Additive Functionalisation –

A concept for cost-efficient and resource-saving lightweight construction

DLR

The Speaker

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Germany

DLR Innovation Lab EmpowerAX – An overview

Knowledge Base

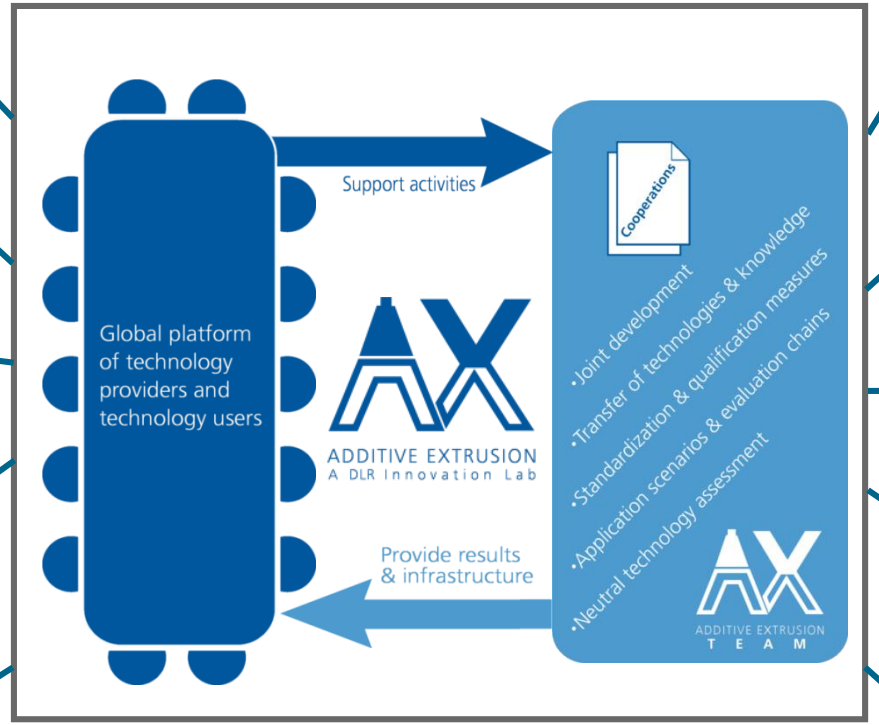
Technology leaders (users & providers)

