Laboratory for Product Development and Lightweight Design
Faculty of Mechanical Engineering
Technical University of Munich

MA

External Master Thesis at Airbus Helicopters:
INVESTIGATING DESIGN PRINCIPLES FOR DAMAGE TOLERANT STRUCTURAL BONDING IN AEROSPACE APPLICATIONS

Keywords: Finite Element, Optimization, Computational Mechanics

Background:

Structural adhesive bonding is a key enabler for lightweight aerospace structures: it offers weight and cost savings and reduces notch effects that typically trigger crack initiation in mechanically fastened joints. However, bonding remains challenging to certify for primary structures, because initial defects (e.g., manufacturing imperfections or impact damage) can propagate along a continuous bond line and thus undermine damage tolerance. Recently, Airbus proposed a new design principle to address this: an intermeshing overlap pattern subdivides a joint into multiple independent “sub-bonds,” where free edges act as effective crack stoppers and local sub-bond failure becomes tolerable—analogous to fail-safe concepts in riveted joints.

Description:

In this cooperative master’s thesis between Airbus and TUM, the candidate will advance the theoretical and numerical foundations of damage-tolerant structural bonding, focusing on high-fidelity FE analysis (and, optionally, optimization) of patterned bond geometries to quantify performance, robustness, and design rules for aerospace-relevant load cases. The thesis will be carried out on site at Airbus Helicopters in Donauwörth.

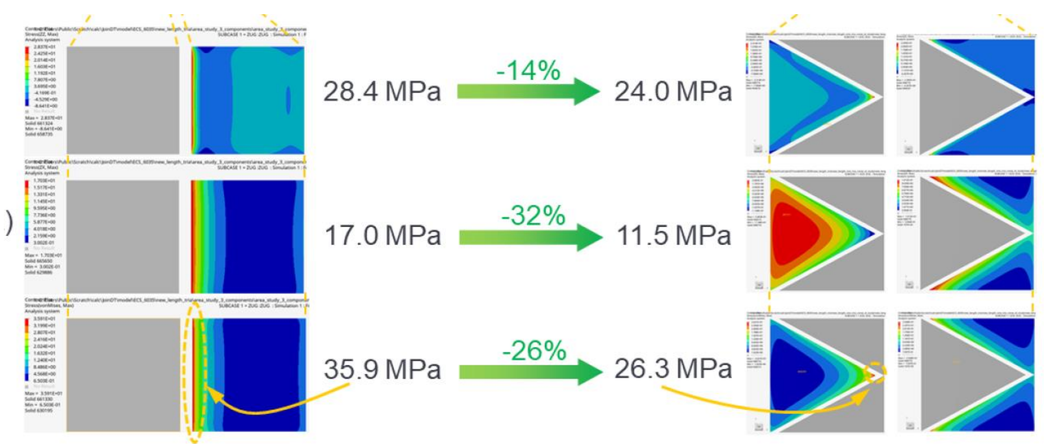

Figure: Stress comparison between conventional and damage-tolerant bonds.

Required skills:

We are looking for a highly motivated person who will work on site at Airbus:

- Finished bachelor in Computational Mechanics, Aerospace, Mechanical Engineering, or similar
- Strong background in solid mechanics, Finite Element Analysis and practical experience in these fields

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