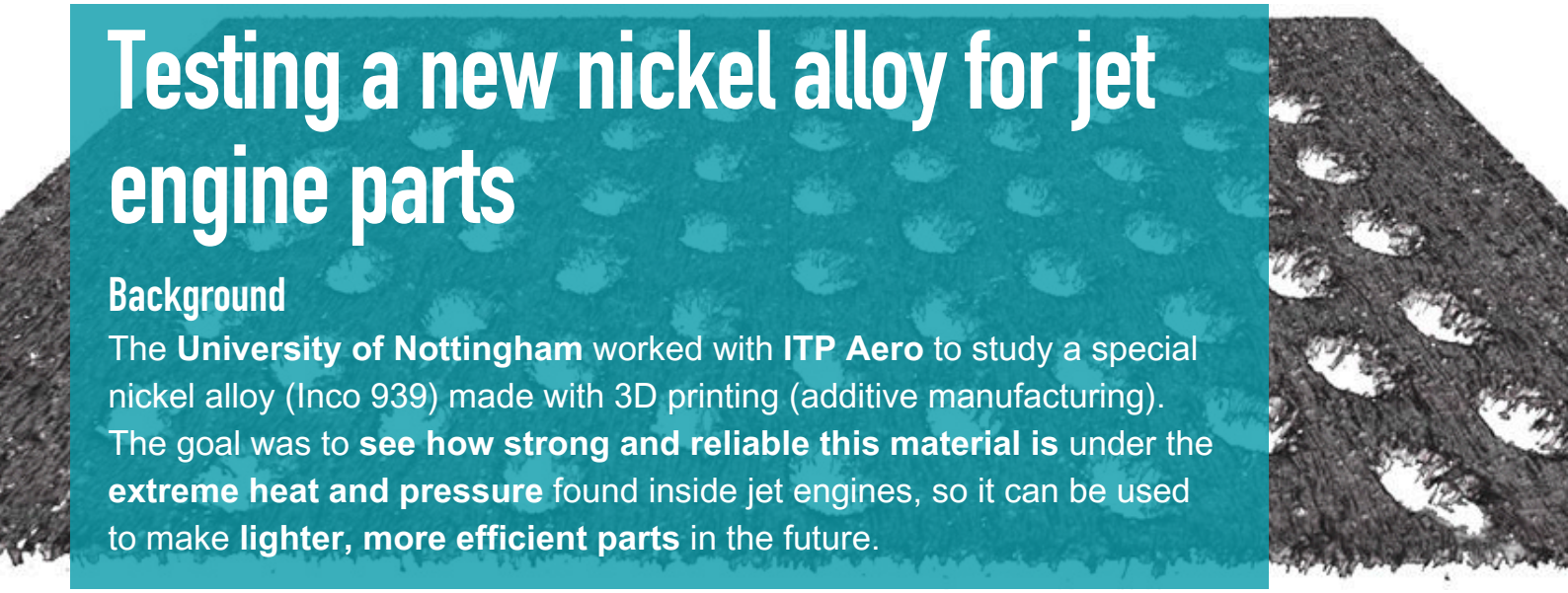
Funded by UK Government

Funded by CLAIRE WARD MAYOR OF THE EAST MIDLANDS | East Midlands Combined County Authority

Testing a new nickel alloy for jet engine parts



Background

The **University of Nottingham** worked with **ITP Aero** to study a special nickel alloy (Inco 939) made with 3D printing (additive manufacturing). The goal was to **see how strong and reliable this material is** under the **extreme heat and pressure** found inside jet engines, so it can be used to make **lighter, more efficient parts** in the future.

The challenge

Jet engines have parts that face very **high heat and force**, especially in the combustor and turbine sections. These parts must be **extremely safe and durable**.

3D printing can make them lighter and allow new shapes that **improve efficiency** — but only if we know exactly how the material behaves. Currently, there isn't enough data to confidently use 3D-printed materials for these critical parts.

Key achievements

- Generated crucial data on how **3D-printed Inco 939 performs in engine-like conditions**
- Created **new testing techniques** for small, hot, high-stress metal samples
- Laid the groundwork for **using 3D printing in safety-critical jet engine parts**

What's innovative about this project?

This project created some of the **first detailed test results for 3D-printed Inco 939 in real jet engine conditions**. The team:

- **Made and tested very small metal samples** to copy the heat and stress inside engines
- Measured surface quality and strength to **check if they meet design needs**
- Studied the internal structure of the metal under a microscope
- Developed new ways to measure how the samples bend and stretch at very high temperatures

Next steps

The team plans to use this data to **build accurate computer models** and **design next-generation engine parts** that are **lighter, safer, and more fuel-efficient**.

Why this matters for the East Midlands

This work strengthens the region's **expertise in sustainable advanced manufacturing** and supports its role as a l**eader in zero-emissions propulsion technologies**. By enabling **lighter and more efficient engine components**, the project contributes to **reducing fuel burn and emissions across the aerospace sector**.