**Software Demonstrations**

**Demo Title:** ANSA & µETA for CFD

**Demo Instructors:** Pravin Peddiraju and Jonathan Krueger

**Instructor Bios**:

Pravin Peddiraju has been with BETA CAE Systems USA for more than 8 years and is currently in the position of CFD Team Leader. His main focus is on the application of ANSA and µETA Post for Computational Fluid Dynamics simulations and strategizing the usage of the software products for industries such as Aerospace, Automotive, Defense etc., He received his Bachelor of Technology degree in Mechanical Engineering from Indian Institute of Technology, Madras, India and Master of Science degree in Aerospace Engineering from Texas A&M University, College Station, Texas.

Jonathan Krueger has been with BETA CAE Systems USA for over 12 years performing various roles inside the organization. His current role involves sales and support at Government and Defense Accounts and the organization of the Training courses. He received his Bachelors of Science from Michigan State University and his Associates in Manufacturing Engineering Technology and Design from Lansing Community College. Prior to joining BETA CAE Systems USA, Jon worked as a modeling specialist for Quantum.

**Demo Description:** This demonstration aims to provide the audience with a brief overview of the capabilities that are present in ANSA & µETA for CFD. A sample test case will be used to show features such as:

-­‐ Geometry healing and manipulation,

-­‐ Surface meshing,

-­‐ Layers generation and volume meshing,

-­‐ Morphing and optimization

-­‐ Visualization and reporting

**Demo Title:** ANSA & µETA for Structural Analysis

**Demo Instructors:** Pravin Peddiraju and Jonathan Krueger

**Demo Description:** This demonstration aims to provide the audience with a brief overview of the capabilities that are present in ANSA & µETA for Structural Analysis. A sample test case will be used to show features such as:

-­‐ Geometry healing and manipulation,

-­‐ Batch meshing and feature treatment

-­‐ Remeshing of legacy data

-­‐ Assembly tools

-­‐ Model management

-­‐ Load case setup

-­‐ Visualization and reporting

**Demo Title:** ANSA for Morphing & Optimization

**Demo Instructors:** Pravin Peddiraju and Jonathan Krueger

**Demo Description:** This demonstration aims to provide the audience with a brief overview of the capabilities that are present in ANSA for Morphing & Optimization. A sample test case will be used to show features such as:

-­‐ Box morphing

-­‐ Direct morphing

-­‐ Parameter definitions

-­‐ Optimization setup

**Demo Title:**  Introduction to ANSYS FLUENT
**Demo Instructors:** Valerio Viti & Edward Clutter (ANSYS Inc.)

**Instructor Bios:**

Valerio Viti is a senior CFD specialist at Ansys in the Lebanon, New Hampshire office. Valerio has over ten years of experience in the field of Computational Fluids Dynamics working on a variety of flow problems, ranging from low to high speed supersonic flows, and applied to different industries, from the aerospace to environmental and power generation industry. Valerio obtained his PhD in Aerospace Engineering in 2002 from Virginia Tech. Valerio joined Fluent, now Ansys, in 2006 and has been working there since then working on CFD applications.

Edward Clutter is a technical services engineer at ANSYS in the Orlando, Florida office.  Edward has over ten years of experience in CFD, with a focus on aerospace and power generation applications.  He has been with ANSYS since October of 2012 and has four years of experience with ANSYS Fluent.  Edward obtained his MS in Aerospace Engineering in 1997 from Mississippi State University, with a focus on Computational Fluid Dynamics.

**Demo Description:**This course will contain the following segments:

* Product & Application Overview presentation: 15 minutes
* Demo of Thermal Fluid-Structure interaction simulation of a re-entry vehicle: 25 min
* Demo of Adjoint-based Optimization: 20 min

**Demo Title:** Advanced Thermal Desktop

**Demo Instructor:** Douglas Bell

**Instructor Bio:** Mr. Bell has been involved in heat transfer and fluid flow since 1993 and has been using C&R Thermal Desktop® since 2000. With a BS degree in Aerospace Engineering from North Carolina State University, Mr. Bell has worked for NASA, Lockheed Martin and CRTech. Mr. Bell has performed thermal or fluid analyses on: stratospheric airships and research balloons and their flight control electronics; the thermal protection systems of X-33 and hypersonic vehicles; launch control electronics for missile launchers; missile storage containers and launch tubes; boilers; and on-orbit spacecraft.

**Demo Description:** This session will provide an overview of new and advanced features within the Thermal Desktop suite and provide demonstration on the use of some of those features. This session is recommended to anyone who wishes to see more advanced capabilities of the Thermal Desktop suite than can be addressed in the introductory session. Since the session is not hands-on, no prior experience with Thermal Desktop is required. Thermal Desktop is a design environment for generating thermal models with additional modules for performing radiation and heating environment calculations (RadCAD) and generating fluid flow circuits (FloCAD). Thermal Desktop is a graphical user interface for SINDA/FLUINT.

