ARRIS
COMPOSITES

Our mission is to advance humanity by creating the highest-performance products for everyone.

We partner with the world's most innovative companies to imagine, design, and manufacture the future.

Carl Bass

Former Autodesk CEO and Arris Composites Advisor

"For decades, we've been on the verge of broadly realizing the superpowers of composites, but they've been limited to a small segment of the market. Arris' technology gives us the possibility of moving this to the broader market."

Jeff Immelt

NEA Venture Partner (Arris' VC) and Former GE CEO

"What we did at GE Plastics in automotive to replace non-structural metal with low cost/lightweight injection molded composites in the 1980s, Arris has now enabled for the rest of the vehicle."

Arris Additive Molding™

Next gen composites manufacturing technology

Additive Manufacturing
+
Compression **Molding**

Ultimate Performance:

3D Stress-vector aligned carbon fiber

Topology optimized part geometry

Highly integrated, multi-material

Ultimate Scalability:

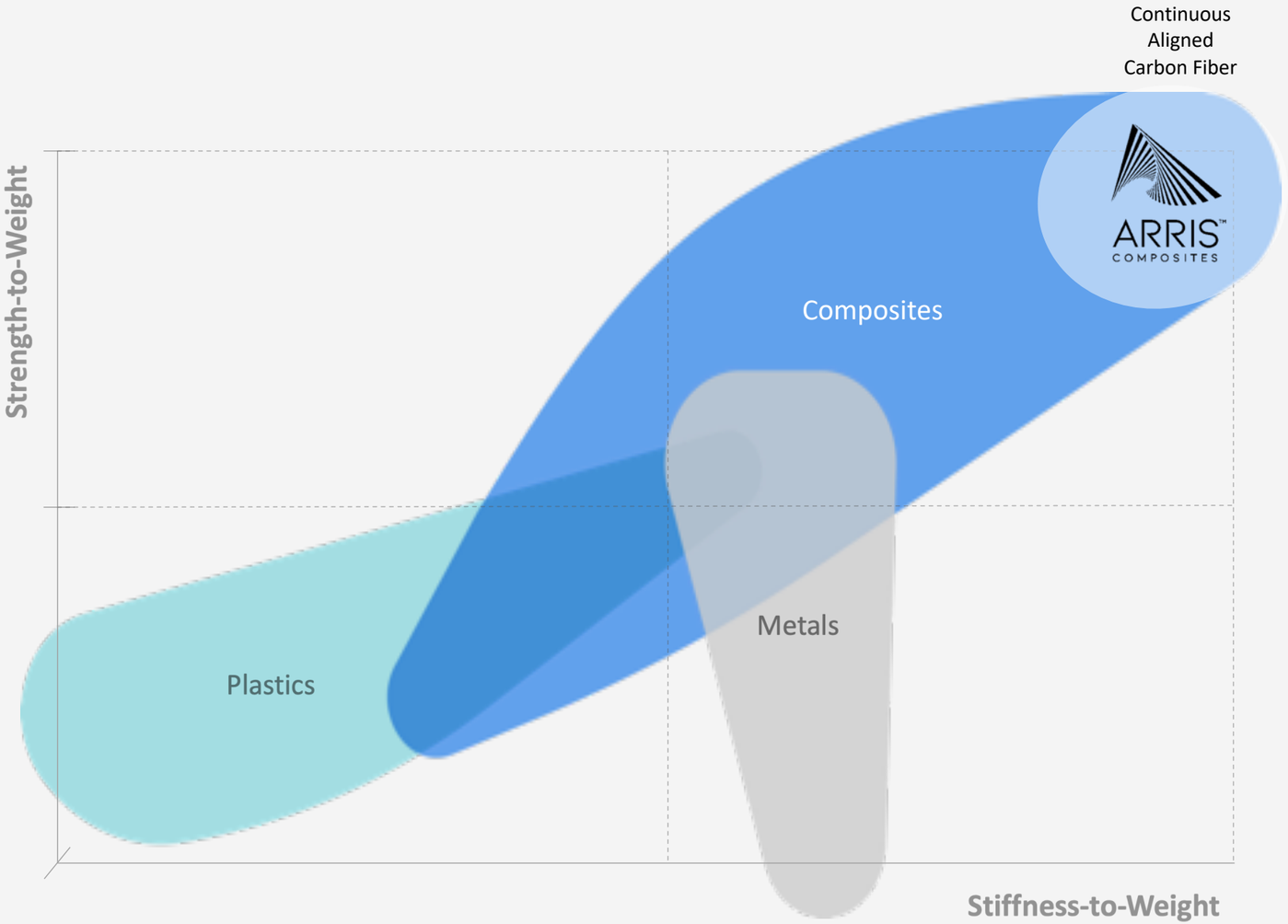
End-to-end automated process

High-quality molded surfaces & tolerances

High throughput & Cost-efficient

Why Composites?

The highest performance materials in the world



Composites:

Slow & Expensive to Manufacture

Slow & Labor Intensive

Faster but Capital Intensive

The Design Revolution:

Ideals in materials & structures

Why do carbon fiber parts look like this?

Google: **Carbon Fiber parts**

Motorcycle Parts Carbon Fiber ...
alibaba.com

Carbon Fiber Rear Fender for ...
italianperformanceparts.com · I...

Carbon fiber motorbikes parts...
omniaracing.net

Triumph - Rocket III - Carbo...
motocomposites.com

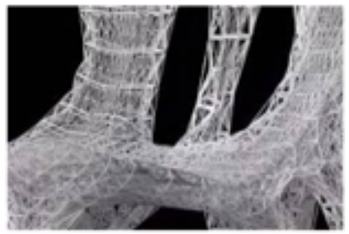
China Carbon Fiber Parts for Ducati ...
klycarbon.en.made-in-china.com

Oem Custom Carbon Fiber Product ...
alibaba.com

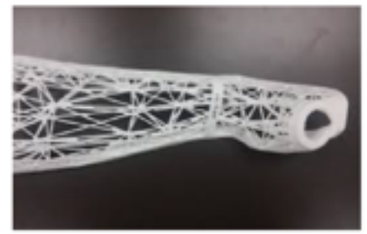
Yamaha - TDM 900 - Carbon Fiber Parts ...
motocomposites.com

When optimal lightweight structures look like this?

