

New stitching technique promises stronger composites

TII Researchers have been exploring new techniques for joining multiple composite sheets using thicker carbon thread than previously explored.

ABU DHABI, UNITED ARAB EMIRATES, December 21, 2021 / EINPresswire.com/ -- High-performance products like airplanes and racing cars are increasingly crafted from multiple sheets of composites formed of carbon fibre reinforced polymers. These materials promise low

weight to strength ratio than traditional materials like steel or aluminium. But it is also challenging to connect the composite sheets together and patch a damaged section.



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*Prof. Zhongwei Guan,
Executive Director, AMRC*

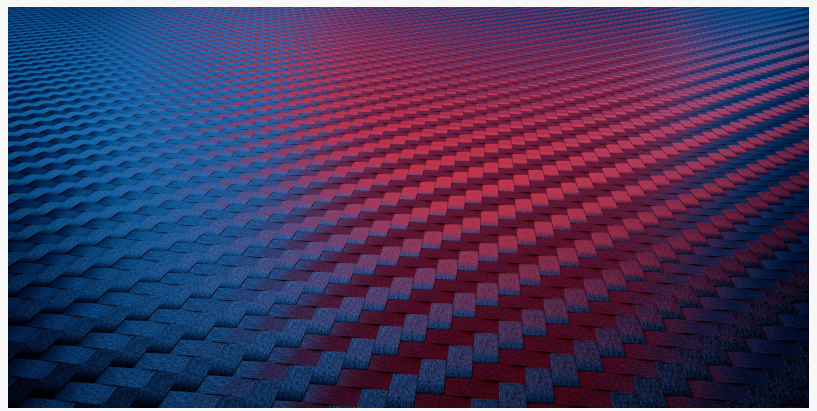
Larger products like airplanes and cars require the assembly of multiple composite sheets into a finished product. And if an airplane suffers damage, technicians need to securely patch a fresh sheet of material around the damage. But these joints where multiple sheets connect are not as strong as the rest of the composite sheet.

Researchers at the Technology Innovation Institute's [TII] Advanced Materials Research Centre have been exploring new techniques for joining these sheets using thicker carbon thread than previously explored. This could lead to

sturdier products like airplanes and cars besides improving the strength of repairs.

Prof. Zhongwei Guan, Energy Absorption and Composite Materials, Executive Director at AMRC, said: “Usually, the repair patch leads to weakened overall structure. With this approach, we are trying to affix a repair patch with the same strength as the mother material.”

Researchers, manufacturers, and repair technicians have explored a variety of approaches for joining composite fabrics, including adhesives, rivets, nuts, and bolts, or a combination of these. A technician drills multiple holes in overlapping sections and affixes the rivets or bolts to connect and repair the area.



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This included stitching the composite sheets using thin wires with a diameter usually less than 1 mm. The AMRC researchers are exploring the characteristics of joining composites with carbon fibre threads of 2-4 mm in diameter. "It is important to balance out the strength of a thicker fibre thread against the effects of a larger diameter hole which weakens the fabric to be connected or repaired," Prof. Guan said.

This research is still in its early days because it is difficult to stitch using such thick fibre thread through a composite component with a large thickness. There are no machines to stitch these thick fibre threads with composite laminates or sandwich to date.

Now, the team is helping to analyse the relative performance of various kinds of single-lap and double-lap weaves. Once they have identified some of the best patterns and stitching techniques, they hope to develop a machine that can automate this process.

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