EmpowerAX Team 6+

Collaboration between users & providers

Infrastructure & Ressources

Cooperation Agreement as a legal framework



Strengthening accessibility to fibre-reinforced 3D-printing for the industry

Technology Assessment & Evaluation Chains

Standardization & Qualification

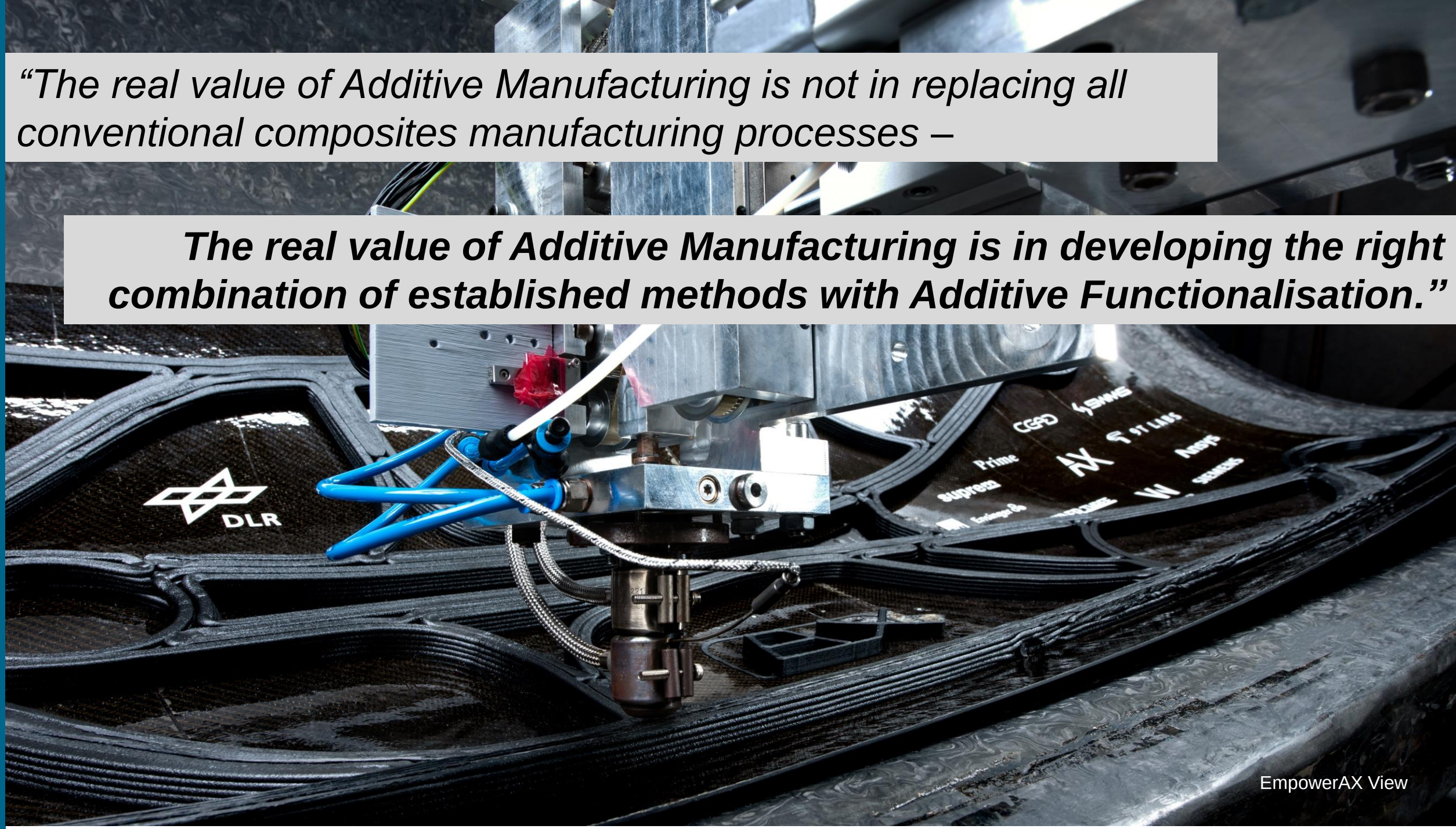
Quality Assurance

Construction & Simulation Methodology

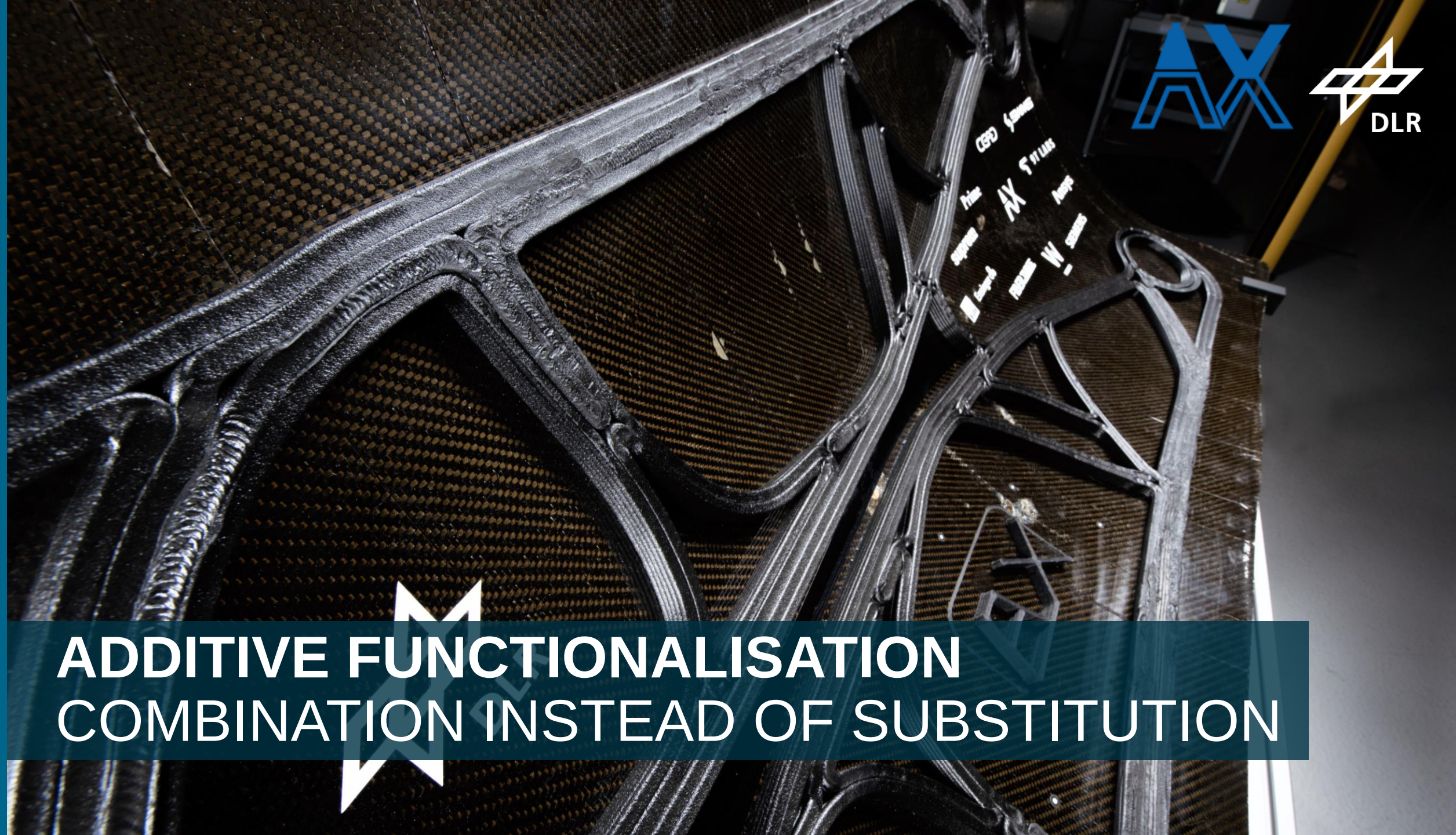
Process Integration & Operation

“The real value of Additive Manufacturing is not in replacing all conventional composites manufacturing processes –

The real value of Additive Manufacturing is in developing the right combination of established methods with Additive Functionalisation.”

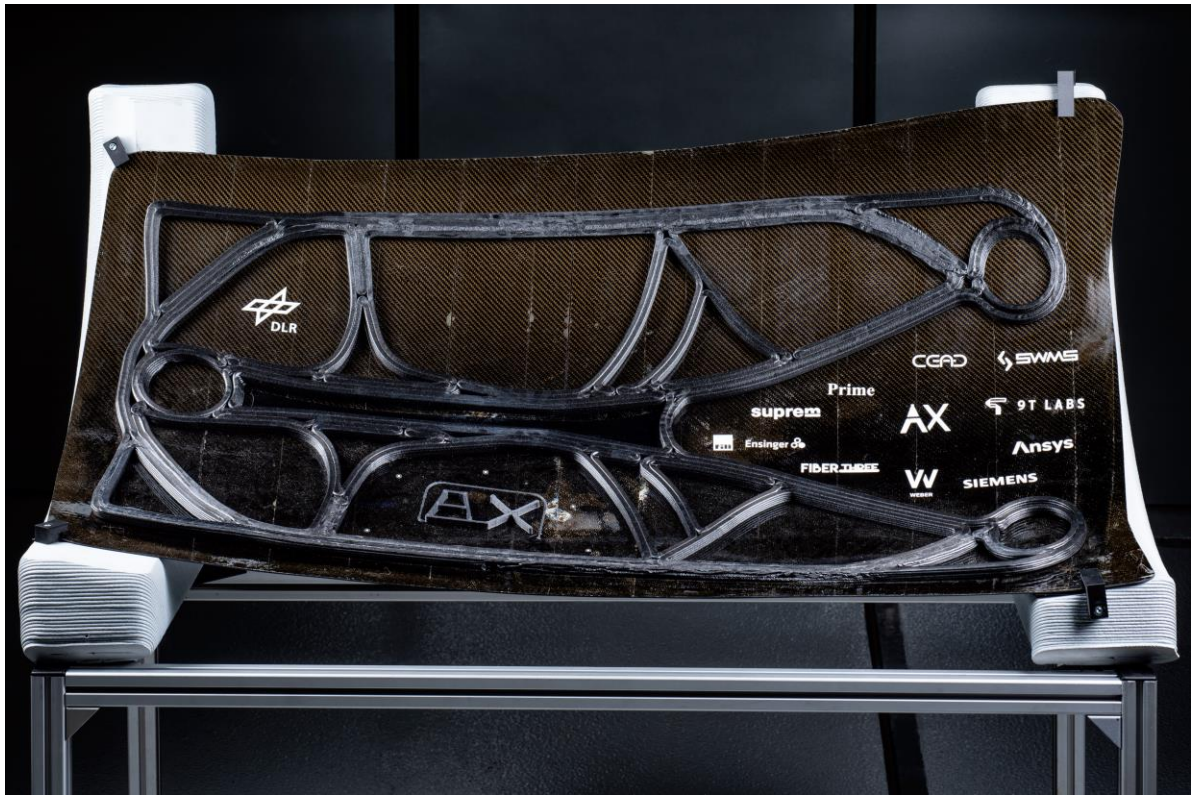


EmpowerAX View



ADDITIVE FUNCTIONALISATION
COMBINATION INSTEAD OF SUBSTITUTION

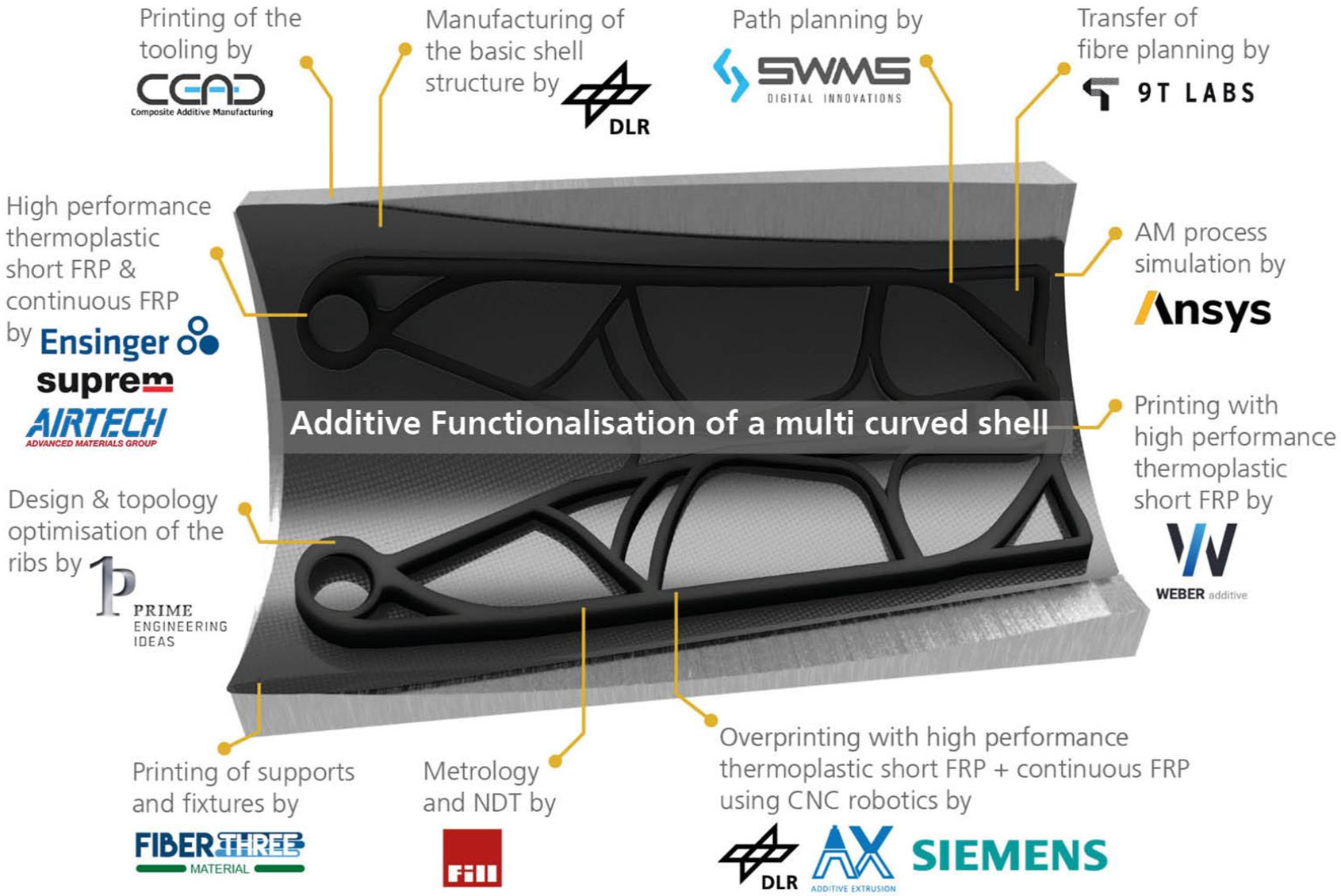
The concept of Additive Functionalisation
Combination instead of substitution



EmpowerAX Demo Part
„Additive Functionalisation of a multi-curved shell“

- Combination of conventional & additive manufacturing processes
- Combination of different materials
  - Thermoset + thermoplast
  - Short and continuous fibre-reinforced material (SFRP + CFRP)
- Overprinting of a multi-curved Shell

