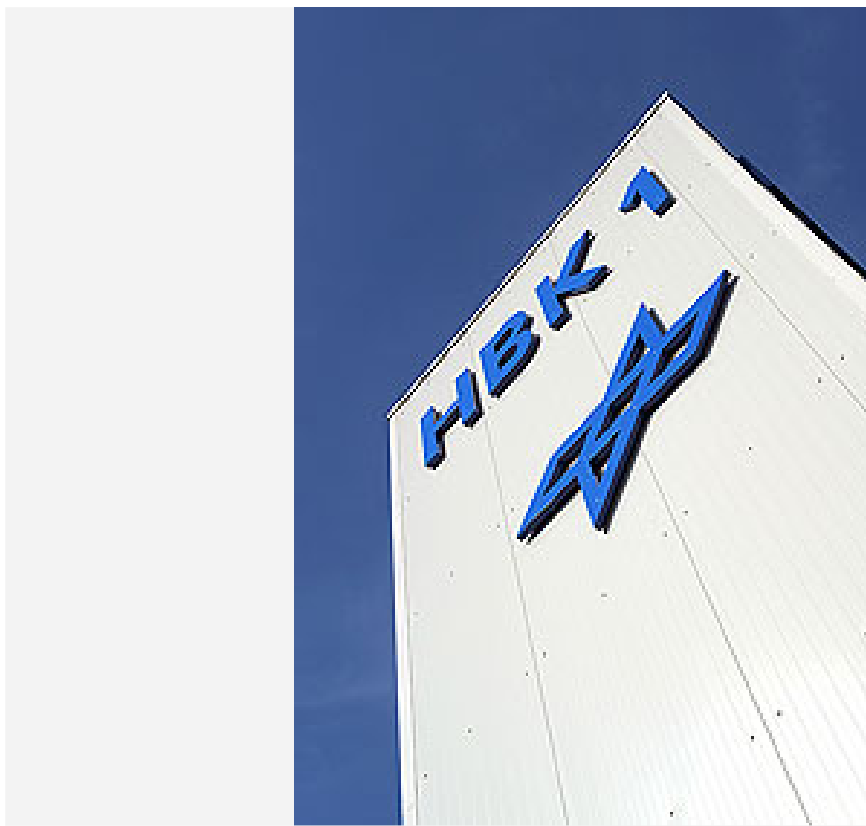


News Archive Cologne

Low-pollution combustion: DLR commissions a new combustion chamber test rig

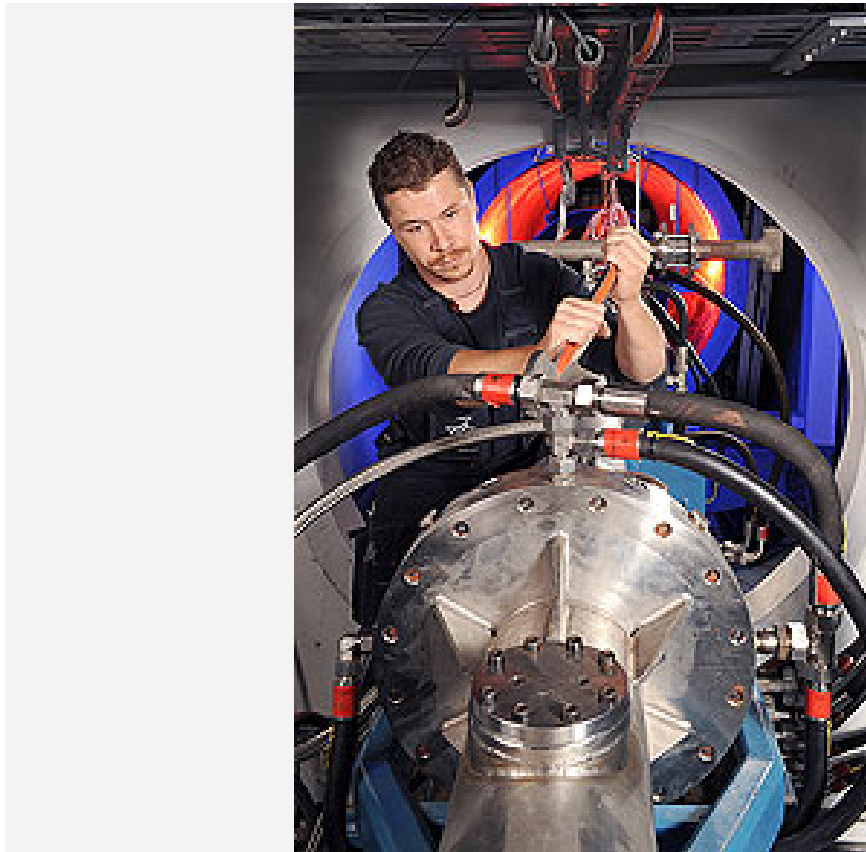
5 October 2009



Exhaust flue on the modernised HBK 1

The Institute of Propulsion Technology at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) in Cologne now has one of the most modern test rigs for researching low-pollution combustion. The HBK 1 high-pressure combustion chamber test rig was officially inaugurated today by DLR Management Board member Prof. Joachim Szodrich, the Director of the DLR Institute of Propulsion Technology, Prof. Reinhard Mönig, and the Technology Development Director for Rolls-Royce Germany, Dr Helmut Richter.

New propulsion units for civil aviation will be required to operate with greatly reduced levels of pollutant emission. The relevant European body, the Strategic Research Agenda (SRA) is talking about a reduction of up to 80 per cent in emissions of oxides of nitrogen. "To achieve this challenging objective, aero engine manufacturers are working on a new combustion chamber concept known as the lean-burn principle. This involves cutting combustion temperatures, the most effective way of achieving the reduction in emissions required on environmental grounds", stated Prof. Szodrich, who went on to add: "This is a field where DLR, with its scientific and applied engineering expertise as well as its facilities and infrastructure, can make a decisive contribution."

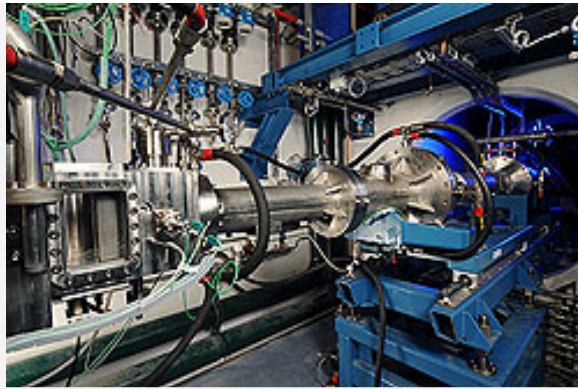


Final preparations prior to commissioning of the test rig

DLR and Rolls-Royce are breaking new ground in their efforts to assist development in this field of research. The lean-burn units for future generations of aero engines are being examined at full scale in a combustion chamber accessible by means of laser metrology techniques. Dr Richter had this to say on completion of the first series of tests: "The images from the test runs demonstrate a hitherto unrivalled quality standard in the operating characteristics of our latest burner developments. Our experts are really enthusiastic about the prospects afforded by this unique test rig. We can hardly wait for all the laser metrology equipment to be installed, which will enable us, in collaboration with DLR, to develop the next generation of burners for our propulsion units and aero engines."

