

APWORKS

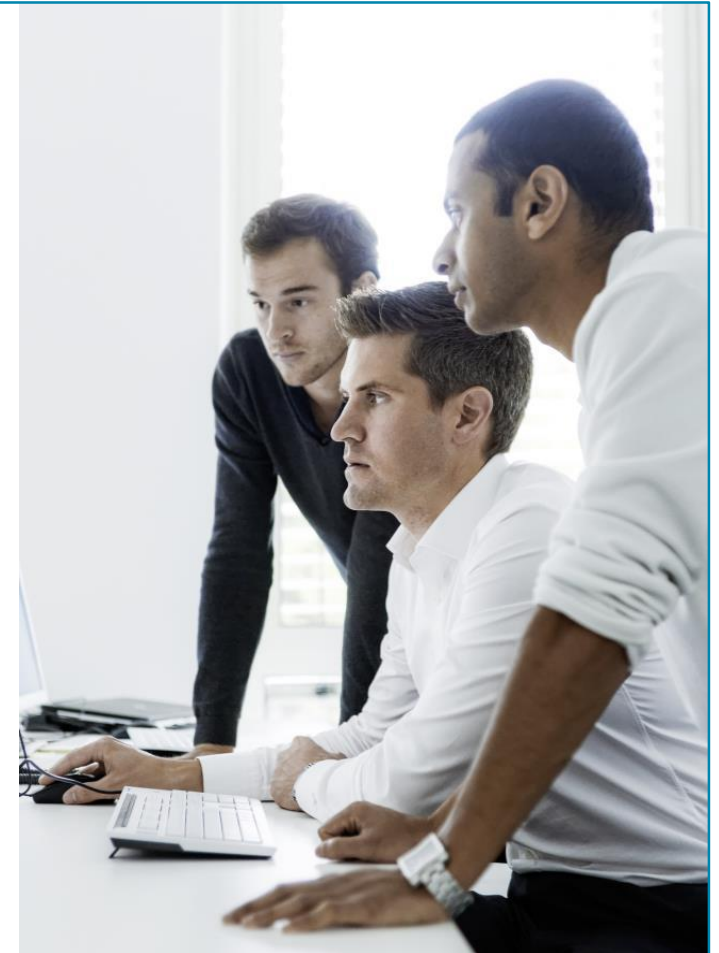
More than 3D Printing.
Design. Materials. Production.

February 2017

Airbus APWorks GmbH Facts & Figures

Agile. Experienced. Future-oriented.

- Founded in 2013
- 100 % subsidiary of Airbus
- More than 17 employees
- Sales Team located in Europe (Headquarter Munich) and the US (Silicon Valley)

