

## **Static and Fatigue Study of Aircraft Composite Structures in the Post-Buckling Field**

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### **Abstract**

Composite stiffened panels used in aerospace structures can sustain loads far in excess of their buckling loads, as their collapse is generally observed deep into the post-buckling range. The collapse mode is quite complex, as it is due to the interaction of the post-buckling deformation with different failure modes, such as intralaminar damage, delamination, skin-stringer separation. The phenomenon is even more complex when fatigue loads are considered in the post-buckling regime and when defects such as manufacturing defects or impact damages are present.

The ability to predict the collapse due to static and fatigue loads and the mechanisms involved in the failure is crucial for the assessment of damage tolerance and the rational design of the composite structures.

This work investigates the capabilities of composite stiffened panels to work in the post-buckling field, considering mainly single-stringer composite specimens under compressive loads, that represent a level of complexity that can bridge the gap between coupon specimens and structural components.

The results obtained from a large test campaign will be presented. The results show the possibility to allow composite panels to work in the post-buckling field during the operative life, moving up the design ultimate load near the collapse load in the next aircraft generation. The test results of these specimens are ideal also for validating or redefining aspects of state-of-the-art damage models, and in particular the modeling and numerical issues related to compression failure and structural collapse.

### **Short Biography**

Chiara Bisagni is Full Professor and Chair of the section of Aerospace Structures and Computational Mechanics at the Faculty of Aerospace Engineering of Delft University of Technology in the Netherlands.

She received her Ph.D. in Aerospace Engineering at the Politecnico di Milano in Italy, where she then became Assistant and later Associate Professor in the Department of Aerospace Engineering. Before

joining Delft in January 2015, she was Full Professor at the University of California San Diego in the US.

Her research topics are aerospace composite structures, and in particular static and dynamic buckling, impact, crashworthiness, damage propagation and fatigue. Her approach combines experimental activities, as well as analytical and numerical techniques for design, analysis and optimization.

Chiara Bisagni received several awards, including an Amelia Earhart Fellowship, a Marie Curie Research Training Grant from the European Commission, a Young Researcher Fellowship from MIT, a Fulbright Grant, and she is Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA).

She is Associate Editor of AIAA Journal, and member of the Editorial Board of the Journal of Sandwich Structures and Materials and of the International Journal of Crashworthiness. In 2015 she was elected Executive Council Member of the International Committee on Composite Materials.