EmpowerAX Demo Part – An example of successful collaboration



EmpowerAX Demo Part
The Basic Idea

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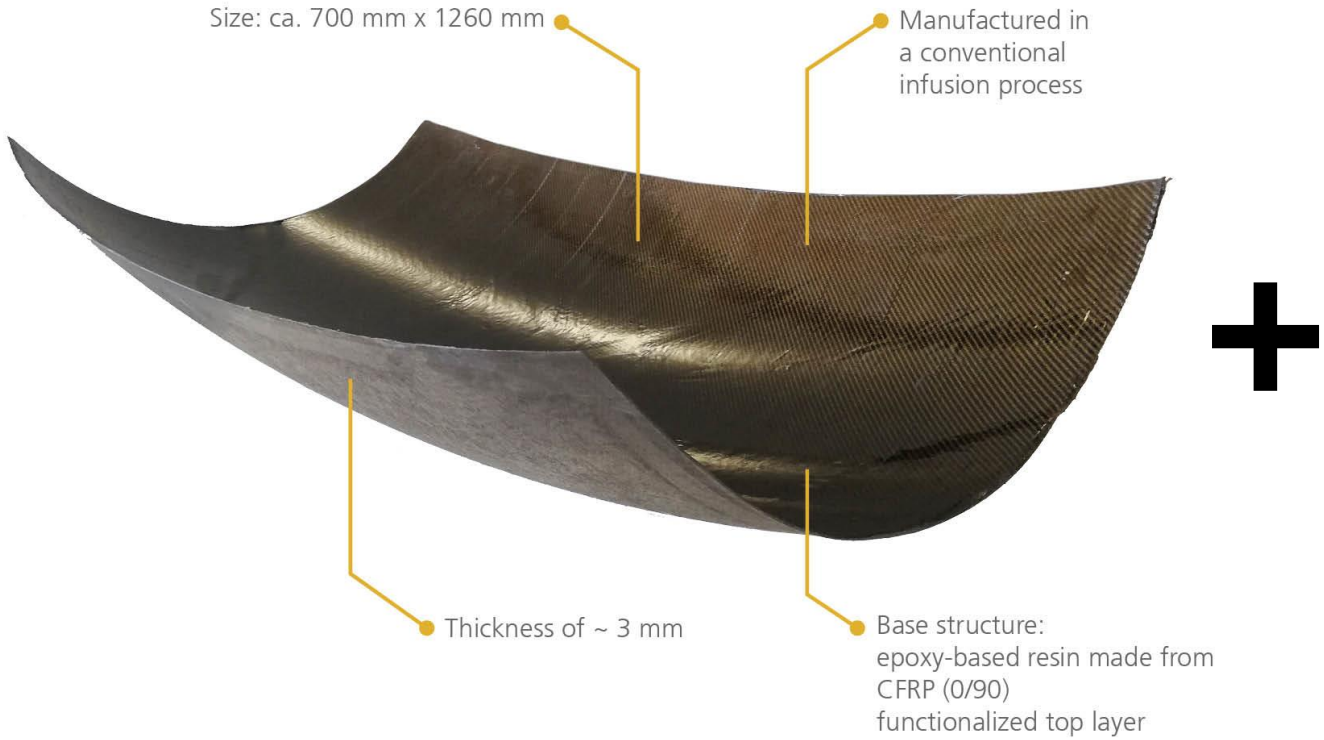
The Basic Idea



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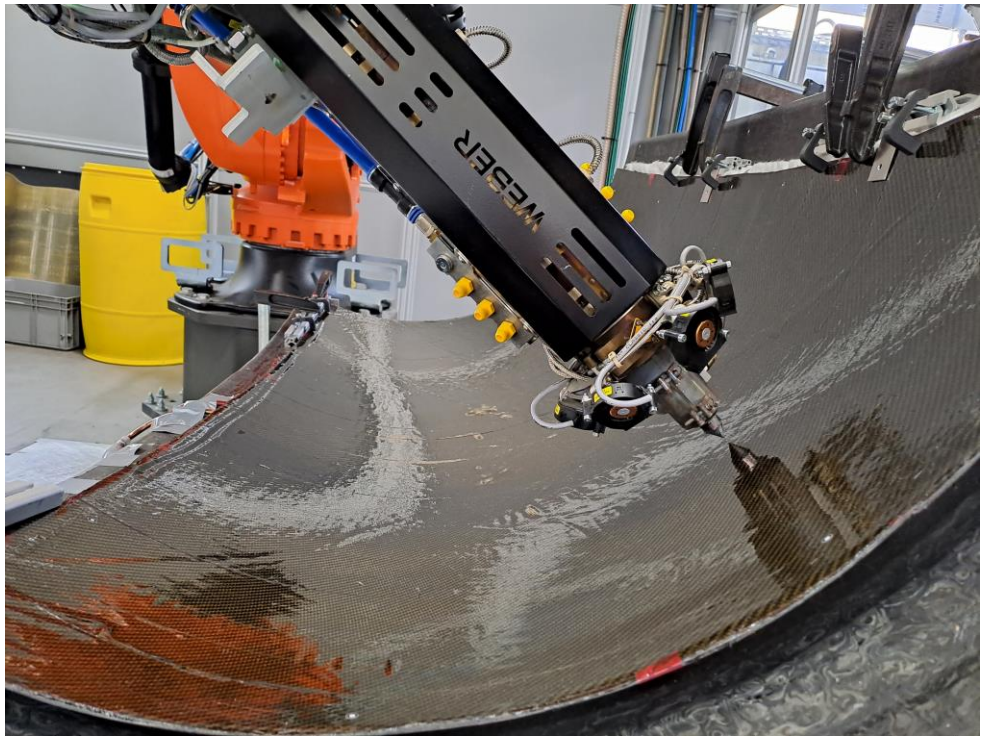
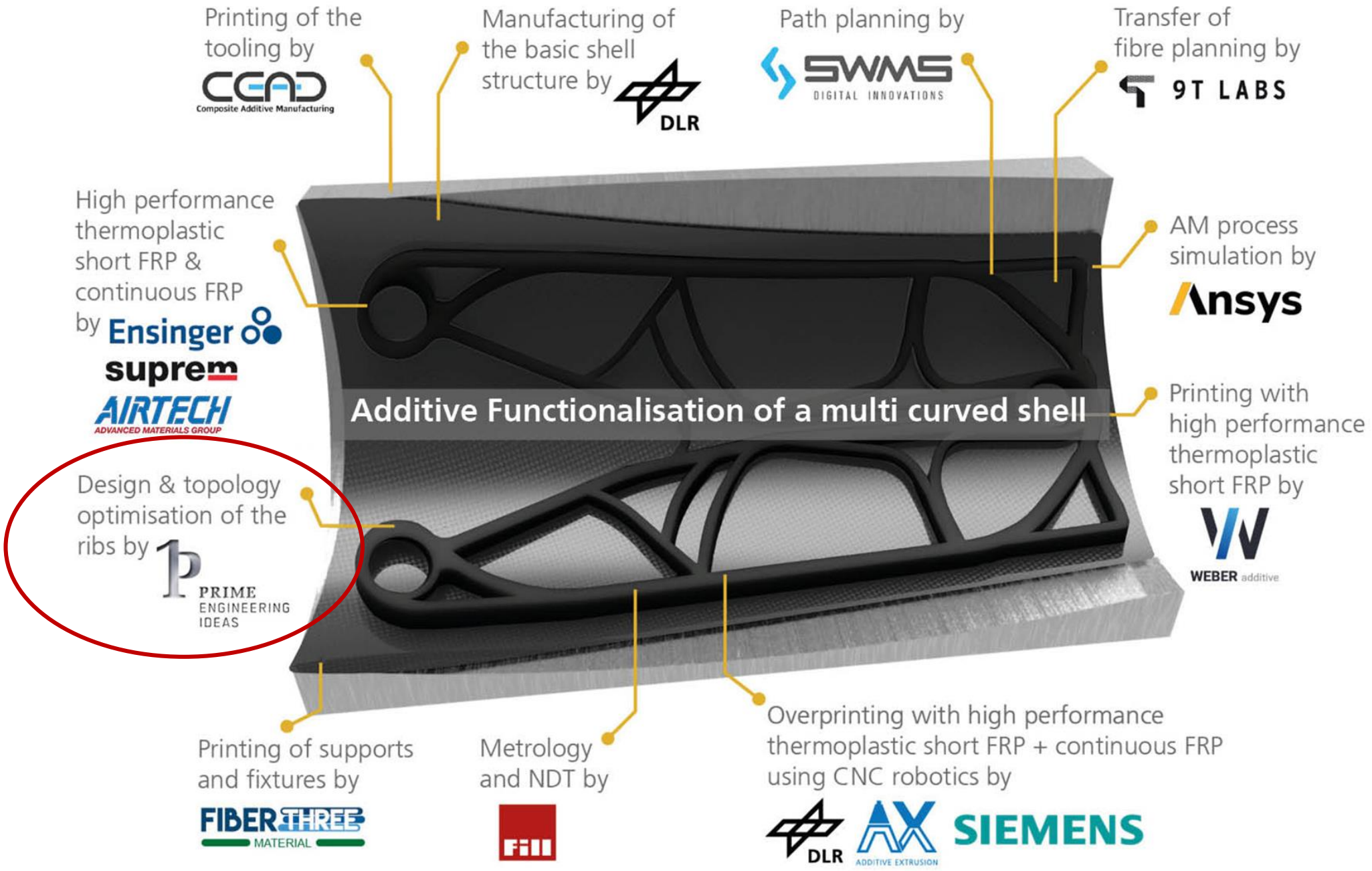
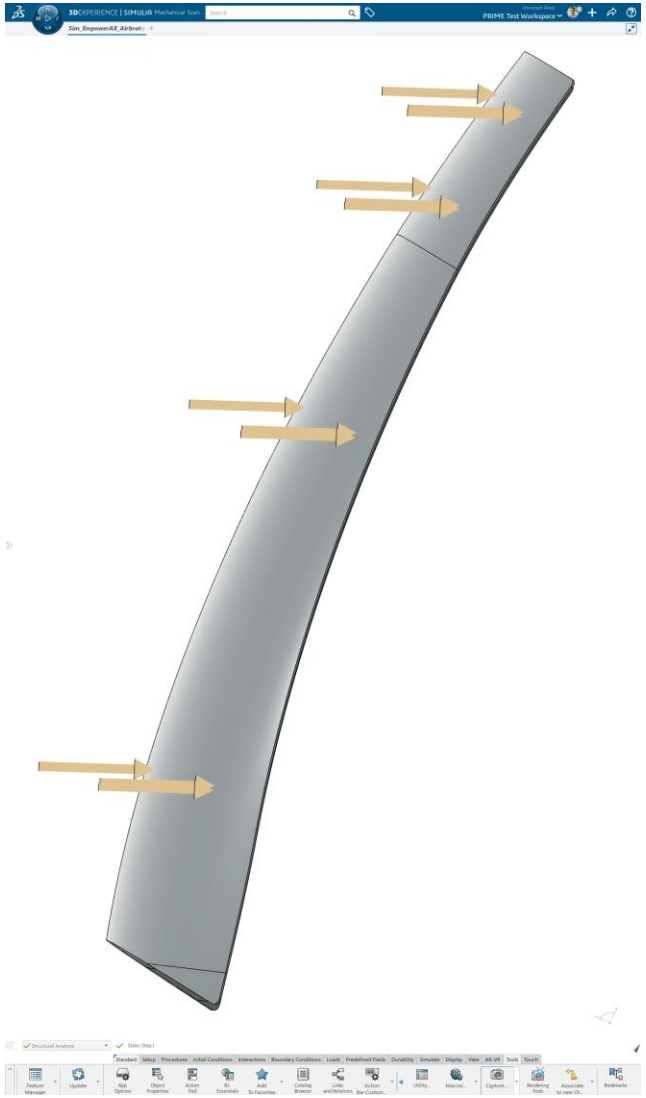



