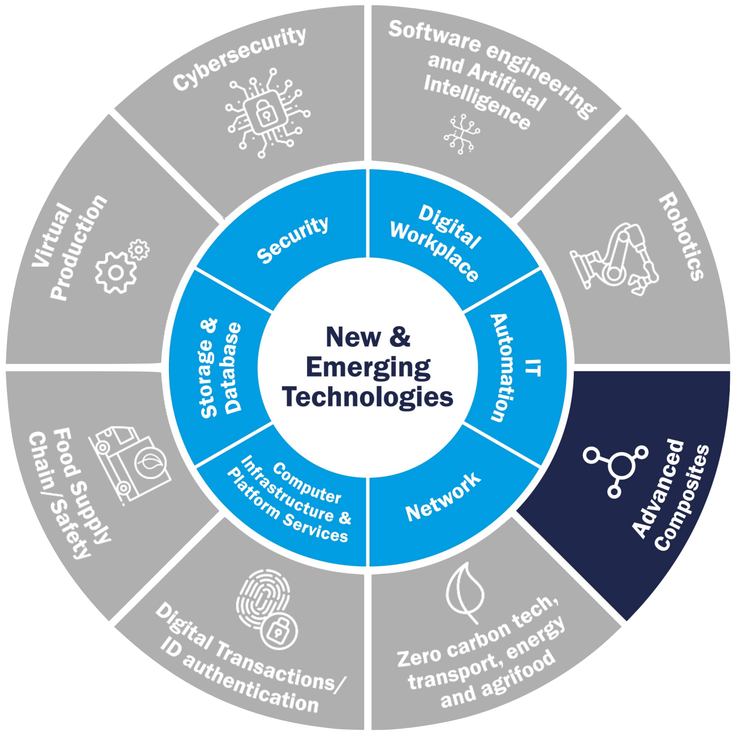


Sources	Composites World	Date	February 2021

Potential scale of impact	Certainty of outcome	Impact horizon
★★★★	★★★★	H1 H2 H3

Composites researchers at the University of Sheffield are collaborating in a European-wide project to develop self-responsive aerospace composites that it is hoped will significantly reduce greenhouse gas emissions and production costs as the aviation sector works toward a net zero goal by 2050. Sheffield is leading the aerospace section of the project to develop three main technologies: self-cure, self-anti-icing and self-sensing.

The team is developing materials through the integration of carbon nanotubes (CNTs) — measured in billionths of a meter — which can be turned into smart products, and are now building a section of a composite leading-edge wing to show the self-cure, self-anti-icing and self-sensing materials in action.

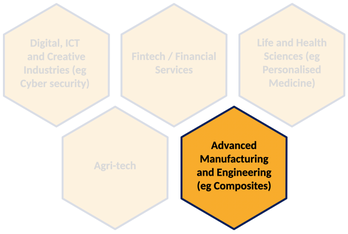
The development of all three technologies centres on the electrically conductive nature of the composite structure, which is vital as the industry moves to more electrified aircraft, with the ultimate aim of one day being fully electric.

The team have developed a new manufacturing technique - self-curing - which is cheaper and faster than the current method of autoclaving. They have developed a heating system where a power supply is directly connected to the composite structure and a current is run through it, heating it up.

Conventional de-icing is achieved by drawing hot air from the engine to melt the ice, but this takes power away from the engine and is less efficient. The newly developed anti-icing system doesn't require separate heating elements in the component.

Self-sensing monitors the electrical resistance of the part to detect damage. Barely visible impact damage (BVID), causes changes in resistance that can be monitored in order to detect where the damage is. This is significantly more effective than the current method of visual inspection.

Developing these smart functionalities has required development of the resin, mixing carbon nanotubes into it so that the whole part is conductive, not just the fibres.



SELF RESPONSIVE COMPOSITES

Reducing GHG emissions and production cost in the aviation sector

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