

Phys4Entry

Planetary Entry Integrated Models

PREPARE FOR LANDING ON PLANETS

One of the major technological challenges associated with the access to planetary surfaces is the entry of the space vehicle in the planetary atmospheres at superorbital speeds. The problem is the very large heat released to the vehicle surface by the surrounding gas, either as convective heating or as radiation.

Optimization of the thermal shield design can have a profound impact on the mass and volume of a vehicle, and consequently on its energy and cost budgets. Today, a poor knowledge of the physics of hypersonic entry is the limiting factor. Uncertainties increase with the entry speed, in particular as radiation becomes a considerable contribution to the overall heat load.

Phys4Entry's main goal is a thorough analysis of the physics behind space vehicle entry into planetary atmospheres and an improvement of crucial elements of the modelling that allows reliable predictions of flight conditions.

Therefore this study is concerned with the development of advanced chemico-physical and plasma models of hypersonic entry flows. Advanced models mean the description of the non-equilibrium chemical kinetics of the high temperature medium on the basis of a state-to-state approach.

This approach, in turn, calls for a microscopic description of the elementary processes that play a role in the high temperature reactive gas mixtures surrounding space vehicles during the entry phase.

The predictive capabilities of theoretical models will be assessed against well-defined experimental measurements, and their impact on the overall heat flux to the surface will be estimated by Computational Fluid Dynamics simulations of realistic ground and flight tests.



MARIO CAPITELLI
IS PROJECT COORDINATOR

QUESTIONS & ANSWERS

What do you want to achieve with this project?

To draw the attention of the scientific community on the issues of aerospace modelling, build up advanced chemical and plasma models addressing those issues, and create a European network of expertise in hypersonics. In summary, to bring Europe on the frontier of aerospace research.

Why is this project important for Europe?

It will establish the leadership of European research in aerospace that is the key to both actual and perceived success in future aerospace missions and industrial development.

How does your work benefit European citizens?

History shows that promoting aerospace research and industry inevitably drives medium- and long-term technological advances also in fields far from aerospace applications.



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Phys4Entry provides physically sound models of atmospheric hypersonic entries.

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LIST OF PARTNERS

- University College London, United Kingdom
- Centro Italiano Ricerche Aerospaziali Scpa, Italy
- Ingénierie et Systèmes Avancés, France
- Università degli studi di Perugia, Italy
- Centre National de la Recherche Scientifique, France
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PROJECT INFORMATION

Planetary Entry Integrated Models (Phys4Entry)

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