Printing of the tooling by
CEAD Composite Additive Manufacturing
Manufacturing of the basic shell structure by
DLR
Path planning by
SWMS DIGITAL INNOVATIONS
Transfer of fibre planning by
9T LABS
High performance thermoplastic short FRP & continuous FRP by
Ensinger
suprem
AIRTECH ADVANCED MATERIALS GROUP
AM process simulation by
Ansys
Additive Functionalisation of a multi curved shell
Printing with high performance thermoplastic short FRP by
WEBER additive
Design & topology optimisation of the ribs by
PRIME ENGINEERING IDEAS
Printing of supports and fixtures by
FIBER THREE MATERIAL
Metrology and NDT by
Fill
Overprinting with high performance thermoplastic short FRP + continuous FRP using CNC robotics by
DLR
AX ADDITIVE EXTRUSION
SIEMENS

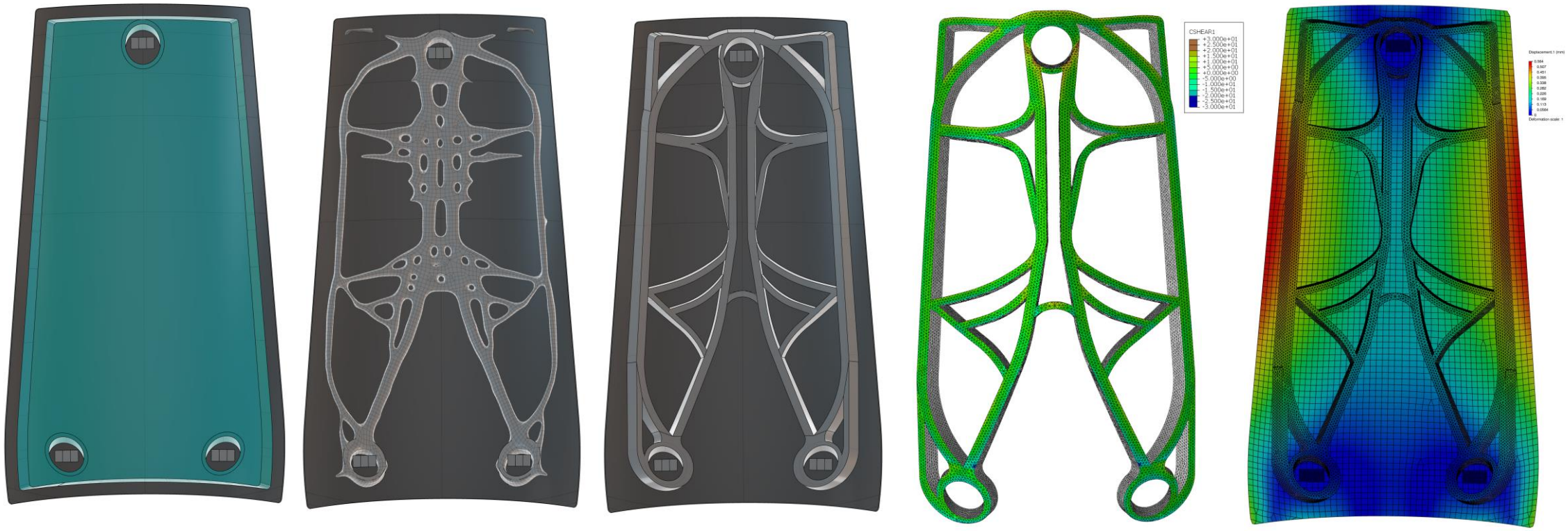
EmpowerAX Demo Part
Starting point: Topology-optimised Design by PRIME



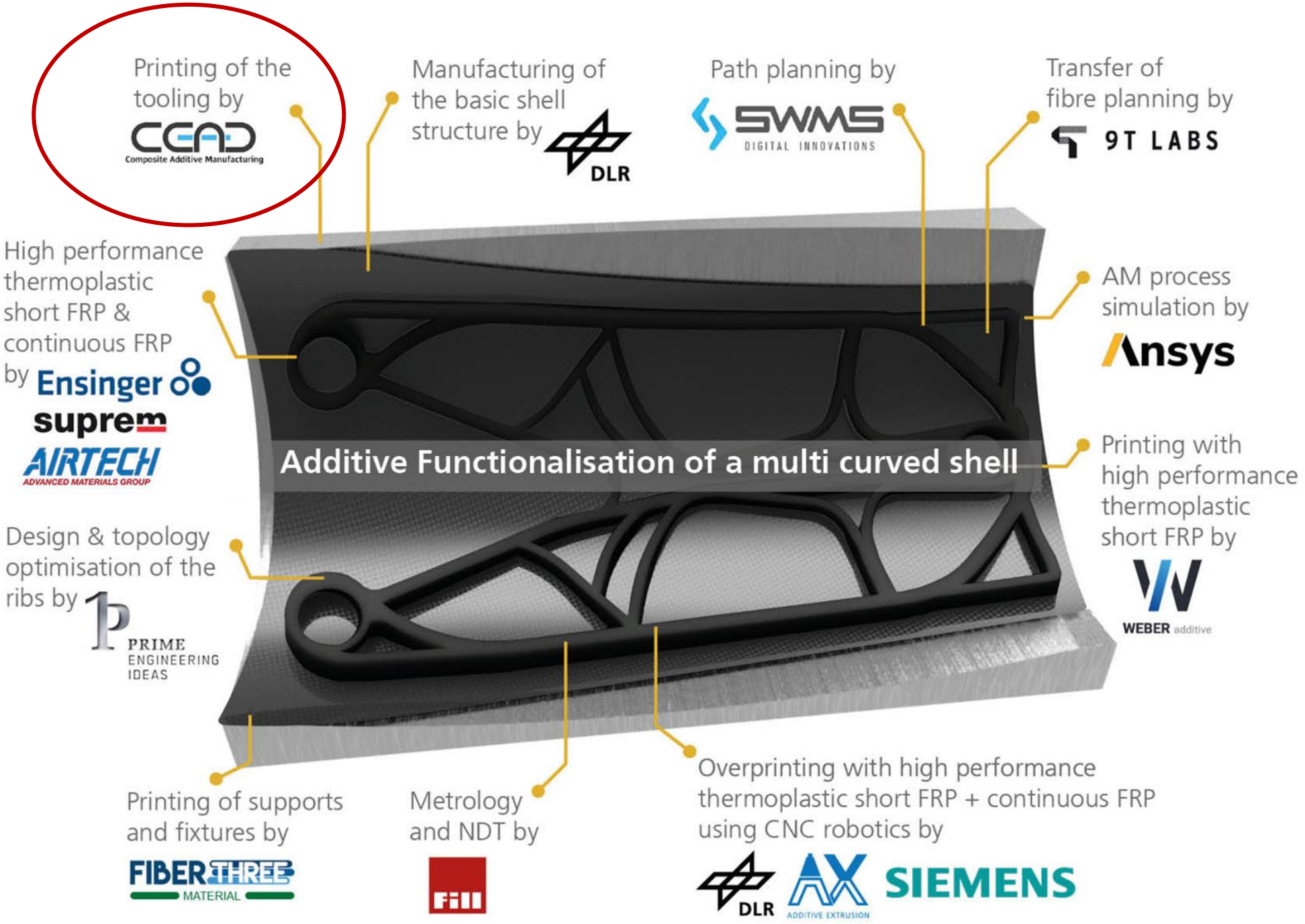
Bacic assumptions for loadcase as design requirements:

