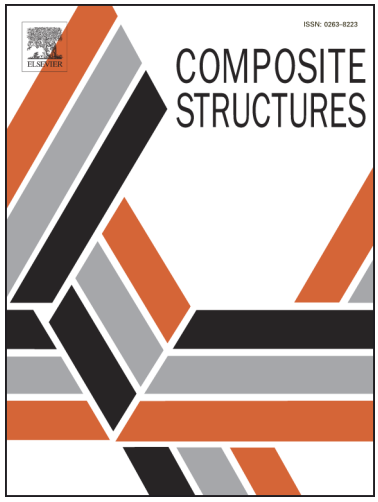

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Thermo-structural Design of a Ceramic Matrix Composite Wing Leading Edge for a Re-entry Vehicle

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Abstract

The design of the wing leading edge of re-entry vehicles is a very challenging task since severe aerothermal loads are encountered during the re-entry trajectory. Hence, advanced materials and structural concepts need to be adopted to withstand the elevated thermal gradients and stresses. Furthermore, particular attention must be paid to the design of hot areas and connections between hot and cold areas of the structure, where the presence of major thermal gradients associated to significant thermal expansion coefficients variations, can lead to damage onset and failure. In order to face this issues, Ceramic Matrix Composites are generally employed as passive hot structures due of their capability to operate at elevated temperatures retaining acceptable mechanical properties. In the present work a novel thermo-structural concept of an hypersonic wing leading edge is introduced and verified by means of an advanced finite element thermo-structural model.

Keywords: Hot Structures, Thermal Protection Systems, Ceramic materials, Thermal stresses.