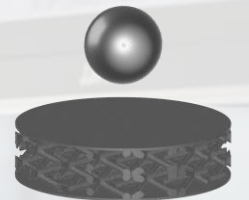
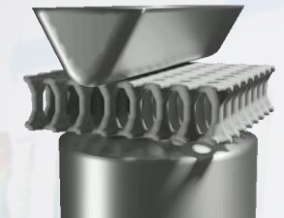
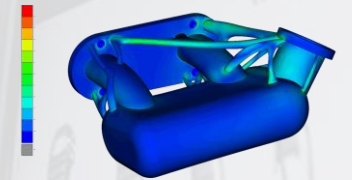
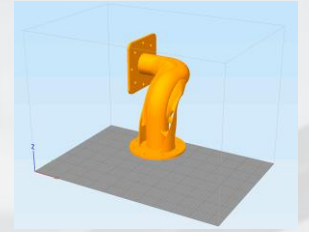


# Ultrasim® 3D Simulation (FEA)



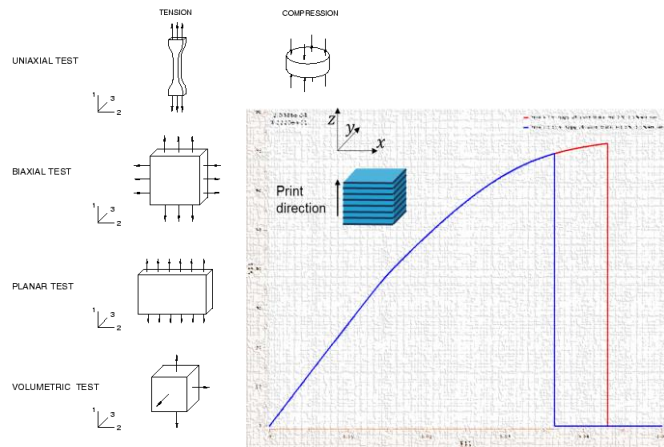
# We support you in every stage – from starter to expert

3D Simulation helps you to speed up the engineering process using a digital twin. We offer 3 easy methods to get started:

## STARTER

### Raw Material Data

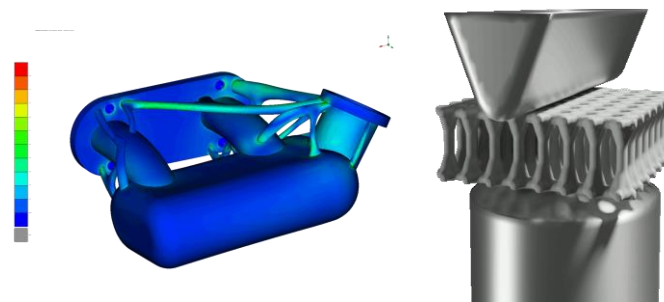
Get the curves behind our TDS data to start basic simulation work.



## PREMIUM

### 3D Simulation

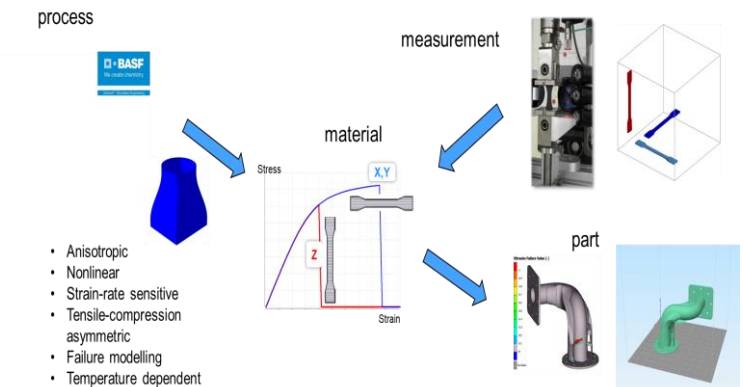
We run the simulation for you. We help you to speed up your engineering process and increase confidence in part performance using a digital twin of your part.



## ENTERPRISE

### Material Model as a Service

Use our in-house developed material models for 3D-Printing incl. anisotropy of the process and FEA support of our experienced virtual engineers.



