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DETERMINING THE PROPERTIES OF A THERMAL BARRIER

#material performance #material characterisation #composite materials
#thermal characterisation #multi-layered materials

As a division of the German group dedicated to aeronautical air systems, Liebherr Aerospace supplies state-of-the-art equipment to the world's leading aircraft manufacturers. As part of its R&D activities, this equipment manufacturer sought to measure, up to 400°C, the thermal conductivity of a thermal barrier coating, deposited in a thin layer on an aluminium substrate. They chose to rely on the thermal specialists at Capacités to carry out this complex characterization of multi-layered materials.

CHARACTERIZING A MATERIAL LAYER THAT IS INSEPARABLE FROM ITS ASSEMBLY

Liebherr Aerospace wished to determine the thermal conductivity of a very thin ceramic coating deposited on an aluminium substrate. However, this characterization is highly complex. Indeed, traditional methods require to perform the measurement on the layer alone but how to do so if it can not be separated from its substrate?

Capacités's experts developed a strategy which involved characterizing through the laser flash method the substrate by itself at first, then repeating the procedure on the assembly comprising the same substrate and the ceramic deposit.

To do so, the numerical model associated to the laser flash method was updated to take into account the multi layered material. The success of the operation also

relied on the thorough characterization with temperature of additional properties which are mandatory to run the inverse algorithm: the specific heat and the thicknesses of each component. The procedure implemented by Capacités resulted in the successful identification of the thermal conductivity of the ceramic layer from ambient temperature to 400°C allowing Liebherr Aerospace to better ensure the mechanical strength of their multi-layered parts in a hot environment.

To complete this ambitious project, the Capacités' experts benefited from support and technical equipment from the LTeN laboratory (Heat Transfer and Energy Laboratory), joint research unit of Université de Nantes and the CNRS. ■

Expertises:

- Thermal engineering

CAPACITÉS

Created in 2005, Capacités is the private engineering and research valorisation subsidiary of the University of Nantes. It employs 90 employees, mainly engineers and PhDs, who work directly with scientists in the research laboratories.



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