SUPER LIGHT-WEIGHT THERMAL PROTECTION SYSTEM FOR SPACE APPLICATION

2014
2015
2016
2017

LIGHT-TPS

www.light-tps.eu

Main challenge

LIGHT-TPS develops a new super-light corrosion and oxidation resistant complex Thermal Protection System (TPS) for various space applications, above all for Reusable Space Systems (RSS), capable of operating within the entire range of working temperatures. The project will radical improve the properties of the TPS used in Space Shuttle, Buran, and other existing and under-development RSS by combining principle advantages of new metallic and ceramic materials in a single system.

Potential application areas

Prime application domain for the LIGHT-TPS results is future RSS missions (ESA's IXV alike) and other space applications, but also Energy and Transport.

Intermediate eXperimental Vehicle (IXV) © ESA–J. Huart

Expected results of LIGHT-TPS

The main outcome of the project will be the realistic prototypes of the TPS elements incorporating new materials, technologies and processes. It will be achieved by obtaining the following:

- The new super high temperature resistant Ni-Cr and Nb alloys with density of 7.5 g/cm^3 and 6 g/cm^3 respectively.
- The new multilayer Ultra High Temperature Ceramics (UHTC) composite coating based on system ZrB_2- SiC / $MoSi_2$ designed for the operation in an oxidizing environment with temperatures up to 2000 °C and under the conditions of thermo erosion effects.
- New manufacturing and construction processes allowing integrating the new materials into a TPS, which will be lighter than 10 kg/m^2.

Scientific objectives of LIGHT-TPS

- To develop scientific fundamentals for new manufacturing processes for alloys production.
- To carry out a pioneering study on the mechanisms of rolling and welding of honeycomb structures from thin sheets and foils of super heat-resistant alloys.
- For the first time ever to investigate the mechanisms of secondary structures formation on the surface of UHTC structures during the operation.
- To optimize the technology for the production of composite ceramic materials with breakthrough properties.
- To develop the technology for deposing the most suitable UHTC compositions based on the ZrB_2-SiC/$MoSi_2$ system on metallic (Ni-Cr, Nb alloy) and non-metallic (C/C, C/SiC, UHTCMC) substrates of the TPS.

EUROPEAN COMMISSION
European Research Area

COOPERATION