Google: **Lightweight Structures**



Caterpillar-like Cocoons 3D-Printed ...
pinterest.com

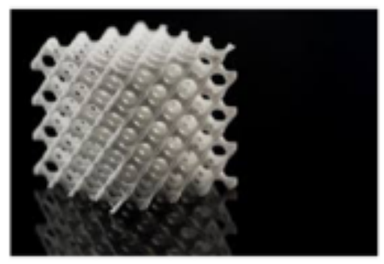


Designing a Patient-Specific 3D-Printed ...
materialise.com

The 3D Printing Transformation
slideshare.net

Materialise Slicing Technology...
materialise.com

Additive Manufacturing in Construction ...
arup.com



3ders.org - Nottingham engineers making ...
3ders.org

Geometry Constraints - Aligning fibers in complex composite structures

Ideal material efficiency

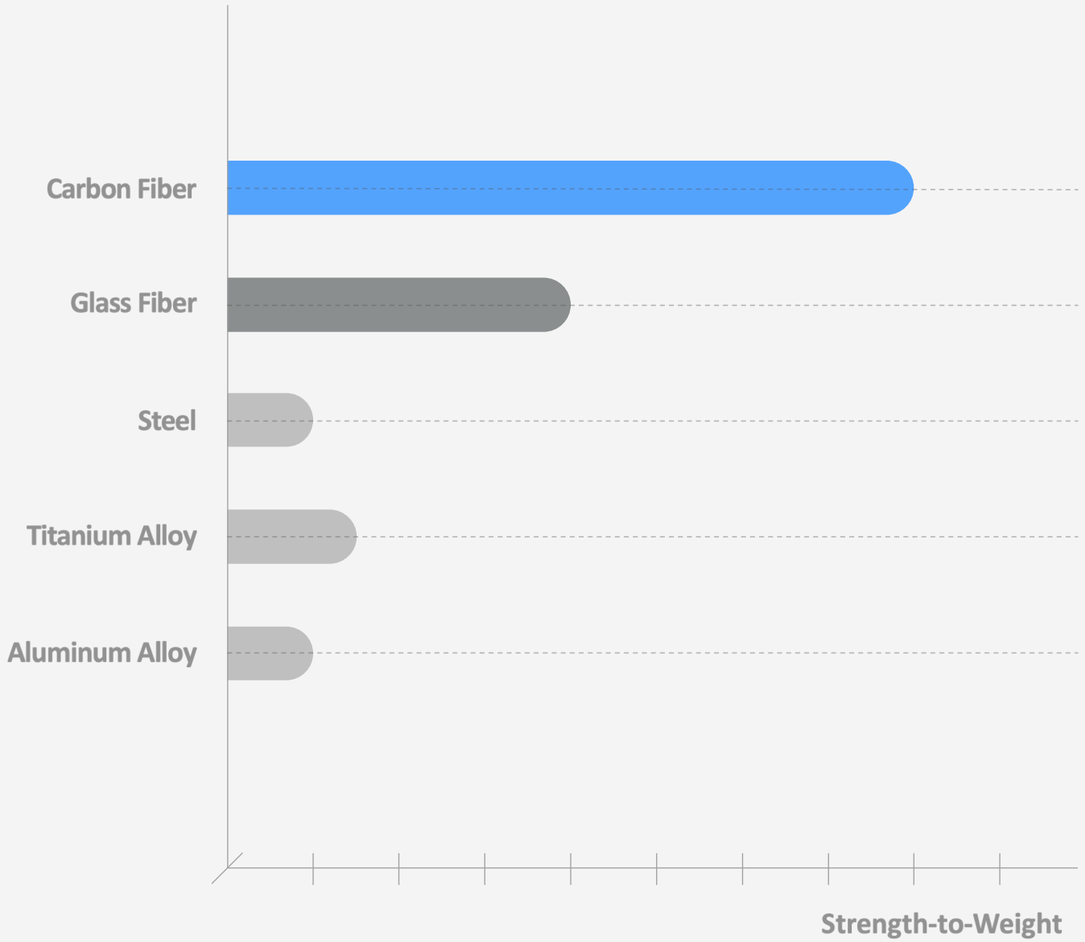
Biologically optimized wood grain alignment - analogous to optimized composite fiber alignment