# Ultrasim® 3D Simulation (FEA) - Offering

	STARTER	PREMIUM	ENTERPRISE
	<p><b>Raw Material Data</b></p> <p>Get the curves behind our TDS data to start basic simulation work. Add additional temperatures or strain-rates to the starter solution.</p>	<p><b>3D Simulation</b></p> <p>We run the simulation for you. We help you to speed up your engineering process and increases confidence in part performance using a digital twin of your part.</p>	<p><b>Material Model as a Service</b></p> <p>Use our in-house developed material models for 3D-Printing including anisotropy of the process and our experience in virtual Engineering.</p>
<b>What you get:</b>	✓	✓	✓
<ul style="list-style-type: none"> <li>Material data at room temperature</li> <li>3D Simulation (FEA) support</li> <li>Ultrasim 3D material model as a service (incl. installation)</li> </ul>			✓
<b>Requirements to get started:</b>			<ul style="list-style-type: none"> <li>Linux System (e.g. CentOS7)</li> <li>LS-DYNA with Sharelib OR ABAQUS</li> <li>Further Details see <a href="#">Appendix</a></li> </ul>
<ul style="list-style-type: none"> <li>IT System</li> <li>FEA Solver</li> <li>Additional requirements</li> </ul>	<ul style="list-style-type: none"> <li>Internal ability to use material data</li> <li>Any solver</li> </ul>		<ul style="list-style-type: none"> <li>ABAQUS, LS-DYNA</li> <li>Advanced FEA knowledge</li> <li>Dedicated Super-User for FEA</li> </ul>
<b>Get your Add-on:</b>	<ul style="list-style-type: none"> <li>Material data at additional temperatures and strain rates</li> </ul>	<ul style="list-style-type: none"> <li>Material data at additional temperatures and strain rates</li> </ul>	<ul style="list-style-type: none"> <li>Material data at additional temperatures and strain rates</li> </ul>
<b>What we need from you:</b>	<ul style="list-style-type: none"> <li>Material of interest (see table)</li> </ul>	<ul style="list-style-type: none"> <li>1 hour of your time to understand your goal and derive the data set you need.</li> </ul>	<ul style="list-style-type: none"> <li>1 hour of your time to understand your problem and derive a solution concept.</li> </ul>
<b>Price:</b>	Free of charge	On request	On request
<b>Lead time:</b>	14 days	On request	On request

# Simulation-Material-Availability

- Validated, available as Material Data Set\*
  - Validated, available via Ultrasim Material Model
  - Preliminary
- \* Can be on short notice be converted into a Ultrasim Material Model

		Available temperatures			Strain rate / loads		Print Orientation / Anisotropy
		Low	23°C	High	Quasi static (structural loads)	High speed (impact & crash)	
Ultrasint® Powders	TPU01	●	●	●	●	●	●
	PA 11 CF	●	●	●	●	●	●
	PP 1400 Black		●		●		
Ultracur3D® Resins	RG 35		●		●		●
	RG 1100		●		●		
	RG 1100 Black		●	●	●		
	RG 3280*		●	●	●		
	ST 45		●		●		
	ST 1400		●		●		
	EPD 2006		●		●	●	

\*Mold-flow material card available [here](#)

➤ Any materials of our portfolio can be added on request.

# How it Works



# Starter Workflow: Raw Material Data

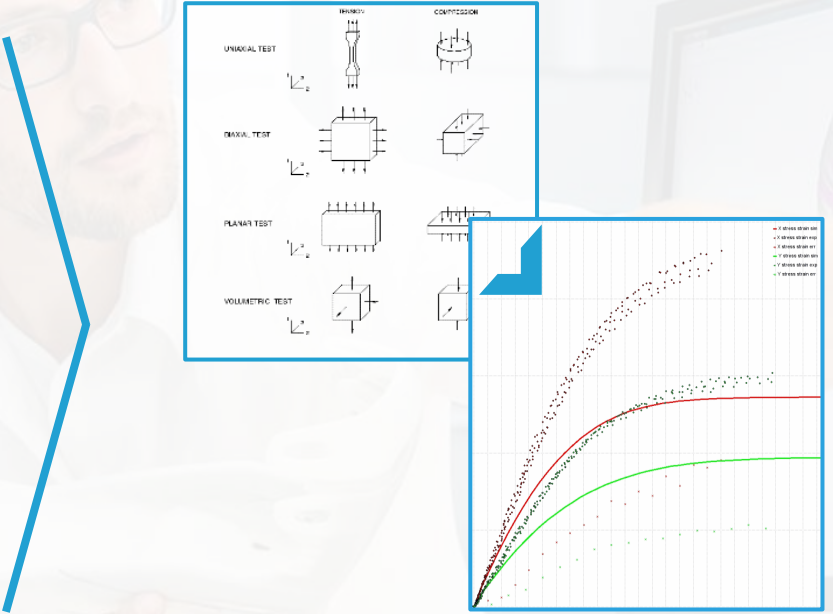
## 1. Meeting to understand your need of material data and format

We set up a 1-hour call to discuss jointly the material data and format you need.



