ZUKUNFT
SCHWERPUNKT 2019: ENTREPRENEURSHIP
Titanbauteile aus dem Drucker

Neue Fertigungstechnologien für die Luftfahrt

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The 91st Academy Awards 2019

- Powder-based 3D printing (Laser sintering)
- 3D print design by Julia Körner
  Salzburg – Los Angeles
- Winner costume design
  Black Panther
  Ruth E. Carter

Image: © Matt Kenneda, Marvel Studios 2018
3D-printed part installed into serial production aircraft

- Titanium 3D-printed bracket on an in-series production A350 XWB
- Part of the aircraft pylon, the junction section between wings and engines
- 3D-printed parts are already flying on some of Airbus A320neo and A350 XWB test aircraft
Metal Additive Manufacturing: SLM

- **Selective Laser Melting**
  - Metal powder layer is recoated on powder bed (platform is lowered layer-by-layer)
  - Powder layer is melted selectively by moving laser spot under inert gas flow
Equipment for SLM

- **EOSINT M280 (EOS)**
  - Build size: 250 x 250 x 325 mm$^3$
  - 400 W Yb-fiber laser

- **FS121M (FARSOON)**
  - Build size: 120 x 120 x 100 mm$^3$
  - 200 W Yb-fibre laser
Additive Manufacturing for innovative aerospace titanium parts

Funded by the Austrian Federal Ministry of Transport, Innovation and Technology (BMVIT) under the program „TAKE OFF“ between September 2017 and August 2020

More information: https://www.ffg.at/content/takeoff
Goals

- Highly stressed titanium parts of airliners
- Manufactured by Selective Laser Melting (SLM)
- Reduction of production costs by 20%
- Weight reduction by „bionic“ construction
- Mechanical and long-term stability
- Certification
Dissemination

- Weight and cost reduction of parts
- Cost estimates of SLM manufacturing along the whole value chain
- Concept of certification for SLM printed titanium parts
- Database of mechanical values for part design

Raw material

„Buy-to-fly“ ratio = 14

Source: FACC & PRIME aerostructures
Demonstrator selection

- Airbus A330neo Fan Cowl Door
- Selection from 4 different titanium hinges
- Size 422 x 190 x 127 mm
Design

- Weight of 2.55kg (-13%)
- Max Stress 740MPa

Titanbauteile aus dem Drucker
Process simulation
Powder degradation - optimization

virgin

used
Surface treatment

- Roughness before electropolishing: 8 µm
- After polishing: 1 µm
Metal tool 3D printed in zero gravity

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