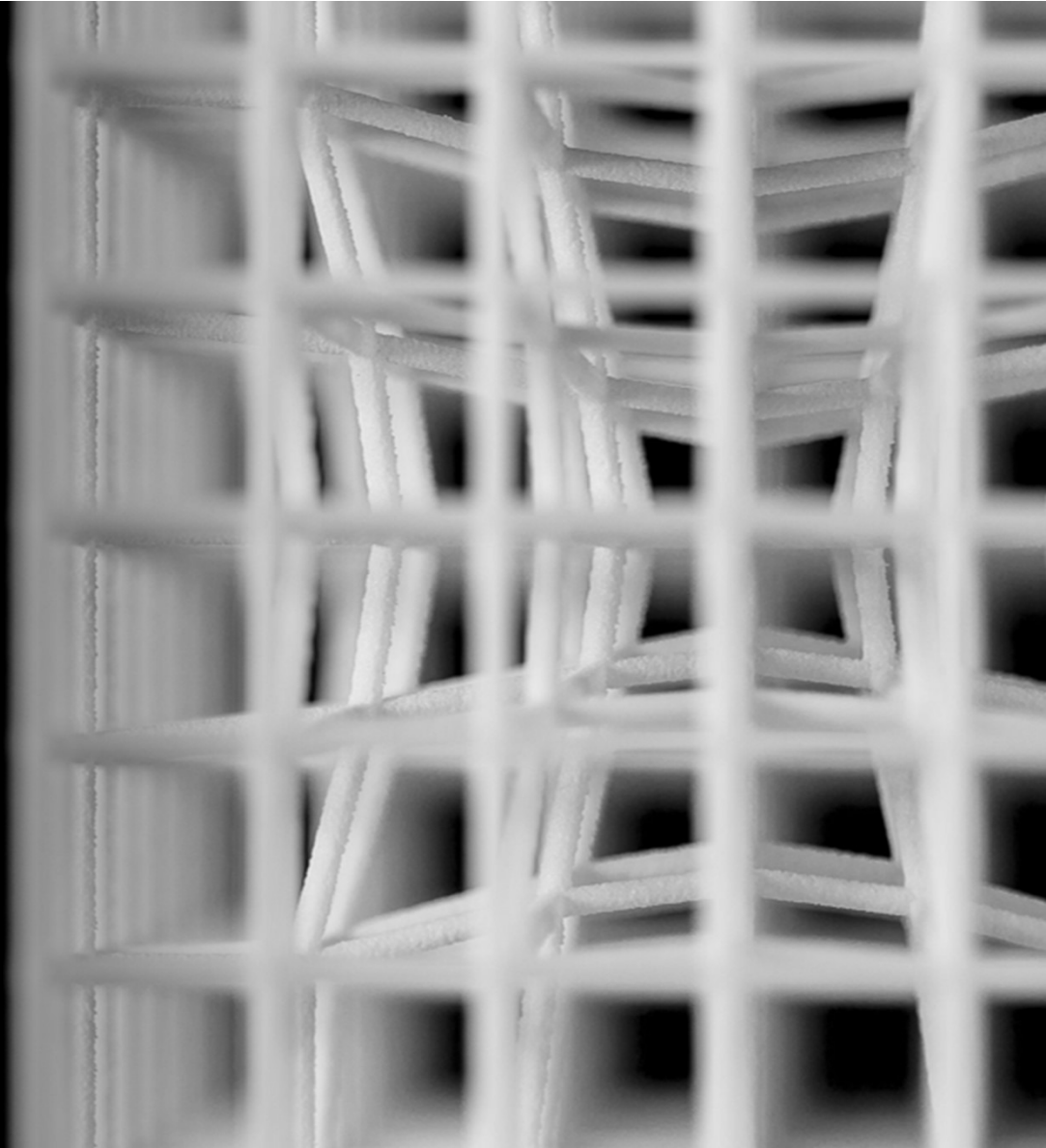


(R-)evolution towards serial manufacturing

Daniel Hoogstraate | Rico Engelman

NAG 3DP Cluster | Eindhoven, 8 feb 2022



Bremen, 1989



Leuven, 1990



Materialise at a glance – 4 key capabilities

Materialise Mindware

Advisory services for business success with AM



Materialise
Software



Materialise
Manufacturing



Materialise
Medical

Growing our expertise, worldwide

materialise
innovators you can count on

26 offices in 19 countries

+195 3D-printers



+2,000 parts printed daily



+210 patents granted



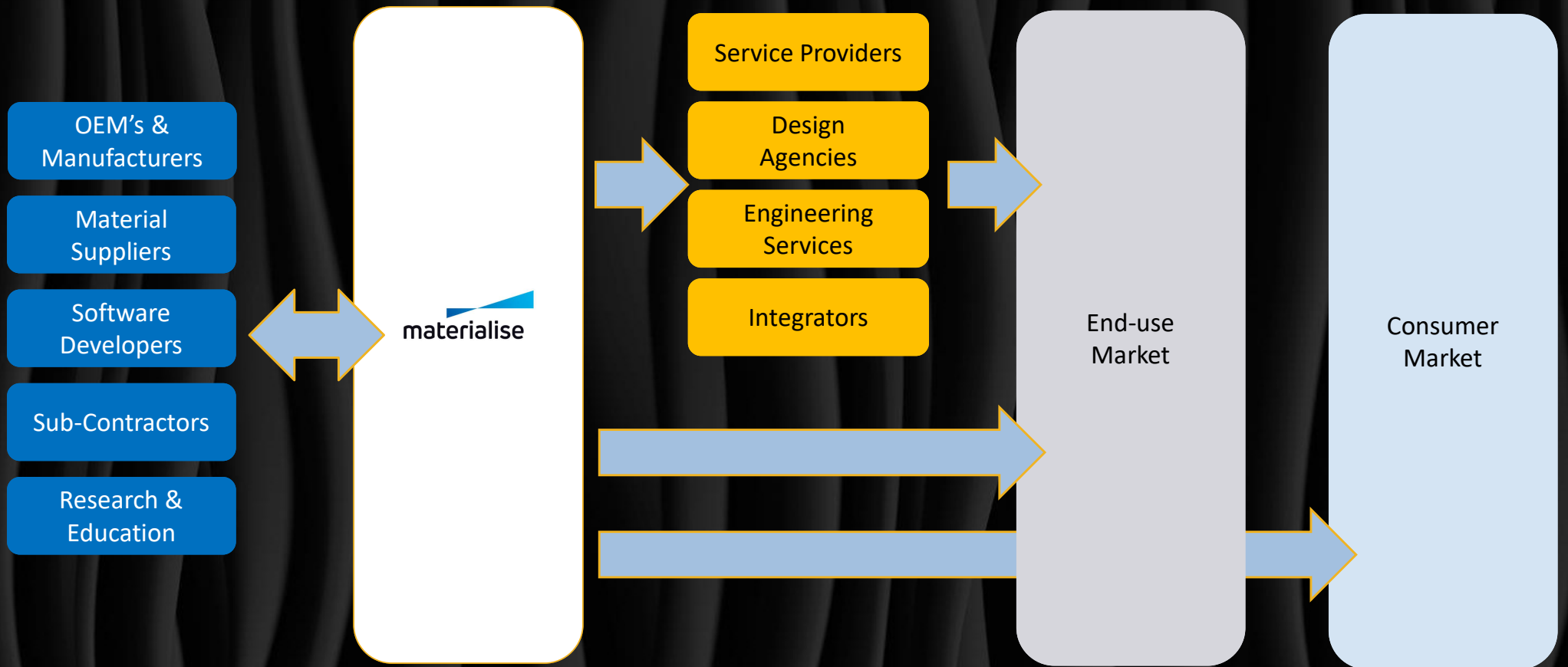
+165 patents pending



+2200 EMPLOYEES



