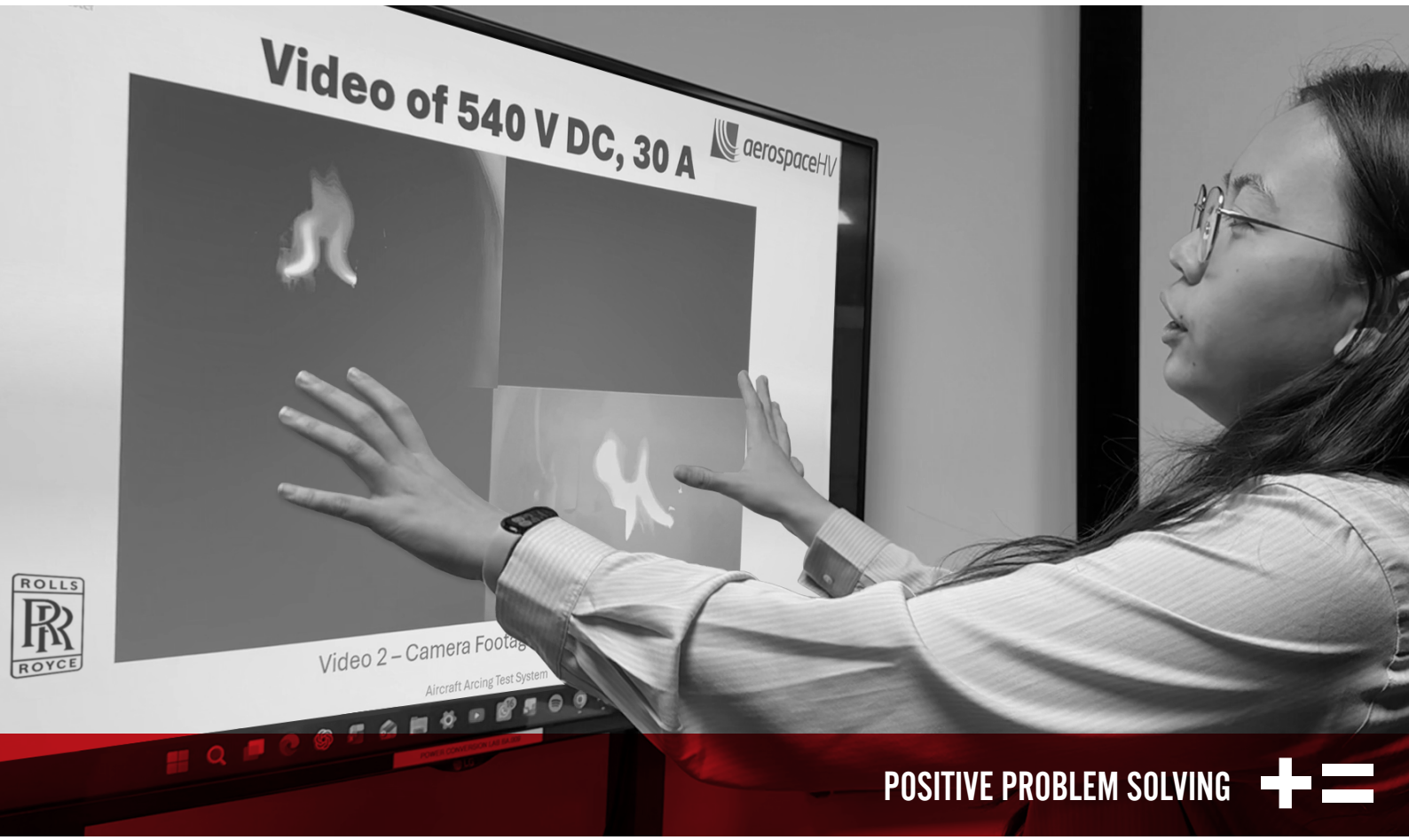
CASE STUDY

aerospaceHV

MANCHESTER 1824
The University of Manchester



POSITIVE PROBLEM SOLVING

TO INVESTIGATE ARC FAULT BEHAVIOUR, A UNIVERSITY OF MANCHESTER TEAM NEEDED A FLEXIBLE POWER SYSTEM TO BRIDGE THE GAP BETWEEN RESEARCH AND APPLICATION.

When designing robust aircraft safety systems, electrical arcing needs to be considered as an inevitability. Common causes include mechanical wear and insulation failure. Arcing is hard to detect, generates intense heat and can damage wiring or nearby structures.

As aerospace transitions toward more-electric architectures at higher voltages, the danger posed by arcing increases. Understanding arc characteristics and propagation will support the development of effective detection methods, improving aircraft safety.