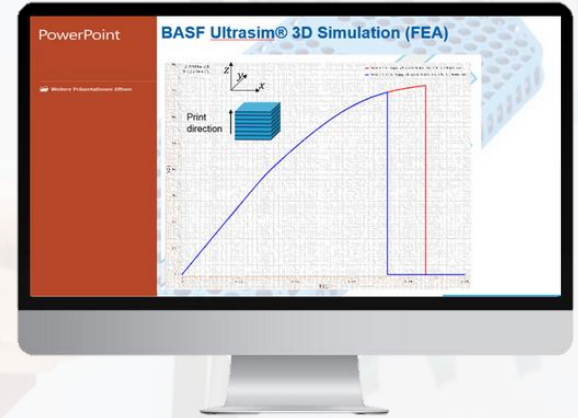
## 2. We generate customized material data deck

We generate a customized material data overview based on your FEA goal and material choice.



## 3. You gain access to your material deck

You receive the material deck including a PPT and the raw data of the materials requested.



# Premium Workflow: 3D Simulation

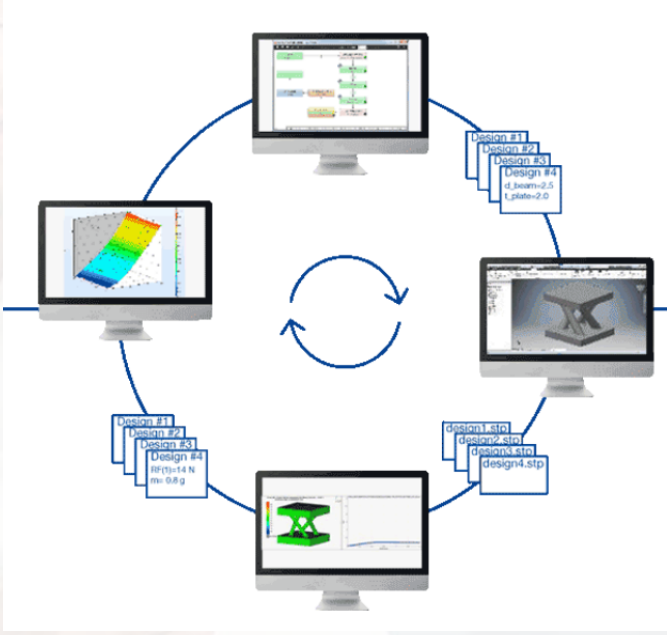
## 1. Meeting to understand your simulation request

We set up a 1-hour call to jointly define how CAE can support your development, the inputs we need and the output you are expecting.



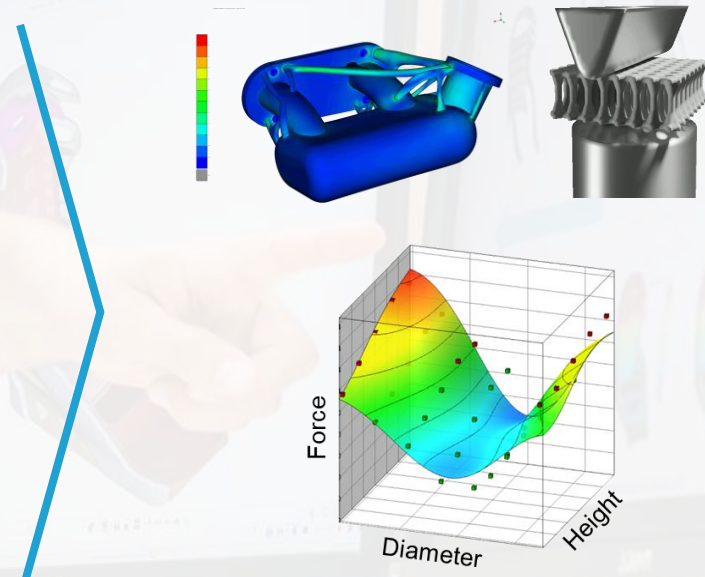
## 2. We run the requested simulation

We set up the FEA models needed and run the simulation and optimization having a close feedback loop with your team.



## 3. We present the results and hand over optimized geometries

We present the results to you and hand over a report plus the optimized part geometries.



# Enterprise Workflow: Material Model as a Service

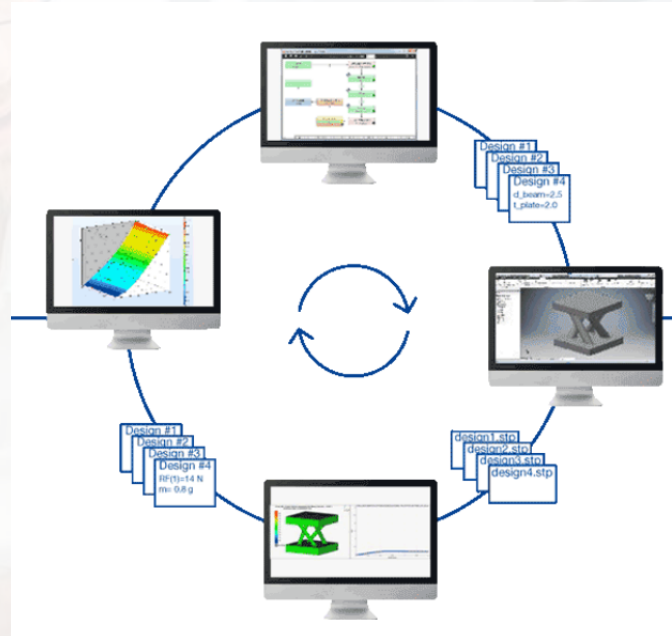
## 1. Meeting to understand your need of a specific material model

We jointly define the material model requirements depending on your application (quasi-static, crash, ...) and ensure that your IT environment is supported by our tools.