- Aeronautical application
- During a landing of 360 km/h
- Aerodynamic drag force combined with simultaneous front and side winds

EmpowerAX Demo Part
Starting point: Topology-optimised Design by PRIME



Topology-optimised design to use material only where it is really needed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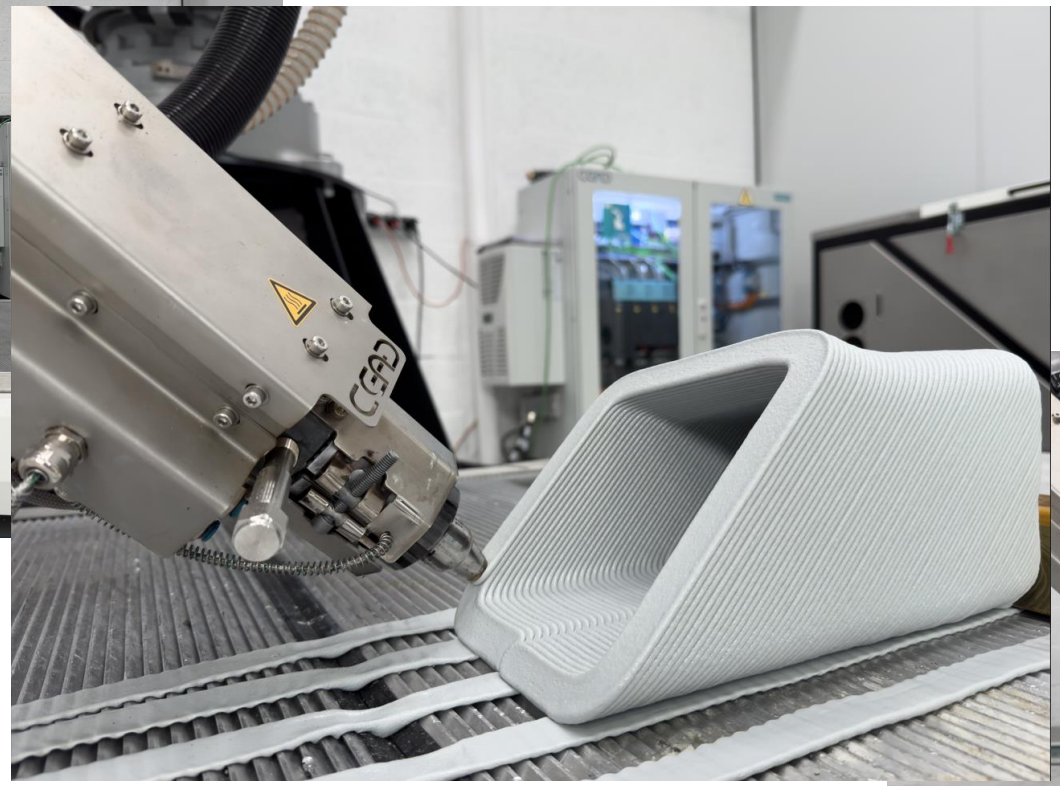
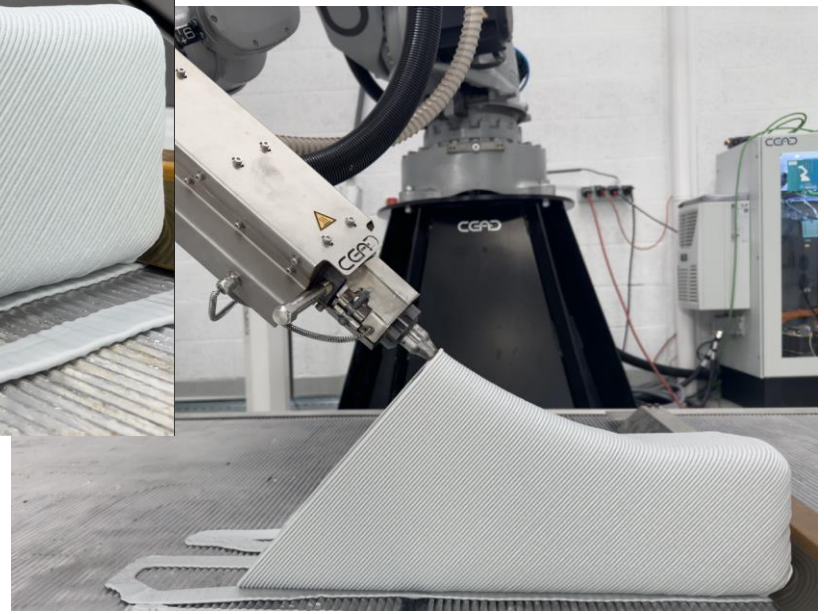
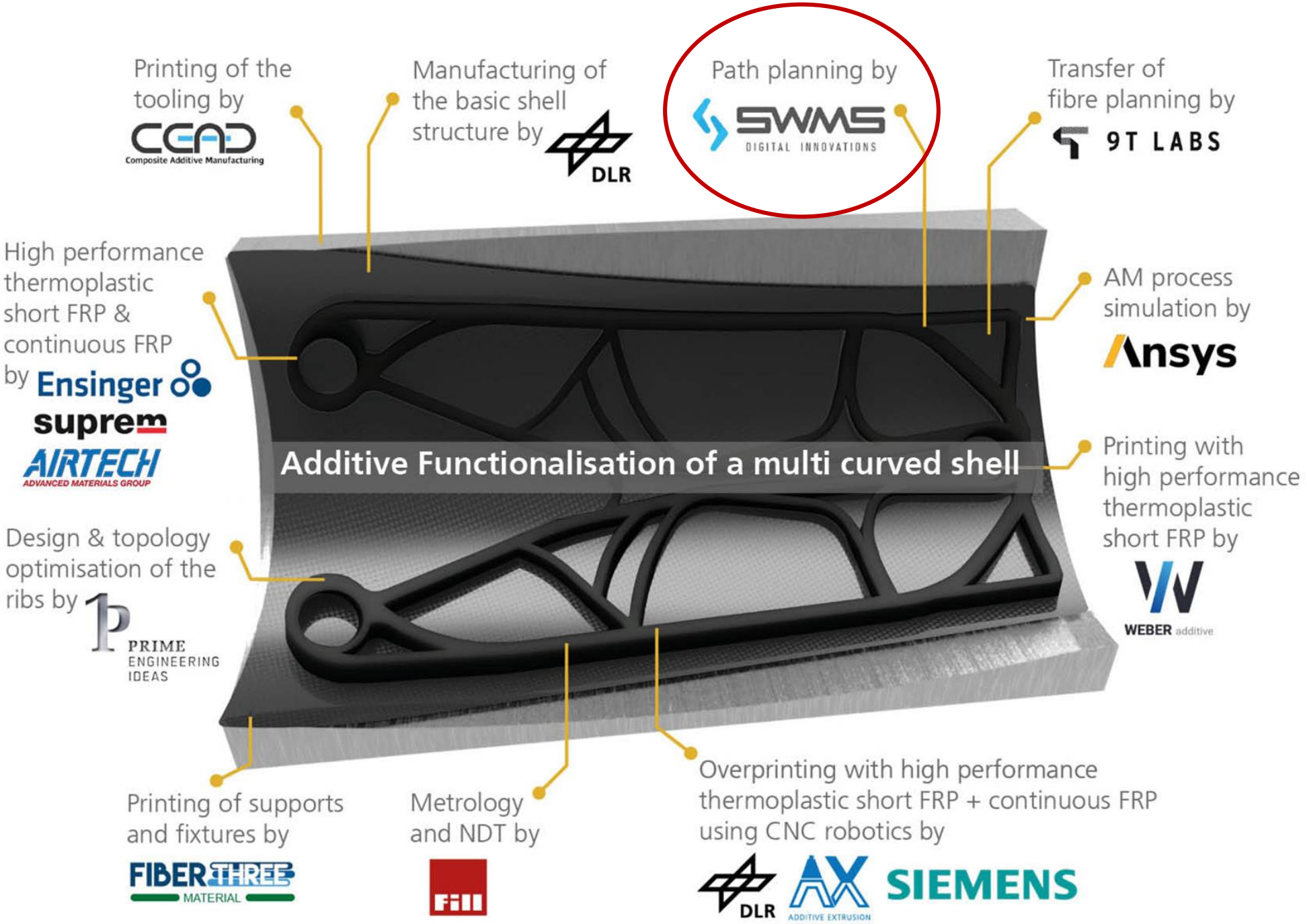
EmpowerAX Demo Part
Printing of the tooling by CEAD