**Demo Title:**  STAR-CCM+
**Demo Instructor:** Mark Ricklick

**Instructor Bio:** Mark Ricklick is an Application Engineer with CD-adapco, working with clients in the Turbomachinery, Automotive, Aerospace, and Agricultural industries, among others. Prior to this, he was a Post-Doctoral research associate for the Center for Advanced Turbines and Energy Research at the University of Central Florida, where his experimental work was focused in the area of turbomachinery thermal protection and aerodynamics.

**Demo Description:** CD-adapco is the world's largest independent CFD-focused provider of engineering simulation software, support and services. CD-adapco's flagship software, STAR-CCM+, provides the world's most comprehensive engineering physics simulation inside a single integrated package.  This session will demonstrate the applications of STAR-CCM+'s unstructured overset mesh capabilities for simulating separation events.  Specific examples will highlight the integrated workflow, illustrate the available options, and show the types of results typically used to investigate the results.

**Demo Title:**  Data Parallel Line Relaxation (DPLR)

**Demo Instructor:**  Chun Tang (NASA-ARC)

**Instructor Bio:** Chun Tang received his B.S. in Mechanical and Aeronautical Engineering, M.S. and PhD in Mechanical Engineering from the University of California, Davis specializing in the field of Computational Fluid Dynamics (CFD).  Dr. Tang has worked on a variety of fluid flow problems: incompressible, transonic, supersonic, and hypersonic simulations for aeronautics and aerospace applications.  He was the NASA Ames technical lead on the Damage Assessment Team for Space Shuttle Mission Support, and a member of the aerothermal team for the Mars Science Laboratory Program.  He is currently supporting the Orion MPCV project in the generation of aerothermal databases.

**Demo Description:** This session will be an introduction to the Data-Parallel Line Relaxation (DPLR) code, a Computational Fluid Dynamics (CFD) Navier-Stokes solver developed at NASA Ames Research Center and used in aerospace simulations.  The session will include an overview of the code and a walk-through of the standard work-flow process: pre-processing of a point-matched volume grid, running axisymmetric and 3D simulations, and post-processing and viewing flow solutions. Discussion can be tailored based on participant feedback.

**Demo Title:** FLOW-3D

**Demo Instructor:** Joel Jacob

**Instructor Bio:** Master of Science in Aerospace Engineering- Aerodynamics, Wichita, KS- 2005

Employed at Flow Science, Inc. in Santa Fe, New Mexico since 2006. Currently, Senior Sales Engineer located at Jacksonville, FL.

**Demo Description:** Demonstration of the FLOW-3D CFD software with an emphasis on its ability to accurately model sloshing and multiphase fuel transport.

**Demo Title:** Generalized Fluid System Simulation Program (GFSSP) Demonstration

**Demo Instructor:** Andre LeClair (NASA-MSFC)

**Instructor Bio:** Andre LeClair received his PhD from the University of Alabama in Huntsville.  He is a thermal analyst in the Propulsion Thermal and Combustion Analysis branch at NASA-MSFC.

**Demo Description:** GFSSP is a general-purpose computer program for analyzing steady-state and time-dependent flow rate, 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 (waterhammer).  GFSSP was been developed at MSFC for flow analysis of rocket engine turbopumps and propulsion systems.  This demonstration will show how to the user can quickly develop a system-level thermo-fluid model, discuss the capabilities of the software, and present model examples.

**Demo Title:** CFD++

**Demo Instructors:** Prasanth Kachgal; Sukumar Chakravarthy

**Instructor Bios:** Prasanth Kachgal is a Senior Engineer at Metacomp Technologies Inc.

Sukumar Chakravarthy is President of Metacomp Technologies Inc.

**Demo Description:**  CFD++ is a powerful commercial CFD software suite developed by Metacomp Technologies Inc.  It combines the accuracy of research codes with the robustness and versatility of a commercial solver.  Within a single, user friendly, GUI interface, a user is able to set up a wide variety of complex problems and solve them, in either serial or parallel mode, on a multitude of computer platforms.  This demonstration will highlight the code's ability to solve a 3D, multi-phase, reacting flow problem using the Eulerian dispersed phase model. In conjunction, the capabilities and ease of use of Metacomp's MIME (Multi-purpose Intelligent Meshing Environment) will be showcased by using this software to generate the mesh for the problem to be demonstrated.

**Demo Title:** Introduction to NX Space Systems Thermal (formerly TMG)

**Demo Instructor:** Carl J. Poplawsky (Maya HTT)

**Instructor Bio:** Mr. Carl Poplawsky is a senior applications engineer for Maya Heat Transfer Technologies, a software development partner and value added reseller (VAR) for Siemens PLM Software. Mr. Poplawsky received his MSME from Purdue University in 1980, and has since focused his efforts in the area of computer aided simulation and analysis for thermal, flow, and structural applications in the Aerospace Industry.

**Demo Description:** This demonstration will introduce Siemens PLM Software **NX Space Systems Thermal,** a space industry application leveraging the entire range of numerical capabilities found within the NX Thermal solver. It provides a comprehensive set of additional tools to simulate orbital heating within the **NX Advanced Simulation** environment. This demonstration will focus on some of the unique capabilities, including effectively utilizing and simplifying parametric design geometry with full associativity to the simulation model.

