RASTAS SPEAR

FP7/SPACE/241992
1/9/2011 – 30/10/2011
Total Budget: 2.3M€

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

Concept:

Ballistic, passive return of a soil sample from another planetary body in a Sample-Return Capsule, entering and aero-braking through the Earth's atmosphere at high velocity.

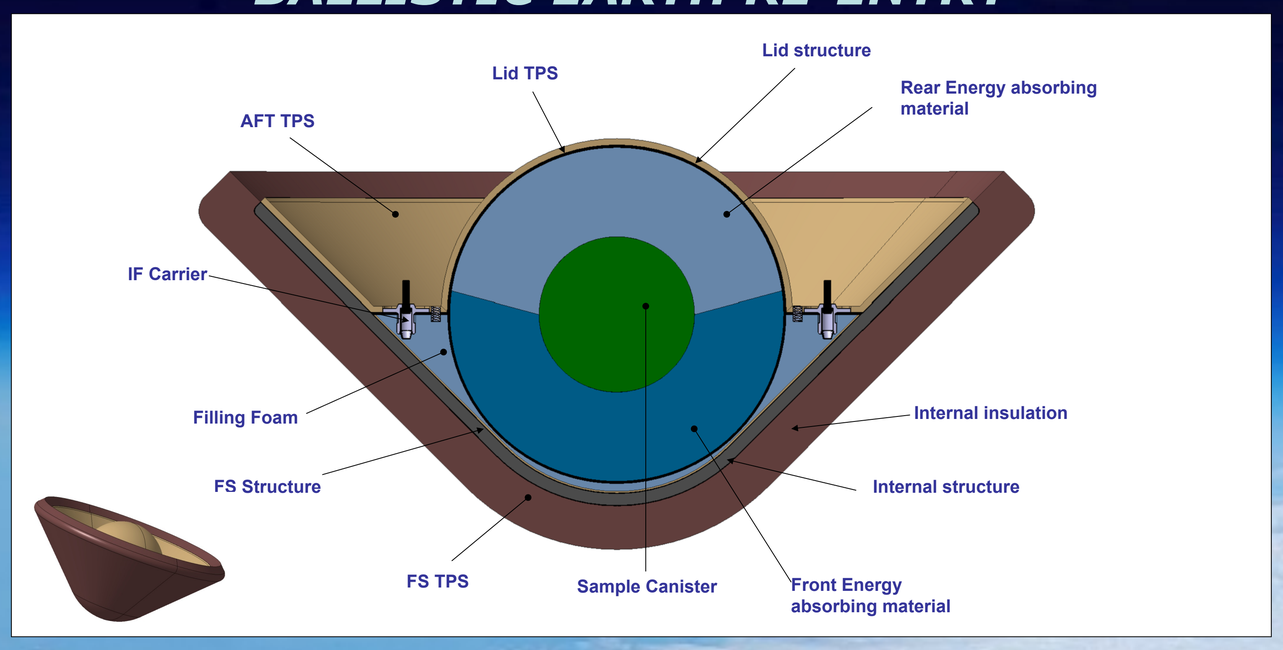
Objective:

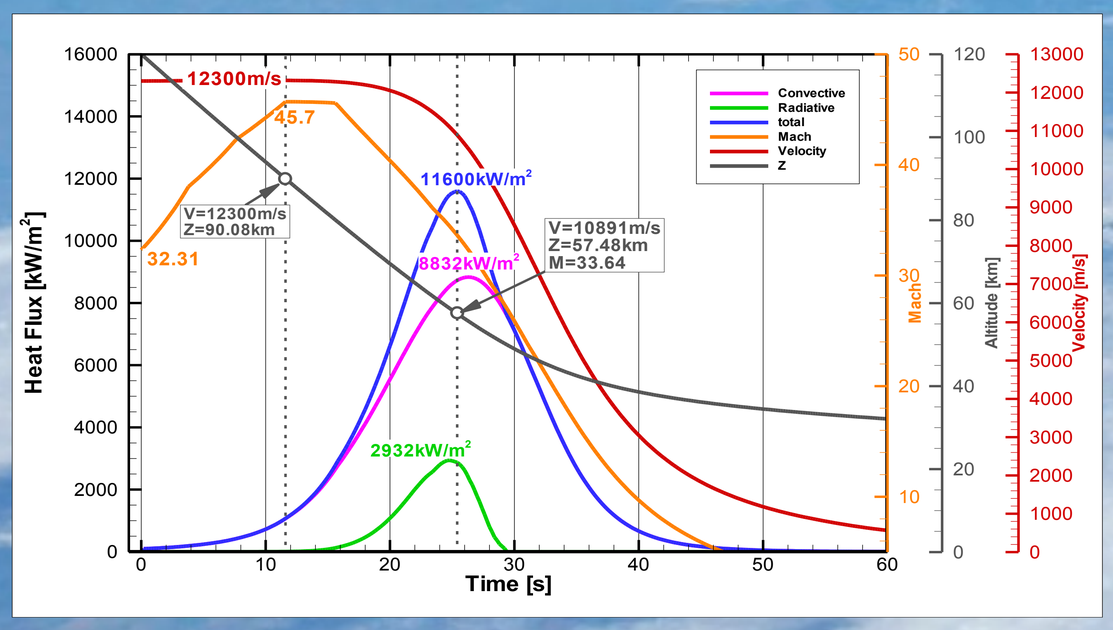
"To increase Europe's knowledge in high speed re-entry vehicle technology to allow for planetary exploration missions in the coming decades"