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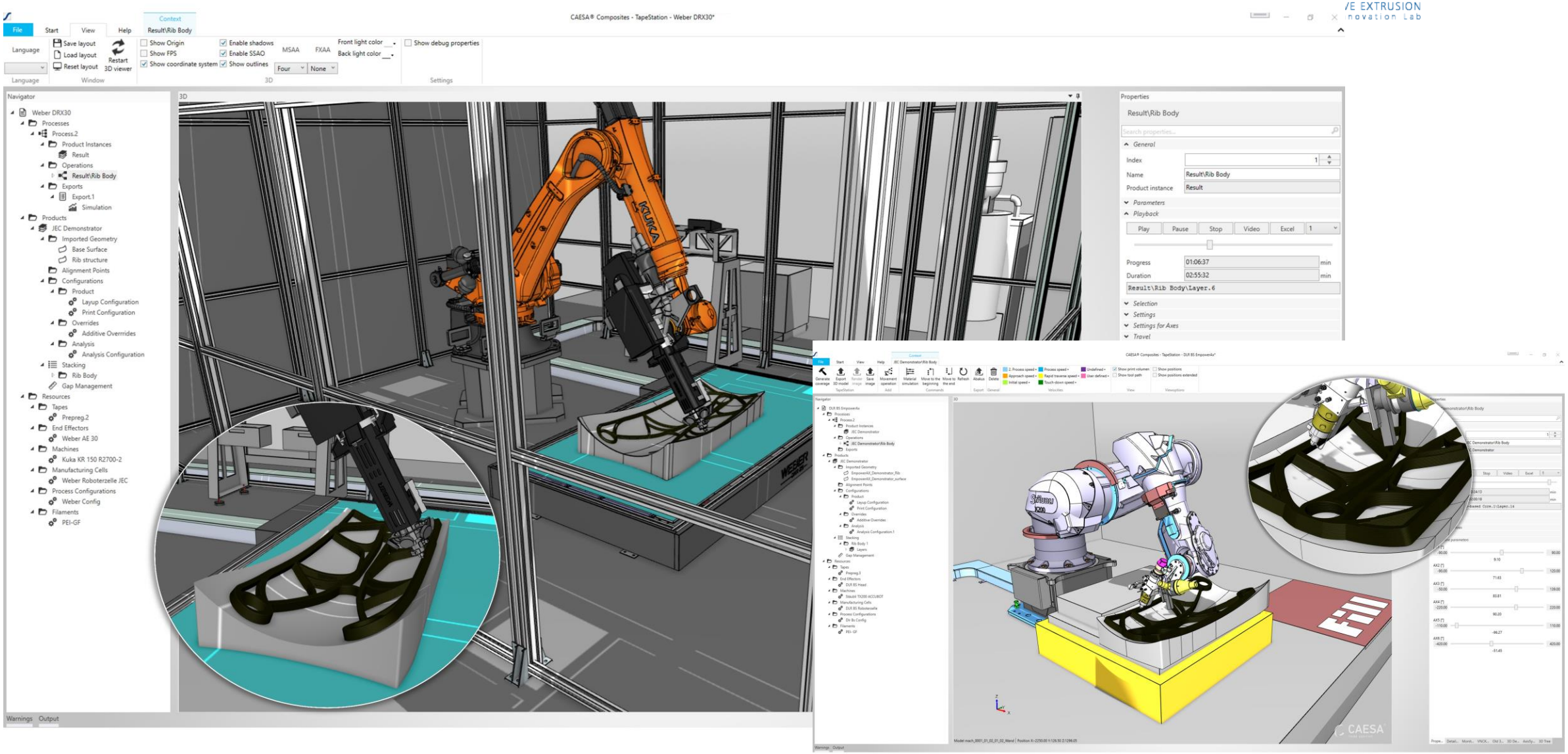
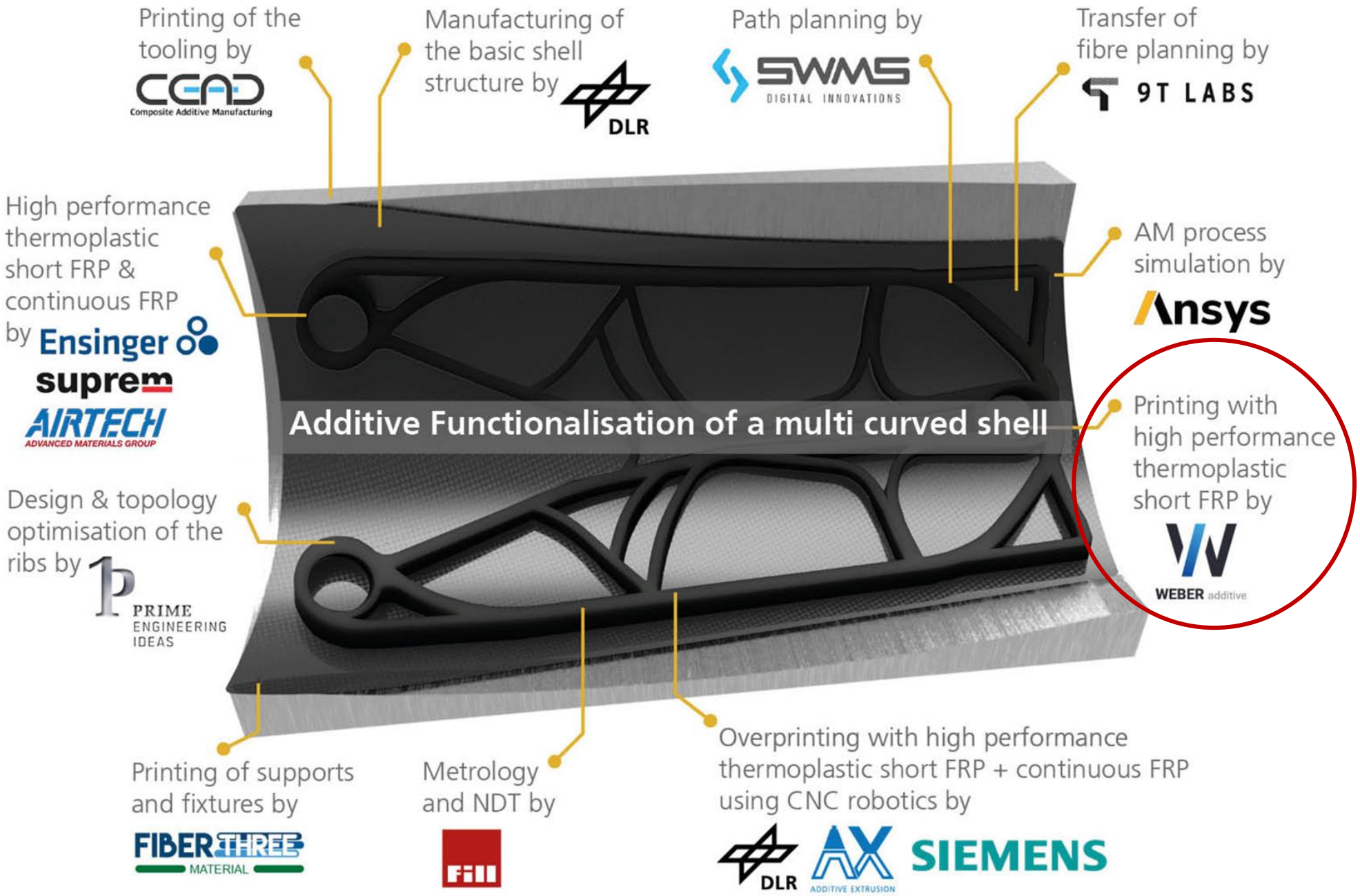
EmpowerAX Demo Part
Path planning for robotic 3D-Printing by SWMS