**Demo Title:** SpaceClaim Engineer

**Demo Instructor:** Roman Walsh

**Instructor Bio:** Roman Walsh is the Application Engineering Manager at SpaceClaim, developing training, demonstration, and marketing material for the company. Roman came to SpaceClaim from Worcester Polytechnic Institute five years ago and has been with the product since it launched.

**Demo Description:** Demonstration of the conversion of CAD geometry into cleaned and optimized models for CFD.  Topics covered will include internal and external volume extraction, the removal of insignificant features (such as rounds, bosses, and holes), fixing problematic geometry (such as sliver surfaces and gaps), tweaking geometry for ideal mesh creation, and adding custom parameters to existing geometry. Significant new capabilities for manufacturing, simulation, concept development, and mesh remodeling will be demonstrated. These enhancements will help all engineers work more effectively in 3D, without the high cost and complexity of traditional CAD.

**Demo Title:** Spacedesign TSS

**Course Instructor:** Joe M. Clay

**Instructor Bio:** Joe Clay received a BS and MS degree in Mechanical Engineering from the University of Iowa in 1993 and 1995, respectively.  Mr. Clay worked as a Researcher at the University of Iowa prior to taking a position with Lockheed Martin Corporation at Johnson Space Center in 1996.  He worked on EVA thermal analysis until moving to become the Technical Lead on Thermal Synthesizer System (TSS) at Lockheed Martin.  In 1998, he left Lockheed Martin forming Spacedesign Corporation and won the commercial rights to TSS.  Mr. Clay ported TSS to the Windows operating system using Hummingbird Exceed and today continues managing the programming, science, and mathematics for the native .NET Windows version of TSS while managing the day-to-day operations of Spacedesign Corporation.  In addition, Spacedesign Corporation produces Structural Analysis Tool (SAT) and continues to perform research and development in the aerospace and energy industries outside of software development.

**Demo Description:** Thermal Synthesizer System (TSS) version 14 is back with an old favorite, the Executive application.  Executive is a top-level TSS application for launching applications and organizing users analysis files and results.  While version 13 featured a native .NET Windows environment and a simple form of Executive, called Launch Pad, in an attempt to move TSS into a more or less strictly PC based setting.  This may have been too much for new users and those that liked the convenience of having all of their data and files presented to them in the simple and intuitive Executive application.  Further improvements are much faster mathematics under the hood to analyze full CAD models from the Transfer applications.  Most CADs feature NURB surface representation and the mathematics of Transfer moves large amounts of data into the conventional Computed Surface Geometry (CSG) representation of ray-tracing programs.  Transfer now features STEP 203 (Configuration controlled 3D design of mechanical parts and assemblies) and STEP 214 (Core data for automotive mechanical design processes) support with an in-house STEP library created directly from the schemas.  Additional features of v14 are the Application Queue service to launch jobs on remote machines and Object file output (.obj) from the Mesh application so model files can be sent to a 3D printer for prototyping.  Many other enhancements will be shown during this presentation, you’ll just have to be there to see them.

**Software Hands-On Training**

**Course Title:** ANSA & µETA for CFD

**Course Instructors:** Pravin Peddiraju and Jonathan Krueger

**Instructor Bios**:

Pravin Peddiraju has been with BETA CAE Systems USA for more than 8 years and is currently in the position of CFD Team Leader. His main focus is on the application of ANSA and µETA Post for Computational Fluid Dynamics simulations and strategizing the usage of the software products for industries such as Aerospace, Automotive, Defense etc., He received his Bachelor of Technology degree in Mechanical Engineering from Indian Institute of Technology, Madras, India and Master of Science degree in Aerospace Engineering from Texas A&M University, College Station, Texas.

Jonathan Krueger has been with BETA CAE Systems USA for over 12 years performing various roles inside the organization. His current role involves sales and support at Government and Defense Accounts and the organization of the Training courses. He received his Bachelors of Science from Michigan State University and his Associates in Manufacturing Engineering Technology and Design from Lansing Community College. Prior to joining BETA CAE Systems USA, Jon worked as a modeling specialist for Quantum.

**Course Description:** The purpose of this short course is to provide attendees with hands on exposure to the geometry manipulation and meshing tools available inside ANSA. A step by step tutorial will guide attendees through the complete process of preparing a model for CFD analysis. This will be followed by a short overview of processing the results and preparing a report.

**Course Title:** ANSA & µETA for Structural Analysis

**Course Instructors:** Pravin Peddiraju and Jonathan Krueger

**Course Description:** The purpose of this short course is to provide attendees with hands on exposure to the geometry manipulation and meshing tools available inside ANSA. A step-by-step tutorial will guide attendees through the complete process of preparing a model for structural analysis. This will be followed by a short overview of processing the results and preparing a report.