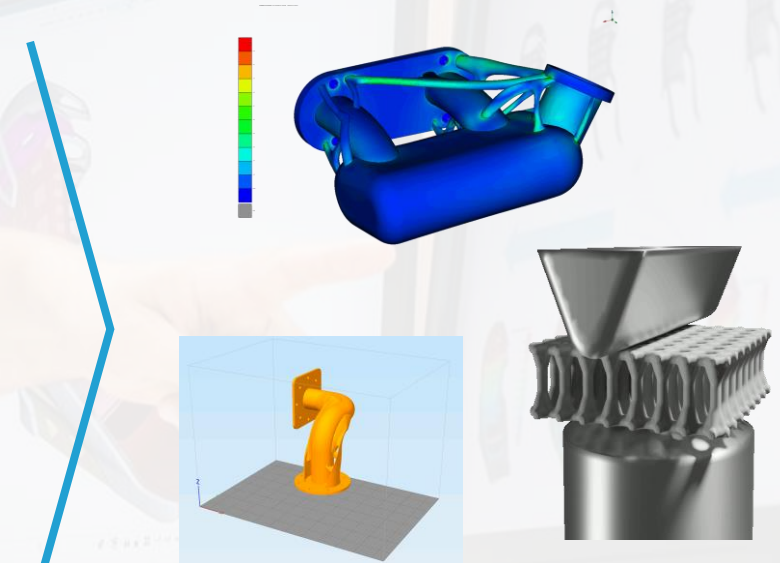
## 2. Installation and test of Ultrasim

You provide a typical input deck you use in FEA simulation (e.g. ABAQUS) without material model. We integrate our specialized material model and get you set up to start working.



## 3. You are ready to apply our material models during your FEA

You can choose our material models during your typical workflow and are supported by our FEA specialists.