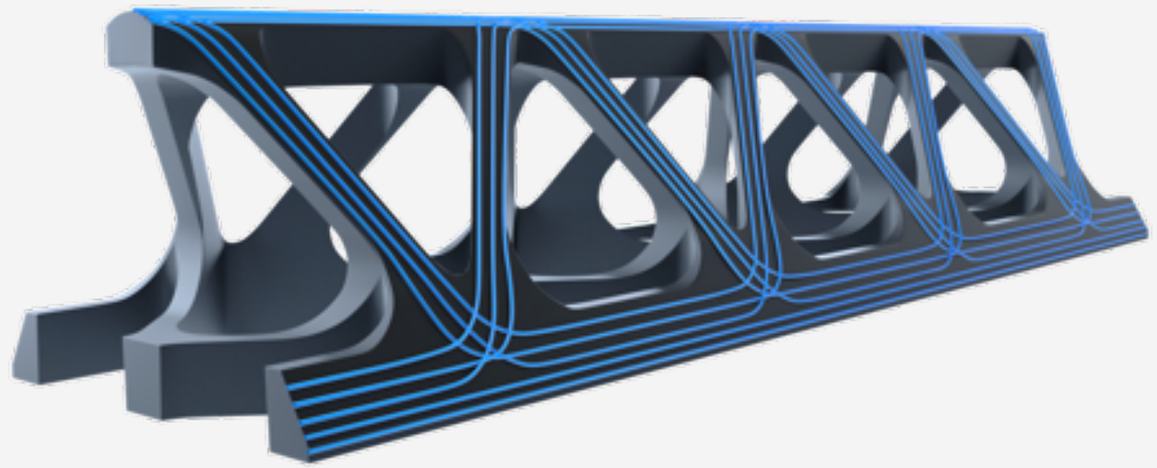
Conventional composites

Fibers not optimally aligned - suboptimal material and structural performance

Fiber Optimized Complex Parts

Fiber 3D-aligned with principal stress vectors

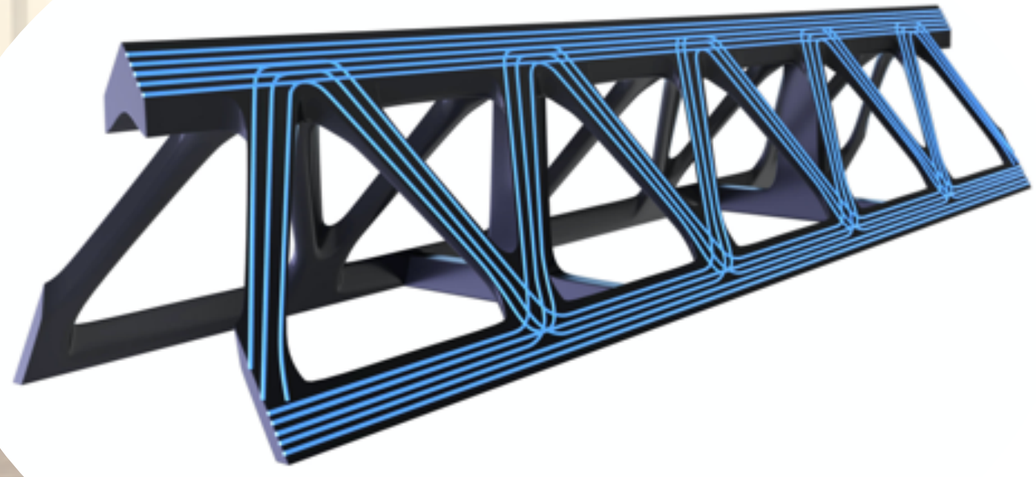




Truss with optimized carbon fiber alignment – schematic of select pathways within Arris part

Fiber Optimized Complex Parts

8’ end-to-end continuous carbon fiber truss



Advanced Materials Toolbox

Products may consist of multiple, dissimilar materials.

> Weight & size reduction
> Reduced part count
> Fewer failure modes & process steps
> Multiple functions

Material	Function
Carbon Fiber *	High strength-to-weight ratio (electrically & thermally conductive)
Glass Fiber *	Circuit board (electrically insulative)
Kevlar / Plastic Fiber *	Flexures & ultra-tough features, etc
Thermoplastics	High quality surfaces & wide range of properties
Metal	Ductility, shape memory fiber*
Wire	Electrically conductive
Embedded Electronics	Sensors, antenna, power, battery, fiber optics, circuits

* Fibers mixed with a matrix material (typically thermoplastic)

SpecificDesign™

Multi-material = Multi-functional

Mechanical	Functional	Electrical / Thermal
Mechanical: Tough Zone	Embedded Electronics	Thermal Insulator / Conductor
Mechanical: Wear Zone	Metallic Inserts	Electrical Insulator / Conductor
Mechanical: Stiff Zone	Ruggedized / Corrosion Proof	EMI Shielding / Transmitting
Mechanical: Strong Zone	Vibration Dampening	Structural Health Monitoring
	Lightweight	