**Course Title:** ANSA for Morphing & Optimization

**Course Instructors:** Pravin Peddiraju and Jonathan Krueger

**Course Description:** The purpose of this short course is to provide attendees with hands on exposure to the morphing tools available inside ANSA. A step-by-step tutorial will guide attendees through preparing the morphing domains and setting up the optimization problem.

**Course Title:**Introduction to ANSYS CFD and Multiphysics Modeling

**Course Instructors:** Valerio Viti & Edward Clutter (ANSYS Inc.)

**Instructor Bios:**

Valerio Viti is a senior CFD specialist at Ansys in the Lebanon, New Hampshire office. Valerio has over ten years of experience in the field of Computational Fluids Dynamics working on a variety of flow problems, ranging from low to high speed supersonic flows, and applied to different industries, from the aerospace to environmental and power generation industry. Valerio obtained his PhD in Aerospace Engineering in 2002 from Virginia Tech. Valerio joined Fluent, now Ansys, in 2006 and has been working there since then working on CFD applications.

Edward Clutter is a technical services engineer at ANSYS in the Orlando, Florida office.  Edward has over ten years of experience in CFD, with a focus on aerospace and power generation applications.  He has been with ANSYS since October of 2012 and has four years of experience with ANSYS Fluent.  Edward obtained his MS in Aerospace Engineering in 1997 from Mississippi State University, with a focus on Computational Fluid Dynamics.

**Course Description:**This hands-on training session is designed to introduce you to the ANSYS Computational Fluid Dynamics (CFD) and Multiphysics Modeling. It will provided the attendees the opportunity to learn about ANSYS capabilities in the area of CFD and Fluid-Structure interaction (FSI) by working on a series of workshop which cover various topics in Multiphase Flow Modeling, Reacting Flows, Discrete Phase, Structural and Thermal Fluid-Structure Interaction, Moving and Deforming Meshes, and Adjoint-based Optimization.

**Course Title:** Introduction to C&R Thermal Desktop®, TD Direct®, and FloCAD®
**Course Instructor:** Douglas Bell and Mark Schmidt

**Instructor Bios:** Mr. Bell has been involved in heat transfer and fluid flow since 1993 and has been using C&R Thermal Desktop® since 2000. With a BS degree in Aerospace Engineering from North Carolina State University, Mr. Bell has worked for NASA, Lockheed Martin and CRTech. Mr. Bell has performed thermal or fluid analyses on: stratospheric airships and research balloons and their flight control electronics; the thermal protection systems of X-33 and hypersonic vehicles; launch control electronics for missile launchers; missile storage containers and launch tubes; boilers; and on-orbit spacecraft.

Mr. Schmidt graduated from the University of Florida with BS and MS degrees in Mechanical Engineering with a specialty in thermal sciences. He has since worked for Lockheed Martin, United Launch Alliance, and Comtech AeroAstro before coming to CRTech. He has provided thermal analyses for: the Atlas and Delta launch vehicles; a variety of payloads, including the Curiosity rover and several NRO missions; small satellite designs; and satellite components.
**Course Description:** These courses will provide an introduction to the capabilities of Thermal Desktop, TD Direct and FloCAD through the creation of a simple model that includes radiation and fluid flow. Thermal Desktop is a pre- and postprocessor for SINDA; FloCAD adds fluid model development based on thermal model geometry and flow path centerlines.  No previous experience with Thermal Desktop is expected. Experienced users are welcome but are requested to allow new users to have priority at the workstations.

CRTech TD Direct™ is powerful software that fills the gap between design geometry and C&R Thermal Desktop®. TD Direct is built in SpaceClaim Corporation’s SpaceClaim Engineer®, a CAD tool that focuses on preparing geometry for analysis, just as Thermal Desktop is built in AutoCAD. With TD Direct, the user is able to solve many of the problems that have challenged thermal engineers for years. The starting point is the full design geometry in any format. The final product is the completed analysis in Thermal Desktop. The step in between is TD Direct, where the user has the ability to easily simplify, heal, and alter the geometry while working with an exceedingly capable mesher.

***Note:*** *The student should consider attending the SpaceClaim Engineer class on Monday morning as a prerequisite to TD Direct.*

**Course Title:** Fluid System Simulation Program (GFSSP) Hands-On Training

**Course Instructor:**  Alok Majumdar (NASA-MSFC) & Andre LeClair (NASA-MSFC)

**Instructor Bios:**

Alok Majumdar received his Ph.D from University Of Burdwan (India). He is a Thermal Analyst in Propulsion Thermal and Combustion Analysis branch at NASA-MSFC.  He is responsible for the development of GFSSP.

Andre LeClair received his PhD from the University of Alabama in Huntsville.  He is a thermal analyst in the Propulsion Thermal and Combustion Analysis branch at NASA-MSFC.

**Course Description:** GFSSP is a general-purpose computer program for analyzing steady-state and time-dependent flow rate, 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 (waterhammer).  GFSSP was been developed at MSFC for flow analysis of rocket engine turbopumps and propulsion systems.  This half-day course will teach the use of the Graphical User Interface to develop, run, and interpret the results of thermo-fluid system models.