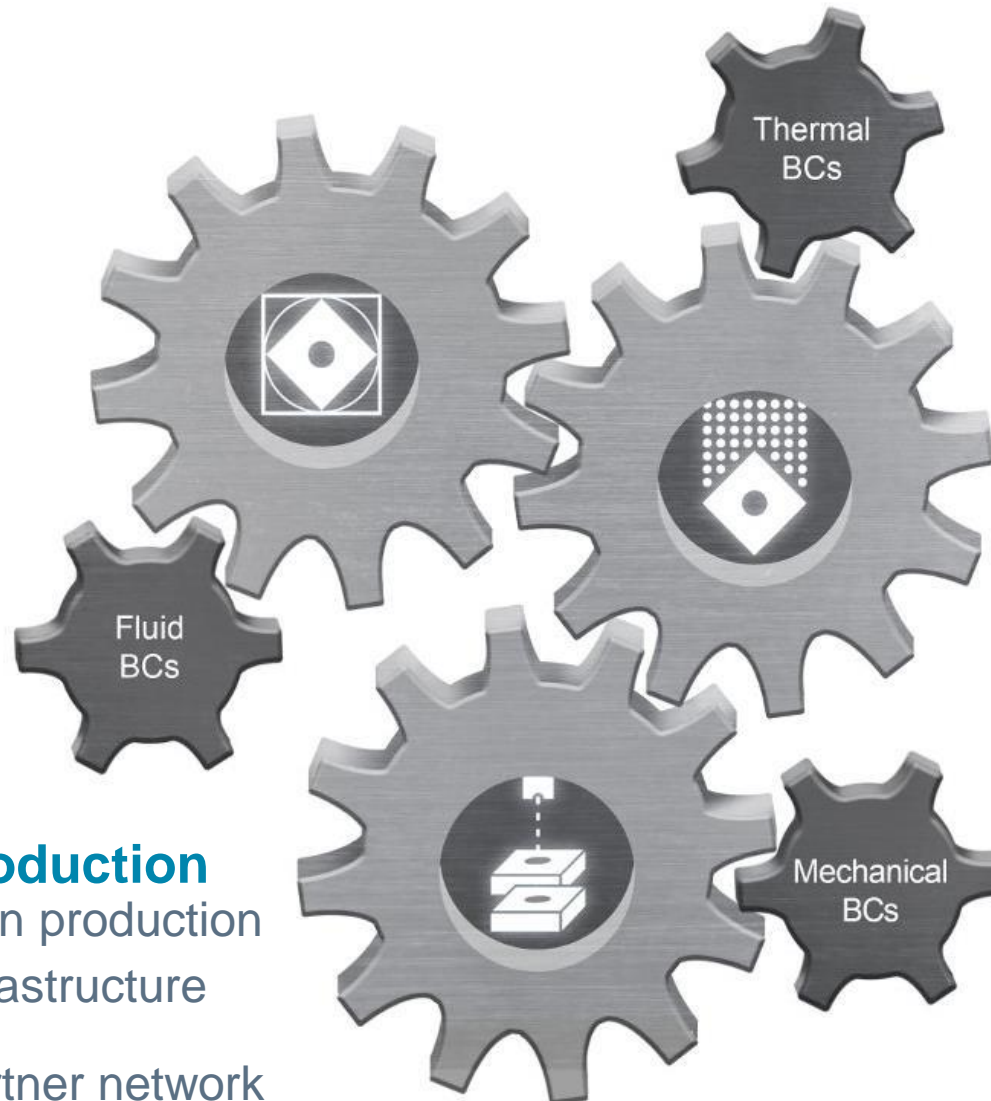


What makes APWorks unique

A perfectly harmonized triad of design, materials & production

Design

Design and optimization expertise



Production

Own production infrastructure

Partner network

Materials

Scalmalloy® - high-strength aluminium

Wide range of other materials

Deep materials knowledge

Certified Aerospace Quality for Metal 3D Printing

EN 9100 Certification from TÜV SÜD




- EN 9100 as a prerequisite for being an aerospace as well as automotive, robotics, or medical technology supplier
- Quality requirements of processes and products are fulfilled, documented and and are continuously improved
- Certification as prerequisite for serial production



The Triad of Design, Materials and Production in more Detail

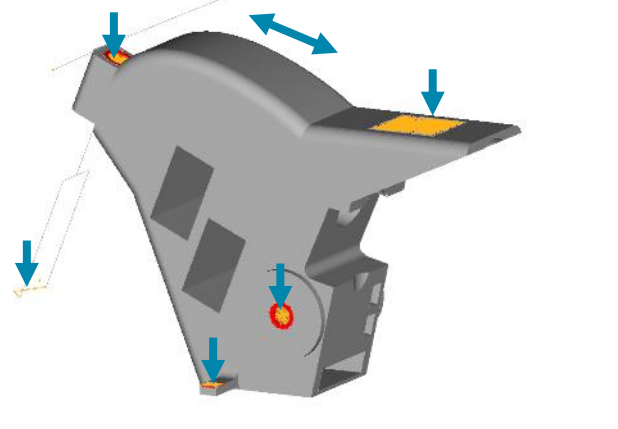
Design: Topology Optimization Step by Step

The four most important steps for an optimized design



#1
DESIGN SPACE

The area in which material can be added or removed.