## Example:

# How Simulation Accelerates Application Development



# The Evolution of NFL Helmets



1950

1970

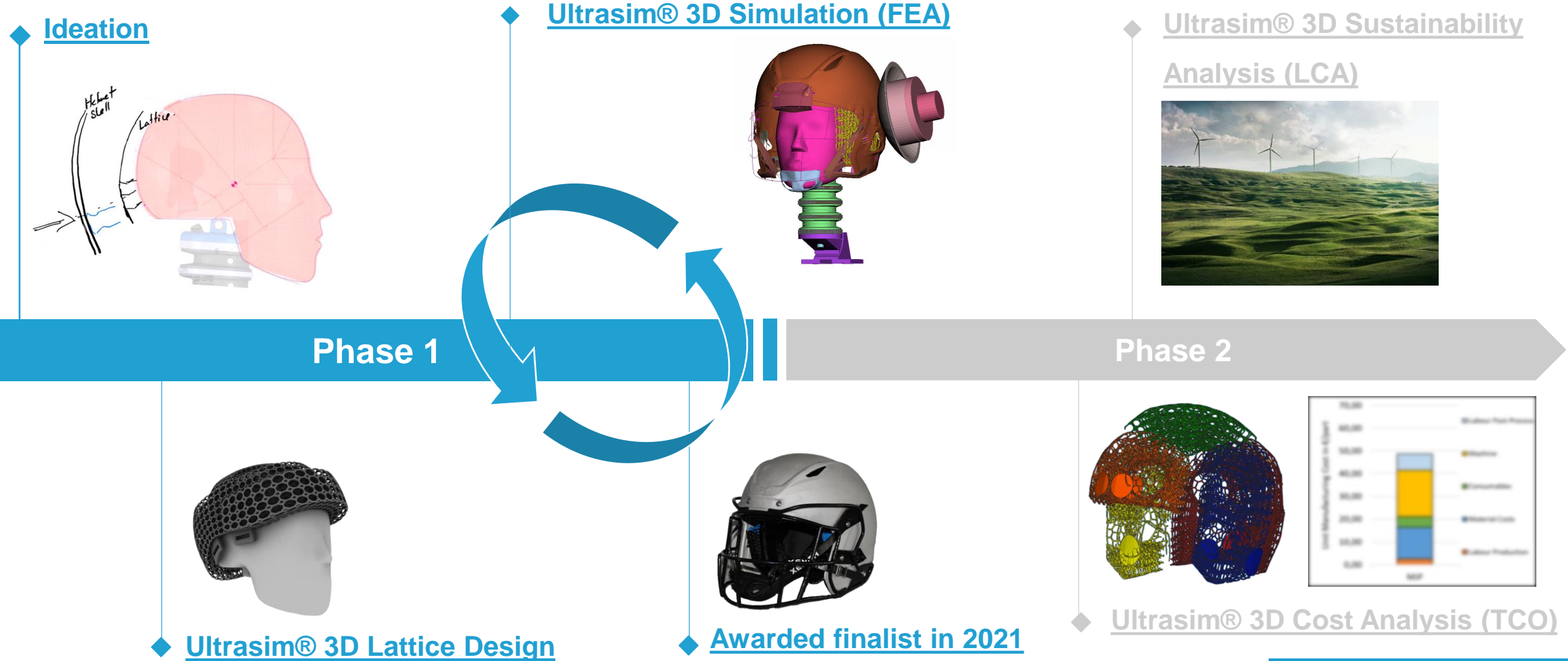
2010

**NEXT**

# NFL Helmet Challenge

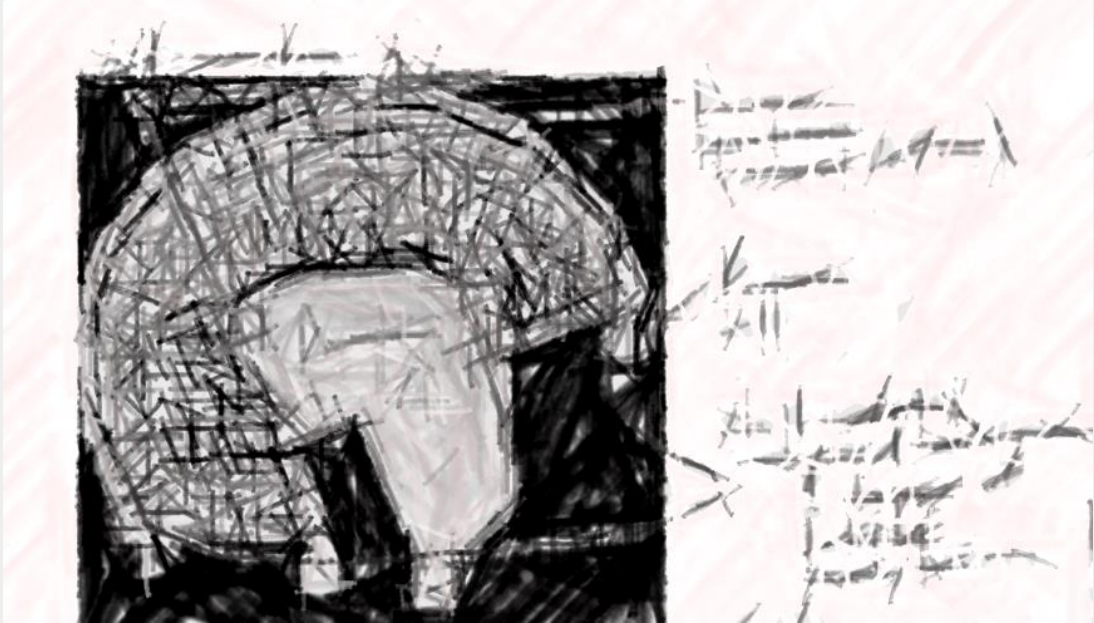
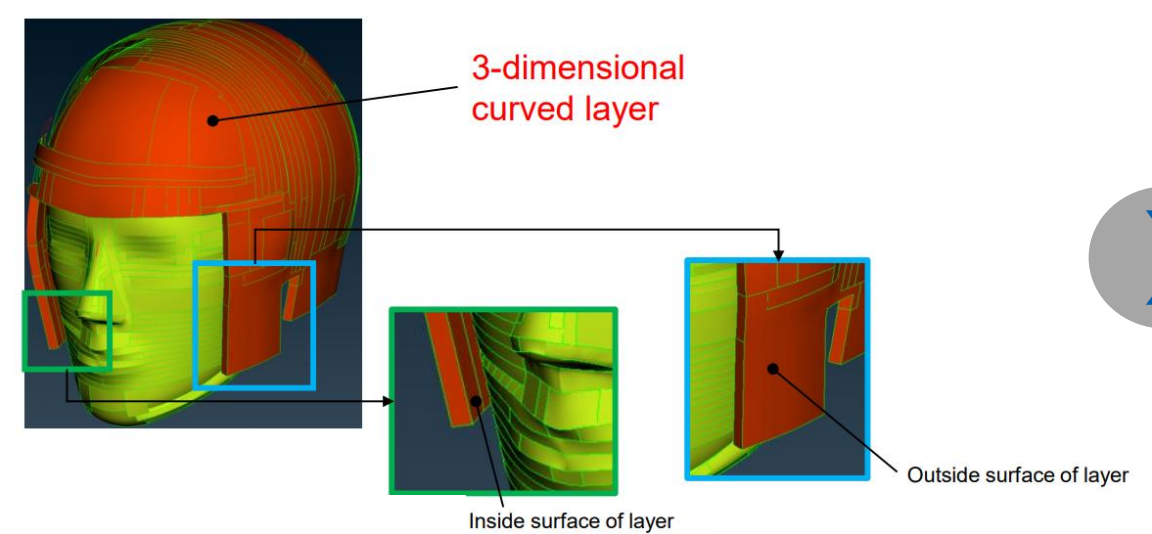