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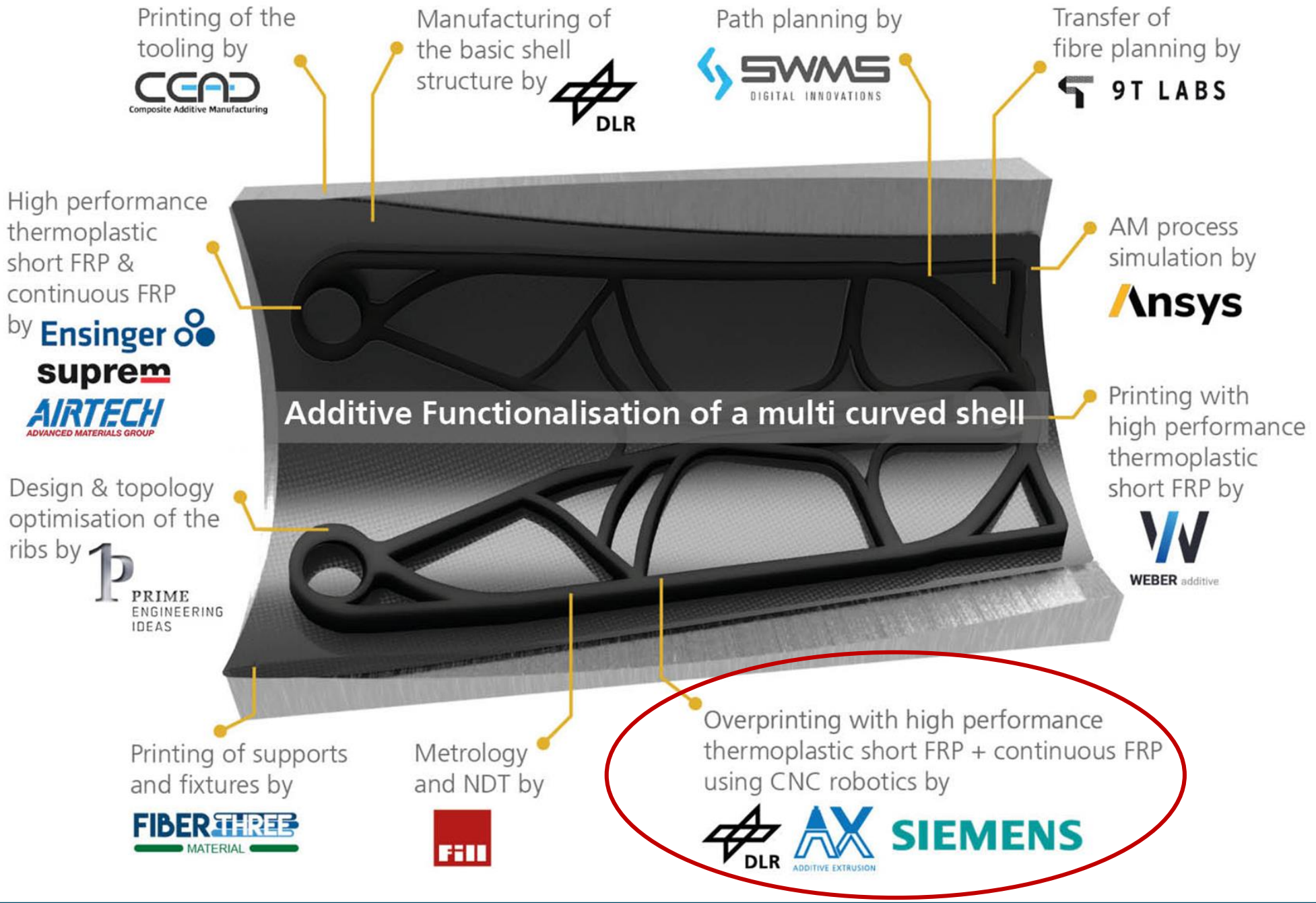
EmpowerAX Demo Part
Printing of the stiffening ribs by WEBER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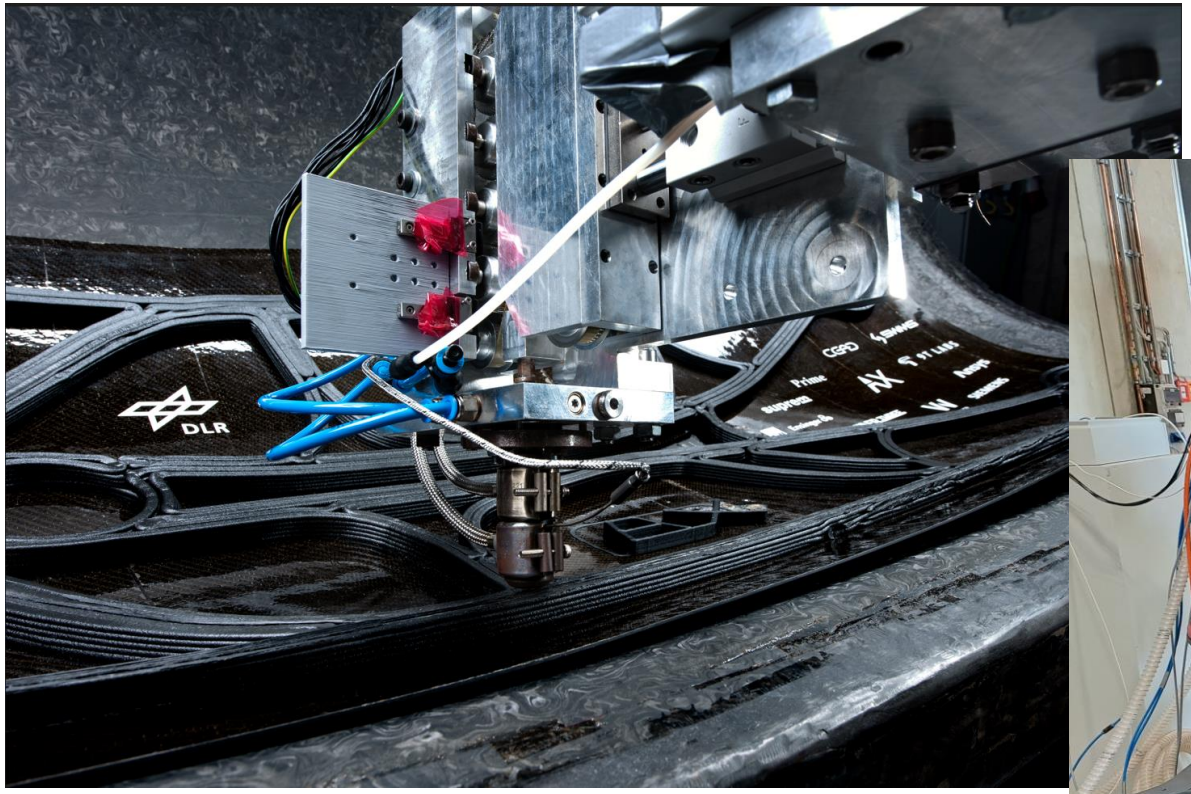
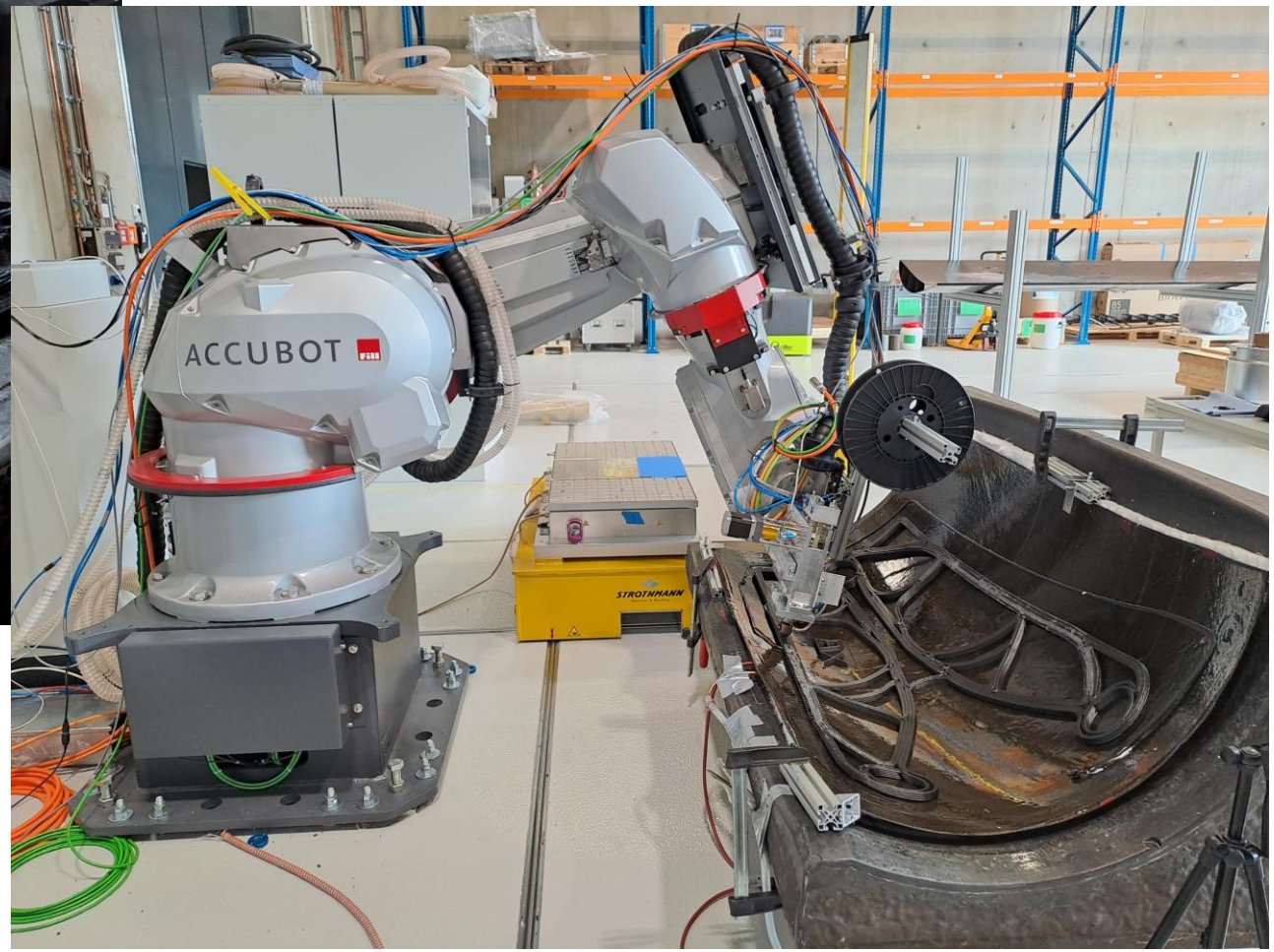
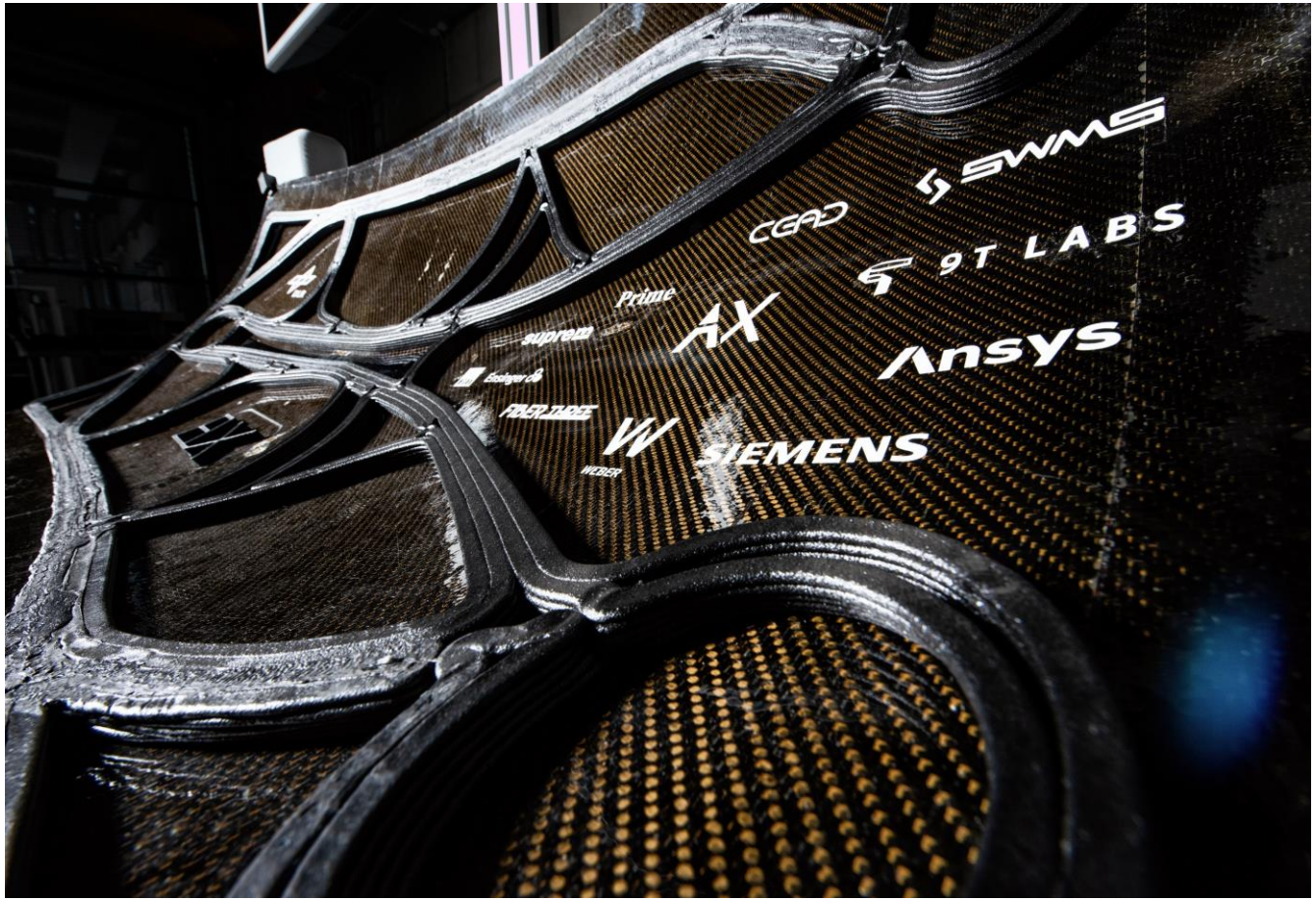
EmpowerAX Demo Part
Overprinting by DLR / EmpowerAX





