WHAT GIVES US IMPETUS

CENTRI-FUGALLY COMPRESSED

Peter Jeschke came to RWTH Aachen University after spending many years working in industry. Above all else, the professor has mainly devoted his time to working on centrifugal compressors that compress combustion air in the turbochargers of marine diesel engines, among other things. He enjoys trying out extraordinary ideas with young, intelligent and highly motivated doctoral candidates and students.

PETER JESCHKE

More pressure from less weight

In a machine hall at RWTH Aachen University, the world's first jet engines sit directly next to one another: the BMW 003 and Junkers Jumo 004 built in Germany and the British Rolls-Royce Derwent. The hall belongs to the Institute of Jet Propulsion and Turbomachinery. The head of the institute, Professor Peter Jeschke, points out the exhibits with a grand gesture. 'These here are the first mass-produced jet engines for aircraft,' he explains. 'They illustrate the different processes used to compress air.' The German engines used axial compression, which means that the air flows parallel to the axis of rotation and is generally compressed in numerous compressor stages. 'This method later gained acceptance on aircraft, but was still rather risky and unstable in this early incarnation,' explains Jeschke. The British approached the task in an altogether more robust manner: they used a single-stage centrifugal compressor whose centrifugal force largely drove the airflow outwards in a stable manner, providing the necessary increase in pressure.

