

CERAMIC LIGHT-WEIGHT STRUCTURES BASED ON C/C-SiC SANDWICH DESIGN

RESEARCH LOCATION

DLR Institute of Structures and Design,
Stuttgart

PROJECT

ESA TDE „C/C-SiC Optical Bench Development“

PROJECT TERM

2022-2024

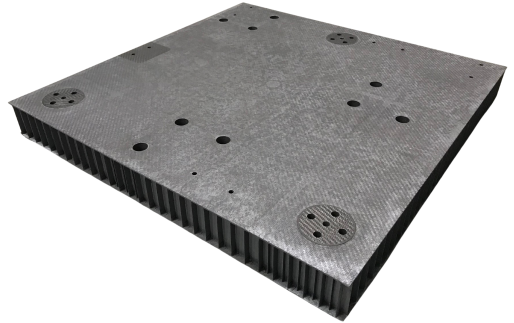
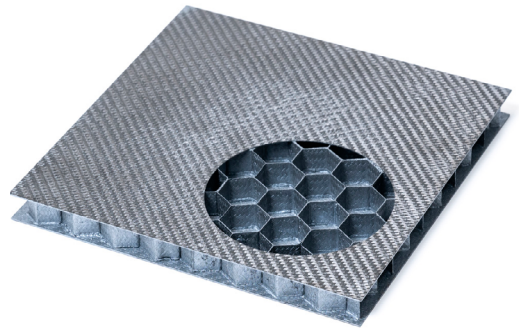
MATERIAL

Ceramic matrix composite (CMC; C/C-SiC)

OBJECTIVES

- Ultrastable optical benches for satellites
- Upscale the manufacturing method from samples to a generic demonstrator in original geometry (600 x 600 x 60 mm³)
- Develop and verify material specific, generic interface concepts

In close cooperation with Thales Alenia Space, France (TAS-F), new technologies for the manufacture and simulation of C/C-SiC sandwich structures have been developed. Thereby, the expertise of TAS in the design, modelling, testing, and the integration of optical bench flight hardware, as well as all industrial and commercial aspects regarding reproducible production and system costs were combined with the knowledge and long-term experiences of DLR in the development of C/C-SiC materials and sandwich structures.



The project was focused on the manufacture and test of a highly stiff and thermally stable optical bench with minimised thermal expansion in all room directions. Interface concepts based on in-situ joined C/C-SiC inserts have been developed. Thereby, even minimal local deformations or stresses were avoided, which would be inevitable with common metallic inserts, due to the large CTE mismatch between insert and sandwich structure. Finally, a demonstrator, including interfaces, have been manufactured at DLR. The mechanical and thermal performance could be verified by an extensive test program at TAS-F, including vibrational and thermal testing.

Contact

Bernhard Heidenreich |
bernhard.heidenreich@dlr.de

More information

[Development of a C/C-SiC Sandwich Optical Bench](#)