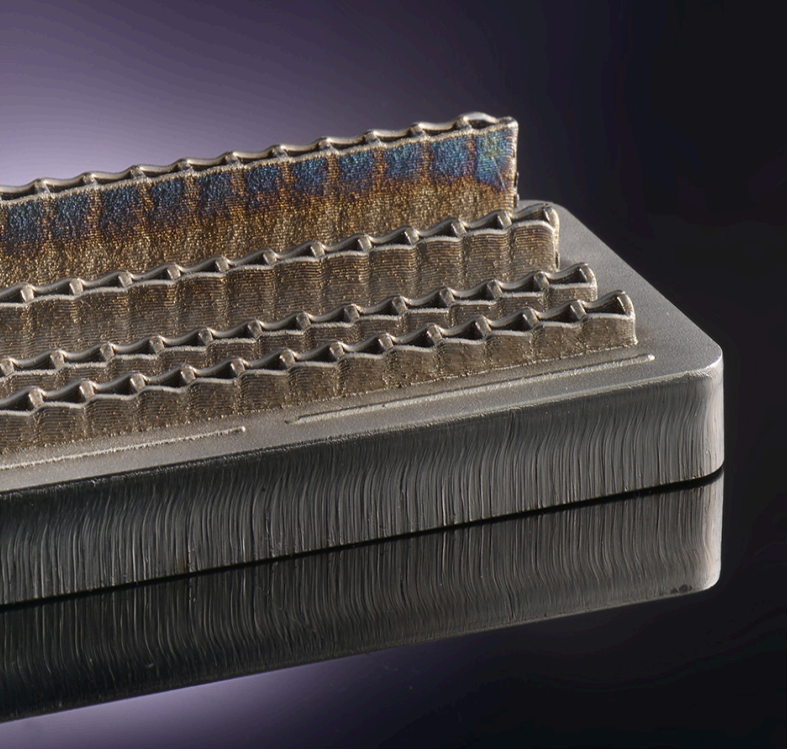

*1 Thin-walled cooling channel samples.*
*2 CAD model of the demonstrator to be manufactured, © ArianeGroup.*

# Additive manufacturing of a rocket nozzle for space travel

Not only does the space industry have to fulfill political climate protection requirements, it is also under increasing pressure to lower costs as international competition grows. To ensure Europe remains competitive, ArianeGroup and 17 other partners are cooperating in an EU project to develop cost-effective and climate-neutral space components for the next generation of rockets. Fraunhofer ILT is involved in the process development and construction of a full-scale rocket nozzle demonstrator in the meter range using laser material deposition (LMD). When thrust nozzles for launch vehicles are conventionally manufactured, multi-stage process steps and processing stations are used, which are not only expensive, but also require a great deal of time. The project partners aim to significantly reduce these by means of additive manufacturing using LMD.

## Scalable installation spaces thanks to LMD technology

As part of the process development, Fraunhofer ILT investigated various path planning strategies for creating the required cooling channel structures. In the following steps, the institute will continue to develop the findings by building ever larger segments and sample bodies to validate the manufacturing process and the material properties. After successful validation, a production demonstrator with the corresponding dimensions of the real components will be build up. The large and flexibly scalable installation space of LMD technology enables such large components to be additively manufactured efficiently.

## Construction of cooling ducts with thin walls

When the process parameters were being developed, the hot gas wall was designed with thin walls so that efficient cooling of the thrust nozzle can be ensured. The partners are investigating and continuing to develop various parameters and construction strategies for the different wall thicknesses needed for an efficient nozzle wall with cooling channel structure in order to produce larger nozzle structure.

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