MATERIALS AND STRUCTURES SYMPOSIUM (C2)
New Materials and Structural Concepts (4)

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FIBER REINFORCED UHTC AND UHTC COATED METALS PAYLOADS ON THE AUSTRALIAN HYPERSONIC VEHICLE SCRAMSPACE.

Abstract

SCRAMSPACE is an Australian led project, aimed to develop Supersonic Ramjet technology. CIRA shall be part of this project and, realizing two different payloads, both based on UHTC technologies. The first CIRA payload consists of two UHTC winglets placed on the vehicle in diametrically opposite positions, in order to preserve the symmetry of the re-entry stage. The ceramic part of the winglets are interfaces to the vehicle by means of a interface realized with refractory metal, coated with plasma spayed UHTC. The objective of the payload is to test, in real suborbital re-entry condition, a specimen made of new UHTC material reinforced with Silicon Carbide short fibers, proving the advantages of these materials and the ability to design and simulate an adequate mechanical interface. In the realization of this payload, CIRA shall implement the latest UHTC technologies developed, including UHTC coating and Fiber reinforced UHTC massive ceramics. The second payload consists of UHTC plasma sprayed on conventional metal. The objective is to prove the effectiveness of this coating technique, aimed to increase the ability of the metals to sustain high thermal loads in an oxidative environment. The payload instrumentation shall include thermocouples and pressure ports, in order to be able to accurately rebuild the aero-thermal environment and the thermo-structural behavior of the tested materials and to validate the numerical models used for the design. One specific aspect of this mission is the heating profile, the fins are exposed to the external environment during the ascent phase too, this shall produce on the payload a first heating during the ascent, a thermal re-equilibration during the extra atmospheric part of the flight, and a strong re-heating at the re-entry. The re-entry flight runs on a very meaningful suborbital trajectory, SCRAMSPACE shall fly at abound Mach 8 in the 15-35km altitude region. This flight will give, then, valuable data in a flight condition that is representative of the future hypersonic vehicles. After a short description of the vehicle, the paper describes the payloads layout and the planned mission. The paper describes also the new materials characteristics and the design and test process that has led to the selection of the final materials set.