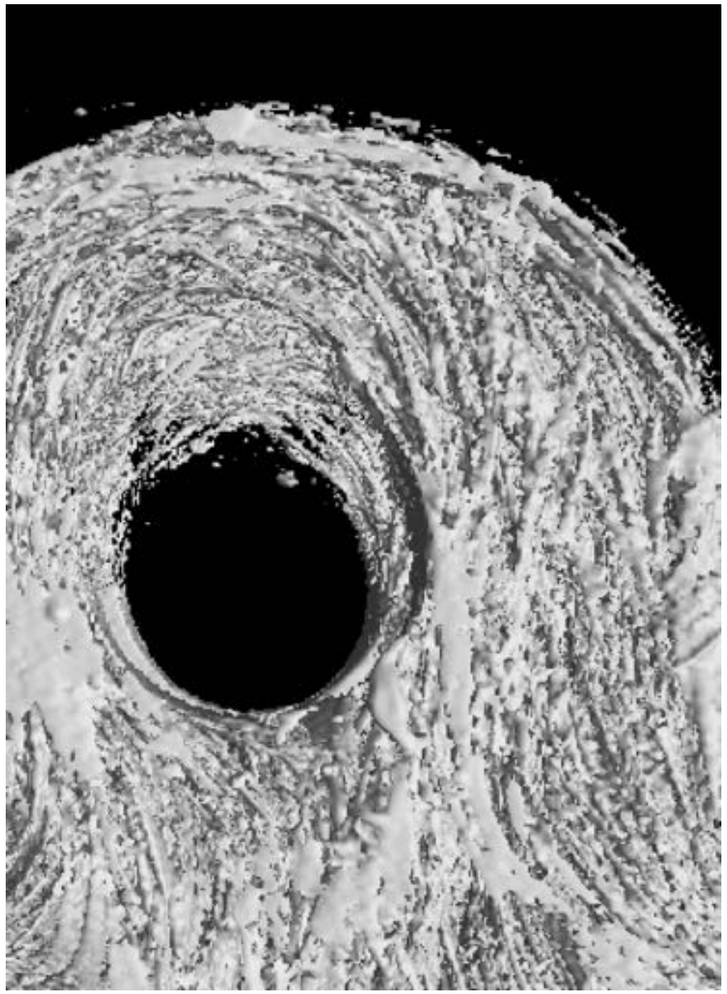
Fiber Optimized Complex Parts

Application example: brackets

Fiber Optimized Complex Parts

Application example: brackets

Topology optimized bracket originally designed for metal 3D printing. Carbon fiber replacement bracket now manufactured with Additive Molding™.



