High Temperature Test Facilities




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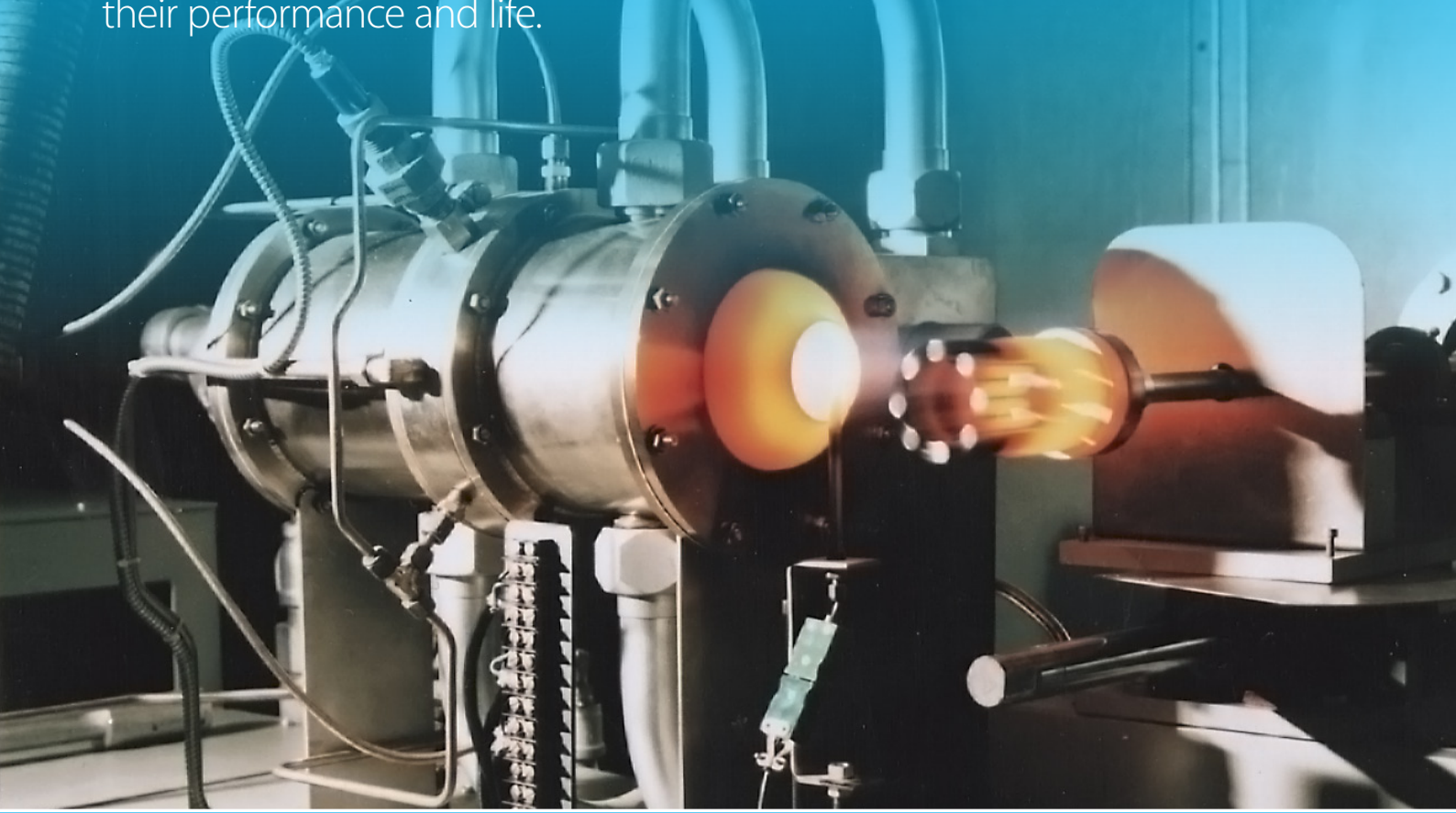
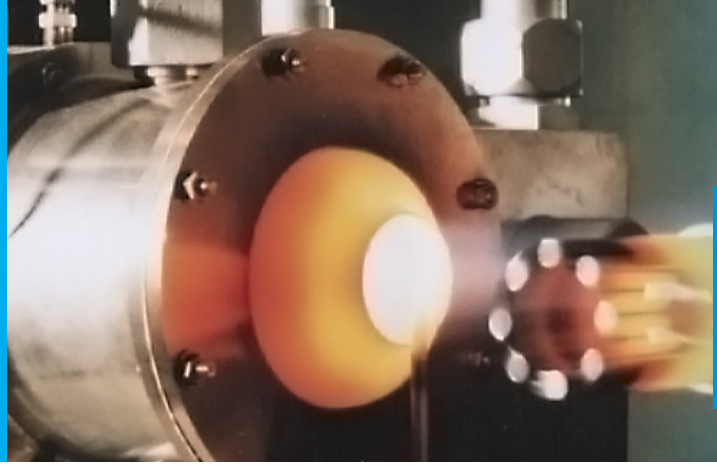
Turbine inlet temperatures in gas turbine engines are still increasing for improved performance and efficiency. Therefore advanced superalloys and coatings have been developed to withstand the extreme environmental conditions in the hot section of gas turbine engines. NLR can test these material/coating systems under simulated service conditions to determine their performance and life.