**Course Title:** The ParaView Tutorial

**Course Instructor:** David DeMarle

**Instructor Bio:** Mr. DeMarle received his B.S. in Electrical and Computer Engineering from the SUNY University at Buffalo in 1995, and his M.S. in Computer Science from the University of Utah in 2003. In the interim Dave worked as a computer systems engineer for the Link Flight Simulation Division of the L3-Communications Corporation. Dave's research interests are in systems level aspects of visualization, in particular memory optimizations for parallel visualization of large data sets. Mr. DeMarle joined Kitware in June of 2005 where he contributes to both ParaView and VTK.  He frequently teaches Kitware’s professional development and training courses for these product applications.

**Course Description:** The ParaView Tutorial is an introductory and comprehensive tutorial. It teaches using ParaView through examples that start at basic usage and continue through more advanced topics such as temporal analysis, animation, parallel processing, and scripting. This tutorial is sometimes referred to as the supercomputing tutorial because it originated as the handout documents for a series of tutorials at supercomputing. However, because the tutorial was designed for the beginning user, the material was general enough to be useful to a broad audience and became a popular document for learning ParaView.

**Course Title:** CFD++

**Course Instructor:** Prasanth Kachgal; Sukumar Chakravarthy

**Instructor Bios:** Prasanth Kachgal is a Senior Engineer at Metacomp Technologies Inc.

Sukumar Chakravarthy is President of Metacomp Technologies Inc.

**Course Description:** CFD++ is a powerful commercial CFD software suite developed by Metacomp Technologies Inc.  It combines the accuracy of research codes with the robustness and versatility of a commercial solver.  Within a single, user friendly, GUI interface, a user is able to set up a wide variety of complex problems and solve them, in either serial or parallel mode, on a multitude of platforms.  This training will go through the step-by-step process of setting up and running a 3D, multi-phase, reacting flow problem using the Eulerian dispersed phase model.  Trainees will also be able to use Metacomp's MIME (Multi-purpose Intelligent Meshing Environment) to generate the mesh for this problem.  The session will also include an overview of another example case that will demonstrate the use of cryogenics and cavitation within CFD++.  At the conclusion of this training, we will be highlighting new features and physical models available in the next release of CFD++ and answering any questions from the audience.

**Course Title:**  NX Space Systems Thermal (formerly TMG) Open Workshop

**Course Instructor:**  Carl J. Poplawsky (Maya HTT)

**Instructor Bio:** Mr. Carl Poplawsky is a senior applications engineer for Maya Heat Transfer Technologies, a software development partner and value added reseller (VAR) for Siemens PLM Software. Mr. Poplawsky received his MSME from Purdue University in 1980, and has since focused his efforts in the area of computer aided simulation and analysis for thermal, flow, and structural applications in the Aerospace Industry.

**Course Description:**This hands-on activity will introduce Siemens PLM Software **NX Space Systems Thermal,** a space industry application leveraging the entire range of numerical capabilities found within the NX Thermal solver. It provides a comprehensive set of tools to simulate orbital heating within the **NX Advanced Simulation** environment. The hands-on workshop for new users will take the participants through thermal model and orbit definition, solution, and post-processing, highlighting some of the parametric capabilities in NX to quickly and efficiently accommodate spacecraft design changes without significant finite element model re-work.

**Course Title:**  Femap Thermal (TMG) Open Workshop

**Course Instructor:**  Carl J. Poplawsky (Maya HTT)

**Course Description:**  This hands-on activity will introduce Siemens PLM Software **Femap Thermal,** a space industry application leveraging the entire range of numerical capabilities found within the Femap Thermal solver. It provides a comprehensive set of tools to simulate orbital heating within the **Femap Simulation** environment. The hands-on workshop for new users will take the participants through thermal model and orbit definition, solution, and post-processing.

**Course Title:** SpaceClaim Engineer

**Course Instructor:** Roman Walsh

**Instructor Bio:** Roman Walsh is the Application Engineering Manager at SpaceClaim, developing training, demonstration, and marketing material for the company. Roman came to SpaceClaim from Worcester Polytechnic Institute five years ago and has been with the product since it launched.

**Course Description:** This class will provide the training required to convert CAD geometry into cleaned and optimized models for CFD.  Topics covered will include internal and external volume extraction, the remove of insignificant features (such as rounds, bosses, and holes), fixing problematic geometry (such as sliver surfaces and gaps), tweaking geometry for ideal mesh creation, and adding custom parameters to existing geometry. Significant new capabilities for manufacturing, simulation, concept development, and mesh remodeling will be demonstrated. These enhancements will help all engineers work more effectively in 3D, without the high cost and complexity of traditional CAD.

