

FAILURE OF THERMOPLASTIC COMPOSITE WELDED JOINTS

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This presentation summarizes the numerical and experimental evaluation of the failure behavior of thermoplastic composites, which are joined by means of conduction welding. The research supports the development of a next generation thermoplastic multi-functional fuselage [1]. The use of these new materials and fastener-free joints introduces new challenge as the strength of the welded joint is highly dependant on the strength and failure behavior of the thermoplastic matrix. A simplified modelling strategy that only accounts for a cohesive zone at the weld is compared to a high-fidelity model that takes into account the physical failure mechanisms at the lamina level. It was found that the joint strength is highly influenced by the failure mechanisms of not only the welded interface but also the surrounding plies. The high-fidelity modelling methodology is able to predict the failure mode of these welded joints with high accuracy with respect to the results obtained experimentally as shown in Figure 1.

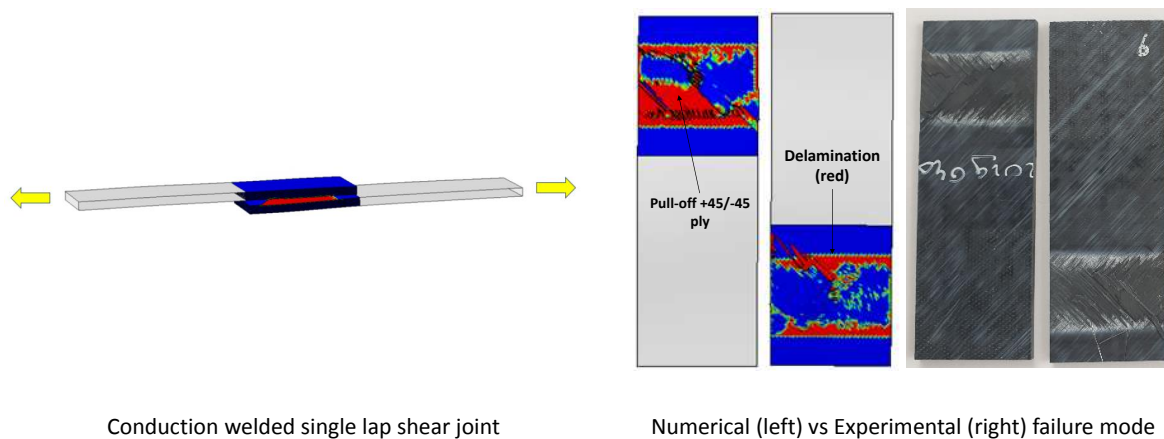


Figure 1. Numerical and experimental failure mode of conduction welded single lap shear joint

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References

- [1] B.H.A.H. Tijs, K.S. van Dooren and C. Bisagni (2020) Development of a numerical framework for virtual testing to support design of a next generation thermoplastic multifunctional fuselage. *Proceedings of the European Conference on Multifunctional Structures (EMuS2020)*.