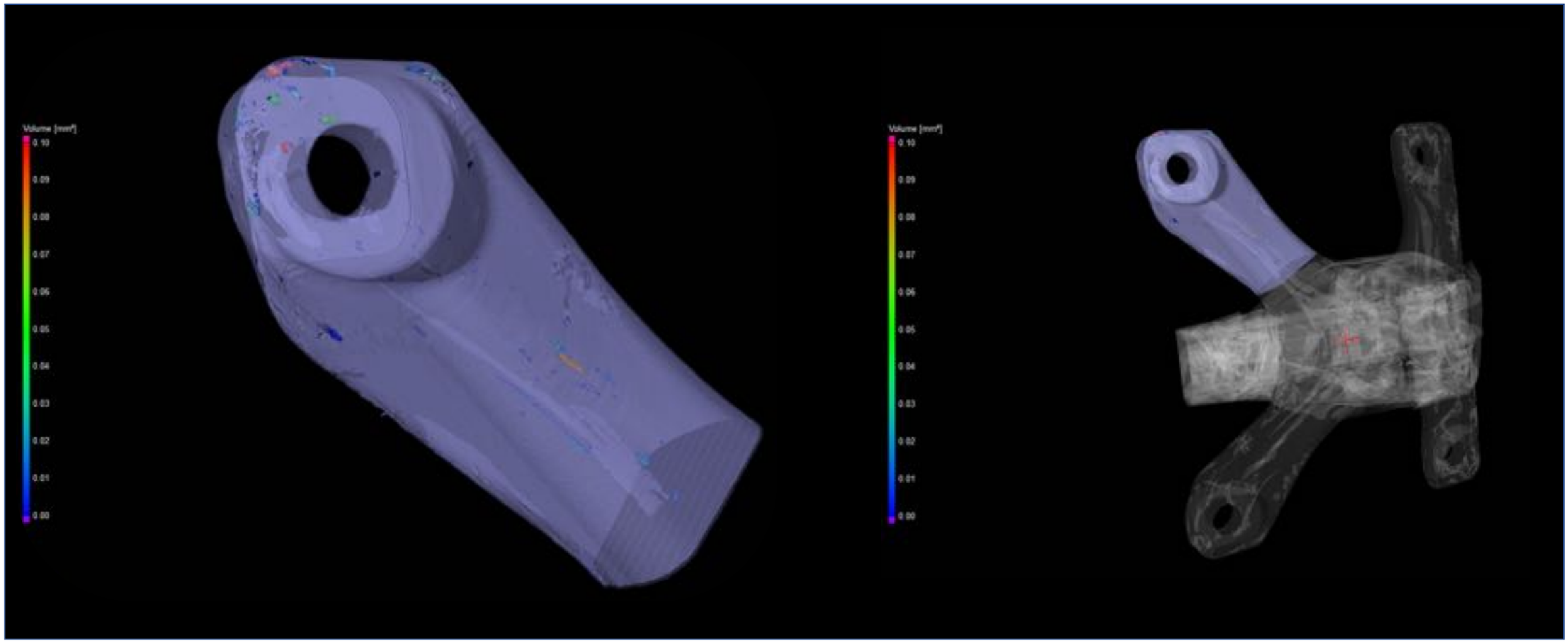
CT scan of fastener hole

CT scan of bracket leg

Arris Composites Meet Aerospace Requirements

Void content analysis shows 0.08% voids

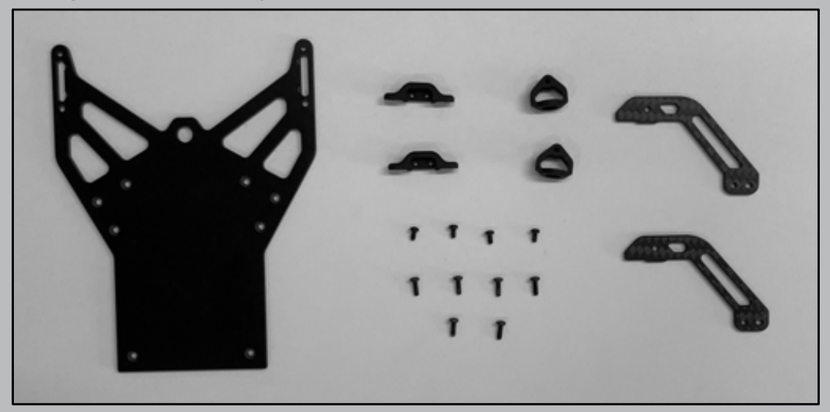
Typical aerospace grade composites require < 1% voids