#2
LOAD CASES

Calculation of load cases that are applied to a typical frame.



#3
RESULT

Geometries and material which withstands all applied loads.

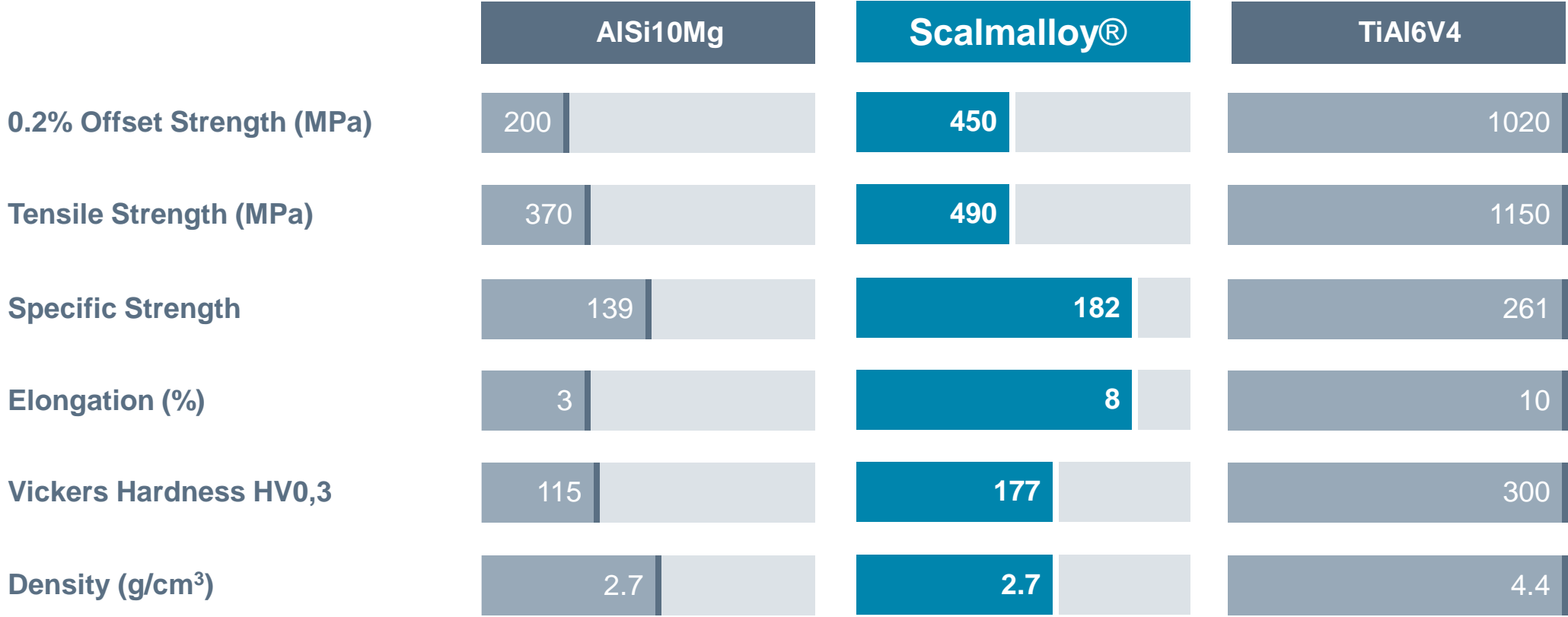


#4
FINAL DESIGN

Attractive redesign of the optimization result for efficient production.