# Football Helmet Case Study



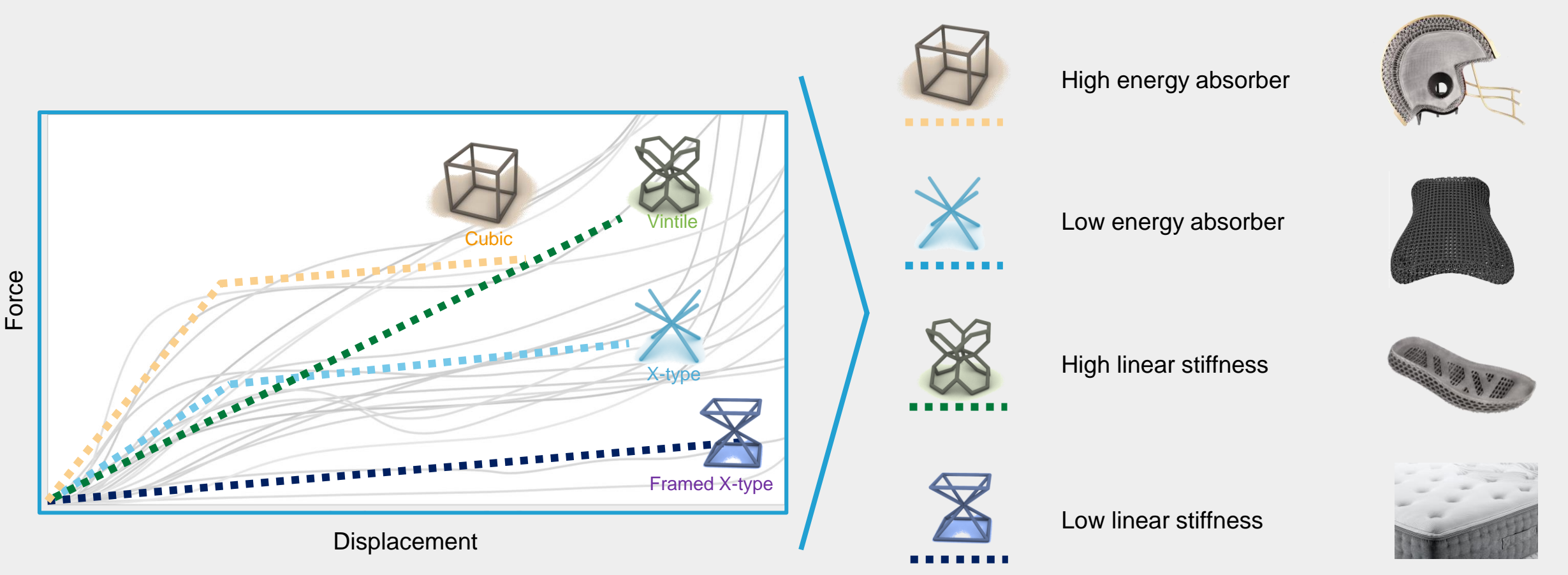
# Phase 1: Lattice Design Generation - Ideation