The specific Objectives are:

1. To better understand phenomena during high speed re-entry enabling more precise Capsule sizing and reduced margins.
2. To identify the ground facility needs for simulation
3. To master heat shield manufacturing techniques and demonstrate heat shield capabilities
4. To master damping at ground impact and flight mechanics and thus ensure a safe return of the samples

CONCEPT OF A SAMPLE-RETURN VEHICLE FOR BALLISTIC EARTH RE-ENTRY





Main characteristics of a ballistic Earth re-entry. *Effective max. total heat flux is about 11.6MW/m², max. velocity 12.3km/sec (47.5Mach), total heat energy about 250MJ/m².*

The PARTNERS:

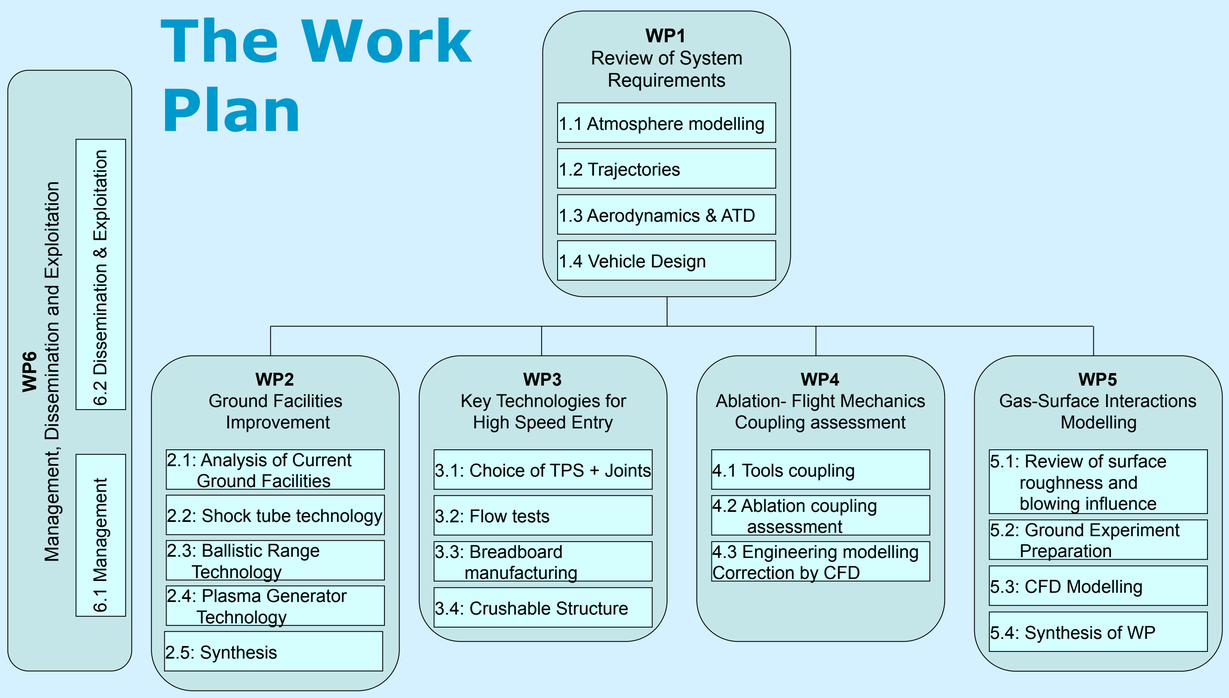
- Centro Italiano Ricerche Aerospaziali, *Italy*
- NCSR Demokritos, *Greece*
- Institute of Aviation, *Poland*
- Office National d'Etudes et de Recherches Aérospatiales, *France*
- ASTRIUM-ST SAS, Coordinator, *France*
- Lomonosov Moscow State University, *Russia*
- CFS Engineering, *Switzerland*
- KYBERTEC, *Czech Rep.*
- CNRS/EM2C, *France*
- Von Karman Institute for Fluid Dynamics, *Belgium*

Challenges:

The main challenges faced by a ballistic, Sample-Return Vehicle are:

1. Ensure the entry phase of the **ballistic** trajectory and **sustain the thermal and aerodynamical loads** encountered during the entry until impact.
2. **Protect the payload from heat and mechanical loads** throughout the re-entry until impact on the ground
3. Comply with the **planetary requirements**, typically ensure sample container integrity until impact and guarantee sealing conditions at any time of the mission and under any circumstances.

The Work Plan



http://www.rastas-spear.eu/

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