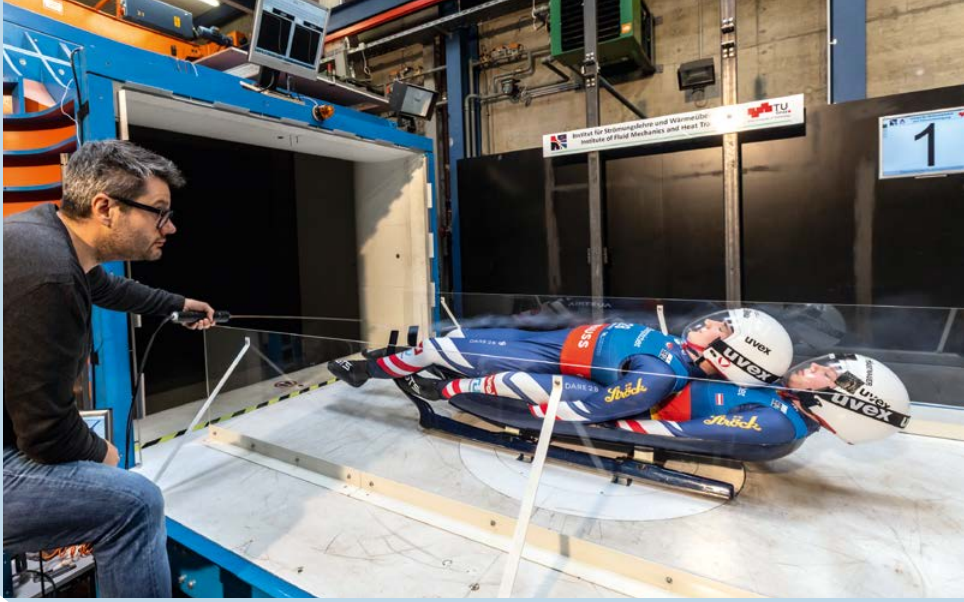
Research with Headwind

Two wind tunnels that can generate air flows of up to 140 kilometres per hour enable aerodynamic tests of all kinds at TU Graz. Tenured Professor Christoph Irrenfried of TU Graz and the Institute of Fluid Mechanics and Heat Transfer are investigating, for example, new types of aircraft propulsion, ventilation techniques for cities and buildings, and even the optimal posture for athletes on competition sleds.

The two Göttingen-type wind tunnels are located at Inffeldgasse 25F. They form a closed air circuit, which means that all the air that is blown out of the nozzle into the measuring section is recaptured on the other side. The air streams can be accelerated to up to 140 kilometres per hour by the fans – two in the smaller wind tunnel and three in the larger – each with a power of 50 kilowatts. “No human being would be able to withstand that speed,” says Christoph Irrenfried, deflecting the question of whether he himself has ever stood in the wind. “However, up to 20 km/h is possible without any problems.”



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But it was not until spring that people were sent into the moving air again – in this case the Austrian national luge team. The athletes tested the optimal lying position with the lowest air resistance on their own sleds on a simulated race track. “We can measure all the acting forces and moments here: the air resistance from the front, the lateral forces, the lift and the moments in all three spatial directions,” explains Irrenfried. Here, a static object has air blown at it, but in reality it is the other way round, which is a challenge. Where in reality the still air is completely free of disturbances, the fans in the wind tunnel generate eddies, causing measurement inaccuracies This problem was solved by using flow straighteners in the wind tunnel, which “calm” the out-flowing air. “We can thus achieve a deviation of less than 0.15 per cent,” says Christoph Irrenfried proudly.

It is not only the increase in performance of the luge team that is the subject of research. Sustainability, above all, is the focus of other projects. For example, the effective ventilation of buildings or entire cities, which not only ensures cleaner air, but can also save energy that would traditionally have to be used for ventilation fans. Or a new type of aircraft propulsion system that could operate completely without emissions – both in terms of pollutants and noise. This would be possible through an electrical corona discharge that would take place between two electrodes and generate ionic winds that could in turn power an aircraft. “The experiments so far are very promising. But we are still only at the demonstrator stage at the moment and it still needs in-depth basic research.” ■