Materials: Scalmalloy® as ductile as Titanium as light as Aluminium

The perfect material for lots of applications



Further Materials

Stainless steel and titanium



Ti6Al4V titanium

Light titanium alloy with excellent mechanical properties

Stainless steel 1.4404

High corrosion resistance

Production: On the Edge of Innovation

APWorks' selection of printing machines covering different needs

MetalFAB1



2x EOS M290



EOS M400



Build volume from
 $250 \times 250 \times 275 \text{ mm}^3$ to
 $420 \times 420 \times 400 \text{ mm}^3$

Production: Qualification and Certification

Quality assurance as prerequisite for certification



- APWorks uses the entire range of quality assurance techniques
- Destructive testing to determine the mechanical properties
- Non-destructive testing techniques such as CT scans, fluid penetration, X-rays and ultrasound to determine defects

The Benefits of 3D Printing for You

Increased value

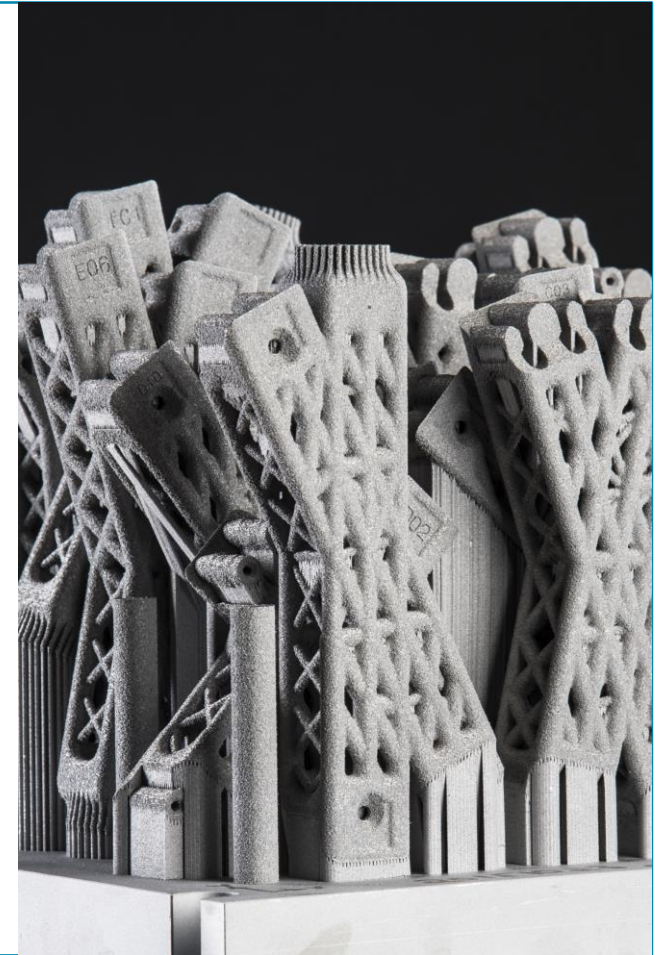
- Reduction of weight for new and existing designs
- Reduction of lead and assembly time
(e.g. for spare parts and tools)
- Shortening of the supply chain
- Shortening of development cycles
- Increase of performance
(e.g. by functional integration)




Our Offer for You

APWorks: Agile. Experienced. Future-oriented.

- A perfectly **harmonized triad** of design, materials & production
- Innovative, extremely **high performant materials** such as Scalmalloy®
- Collaborative **qualification** of your parts
- **Consulting** and **part screening**
- Customized **trainings** covering your needs





Airbus APWorks' example parts for additive manufacturing

Aerospace Parts - The Scalmalloy® Bionic Partition

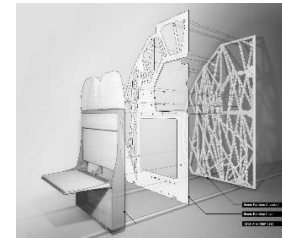
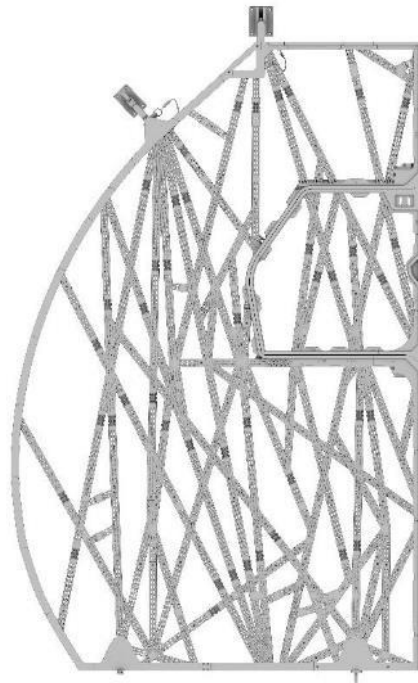
World's largest metal 3D printed airplane component

