Radiation-Shapes-Thermal Protection Investigations
for High Speed Earth Re-entry

RASTAS SPEAR: Radiation-Shapes-Thermal Protection Investigations for High Speed Earth Re-entry

Let's embrace Space - FP7 Conference- Budapest 12-13 May 2011

ASTRIUM-ST SAS (F) IoA (PL)
CIRA (I) KYBERTEC (CZ)
CFS Engineering (CH) MSU (R)
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CNRS (F) VKI (B)

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 241992
• In the frame of EC (European Community) FP7 second call
  • Activity 9.2 • strengthening of space foundations / research to support space science exploration
  • SPA.2009.2.1.01 Space Exploration
• Duration
  • Sep 2010 - Sep 2012
• Status : Astrium is the coordinator. Team composed of 10 partners
• More on www.rastas-spear.eu
Partners per country
General Objective

• Need to develop the capability to send vehicles into space, which collect and return to Earth samples from solar system bodies.

• Rastas Spear project aims to increase Europe’s knowledge in high speed re-entry vehicle
Objectives of the project

- **OBJ 1 (WP1, WP2, WP4 + WP5)**: To better understand phenomena during high speed re-entry enabling more precise Capsule sizing and reduced margins.

- **OBJ 2 (WP2)**: To identify the ground facility needs for simulation.

- **OBJ 3 (WP3)**: To master heat shield manufacturing techniques and demonstrate heat shield capabilities.

- **OBJ 4 (WP3+WP4)**: To master damping at ground impact and flight mechanics and thus ensure a safe return of the samples.

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WBS

WP1
Review of System Requirements
- 1.1 Atmosphere modelling
- 1.2 Trajectories
- 1.3 Aerodynamics & ATD
- 1.4 Vehicle Design

WP2
Ground Facilities Improvement
- 2.1: Analysis of Current Ground Facilities
- 2.2: Shock tube technology
- 2.3: Ballistic Range Technology
- 2.4: Plasma Generator Technology
- 2.5: Synthesis

WP3
Key Technologies for High Speed Entry
- 3.1: Choice of TPS+Joints
- 3.2: Flow tests
- 3.3: Breadboard manufacturing
- 3.4: Crushable Structure

WP4
Ablation-Flight Mechanics Coupling assessment
- 4.1 Tools coupling
- 4.2 Ablation coupling assessment
- 4.3 Engineering modelling Correction by CFD

WP5
Gas-Surface Interactions Modelling
- 5.1: Review of surface roughness and blowing influence
- 5.2: Ground Experiment Preparation
- 5.3: CFD Modelling
- 5.4: Synthesis of WP

WP6
Management, Dissemination and Exploitation
- 6.1 Management
- 6.2 Dissemination & Exploitation
Conclusion

- Rastas Spear is a typical R&D project
  - Part of European Community Framework Programme n°7 (FP7)
- Objective to increase the TRL of
  - Key technologies
  - Methodologies
- Project is now on-track
- Frame of the study has been defined
  - Focus on passive Earth Return Capsule
- Remaining steps until end of study will allow completion of overall project objectives
  - Completion Fall 2012