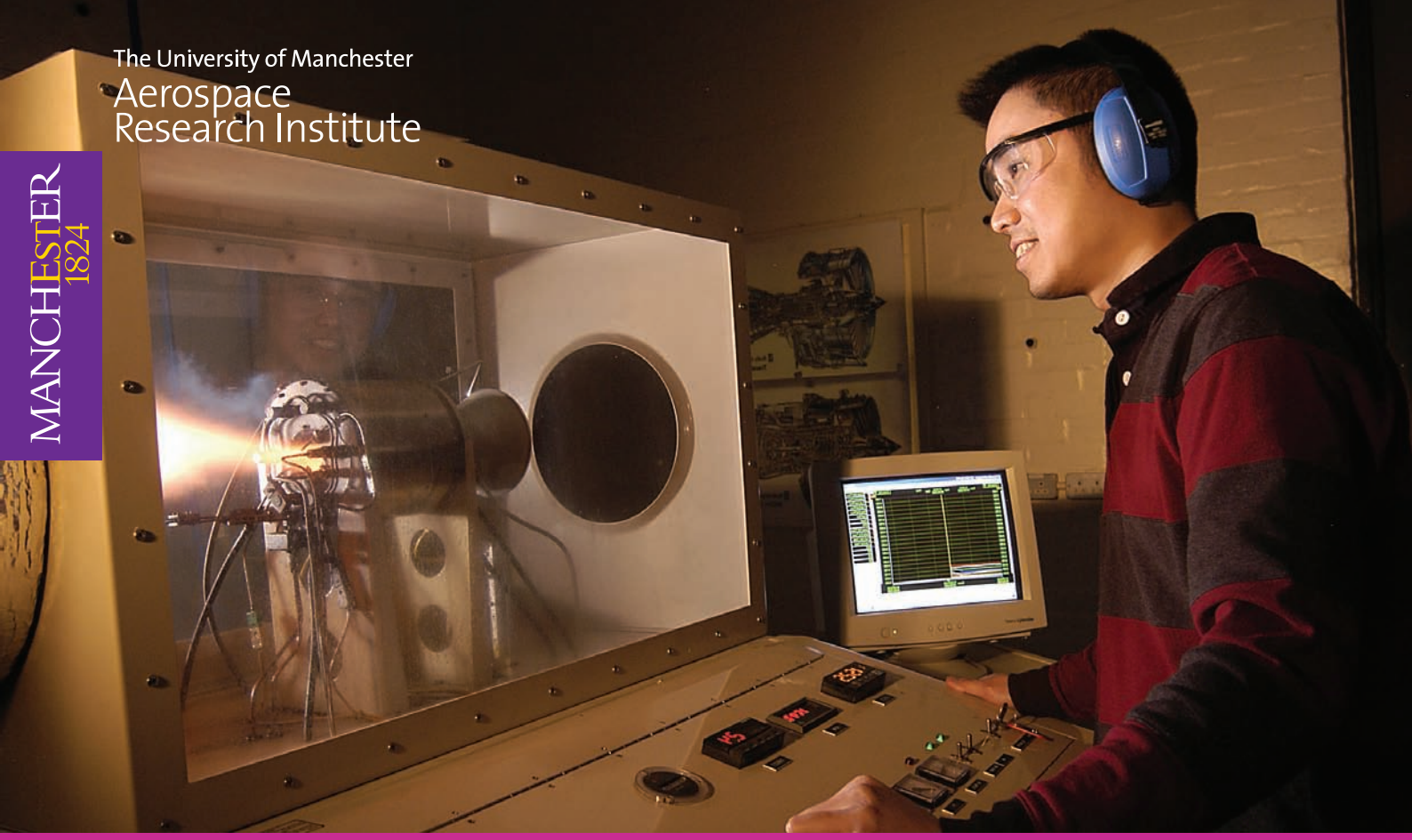
The University of Manchester
Aerospace
Research Institute

MANCHESTER 1824



Environmental Technology for Advanced Aeropropulsion

Improving the environmental performance of aircraft is critical to the long term sustainability of the aerospace industry. Within the National Aerospace Technology Strategy, the research themes are identified as:

- Combustion: System cost reduction and durability improvements through extended component life design, materials and manufacturing.
- Noise: Substantial modification of analysis/design methods for engine aeroacoustics to understand and subsequently alleviate various noise sources and propagation mechanisms. Development of novel active noise control technologies including a newly designed acoustic shielding strategy.
- Performance: Step change increases in turbomachinery component efficiency/reduction in fuel consumption through improved engine operating cycle and improved aerodynamics/reduced drag on engine and airframe.

The Energy and Multi-Physics Group tackles a wide range of problems within aerospace: aerodynamics, energy systems, turbomachinery, combustion, heat transfer, spray and multiphase flows.

- Extensive academic and applied expertise in concept design and development of modern aero gas turbines
- Various EPSRC and industry funded fundamental/applied research undertakings for unit aerothemochemical process elucidation/exploitation for environmental purposes

Research areas

Computational research

- Atomisation
- Computational high-temperature aerophysics
- Computational chemistry
- LES for turbomachinery component analysis and design
- Computational aeroacoustics
- Analytical/computational thermoacoustic studies
- Computational methodologies and submodel development for reacting flow LES
- Combustion synthesized nanoparticulates
- Computational environmentally friendly engine design

Experimental research

- Heat transfer measurement techniques
- Gas turbine heat transfer and aerodynamics
- Flow control
- Acoustics (including flame-induced) and signal processing
- Stereo imaging of flame diagnostics

Theoretical studies

- Combustion modelling
- Atomisation and spray modelling
- Thermo-acoustic instability
- Difference Potential Method (DPM) for acoustic shielding

Research facilities

Combustion laboratory

The combustion laboratory has several lab scale burners for both fundamental research and teaching. An industrial gas turbine combustor (1 megawatt) has been installed for testing and research.

Besides the conventional diagnostic techniques the group is also known for in-house developed unique and innovative diagnostic techniques including a variety of signal and image processing capabilities incorporating multi-channel data acquisition, high speed imaging and stereo imaging.

Fluids laboratory

The fluids laboratory has a number of wind tunnels from low speed (including a Mach 0.3 turbine cascade wind tunnel) to hypersonic, as well as several water flumes. Various laser systems for the measurement of fluid velocity and particle/droplet size and concentration and facilities for the measurement of temperature using both conventional thermocouple and liquid crystal technologies exist.

Relevant postgraduate study

MSc Thermal Power and Fluids Engineering

The University of Manchester has provided an internationally recognised Masters programme in Thermal Power and Fluids Engineering for many years.

Academic staff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