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A multi-physics process model for simulating the manufacture of resin-infused composite aerostructures

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Abstract

The increasing demand for large, complex and low-cost composite aerostructures has motivated advances in the simulation of liquid composite moulding techniques with textile reinforcement materials. This work outlines the development and validation of a multi-physics process model that better simulates infusion behaviour through a complex preform compared with traditional models used in industry that do not account for fabric deformation. By combining the results of a preform draping model with deformation-dependent permeability properties, the shape and local flow characteristics of a deformed textile reinforcement have been more realistically defined for infusion. Simulated shear deformation results were used to define the distributed permeability properties across the fabric domain of the infusion model. Full-scale vacuum infusion experiments were conducted for a complex double dome geometry using a plain weave carbon fibre material. The multi-physics process model