During their final year research, a team of six MEng students developed a test rig to generate arcs in controlled conditions. An atmospheric chamber was used to produce low pressure environments, replicating altitudes up to 60,000 feet.

A voltage is applied to a pair of electrodes that are initially touching. As they gradually separate, an arc forms. The characteristics of this arc are monitored and recorded.

Traditional test set-ups consist of a separate power supply and resistive load. ETPS supplied a dual channel bidirectional DC power system to the group, with single point of control.

Professor Ian Cotton, stated “Two independently programmable channels allow one unit to emulate source resistance and constant power load characteristics simultaneously.”

“DC converters typically operate as constant power loads. As an arc develops, the voltage and current consumed by the ETPS power system vary in real time, emulating what would happen on the aircraft.”

> “TWO INDEPENDENTLY PROGRAMMABLE CHANNELS ALLOW ONE UNIT TO EMULATE SOURCE RESISTANCE AND CONSTANT POWER LOAD CHARACTERISTICS SIMULTANEOUSLY.”

ETPS
ELECTRONIC TEST & POWER SYSTEMS

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CASE STUDY
UNIVERSITY OF MANCHESTER & AEROSPACEHV

A SPARK OF INNOVATION

Professor Cotton added, "The unit is flexible, allowing us to program both channels independently or connect them in series or parallel. Having a highly dynamic power system enables us to rapidly adjust voltage and current set points during transient events."

"A range of user adjustable safety features enable us to protect the power unit and our test objects from damage during unforeseen events. The system also has excellent communication capabilities."

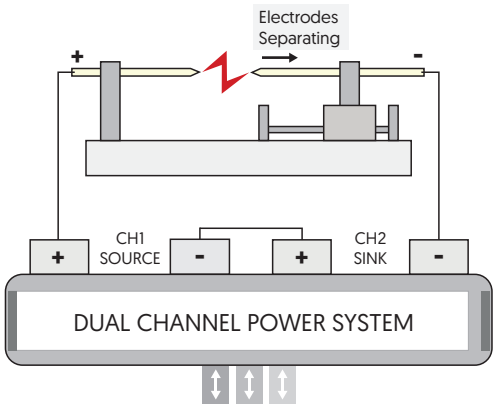
The students are supported by industry specialists from aerospaceHV and Rolls-Royce. Sofia Mavidou, UTC Coordinator and Engineer at Rolls-Royce, explained "Delivering safe products is imperative to us. Investigating different arc fault scenarios is essential for effective mitigation. The team at the University is providing extremely valuable data."

When asked about working with ETPS, Professor Cotton replied, "We found the support from ETPS to be excellent. They've been incredibly responsive as we've needed help and swiftly handled all of our queries about operating the power system."

Belonging to the prestigious Russell Group, the University of Manchester was founded in 1824. It consistently ranks within the top 10 best universities in the UK. The University features a £9m high voltage lab, which is the biggest electrical infrastructure test and research facility in UK academia.

Rolls-Royce opened the University Technology Centre (UTC) to work closely with a wealth of talent and creativity at Manchester's world-class academic institute. Their focus includes electrical system architectures, energy management and fault reconfiguration.

Close support is also provided by aerospaceHV. The company are global leaders in the design, development and validation of high voltage electrical systems required in electric transport.



ARC TESTING WITH SEPARATE SOURCE AND LOAD

> "HAVING A HIGHLY DYNAMIC POWER SYSTEM ENABLES US TO RAPIDLY ADJUST VOLTAGE AND CURRENT SET POINTS DURING TRANSIENT EVENTS."

ABOUT MULTI CHANNEL DC POWER SYSTEMS

Our multi channel bidirectional systems are available with two or four DC channels. Each channel operates independently as either a DC source or load. Variables programmable per channel include voltage, current, power and resistance.

When testing multiple devices, selected units can recycle energy between channels above the nominal power of the system. For example, a 650kW system can recycle up to 2.88MW between channels by sinking on one channel (e.g. from a battery pack) and using the energy directly in the second. This allows high power devices to be tested without upgrading grid infrastructure.

Operating in series around a midpoint earth for split +/- voltages is also possible for certain models. This is essential for proper testing of midpoint earth or split voltage test pieces, such as those used in aerospace and marine environments. The midpoint can be connected to the protective earth or to a floating 0V line.

Unlike single channel systems that create a midpoint earth by using a capacitive filter, our multi channel systems can cope with imbalances in voltage or current up to the maximum ratings of the channel. This allows the testing and emulation of imbalanced load conditions.

If you'd like to discuss how an ETPS system could launch your aerospace test program, contact us today.