**Course Title:** Spacedesign TSS Introduction Class
**Course Instructor:** Joe Lepore

**Instructor Bio:** Joe Lepore received a BS degree in Mechanical Engineering from the University of Illinois at Urbana-Champaign in 1987, and shortly thereafter began working as a Thermal Systems Engineer for Lockheed Corporation at the Johnson Space Center.  He was lead thermal analyst on a variety of NASA projects for Space Shuttle and Space Station, and performed Independent Assessment for Space Station projects while a Systems Engineering Specialist for SAIC Corporation.  Since 2001, he has worked as an Engineering Technologist at Spacedesign Corporation providing technical support and development of the Thermal Synthesizer System (TSS).

**Course Description:** This hands-on class will progress through a thermal analysis of a spacecraft. The student will go through each major step in the analysis process using a simple example. This is the basic framework needed to create, analyze, and obtain temperatures using TSS. The spacecraft model will begin as a CAD file, which is moved into TSS by using the Transfer application. As each TSS application is used, user interface and TSS features are demonstrated by the instructor and utilized by the student. Calculations of radks, heating rates, conduction/capacitance network, and temperatures are performed. The latest TSS capabilities demonstrated in this class include the return of the Executive application for Windows and SindaWin application. Everyone interested in learning how to perform satellite thermal analysis should attend this class.

**Course Title:** Spacedesign TSS Advanced Class

**Course Instructor:** Joe Lepore

**Course Description:** This hands-on class will demonstrate more TSS features and modeling techniques. Topics include: Radiation analysis of CAD surfaces using STEP and IGES Translators, further use of the SindaWin application, Geometry model validation, building models with Symbols, distributed processing, managing Boolean surfaces and chains, adjusting conductor values, using the Mesh and FEM applications, and SATSTRAN. Topics of specific interest to users will be discussed. Examples include the rich feature set in TSS such as programming in the command language, utilizing TSS as a prototyping tool, eliminating costly 3rd party applications to move data from a CAD package to a thermal software system, and utilizing TSS as a simple CAD package.

**Course Title:** Post-Processing of Thermal Model Output Files using TARP
**Course Instructor:** Hume Peabody

**Instructor Bio:** Hume Peabody graduated from Virginia Tech with a BS in Mechanical Engineering in 1994 and an MS in 1997.  Outside of his normal 9-5 day job, Hume founded Thermal Modeling Solutions, LLC in 2005 and released the first version of TARP in 2007, a program dedicated to creating post-processing products from standard thermal solver outputs.  Since then, steady improvements and feature additions have been made to increase the types of products available.  This year, TMS is releasing COVeR (after a two year plus development effort) to provide additional ways to visualize data.  The most powerful of these are the Graphical Heat Maps, which display heat flow data between user defined groups or components in a block diagram form, allowing for a better understanding of thermal designs by providing heat flows.

**Course Description:** TARP is a Windows based post-processing program that creates an interface between the ASCII output from numerous thermal analysis solvers and Microsoft Excel. Users define the post processing objects within the TARP environment to create in the output Excel workbook, including: DataSets, Plots, Tables, etc. A user also has the ability to define further data points, such as group averages, maximums, and minimums. Lastly, a feature exists for the creation of a specialized workbook for the evaluation of nodal heatflows, which can be further extended to heatflows between the defined groups.

**Course Title:** COVeR: Capture Output and Verify Results
**Course Instructor:** Hume Peabody

**Course Description:** COVeR is a new post processing environment nearing completion to allow a user to quickly find and display nodes or groups of interest, leveraging the data structures used in TARP. It includes the capability to display raw output from thermal models (such as Temperature, Heat Load, etc.) as well as derived data from the same output files (such as Sink Temperatures and Heat Flows). This data is displayed as a transient plot along with the corresponding tabular data. Furthermore, COVeR includes the capability to display heat flows between groups in a block diagram form with numerous options to control the display (e.g. show heat imbalances, conductance values, color bars, etc). Heat Flow layouts may be saved and retrieved for use with updated output files or those from other cases. Lastly, the images may be pasted into other programs or printed as needed.

**Software Companies**

**ANSYS, Inc.**

**Website:** [**http://www.ansys.com**](http://www.ansys.com/)

**Point of Contact: Ron Lewis** **(ronald.lewis@ansys.com)**

**Company Description:** ANSYS brings clarity and insight to customers' most complex design challenges through fast, accurate and reliable engineering simulation. Our technology enables organizations ― no matter their industry ― to predict with confidence that their products will thrive in the real world. Customers trust our software to help ensure product integrity and drive business success through innovation. Founded in 1970, ANSYS employs more than 2,200 professionals, many of them expert in engineering fields such as finite element analysis, computational fluid dynamics, electronics and electromagnetics, and design optimization. Headquartered south of Pittsburgh, U.S.A., ANSYS has more than 65 strategic sales locations throughout the world with a network of channel partners in 40+ countries. Visit [**www.ansys.com**](http://www.ansys.com/) for more information.

**BETA CAE Systems USA**

**Website:** <http://www.ansa-usa.com>

**Point of Contact:** Arthur Papadopoulos **(****arthur@ansa-usa.com****)**

**Company Description:** BETA CAE Systems USA is an engineering services company that distributes & supports the industry leading ANSA & µETA Post software. The company provides full model build services from CAD data for complete running deck models, for all disciplines as well as model setup for optimization.