44% Weight saving

Homogenized stress distribution

Increased stiffness

Load: 9G Forward



The partition is a dividing wall between the seating area and galley of a plane, and it is a challenging component to design because it must include a cutout for emergency stretcher access and it must hold a fold-down seat for cabin attendants.

Produced by Airbus APWorks

Aerospace Parts – Ti64 and Scalmalloy® Interior Components

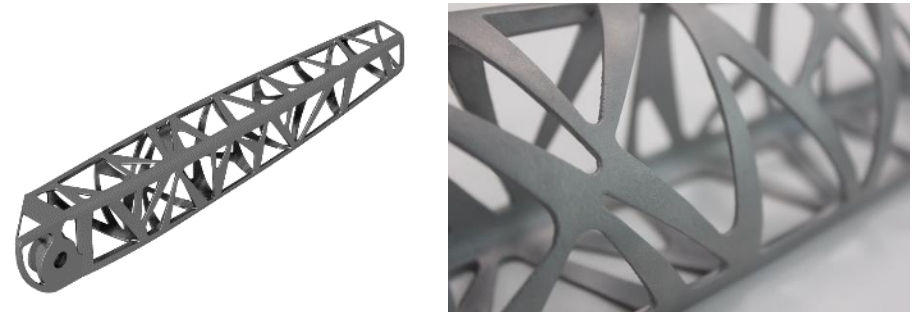
Cabin parts such as brackets, armrests etc.

Cabin Bracket



72% Weight saving

Armrest



44% Weight saving

(Optimized) and produced by Airbus APWorks

Aerospace Parts – Ti64 Bracket

A part optimized for weight reduction



20% Weight Saving*

60% Cost Saving*

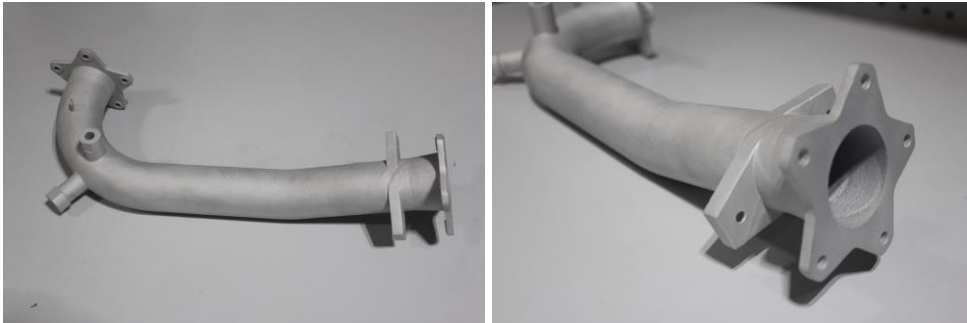
* In comparison to the AM optimized customer's design

Optimized by Airbus APWorks

Aerospace Parts – Scalmalloy® Spare Parts

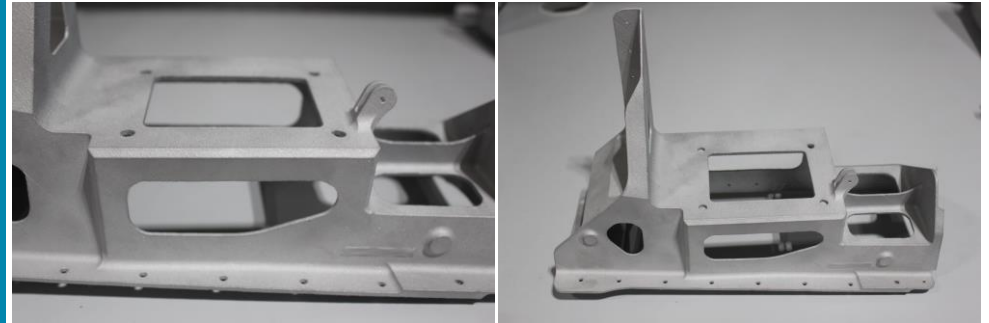
On demand spare part production (feasibility study)

