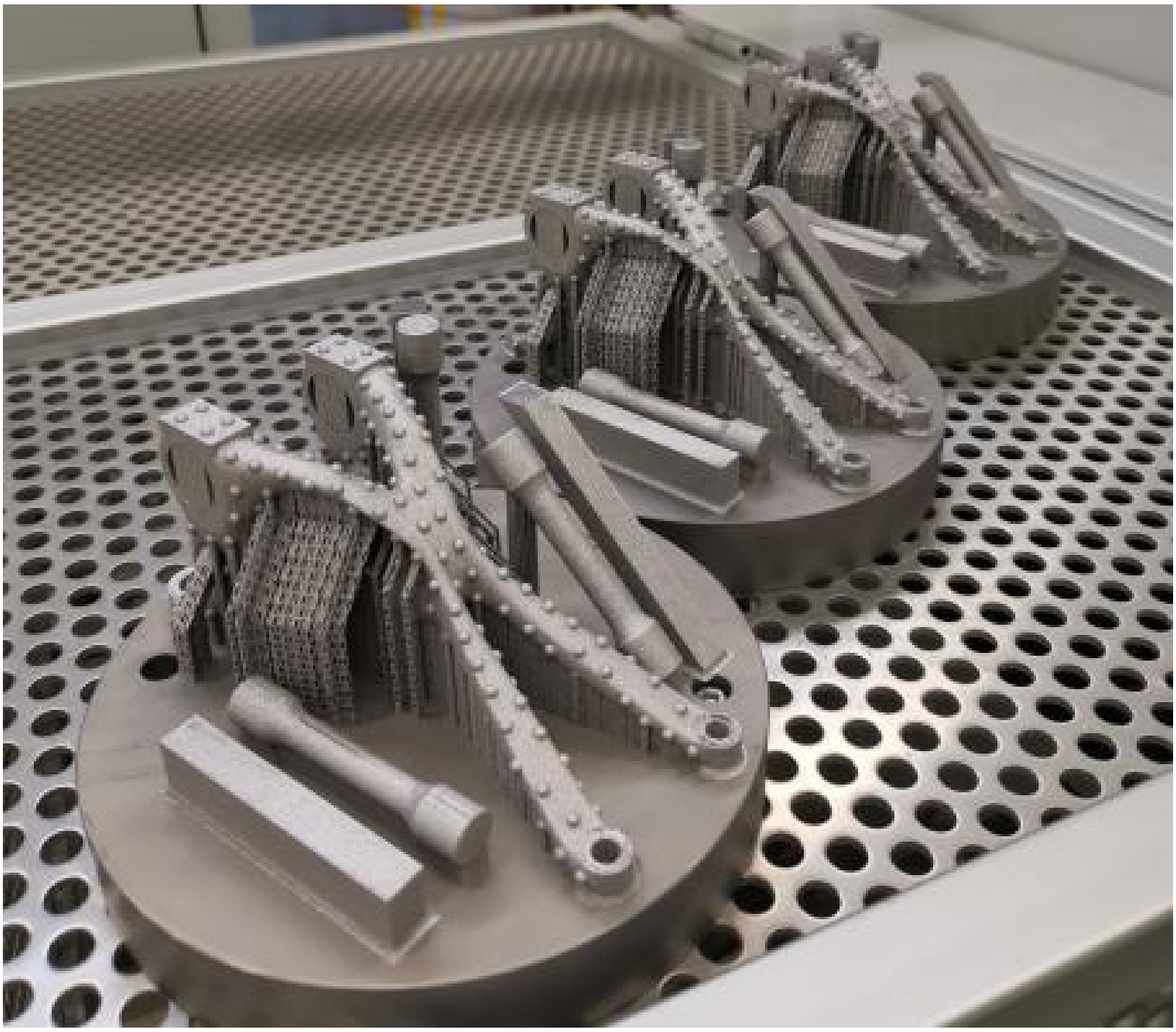
Ensuring the quality of 3D-printed components: bionic components for aviation

About this project



ENABL3D

Ensuring the quality of 3D-printed components: bionic components for aviation

Markets:

Material: Aluminium, Magnesium, Steel, Titanium, Others (Metals)

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This project is funded by the Technology Transfer Programme Leichtbau (TTP LB) of the Federal Ministry of Economics and Energy.

Technology Transfer Program Leichtbau

Context

3D printing technologies offer great potential for lightweight construction, as they enable particularly complex and lightweight structures. For example, 3D printing can be used to produce bionic lightweight components for aviation, which can significantly reduce aircraft CO# emissions. Inline quality assurance is essential for these safety-critical components. This is because the elements have to be closely inspected before they are installed in passenger and cargo aircraft. The problem is that printed parts of the same design can have slight differences.

Traditionally, accompanying samples are produced in the same printing process, which are then subjected to destructive testing. However, it is difficult to transfer the material characteristics of the accompanying samples to the real components due to process fluctuations. The results of the material sample tests can therefore not be transferred one hundred percent to other components. Conventional destructive tests are not an alternative due to the high resource and energy requirements. The same applies to expensive technologies such as X-rays.