"BURNER RIG FOR TESTING AT TEMPERATURES UP TO 1650 °C"

Simulated service conditions

The National Aerospace Laboratory NLR of the Netherlands operates two facilities for testing parts of gas turbines (blades, vanes) in high-temperature gas flows. Comparative tests can be carried out under simulated service conditions including pollutants, erodents and thermal shocks. This way, coatings, materials and repair methods are evaluated for several customers which operate, manufacture and repair gas turbines. NLR has two high temperature test facilities for different applications.

Burner Rig

In the high-temperature Burner Rig, small specimens are studied in a test zone of 50 mm diameter in which flight-by-flight temperature profiles can be simulated with temperatures up to 1650 °C. The maximum velocity of the gas flow in the test area is Mach 0.8.
The high temperature Burner Rig features both pollutant and erodent injection and offers the use of alternative fuels. Temperatures can be monitored accurately by thermocouples and pyrometry.

Compressor Test Rig

NLR's Compressor Test Rig has a test zone of 200 mm x 50 mm, with block temperature control. The air flow has a maximum temperature of 700 °C and a maximum velocity of Mach 0.6.
This test rig is capable of injecting both pollutants and erodents. In addition, it features a facility for testing for thermal fatigue by cycling between the hot test zone and cold air or even water.

Post-test analysis

For analysing test specimens after a test, NLR uses advanced equipment including optical microscopes and scanning electron microscopes, equipment for micro-analysis, image analysis and a variety of non-destructive testing techniques.

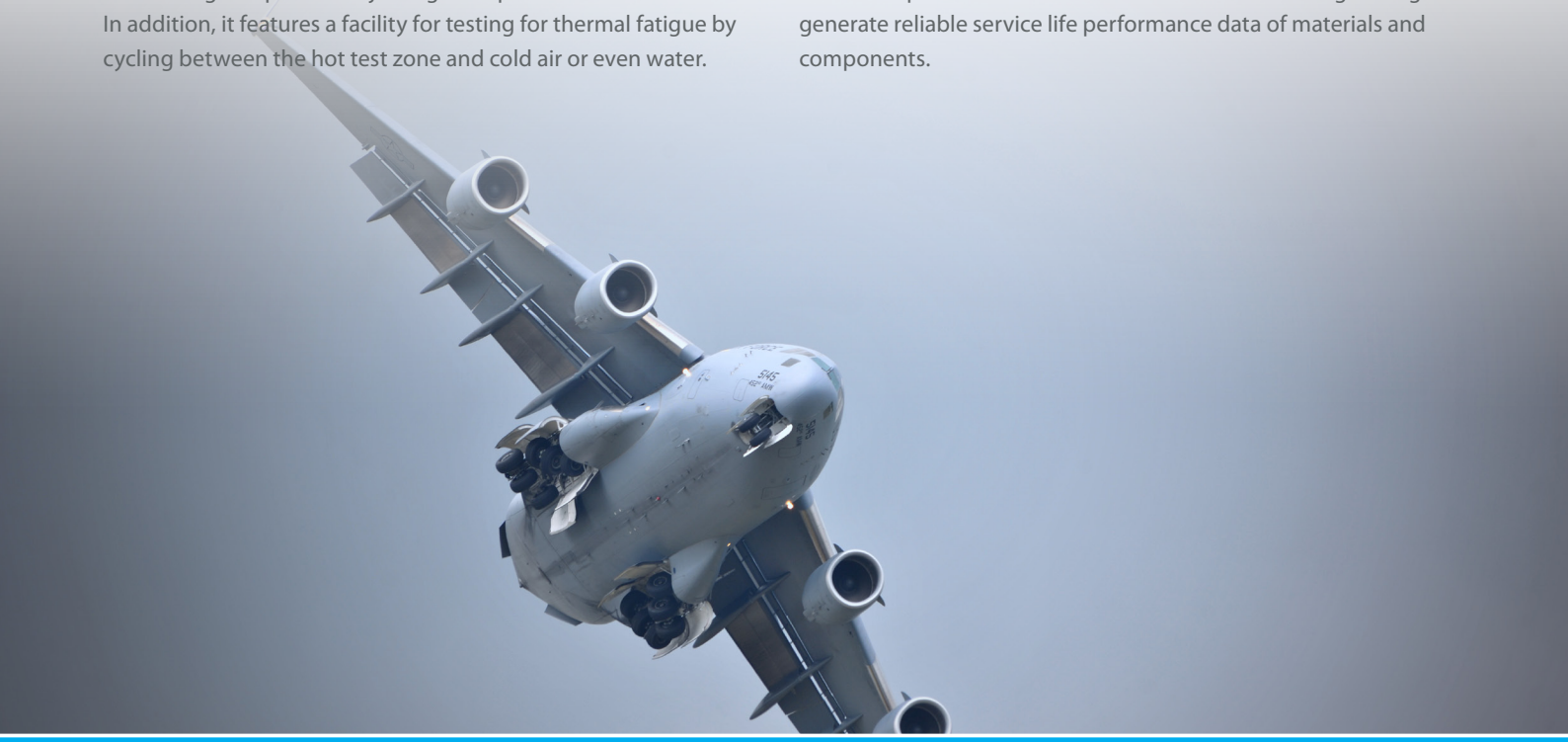
Numerical simulation

Numerical tools enable NLR to analyse:

- heat transfer
- transient thermal loads
- temperature distributions
- thermo-mechanical stresses

Numerical simulations contribute to setting up the appropriate test conditions.

Numerical parameter studies combined with burner rig testing generate reliable service life performance data of materials and components.



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