Fuel Pipe



- Reduction of lead time by 5 months
- Reduction of assembly costs / time by reduction of number of parts: 13 → 1

Box



- Reduction of lead time by 7 months

Produced by Airbus APWorks

Aerospace Parts – Scalmalloy® Antenna Parts

Reduction of manufacturing costs



Lower costs

Shorter lead time

Complex geometries

Produced by Airbus APWorks

Aerospace Parts – Scalmalloy® Satellite Panel

A part optimized for weight and cost savings



15% Weight Saving

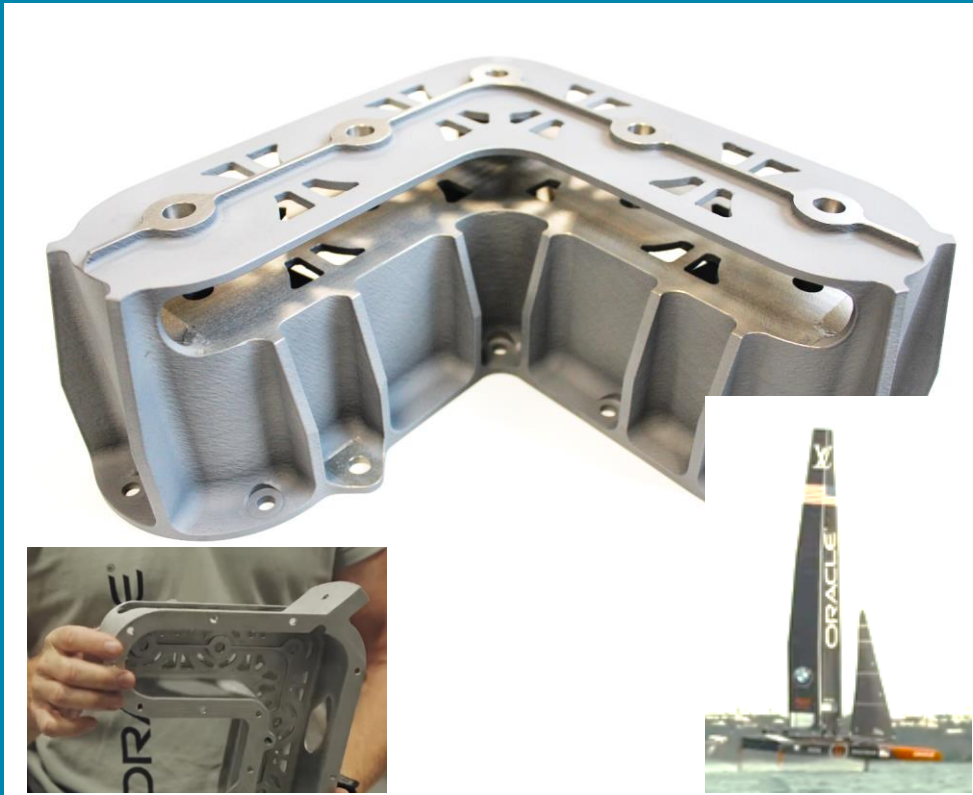
Shorter development cycles

Reduction of the number of parts

Optimized and produced by Airbus APWorks

Sailing Part – Scalmalloy® Forward Organizer for Team ORACLE

A part optimized for weight and cost savings



45% Weight Saving

Shorter development cycles

Complex geometry

Produced by Airbus APWorks

Our Best Practice Example

The Light Rider – World's first prototype of a 3D printed motorcycle



Designed and Produced by Airbus APWorks

The Light Rider: Inspired by Nature

Bionic Design. Lightweight. Functional Integration. Scalmalloy®.