EmpowerAX Demo Part
Overprinting by DLR / EmpowerAX

EmpowerAX Demo Part
Additive Functionalisation – Summary



- Additive Functionalisation for cost-efficient manufacturing of composites parts
- Overprinting of a multi-curved shell with short and endless fibre-reinforced materials
- Combination of thermoset and high performance thermoplastic
- Demonstration of an industrially available process chain

EmpowerAX Demo Part
Additive Functionalisation – a award winning concept

ADDITIVE EXTRUSION
A DLR Innovation Lab

DLR

09/2023:
Winner of Innovation Award Lower Saxony 2023
Category: Cooperation

INNOVATIONSPREIS
NIEDERSACHSEN
2023

Sieger!
in der Kategorie „Kooperation“

02/2024:
Winner of JEC Innovation Award 2024
Category: Aerospace Process

JEC WORLD
INNOVATION
AWARDS
WINNER
2024

WOULD YOU LIKE TO EXPERIENCE FIBRE-REINFORCED 3D PRINTING LIVE?

Save the Date!

25.09.2024

DLR
Braunschweig

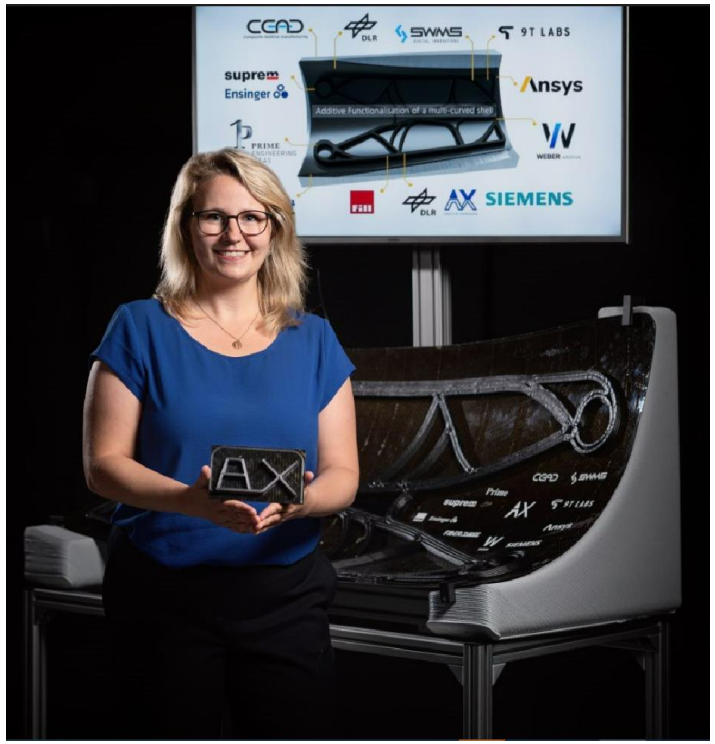
EmpowerAX Science Day 2024

LinkedIn Event

Thank you for your attention!

Questions?

Possibilities of further contact



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