Purpose

In the ENABL3D project, researchers are developing a new method for efficient quality assurance in bionic metal 3D printing. The team aims to reduce the costs of verification by at least 60 percent and the time required for this by at least 65 percent. This opens up new application possibilities, for example in aviation, the automotive industry and medical technology. As 3D printing conserves resources and the bionic lightweight components consume less CO# during use due to their lower weight, large amounts of greenhouse gas emissions can be saved.

In addition, the method is to be widely used after the end of the project through standards and exchanges with industrial partners.

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Procedure

The project team is developing a testing method with which every single component from the 3D printer can be tested non-destructively. The researchers record the quality properties by intelligently combining indentation testing, process monitoring and micro-computed tomography. To do this, they determine the relevant material properties, such as tensile strength, yield strength, ductility and anisotropy, directly on the component.

Thanks to high-resolution monitoring data, they can verify the process stability and thus transfer the locally measured properties to the overall component. They can also identify any critical areas. Using micro-computed tomography, the researchers can then additionally check the areas classified as critical in a non-destructive manner.

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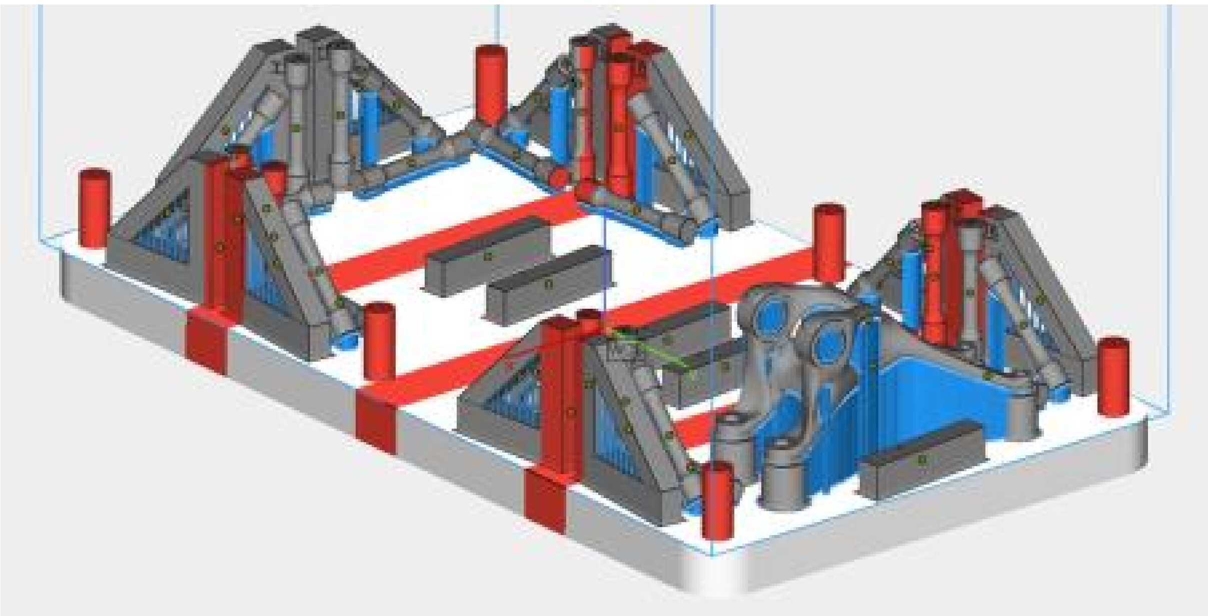

Funding duration:

Funding sign:	03LB5000	**Funding amount:**	EUR 1.3 million

Final report

Further websites

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Project coordination

Contact:

Mr Stefan Grottker

+49 040 484010-763

stefan.grottker@iapt.fraunhofer.de

Organisation:

Fraunhofer Research Institution for Additive Manufacturing Technologies

Am Schleusengraben 14
21029 Hamburg
Hamburg
Germany

www.iapt.fraunhofer.de/

English (EN){{ Projektpartner }}

Lightweighting classification

	Realisation
Offer	
Products Parts and components, Semi-finished parts	✓
Services & consulting Standardisation, Validation	✓

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Lightweighting classification

	Realisation
Field of technology	
Design & layout	
Functional integration	
Measuring and testing technology Component and part analysis, Visual analysis (e.g. microscopy, metallography), Materials analysis, Non-destructive analysis	✓
Modelling and simulation	
Plant construction & automation Plant construction, Robotics	✓
Recycling technologies	
Manufacturing process	
Additive manufacturing 3D printing	✓
Coating (surface engineering)	
Fibre composite technology	
Forming	
Joining	
Material property alteration	
Primary forming	
Processing and separating	
Textile technology	

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Lightweighting classification

	Realisation
Material	
Biogenic materials	
Cellular materials (foam materials)	
Composites	
Fibres	
Functional materials	
Metals Aluminium, Magnesium, Steel, Titanium, Others (Metals)	✓
Plastics	
Structural ceramics	
(Technical) textiles	