ANSA is a CAE pre-processing tool for FE & CFD Analysis, for full-model build, from CAD to solver input file, in one integrated environment.

µETA Post is a post-processor for analyzing results from NASTRAN, ABAQUS, LS-DYNA, ANSYS, PAMCRASH, RADIOSS, MADYMO, FLUENT, STAR CCM, CFD++ & other solvers.

**Cullimore and Ring Technologies, Inc
Website:** [http://www.crtech.com](http://tfaws.nasa.gov/TFAWS12/www.crtech.com)**Point of Contact:**  Doug Bell (doug.bell@crtech.com)
**Company Description:**  C&R Technologies® provides software for heat transfer analysis, thermal radiation, environmental heating and fluid flow design in addition to product [training](http://crtech.com/training.html), and [consulting services](http://crtech.com/services.html) in the area of thermal and fluid system design and analysis. We are dedicated to producing software tools that not only help heat transfer and fluid flow design engineers produce analytical answers, but also product design solutions. Our software products are routinely used by several industries for heat transfer and fluid flow modeling. Our comprehensive [two-phase flow capabilities](http://crtech.com/twoPhase.html) are one of many features which make our software world class.

Built on top of our core solving engine, SINDA/FLUINT, we provide a [geometric](http://crtech.com/thermaldesktop.html) (Thermal Desktop®) or [nongeometric](http://crtech.com/sinaps.html) (Sinaps®) graphical user interfaces that can help you build and analyze any system. Sinaps offers full thermal and fluid flow modeling in a sketch-pad environment. CAD-based Thermal Desktop with its expansion packs FloCAD® and RadCAD® provide thermal and fluid flow analysis capabilities along with thermal radiation analysis and orbital heating calculations. Thermal Desktop usage can be extended using CRTech SpaceClaim® and its dedicated meshing module to import, heal, simplify, and mesh geometry from virtually any CAD source.

**CD-adapco**
**Website:** <http://www.cd-adapco.com/> **Point of Contact:** Ruben Bons (ruben.bons@cd-adapco.com)
**Company Description:** CD-adapco is the world's largest independent CFD-focused provider of engineering simulation software, support and services. We have over 30 years of experience in delivering industrial strength engineering simulation to a wide range of industries and application areas.

**Flow Science, Inc.**

**Website:** <http://www.flow3d.com>

**Point of Contact:** Joel Jacob (joel@flow3d.com)

**Company Description:** Since its founding, the goal at Flow Science has been to provide our customers with excellence in computational fluid dynamics software and services, giving close and careful attention to each customer's special modeling needs. This objective led to the commercial release in 1985 of *FLOW-3D*, a highly-accurate, general-purpose CFD software package. The fluid dynamics and heat transfer program was designed from the outset to support diverse engineering applications with emphasis on modeling accuracy, problem adaptability and user convenience.

Flow Science now supports a worldwide customer base of commercial, academic and government users. Our staff of scientists and engineers constantly strives to make innovative and useful improvements to *FLOW-3D*. We take pride in the level of customer support we provide. In 2010, Flow Science celebrated its [30th year of improving the world through accurate flow modeling](http://www.flow3d.com/about/30th/index.html).

**Kitware, Inc.**

**Website:** <http://www.kitware.com>
**Point of Contact:** Lisa Avila, VP of Commercial Operations. (**kitware@kitware.com****)**

**Company Description:** Kitware is a leader in the creation and support of open-source software and state-of-the-art technology, and is one of the fastest growing software companies in the country. Kitware leverages its diverse technical expertise to provide advanced custom solutions for a host of complex technical problems in the fields of scientific computing, computer vision, data management, software process, and medical computing. Kitware is widely recognized for its major contributions to a variety of open-source projects including VTK, ITK, CMake, and ParaView. As an underlying foundation to these efforts, Kitware has developed an agile, cross-platform, quality software process that enables our open-source tools to thrive.

**Maya Heat Transfer Technologies Ltd.**
**Website:** [http://www.mayahtt.com](http://www.mayahtt.com/)
**Point of Contact:** Mike Swanson (mike.swanson@mayasim.com)
**Company Description:** Founded in 1982, MAYA HTT Ltd. (MAYA Heat Transfer Technologies Ltd) is a leading supplier of advanced thermal and fluid flow analysis software, structural analysis software, mechanical vibration test data acquisition software and related training and consulting services in mechanical engineering.  As a Siemens PLM Software development partner and reseller, Maya software is embedded into the UG NX, Femap, and I-deas CAD/CAE platforms.  Maya has been supporting the I-deas TMG / NX Space Systems Thermal installations at NASA JPL and other spacecraft development locations for the last several decades.  Maya engineering consulting services span over twenty-five years and hundreds of projects, and also include training and custom software development.