Enterprise – Full Engineering



# Phase 1: How to find the right Lattice?

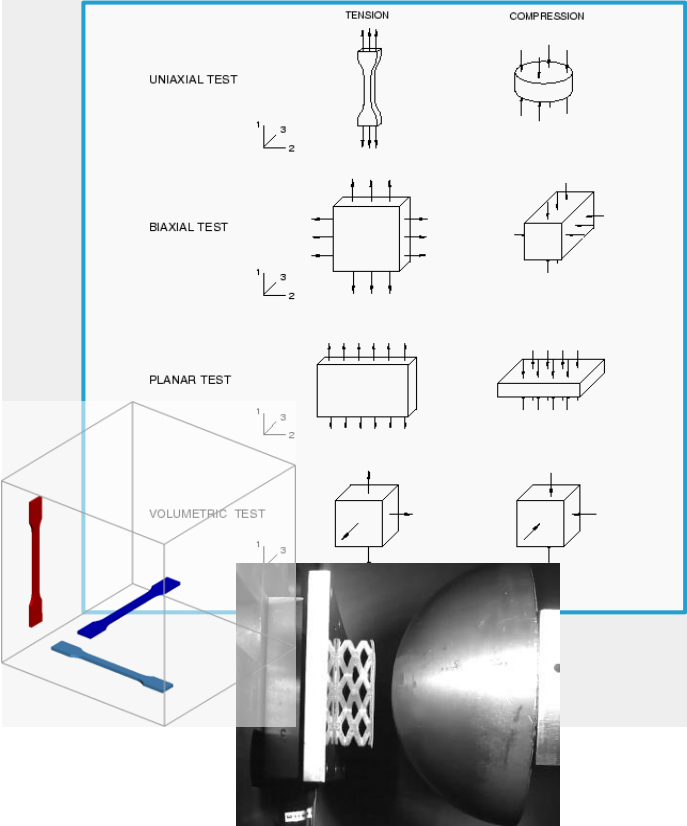
One material many behaviors



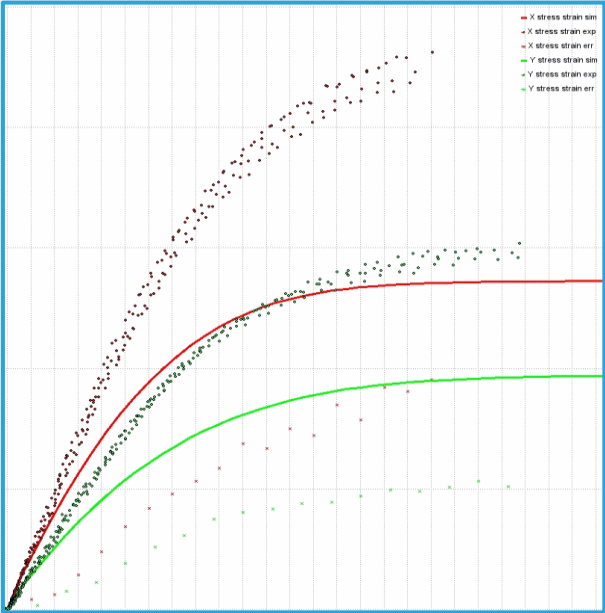
# Phase 1: How to be Sure that the Design Works?

