

Tutorial on Ablative TPS: Welcome, Introduction and Overview

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Welcome, Introduction & Overview

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- **Welcome**
- **Introduction**
 - **Brief background: Instructors and attendees**
 - **Need for a course on Ablators**
 - **Expectations**
- **Overview of the Course**
 - **Course Outline**
- **Feedback**
- **A word about the Probe Workshop**

WELCOME

- **Welcome**
 - **We are honored by the response to this course**
 - **Larger than anticipated attendance**
 - **Audience is great mix and a wide spectrum**
 - **Leaders to students**
 - **Audience participation**
 - **The tutors are some of the best practitioners of the Science and the Art of TPS**
 - **The audience also has a number of people that are leaders in Entry Systems and TPS.**
 - **Encourage feedback**
 - **very valuable to us**
 - **With a significant number of people on the waiting list, we will look into offering the course in the future and make it better with your help**

Introduction

Brief background: Instructors

Space Technology Division



Mr. Paul Wercinski is a Senior Staff Scientist and a Project Manager with the Space Technology Division at NASA Ames. He served as the Program Executive for the In-Space Propulsion program at NASA HQ for a year. Prior to that, he was the Deputy Division Chief of the Space Technology Division and the Branch Chief of the Reacting Flows Environments Branch for many years. He is well known for his contributions and expertise in the area of Mission Design and System Studies of Planetary Entry Probes with an emphasis on TPS for both robotic as well as human missions.



Dr. Michael Wright: Currently he is an Aerospace Engineer with the Reacting Flow Environments Branch at NASA Ames. Prior to that he was a Senior Scientist with ELORET supporting NASA missions for many years. He is a world renowned expert in Computational Fluid Dynamics (CFD) and its applications to hyper velocity, reacting flows that one encounters in entry systems. Dr. Wright is the principal author of the CFD code DPLR, one of the workhorse tools used at NASA Ames for many of the Entry System CFD analysis.

Introduction

Brief background: Instructors

Space Technology Division



Dr. Dinesh Prabhu is currently a Senior Staff Scientist and Technical Manager with ELORET Corp. He has been with ELORET for many years and prior to that he worked as Senior Scientist in the National Aeronautical Laboratory in India for three years. Dr. Prabhu has contributed to many national programs including Shuttle, NASP, X-33, AFE, Shuttle Return to Flight and Arc Jet Characterization. His contributions to the field of Computational Fluid Dynamic and Radiation modeling are well recognized around the world.



Mr. Mike Tauber was with NASA for over four decades and after retiring from NASA, he joined ELORET and continues to serve the nation as a senior consultant. While with the Space Technology Division at NASA Ames, Mr. Tauber led numerous system and engineering design studies in support of human and robotics missions. His critical contributions to the success of many missions include Mars Pathfinder and MER. Mr. Tauber also taught engineering aspects of Entry System at Stanford University for many years. Mr. Tauber is legend in the development and use of innovative engineering methods. A number of his engineering equations continue to be used in the design entry probes today.

Introduction

Brief background: Instructors

Space Technology Division



MR. Bernard Laub: The Course Leader, Mr. Laub, is a legend in the field of ablative TPS. Prior to joining NASA, he was the Vice President for Research with Aerotherm Corp. and trained many of the leaders in the TPS community (10 years at Avco, 27 years at Aerotherm, 4 years at NASA). He was part of the “Apollo” generation and made critical contributions to understanding the Apollo heat shield. His understanding of the Carbon-Phenolic TPS is world renowned and he successfully supported many of the U.S. Airforce’s ballistic missile heat-shield developments.



Mr. Donald M. Curry: Mr. Curry is another legend in the TPS field. He has been with NASA for over a “century”. His contributions continue to be critical to the success of the manned space programs. He was a leader in the community that developed the Apollo heat-shield. After Apollo, under his leadership, NASA developed the Shuttle wing-leading edge TPS system. His knowledge of both ablative and reusable TPS and his years of experience in flight qualifying and ground validating TPS is unparalleled in the world.

Introduction

Need for a Ablator Course

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- **Ablator Course**
 - Truly multi-disciplinary
 - requires expertise across many discipline including knowledge of specialized test facilities
 - Expertise is critical to mission success
 - institutions developed the expertise in-house or at a few specialized consulting houses
 - No formal course anywhere to the students and professionals that want to learn ablators
- **The leaders are getting legendary**
 - need for the next generation to be trained in the art and science of ablators

Introduction

Pre-requisite and Expectation

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- **Prerequisite**
 - We did not set any
- **Expectations**
 - You will get a larger perspective and a better appreciation for the complexity involved in TPS system in general and ablators in particular.
 - Ablator TPS development, design, testing and application to missions require collaboration among many experts who also have an appreciation for other disciplines.

Course Overview

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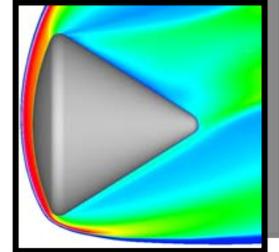
Saturday, 8/21/04

- Mission Analysis
- Entry heating – convective
- Entry heating – radiative
- Engineering methods

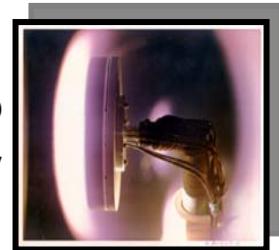
Sunday, 8/22/04

- Ablative TPS – Early studies
- Organic resin composites
- Surface recession modeling
- High fidelity model development
- Testing approaches/requirements
- Future needs
- Feedback from participants

- Wercinski
- Wright
- Prabhu
- Tauber



- Laub
- Laub
- Laub
- Laub
- Curry & Laub
- Laub & Curry
- All



Support Team: A big thanks

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Ed Martinez:
Chair - Local Organizing Committee



Marla Arcadi
Program Coordinator:
You need something you go to Marla

- San Jose State Students
- Pacific Media