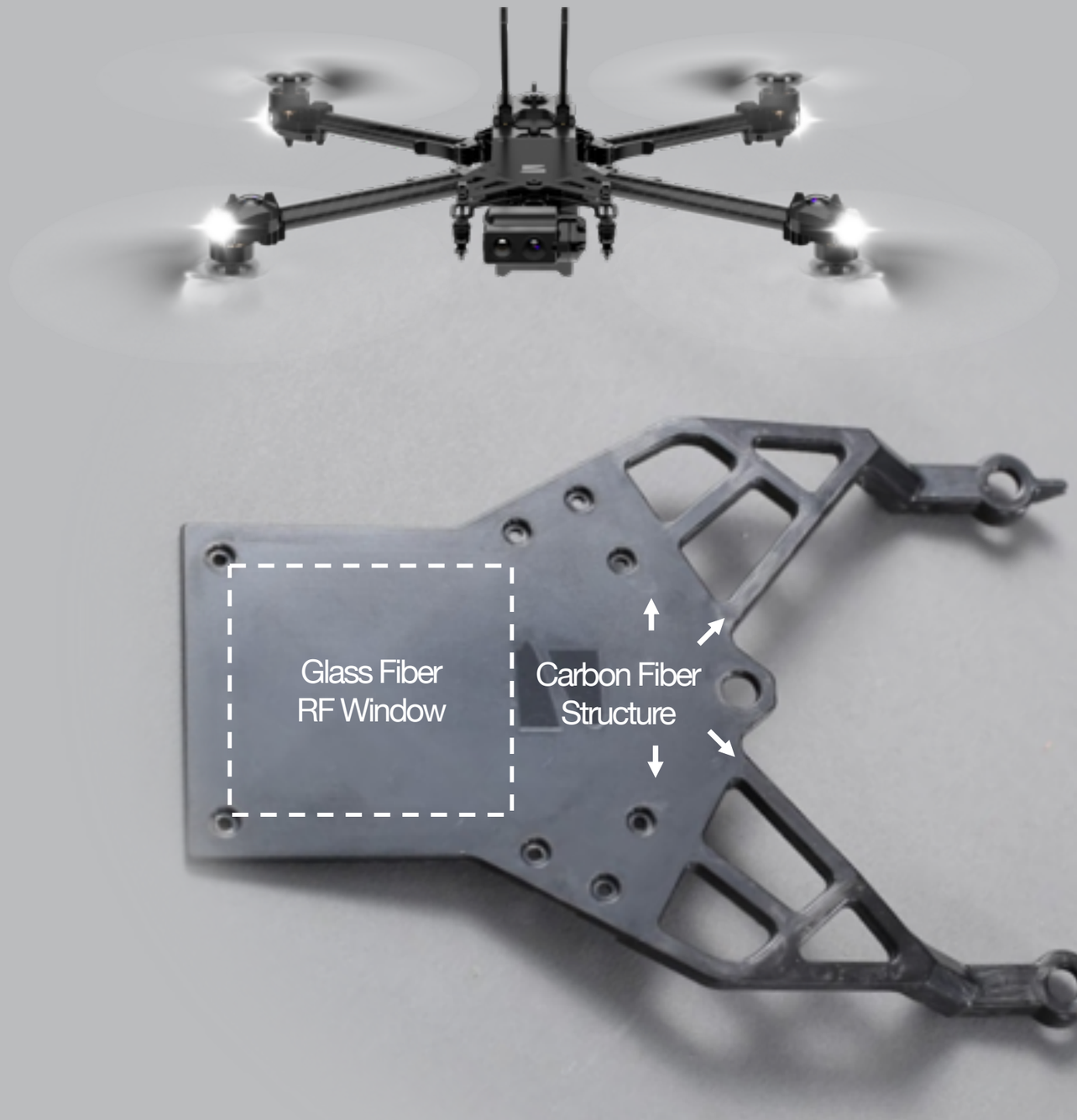


UAV Case Study (Skydio)

- Assembly consolidations: 17 parts to 1
- 25% weight reduction
- Increase in strength, stiffness, and durability
- Multi-material for optimal RF transparency and mechanical performance

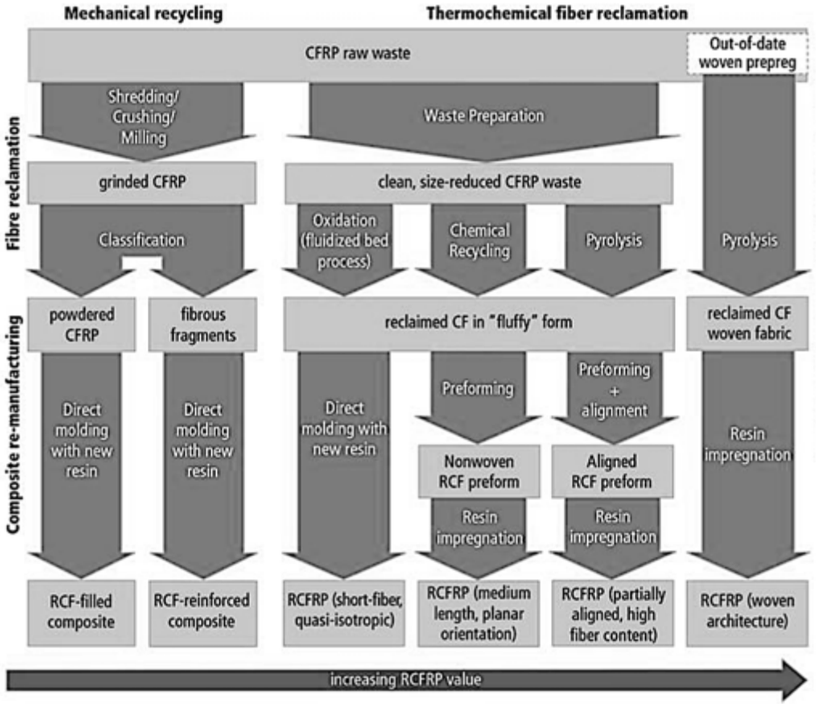
Original Assembly:





The Future of Sustainable Composites:

Repairable / Recyclable / Re-manufacturable



Problems of the Present

- Epoxy & thermoset resins
- High energy consumption
- Waste & emissions
- New resin for reclaimed raw fiber
- Not recyclable