Simulation of part behavior

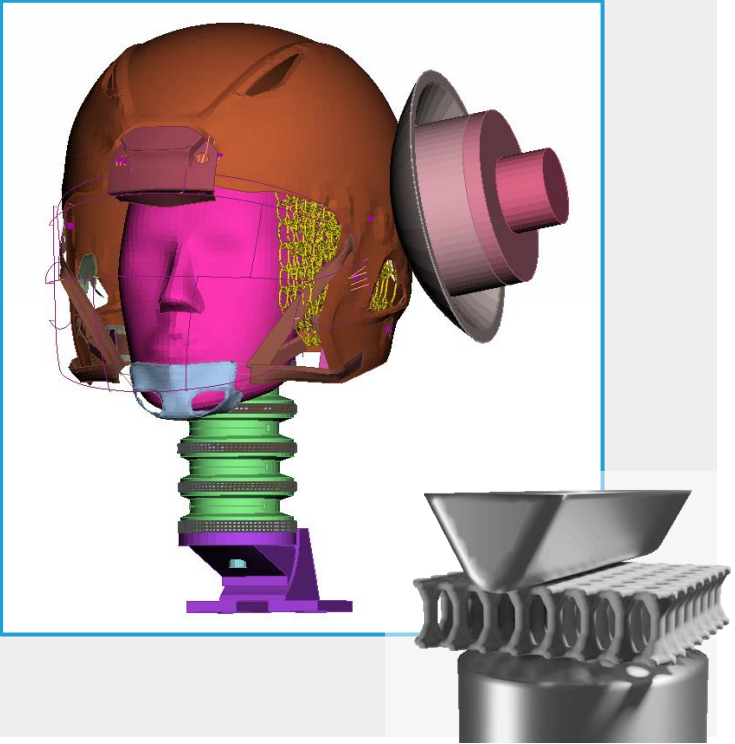
## 1. Data Measurements



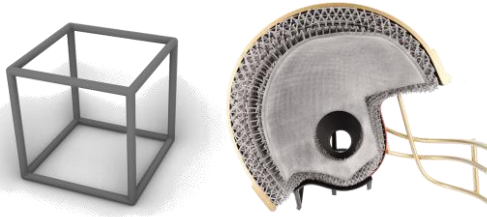
## 2. Multidimensional Data Fitting



## 3. Material Model Generation

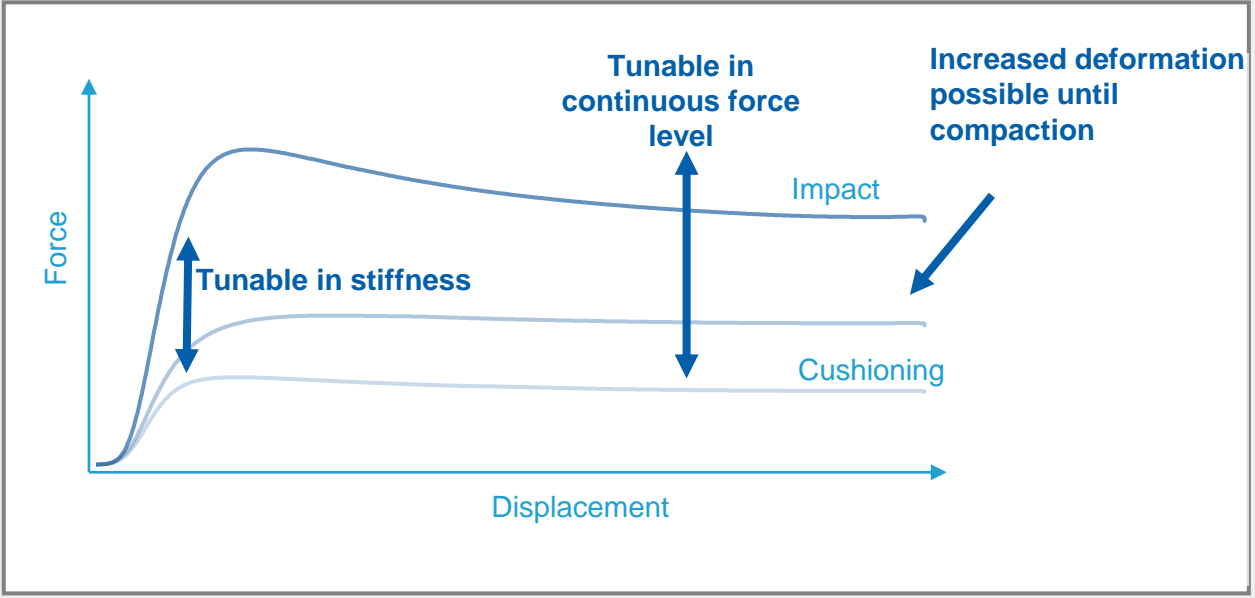
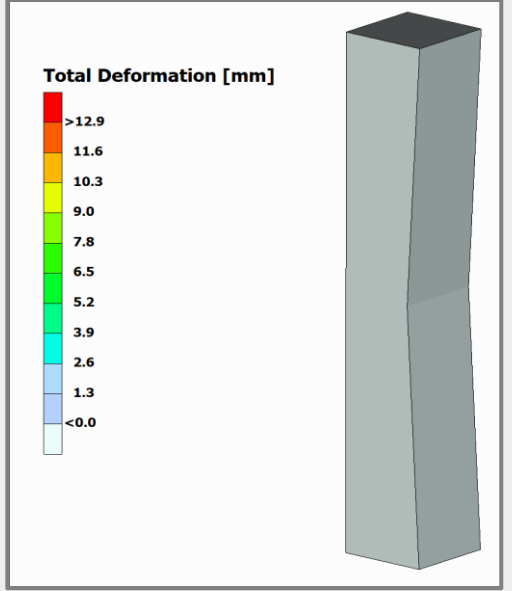


# Phase 1: Optimized Lattice for Energy Absorption



## Challenge

- High energy absorption
- Tunable in force level
- Late compaction





# Results of Phase 1: Xenith named a finalist in NFL Helmet Challenge

- **Xenith wins \$496.500** named a finalist in the 2021 NFL Helmet Challenge
- “The **Ultrasim® capabilities of Forward AM are second to none** – deep knowledge of lattice performance, durability and design for AM. When provided a design goal this workflow can be applied to filter the number of design options and converge on a physical product to meet this goal in a very time efficient manner. This is a **game-changer to solving the very complex problems with virtually an infinite number of possible solutions!**“

Dr. Ron Jadischke, Chief Engineer, Xenith.



# Summary

## Enabled by Xenith with:

- Ultrasim® 3D Lattice Design
- Ultrasim® 3D Simulation (FEA)
- Ultrasim® 3D Costs Analysis (TCO)
- Ultrasim® 3D Sustainability Analysis (LCA)



1950

1970

2010

**NEXT**



# Any Questions? Contact Us!

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**Marius Haefele**

Product Manager Services

**[sales@basf-3dps.com](mailto:sales@basf-3dps.com)**

 - **BASF**

We create chemistry



**FORWARD AM**

Innovating Additive Manufacturing