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SPACE EXPLORATION SYMPOSIUM (A3)
Mars Exploration – Part 1 (3A)

Author: Mr. Aurelien Pisseloup
EADS Astrium, France

Mr. Jean-Marc BOUILLY
EADS Space, France

RASTAS SPEAR : RADIATION-SHAPES-THERMAL PROTECTION INVESTIGATIONS FOR HIGH SPEED EARTH RE-ENTRY PROJECT

Abstract

An important step for Space Exploration activities and for a more accurate knowledge of the Earth, universe and environment is to develop the capability to send vehicles into space, which collect and return to Earth samples from solar system bodies. To return these samples, any mission will end by high-speed re-entry in the Earth's atmosphere. This requires strong technological bases and a good understanding of the environment encountered during the Earth re-entry. Investment in high speed re-entry technology development is thus appropriate today to enable future Exploration missions such as Mars Sample Return.

Rastas Spear project started in September 2010 for 2 years, with the main objective to increase Europe 's knowledge in high speed re-entry vehicle technology to allow for planetary exploration missions in the coming decades. The project is carried out by a consortium of 10 European companies and institutes: VKI (B), Kybertec (Cz), Demokritos (Gr), IoA (Pl), CIRA (I), CFS (CH), MSU (Ru), CNRS and ONERA (F), and coordinated by Astrium (F).

The research leading to these results has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n 241992. The main objectives of Rastas Spear are:

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

The aim of this paper is to present the main results reached within Rastas Spear especially on:

- Aeroshape stability - High speed aerothermal environment
- Sub-system / equipment : Thermal protection, Crushable material