DLR test rig for lean burners is unique in Europe

The optical combustion chamber in the HBK 1 facility augments another high-pressure combustion chamber used by Rolls-Royce in HBK 3, another of the test rigs at the DLR Institute of Propulsion Technology. In this HPSS (High Pressure Single Sector) combustion chamber, the emissions and operating characteristics of lean-burn units are measured across the entire operating range of an aircraft engine, from idling up to take-off speeds. This calls for air pressures of up to 40 bar. In the new BOSS (Big Optical Single Sector) combustion chamber in HBK 1, laser metrology techniques at an atmospheric pressure of 20 bar can be used to research the interaction of airflow and combustion as well as the role that fuel spray has to play in the process. The aim is to gain a better understanding of how pollutants are formed and ultimately to accelerate the development of low-emission combustion chambers. To this end, a test rig previously used for conventional combustion chamber trials has been updated and extended with an additional measuring section. The financial backing required for this test rig is being provided by DLR, while funding for the new measuring section is being provided by the aerospace research programme of the German Federal Ministry of Industry and Technology (Bundesministeriums für Wirtschaft und Technologie; BMWi) and Rolls-Royce.



The heart of the test rig: the combustion chamber

This means that the test rigs operated at the DLR Institute of Propulsion Technology can be used together to simulate, at full scale, the large civilian aircraft engines in the Rolls-Royce Trent class. Engines in this class are used primarily in long-haul aircraft, whose emissions at high altitudes are very much the focal point of efforts to cut pollutant levels. To achieve the objective of creating "powerful and at the same time environment-friendly engines", the test rig and the research results obtained from it will be employed in German and European research projects.

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