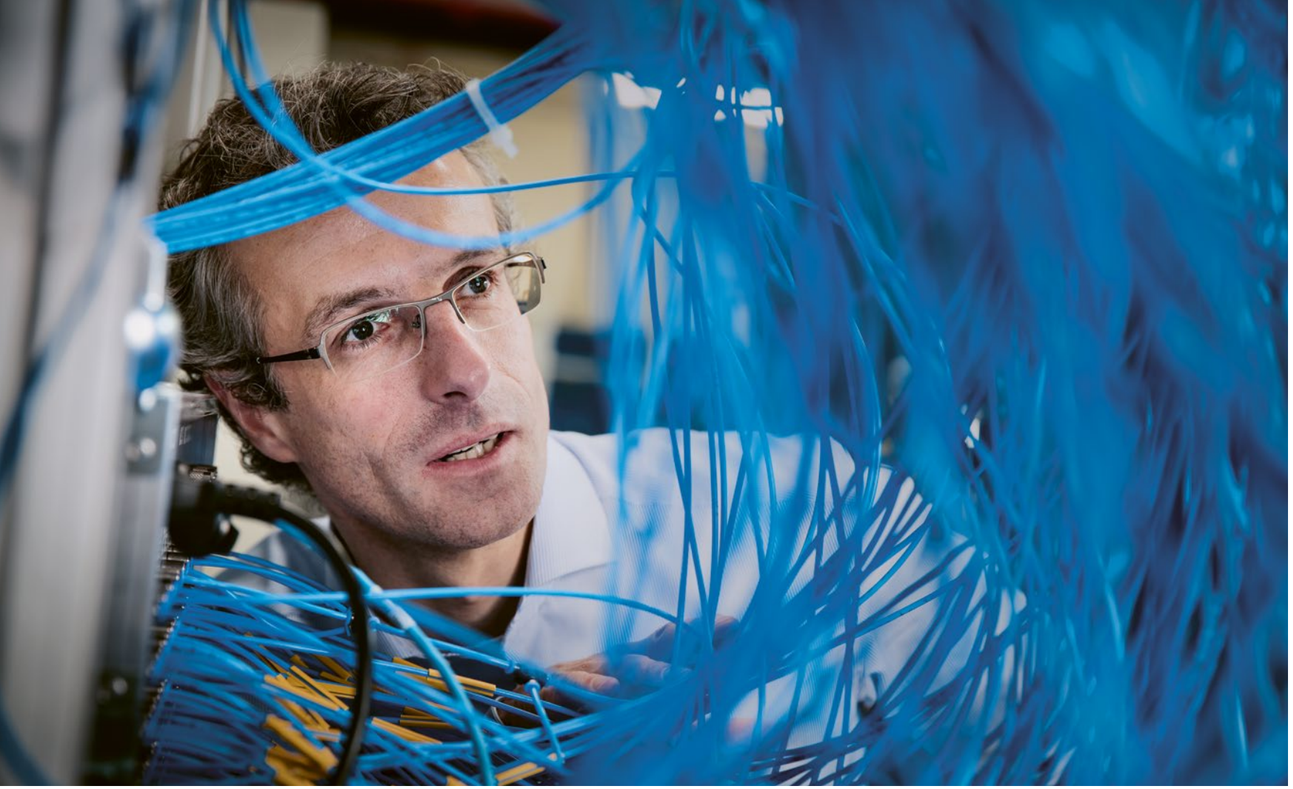
PROF DR PETER **JESCHKE**

Born 1968

Peter Jeschke was born in St. Georgen in the Black Forest and grew up near Frankfurt. After leaving school he enrolled on a general mechanical engineering course at the **TU Darmstadt** in 1988. During the course, he studied for a master's degree in aerospace engineering at **Cornell University** in the USA from 1991 to 1992. After graduating he worked at the TU Darmstadt as a scientific assistant while undertaking his doctoral studies, which he completed in 1998. He worked in industry for ten years, firstly at **Siemens** for three years, then at **MTU Aero Engines** for five years and **Leistritz** for two and a half years. In his role as professor, he has been head of the Institute of Jet Propulsion and Turbomachinery at **RWTH Aachen University** since 2007. Jeschke is married and has two children.

Such centrifugal compressors have been the specialist field of the institute in Aachen for some time. 'We have a tradition that dates back more than 30 years and are renowned for our expert knowledge in the field of centrifugal compressors in professional circles,' says Jeschke proudly. Turbo compressors are used in combustion engines to increase performance by compressing the air flow, thereby supplying more air for the fuel combustion process in a combustion chamber whose volume remains unchanged. 'Centrifugal compressors have a broad range of applications, because they can generate more pressure with little weight in small spaces and thus produce higher performance than axial compressors,' says Jeschke. 'The price paid for high power density, however, is often a lower level of efficiency. In addition, they are not suitable for higher mass flows.' Accordingly, axial compressors are predominantly used in aircraft engines these days. Centrifugal compressors, meanwhile, are the preferred choice in turbochargers for marine diesel engines or those fitted in road vehicles, but also in the process industry, for example, to produce technical gases.

Jeschke has been head of the Institute of Jet Propulsion and Turbomachinery since 2007. It currently employs 75 people, including 45 doctoral candidates. 'I came here after previously moving around quite often,' explains Jeschke. Born in the Black Forest and raised near Frankfurt, he initially showed an interest in maths and physics. One of his sister's friends then steered his interest towards mechanical engineering, which was altogether more tangible. Jeschke enrolled on a course at the TU Darmstadt and soon became one of the best students in



his year, earning a scholarship from the German Engineering Federation (VDMA) and the German Electrical and Electronic Manufacturers Association (ZVEI) to study for a master's degree in aerospace engineering at Cornell University in the USA. He subsequently worked in Darmstadt as a scientific assistant for five years and wrote his doctoral thesis on the subject of technical thermodynamics.

'I then came to the turbomachine rather by chance – through my first job at Siemens,' reports Jeschke. In Mülheim he spent two years working as part of a team to develop a new high- and medium-pressure blade concept for steam turbines used to generate power. He then moved to Munich, joining MTU Aero Engines, where he stayed for five years and, among other things, oversaw the development of an MTU high-pressure compressor for the Airbus 318. Finally, he went to Nuremberg to work for the machinery and plant manufacturer Leistritz, managing the central development department there for two and a half years. 'But I found my real mission in life here at Aachen University,' says Jeschke. 'I take inspiration from working with young and highly motivated people who want to try out different ideas, some of which are quite extraordinary. Close cooperation with industry also makes it possible to conduct research on real problems and products. But unlike my time in industry, I am my own boss here and can plan my own working day.' It is also important for him to be close to his family. In summer, the father of two children sometimes packs the tent and sleeping bag and heads for the great outdoors to camp with like-minded fathers and children. Jeschke also likes to keep active in his spare time, mostly on his mountain bike, with which he regularly crosses the Alps from Oberstdorf to Lake Garda.

Jeschke can mostly be found at his institute, however, overseeing many different research projects. His most important project at present is a new large-scale test stand, which he has been working on in conjunction with the FVV since 2011. The project is concerned with validating the simulation of complex impeller geometries in centrifugal compressors. With investment of more than three million euros, Jeschke is building a soundproof room with reinforced concrete walls and is procuring the necessary equipment, including a two-megawatt electric motor. The test stand has been in operation since April 2016; two further FVV projects will look at how the efficiency level can be raised while cutting noise emissions. The compressor increases the air pressure by a factor of up to seven and thus can no longer be compared to the centrifugal compressor in the British Rolls-Royce Derwent.

Testing extraordinary ideas with young people

Photo: *The Institute of Jet Propulsion and Turbomachinery at RWTH Aachen University has modern test stands as well as historical exhibits.*