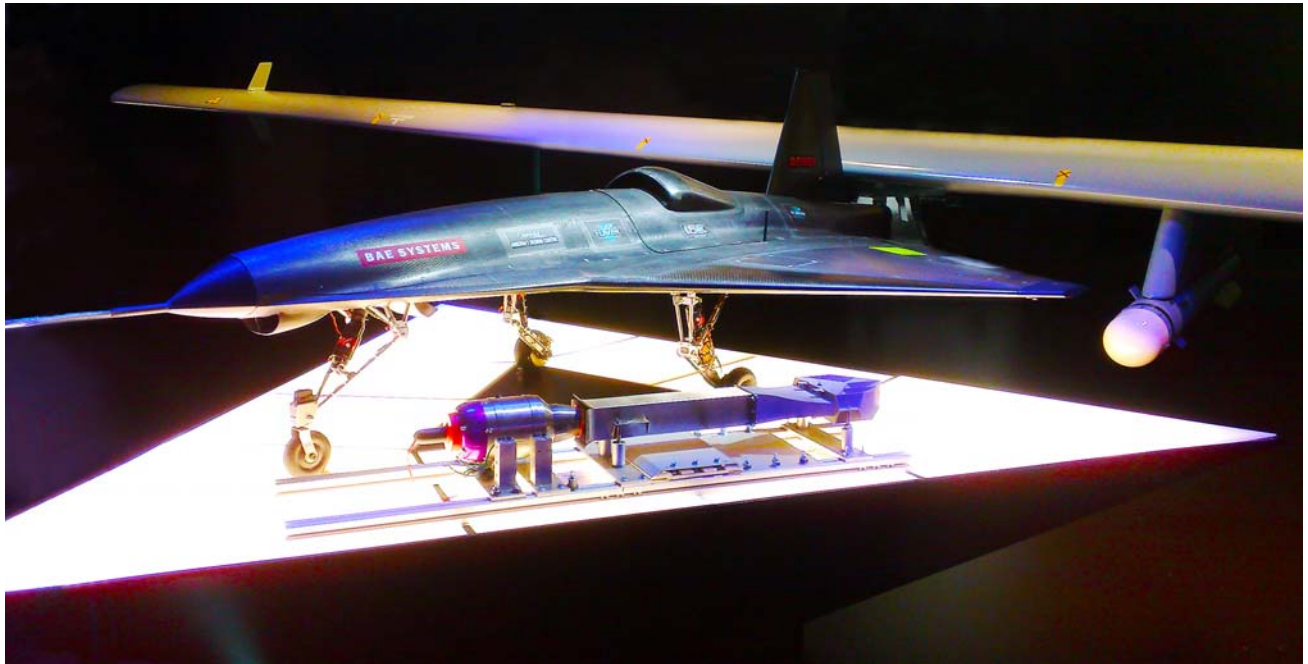
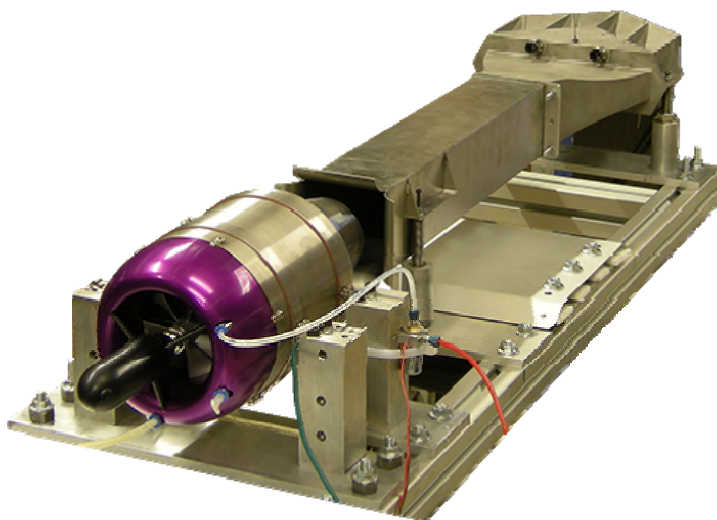


## Our Research Work on Display at Farnborough Airshow



The DEMON aircraft is the major output of the FLAVIIR programme, which was instigated by BAE Systems and EPSRC in 2004 to develop new technology for future Unmanned Combat Air Vehicles (UCAVs). In particular, it was recognised that mass, observeability ('stealth') and maintenance aspects of the design could benefit if the conventional flapped control surfaces used to manoeuvre the aircraft were eliminated.

## A Fluidic Thrust Vectoring (FTV) Nozzle



A team at the School of Mechanical, Aerospace and Civil Engineering (MACE) led by Dr Bill Crowther has several years of expertise in the development of control technologies that allow this aspiration to be met, using blowing of compressed air to generate control forces. A technology known as Circulation Control (CC) is used to alter the lift generated by each wing, giving roll control. Fluidic Thrust Vectoring (FTV) uses secondary jet nozzles and curved surfaces above and below the engine exhaust, to angle the thrust vector from the engine and provide control in pitch. Both technologies achieve their respective effects with no external moving parts.

Simulation, laboratory experiments and flying model tests were conducted by MACE researchers, which culminated in a team led by Dr Jonathan Potts and Dr Steve Liddle achieving integrated FTV control with a jet

engine in flight trials of the JAVA aircraft in February 2010. Development of a practical FTV nozzle system for the 80kg DEMON aircraft built by Cranfield University proceeded in parallel. A laser sintering additive manufacturing process was used to build the complex nozzle geometry. Design and analysis work was undertaken in Manchester by John Ashley and David Willmot in collaboration with Materials Solutions Ltd and BAE Systems.

Bench testing of the system was carried out by Dr Andrew Kennaugh, in order to clear the nozzle for flight and provide performance data for the integrated control system designed by Ian Lunnon.

The Demon aircraft and MACE nozzle system were exhibited in July 2010 at the Farnborough Airshow as part of the main BAE Systems technology exhibition, with flight trials expected to start in September 2010.