**Metacomp Technologies**

**Website:** <http://www.metacomptech.com>

**Point of Contact:** Vedat Akdag (vedat@metacomptech.com)

**Company Description:** Metacomp Technologies develops and disseminates simulation software and services in multiple physics areas including fluid dynamics, aero and hydro acoustics, structural mechanics and electrostatic paint deposition. Our technology focus is devoid of hype but offers significantly broad and deep capabilities in many application areas of interest to scientists, engineers, technologists and educators. Metacomp Technologies has the Independence, Conviction and Value System for a sustainable and satisfying relationship with our customers.

**SpaceClaim Corporation**
**Website:** <http://www.spaceclaim.com>
**Point of Contact:** Laura Kriebel (laura@spaceclaim.com)
**Company Description:** SpaceClaim, the leading provider of 3D Direct Modeling software, develops the best direct modeling solution for engineering and manufacturing. SpaceClaim’s acclaimed software is easy to learn and use and is completely CAD-neutral. It enables engineers and other manufacturing professionals to rapidly create new designs or manipulate and edit existing 2D and 3D geometry, without the complexity of traditional CAD.

**Spacedesign Corporation**
**Website:**  [http://](http://www.cometsolutions.com)[www.spacedesign.com](http://www.spacedesign.com)
**Point of Contact:** Joe Clay (joe.clay@spacedesign.com)
**Company Description:**  Spacedesign staffs a team of software engineers and programmers working to meet the latest needs of the spacecraft design industry.  From thermal software to a burgeoning structural analysis tool, interdisciplinary design is made easy by combining optics, thermal and structural analysis. Spacedesign is currently working with spacecraft manufacturers to design and build spacecraft for LEO, GEO and interplanetary missions.  The proof is in the multitude of satellites designed and built using TSS.

**Thermal Modeling Solutions, LLC**
**Website:** <http://www.tarpthermal.com>
**Point of Contact:** Hume Peabody (tarpthermal@comcast.net)
**Company Description:** Thermal Modeling Solutions focuses on the development of post processing tools that interface with the standard output files from numerous commercial thermal solvers.  The Thermal Analysis Results Processor (TARP) post-processing tool allows the user to define numerous thermal outputs including plots, tables, heat flows, equivalent sinks as well as allowing the user to group nodes together into logical components.  The output from TARP is a familiar Microsoft Excel® workbook, further allowing the full power of Excel to be used for any additional post processing.  The Capture Output and Verify Results (COVeR) post processing tool builds on TARP technology but displays the data in its own environment allowing for data plotting/tabulation and the display of block diagram graphical heat maps.

**Hardware Vendors**

**ATK Space**
**Website:** <http://www.atk.com/>
**Point of Contact:** Warren Chen (Warren.Chen@atk.com)
**Company Description:** ATK is an aerospace, defense, and commercial products company specializing in small and micro-satellites; satellite components and subsystems; lightweight space deployable and solar arrays; low-cost, quick to market launch solutions; flares and decoys; and energetic materials and related technologies. It is also the world's top producer of solid rocket propulsion systems with extensive experience supporting human and space payload missions, and a leading supplier of lightweight and reliable composite aircraft structures. ATK has operations in 22 states, Puerto Rico, and internationally, and revenues of approximately $4.8 billion.

**DUNMORE Corporation**
**Website:** <http://www.DUNMORE.com/>
**Point of Contact:** Art Mallett, Jr. (amallettjr@dunmore.com )
**Company Description:** DUNMORE is a manufacturer of engineered films and tapes for aerospace, supplying multilayer insulation materials to the aerospace industry for over twenty-five years. With a highly technical product base of over 400 certified products, DUNMORE is the trusted source for engineered aerospace films and tapes.  *TOGETHER WE'RE GOING PLACES*

**IRCameras**
**Website:** <http://www.IRCameras.com>
**Point of Contact:** Eric Lovette (eric.lovette@IRCameras.com)
**Company Description:** IRCameras manufactures and distributes high performance infrared imaging systems for exceptionally demanding scientific, industrial and military applications. We offer commercial and customizable cameras and IDCAs that utilize the most sophisticated digital focal plane technologies, providing the highest sensitivity and fastest frame rates. IRCameras is uniquely positioned to advance the development of thermal imaging technologies, and to commercialize these technologies for a wide range of applications including:
• nondestructive testing
• predictive maintenance
• online process monitoring and control
• scientific research
• target signature
• security and surveillance"

**Sierra Nevada Corporation**
Website: <http://www.sncorp.com>
**Point of Contact:** Bryan Helgesen (Bryan.Helgesen@sncorp.com)
**Company Description:** Sierra Nevada Corporation (SNC) is a world-class aerospace prime systems integrator and our Space Systems business area develops high performance, innovative components and systems that are changing how we reach, explore, and utilize space. Our products range from spacecraft actuators that power the Mars rovers, to hybrid rocket technologies that powered the first commercial astronaut to space, and from microsatellites controlled by the Internet to Dream Chaser®, a winged and piloted orbital commercial spacecraft. SNC's Space Systems products innovate, enable and perform.