Flexural Loaded Joints for the Aerospace Industry

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Abstract:

Thermoplastic composites are expected to play an important part in the structural material repairs, and one of the best examples is through use of the Single Strap Joint (SSJ), albeit works related to the joint are limited. This study focuses on the co-cured SSJ with thermoplastic adherends, subjected to four-point bending. The performance of the joints by flipping positions of the strap (strap-up and strap-down) were investigated, with a particular focus on the capacity of the load as well as the applied displacements. The joint having a strap of 30 mm length was also numerically analyzed via an ABAQUS program. The results showed the joints with the strap-up were stronger than those with the strap-down because the strap remined mainly in normal compression stresses where the critical points exist for the joints with strap-up, while for those with the strap-down, the strap suffered from the peeling stresses in the same region. Two different failure mechanisms were observed; while failure of adherends was the case for the former, the strap failed for the letter. Nevertheless, the failure zones for both cases were in tensile and/or shear out-of-plane stresses. Simulations show the joint design could be improved for better performance.

Keyword:

thermoplastic adherends, fusion bonding, single strap joint, bending test, numerical analyses.