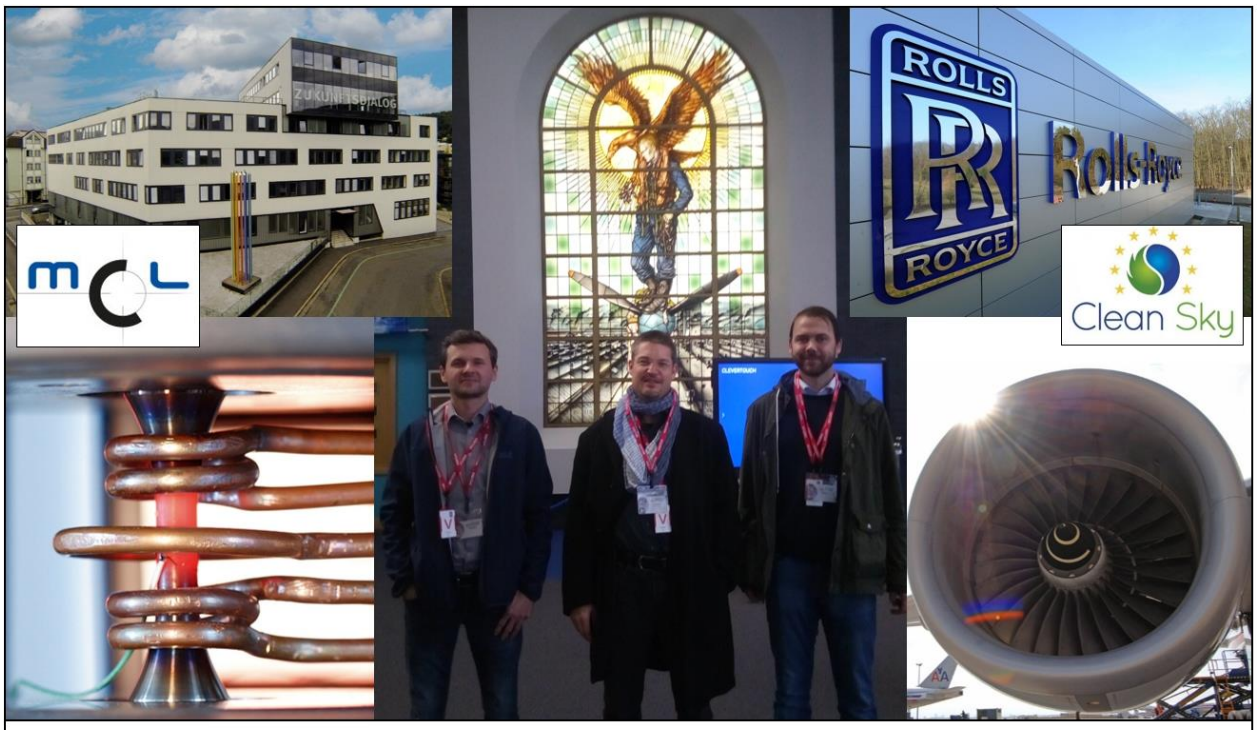
Testing innovative high-temperature materials for aircraft engines

High fuel efficiency and lower overall weight requirements call for lighter materials that endure even higher turbine speeds and higher temperatures than the materials used today.

Recently, Titanium-Aluminide (TiAl) alloys were developed that are half the density of Nickel-based alloys which they could replace while still being able to operate at temperatures up to 750°C.

- But will the new alloys withstand the loads in the aircraft engines?
- What happens if harmful service conditions cause a small dent on a TiAl turbine blade rotating at approx. 10.000 rpm at a high temperatures?
- How long will it take for a small crack that is only a few µm long to grow until the part fails?



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MCL researchers work in the EU programme CleanSky together with Rolls-Royce plc

FFG Bundesministerium Verkehr, Innovation und Technologie
Bundesministerium Digitalisierung und Wirtschaftsstandort
SFG NEUES DENKEN. NEUES FÖRDERN.
Das Land Steiermark Wirtschaft und Innovation
Tirol Standortagentur
LAND OBERÖSTERREICH

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To answer such key questions, researchers at Materials Center Leoben Forschung GmbH have set up so-called „**fatigue crack growth measurements**[1]“ at temperatures up to 800°C in close collaboration with Rolls-Royce plc in Derby, UK.

Within the project „**TiAlCracks**[2]“ (funded within the Horizon 2020 Joint Undertaking **CleanSky2**[3]) next-generation TiAl alloys are tested at various temperatures and load conditions; the test results are an important input to the design process of the IP turbine of the **UltraFan engine**[4].

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[1] R. Pippan et al. “A comparison of different methods to determine the threshold of fatigue crack propagation”
[2] Cordis project description “TiAlCracks”: Crack growth threshold analysis in TiAl alloys
[3] Horizon 2020 Joint Undertaking CleanSky2
[4] Rolls-Royce plc homepage „Future of flight -Our new generation of engines will transform flight, setting new benchmarks in efficiency, environmental performance and precision engineering”