Arris Remoldable Composites

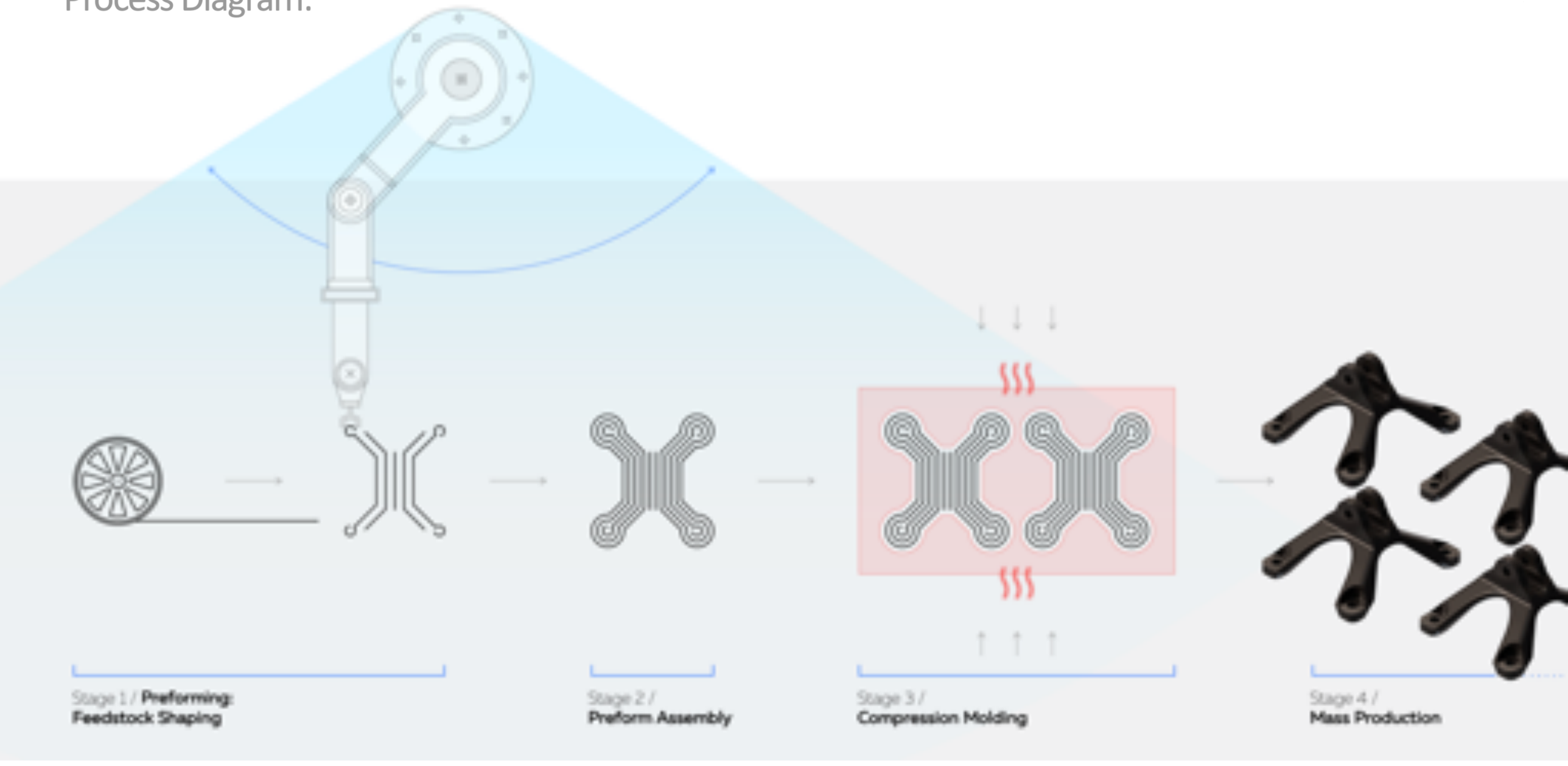
Aligning Performance & Sustainability

The Future

- Thermoplastic resins
- Recyclable / remoldable
- Low energy consumption
- No waste & no emissions
- No reclamation & no new resin

Additive Molding™

Process Diagram:



Stage 1 / **Preforming:**
Feedstock Shaping

Stage 2 /
Preform Assembly

Stage 3 /
Compression Molding

Stage 4 /
Mass Production

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