6kg Weight Frame



Electric Drive



80km/h

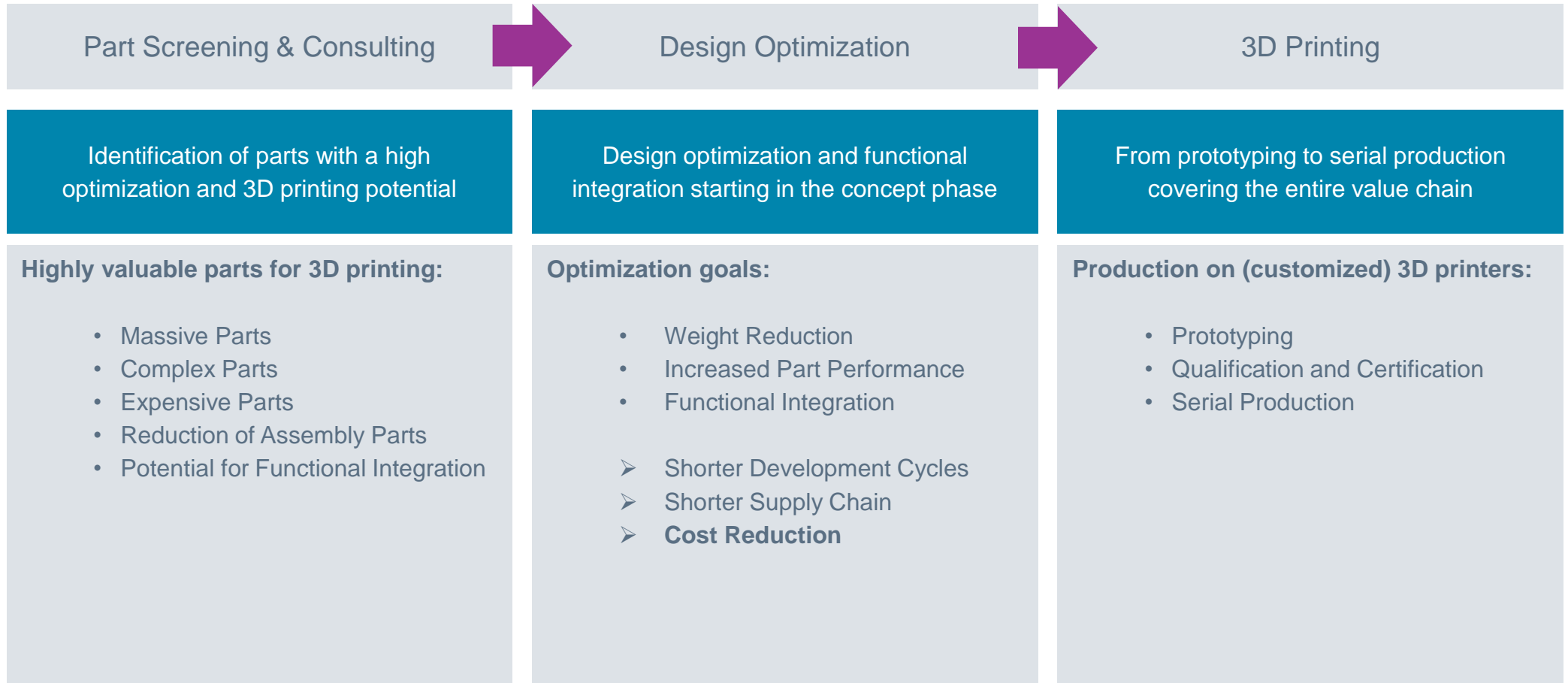


35kg Overall Weight



Way Forward

Step by step



ReThink

More than 3D Printing.

Optimized parts. Increased product value.

APWORKS

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