community lacks an established set of common standards to guide projects during the design & development phase. Without a standard, each project (particularly multi-center programs such as Constellation) struggles with how to manage the design risk associated with thermal math model uncertainty. Historically, it has been difficult to find a "one size fits all" approach to defining thermal uncertainty, which has prevented the formation of a standard. The NASA Engineering Safety Center (NESC) Passive Thermal Control Discipline Team has sponsored a proposal to write a white paper documenting the range of approaches across NASA and this Panel Discussion is an aspect of this data gathering as well as hearing non-NASA perspectives on this issue.

Unintentional Intolerance: An Open Mind Is a Terrible Thing to Close
Presented By: Dr. Steve L. Robbins, S.L. Robbins & Associates
Wednesday, August 18, 2010; Marina Plaza Ballroom; 6:00 pm to 8:00 pm

A sought-after consultant and keynote speaker, Dr. Steve L. Robbins, coined the term "unintentional intolerance" several years ago, and has since developed engaging presentations and workshops that take a fresh, inviting approach to an often-difficult topic. Research and experience tell us that we all have biases that we are often unaware of, or think little about. Yet, these biases guide our decision-making, behaviors and attributions on a daily basis. Could nice, well-meaning people be making "bad" decisions and engaging in exclusive behavior without knowing? The answer is, "Yes." Dr. Robbins explores the "how's" and "why's" surrounding unintentional intolerance in this interactive, humorous and eye-opening presentation… and shows us the antidote for unintentional intolerance. This is a "must go to" presentation for NICE people seeking to be good leaders and good citizens in an increasingly diverse 21st century, and for anyone interested in the link between diversity and inclusion and creativity and innovation.

Variable Specific Impulse Magnetoplasma Rocket (VASIMR) Technology
Presented By: Dr. Leonard Cassady, Ad Astra Rocket Company
Thursday, August 19, 2010; Marina Plaza Ballroom; 11:30 am to 1:00 pm

Ad Astra Rocket Company is developing the Variable Specific Impulse Magnetoplasma Rocket (VASIMR) technology for in-space transportation as a transfer vehicle for cargo missions, drag compensation, and high-speed deep space missions. The VASIMR consists of three magnetically linked cells consisting of a plasma source, RF booster, and a magnetic nozzle. Neutral gas propellant flows into the plasma source cell where it is ionized to form a plasma. This plasma is contained by strong magnetic fields and flows downstream to the RF booster cell where it is further energized using radio frequency electromagnetic waves. The magnetic nozzle cell converts the energy of the plasma into directed motion thus producing useful thrust. This type of electric propulsion has the ability to transfer relatively large payloads on reasonable timescales. Future plans include using the ISS as a platform for testing VASIMR and other high power electric propulsion and power devices. Ad Astra is currently working on solving the challenges of thermal management such as transferring the waste heat from the plasma facing surfaces of the rocket core to high temperature radiators without imparting a heat load on the 50 Kelvin superconducting magnets a few 10s of centimeters from the plasma. Ad Astra is researching advanced ceramics to conduct the heat from the rocket core to titanium-water heat pipes. The heat would then be rejected to space by high temperature radiators that also contain titanium-water heat pipes.