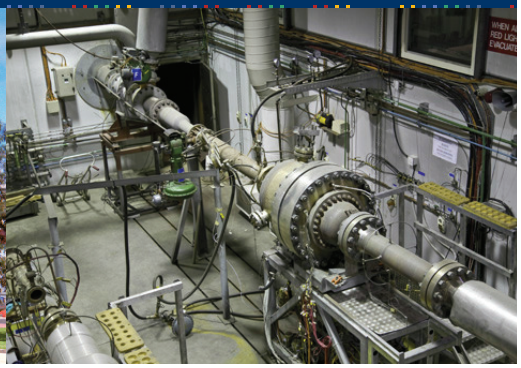
Australian Government
Department of Defence
Defence Science and Technology Group



Major Propulsion Systems Facilities

The Defence Science and Technology Group (DST Group) is the Australian Government's lead agency charged with applying science and technology to protect and defend Australia and its national interests. DST Group delivers expert, impartial advice and innovative solutions for Defence and other elements of national security.

DST Group has a number of world-class facilities to test and design propulsion systems and related technologies. Among these facilities are the Combustion Test Facility, Cyclic Spin Test Facility, Helicopter Transmission Test Facility, Small Engine Test House, and the Fuel Tank Farm. The facilities are located at DST Group's Fishermans Bend site.

Combustion Test Facility

The Combustion Test Facility (CTF) is purpose-designed to test hot section components from many modern and older gas turbine engines at simulated engine operating conditions. These components are usually tested in a rig designed to withstand the appropriate pressures and temperatures. In the CTF, the components can be instrumented, modified and tested without risking damage to a complete engine. This is often done in a manner that would be impossible, or at least very costly, in a full engine. Once the component has satisfactorily completed rig tests, in-service evaluation in operating engines can commence.

The CTF can simulate conditions in engines continually at:

- pressures up to 30 atmospheres;
- inlet temperatures of up to 650 degrees Celsius; and
- air mass flows of up to 9.5 kg/s.

It can also be operated with fuel/air ratios of up to 0.03 and can reduce pressures inside the test rigs to simulate pressures at altitudes of up to 10,000 metres.

During a testing program, many parameters are measured and these may include:

- exhaust gas measurements of carbon monoxide and dioxide, oxides of nitrogen, unburnt hydrocarbons and smoke;
- metal temperatures;
- combustion limits such as those for light-up and flame-out conditions;
- heat transfer from the flame, and;
- quality of the temperature profile at entry to the turbine section of the engine.

These parameters are normally recorded on a data acquisition system that was specifically designed for the facility and, where applicable, all measurements are carried out to international standards.

The CTF is capable of testing two different fuel types simultaneously and is equipped with a high pressure fuel nozzle spray facilitiy.

Combustion Test Facility Control Room

Main pictures: (left) Combustion Test Facility and (right) Combustion Test Facility Test Rig