

## Thermal Protection Systems for Space Applications: from engineering concepts to fundamentals

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The design of the Thermal Protection System protecting a spacecraft from the heat exposure upon atmospheric entry is a very complex process relying on a collaborative process from multiple disciplines such as physics, chemistry, material science and engineering. Most high velocity entry speeds (hypersonic) use ablative (and not reusable) technology as concept for the Thermal Protection Systems. While the ultimate design is achieved using modeling tools for aerothermodynamics, heterogeneous gas-surface interactions (catalysis) and material response, these models are built and validated in ground based facilities and one of their major challenges is extrapolating the domain of application of these models to real flight conditions. The talk will describe the currently undergoing efforts in the heatshield design process to replace engineering judgment with a more methodical technique through the application of statistically derived factors of various elements of the design. It will also overview current model development efforts in the area of ablation and gas-surface interactions for hypersonic conditions (where temperatures at the surface reach more than 3000K and pressures up to 0.5 atm ) including the corresponding experimental support. The information in this talk is based on the recently published AIAA paper (AIAA-2011-3757 ) "Defining Ablative Thermal Protection System Margins for Planetary Entry Vehicles" as well as the 4th Annual AFOSR/NASA/SNL Ablator Modeling Workshop

Speaker's Bio: Ioana is currently a senior research scientist with ERC Incorporated at NASA Ames Research Center in California, the United States. She has received her PhD in Physics from the University of Groningen, the Netherlands in 2001 followed by studies in computational chemistry at California Institute of Technology and biochemistry/genomics at Stanford University. She works for NASA since 2003 on various projects such as Stardust Post Flight Analysis, Orion CEV, Mars Science Laboratory Post Flight Analysis. She has two daughters (6 years and 3 years old) and enjoys mentoring students and writing poetry.