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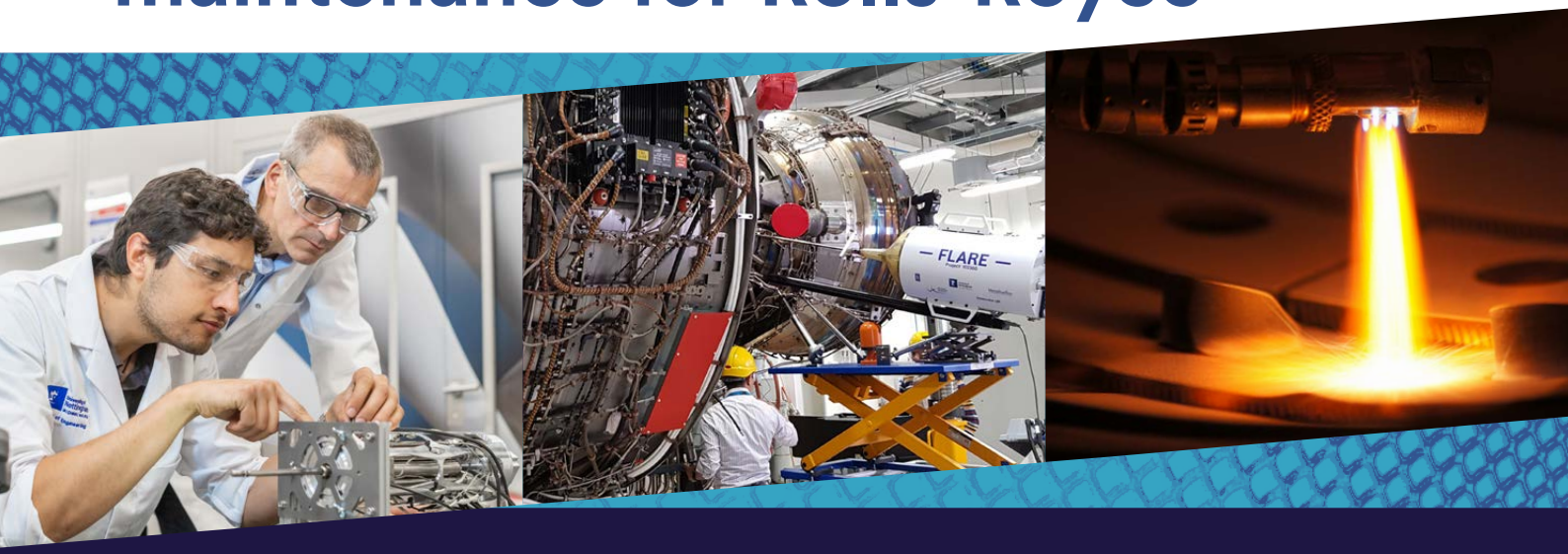
Engineering impact

The robots bringing about a revolution in on-wing engine maintenance for Rolls-Royce



With 4,500 civil aero engines in service globally and a need to maximise their availability for service, The Rolls-Royce University Technology Centre (UTC) for Manufacturing and On-Wing Technology has developed a new generation of bespoke robots capable of carrying out maintenance without removing engines from the wing.

This is no easy feat – aero engines require maintenance to micron-level tolerances, but restricted access to the internal components within a confined, complex and dark engine make in-situ repairs challenging.

The solution? A team led by Professor Dragos Axinte has developed robots capable of snaking their way around an on-wing engine to perform in-situ repairs, operating end-effectors at all angles and to precision tolerances. These robots are improving operational efficiency for Rolls-Royce and minimising disruption for air passengers.

Based on kinematics modelling and research into calibration methods, advanced actuation, and smart navigation systems, the UTC developed the world's first teleoperated bore-blending robot, the award-winning REINER. This can carry out complex repairs to engines in remote locations while being controlled by an expert based at Rolls-Royce's Aircraft Availability Centre in the UK, removing the need for specialist engineers to travel and reducing engine downtime from days to hours.

Another development known as FLARE, comprises a pair of snake robots flexible enough to travel through an engine before collaborating to carry out patch repairs to damaged thermal barrier coatings.

> "Reducing aero engine maintenance downtime from days to hours"

> "Robots capable of snaking their way around an on-wing engine to perform in-situ repairs"

Find out more
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University of Nottingham in partnership with Rolls-Royce