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QUASI-STATIC CRUSHING BEHAVIOUR OF A HIGH-STRENGTH CARBON FIBRE-REINFORCED THERMOPLASTIC (CFRTP) IN MECHANICALLY FASTENED JOINTS

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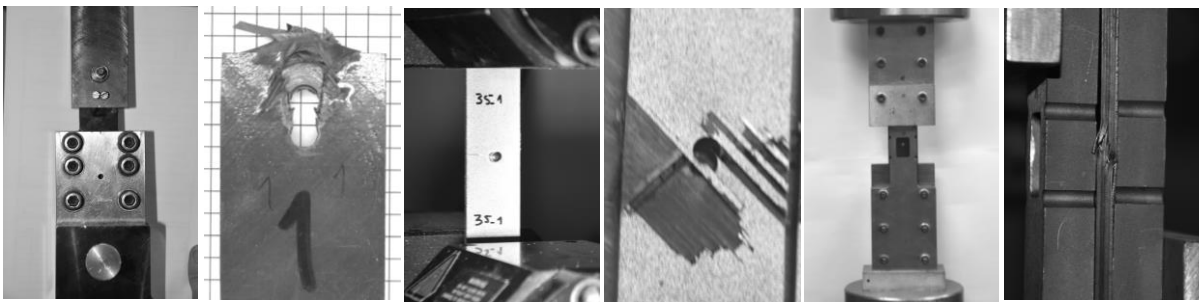
ABSTRACT

Mechanically fastened joints are still a fast and effective way to lock parts together when assembling components or sub-components. This work presents the results of quasi-static bearing [1] and filled-hole tensile and compressive testing [2] of a novel aeronautical-grade high-strength CFRTP, and is one of the first studies to assess the quasi-static performance of mechanically fastened composite laminates manufactured from unidirectional (UD) tape CFRTP. The extent of delamination and intralaminar damage is assessed with the aid of X-ray and optical microscopy, to assess the effect of the manufacturing process parameters for coupon hole drilling and end-face trimming and the crushing mechanisms in the bearing and filled-hole coupons.
All bearing specimens exhibited a bearing failure mode, without tearing. The filled-hole tension and compression tests exhibited multi-mode failure including extensive delamination and splitting.
It is concluded that high-strength CFRTPs can be an alternative to more conventional thermoset-based composites [3], due to their comparable structural performance, whilst having an interesting potential for manufacturing and recyclability.



(a) Bearing (b) Filled-hole tension (c) Filled-hole compression

Figure 1: Bearing, filled-hole tension and filled-hole compression testing rigs and specimens.

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