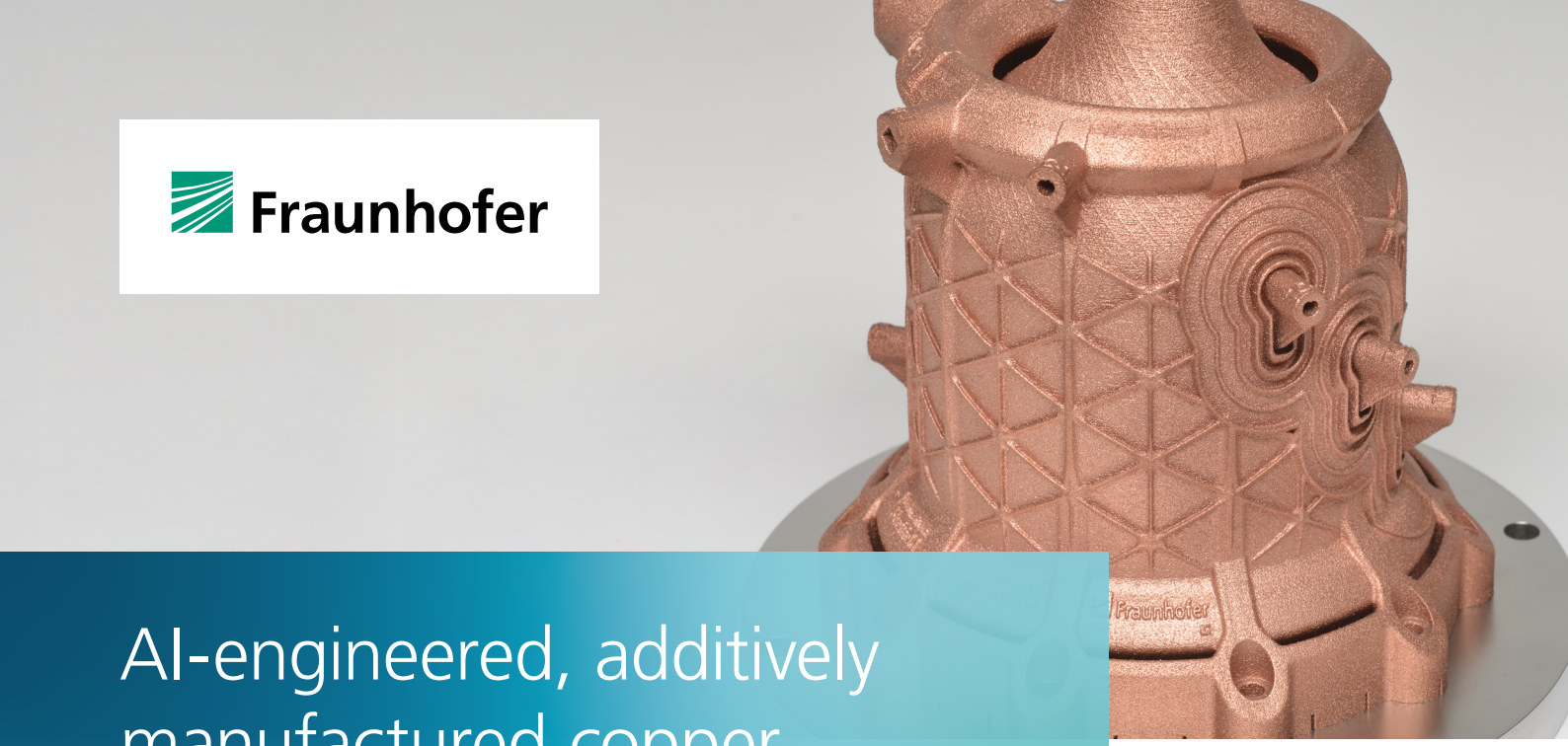

AI-engineered, additively manufactured copper aerospike engine

From computational design to first-try hot-fire: a monolithic CuCrZr aerospike successfully built via Laser Powder Bed Fusion (PBF-LB/M)

LEAP 71's Noyron-designed aerospike moved from algorithm to ignition via a four-way partnership: Aconity3D manufactured a monolithic CuCrZr engine by PBF-LB/M, Fraunhofer ILT refined it by heat treatment, the University of Sheffield supported preparation and testing culminating in a successful 5 kN hot-fire.

The project fused computational engineering with industrial metal AM to realize a cryogenic KeroLOX aerospike. LEAP 71 generated the engine geometry using its Noyron model, optimizing combustion, cooling and manufacturability as a single component. Fraunhofer ILT spin-off Aconity3D manufactured the engine from aerospace copper alloy CuCrZr on an AconityMIDI+ via PBF-LB/M. After depowdering by Solukon, Fraunhofer ILT performed heat treatment to achieve the required thermal conductivity and strength of the specialized alloy. The University of Sheffield's Race-2-Space team prepared the unit for hot-fire testing and supported test operations.

The 5 kN aerospike was unveiled at Formnext 2024 and later hot-fired successfully on the first attempt, validating cooling performance, structural integrity and ignition stability. The toroidal chamber around a central spike maintains high efficiency from sea level to the vacuum of space. Combined with a monolithic build, the design minimizes leakage paths, fasteners and lead time while boosting thermal performance in copper.

This collaboration shows that AI-authored, print-first rocket hardware can move from to hot-fire testing rapidly, de-risking scale-up to larger thrust classes and accelerating flight-relevant development cycles.

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exhibit overview

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