

## MATERIALS AND STRUCTURES SYMPOSIUM (C2)

## Space Structures I - Development and Verification (Space Vehicles and Components) (1)

Author: Mr. Jesús Gómez García  
Airbus DS GmbH, Germany, [jesus.gomez@airbus.com](mailto:jesus.gomez@airbus.com)

Mr. Svend Hinsch  
Airbus DS GmbH, Germany, [svend.hinsch@airbus.com](mailto:svend.hinsch@airbus.com)

Mr. Gerrit Quappen  
Airbus DS GmbH, Germany, [gerrit.quappen@airbus.com](mailto:gerrit.quappen@airbus.com)

Dr. Patricia Cambresy  
Airbus DS GmbH, Germany, [patricia.cambresy@airbus.com](mailto:patricia.cambresy@airbus.com)

Dr. Jochen Albus  
Airbus DS GmbH, Germany, [jochen.albus@astrium.eads.net](mailto:jochen.albus@astrium.eads.net)

## DEVELOPMENT AND QUALIFICATION OF ADVANCED COMPOSITE SANDWICH STRUCTURES

**Abstract**

Different aspects like performance, development and production costs, schedule, geometrical boundary conditions and payload requirements drive the development of launchers. In case of non-pressurised primary structures, one of the preferred design solutions consists of advanced composite sandwich structures. This is due to many advantages compared to pure metallic structures (i.e. lightweight structure with high stiffness and high buckling capacity). In addition, the industrialized composite manufacturing processes using automated fiber placement and autoclave composite bonding technology ensure high quality products during series production.

Within this paper, a quick overview on the general mechanical development and qualification process is presented based on example of the Ariane 5 Vehicle Equipment Bay in Fibre Placement Technology.

The overview is subdivided in five general aspects:

- The load environment (mechanical and thermal loads)
- The material choice: justification and also damage tolerance aspects
- The static (strength, stiffness and buckling) validation/qualification
- The correlation of test results and analysis tools
- The dynamic validation/qualification

The main emphasis is put on the static and material qualification, presenting the different analyses and test techniques applied to identify local failure modes, up the full-scale detailed FE model and its validation by a full-scale thermo-mechanical test.

The treatment of geometrical discontinuity zones, like the joints between metallic parts and sandwich zone is highlighted. In addition, the aspects of possible impact damages and the consequences for the structural behaviour and finally the performance are treated.

The paper will provide a general picture as well as a deep insight view to the state of the art development and qualification process for advanced composite sandwich structures.