Value chain



Over 3 jaar 3D-geprinte
woningen in Kempen
Iedereen een fabriek

OP WEG NAAR
EEN NIEUWE
INDUSTRIËLE
REVOLUTIE?

3D printing slaat gat in wereldhande

25% tot 40% minder wereldhandel pakt voor
Nederland negatief uit



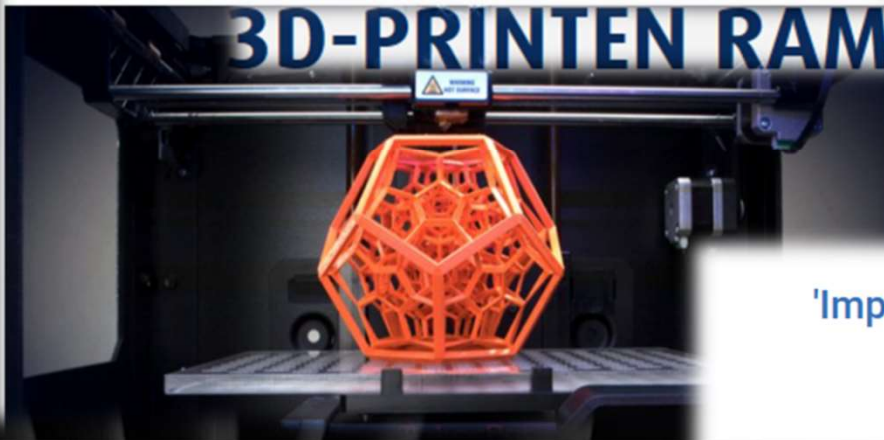
Maakt de 3D-printer de
maakindustrie overbodig?



3D-printer klaar voor
massaproductie

17 - In 2060 wordt de helft van alle
producten door 3D printers gemaakt, als het huidige
groei tempo van 3D printing aanhoudt. Dit zal tot gevolg
hebben dat het volume van de wereldhandel in 2060 een
binnenlands plaatsvindt. Deze vermindering van de
wereldhandel zal in Nederland de havens,
grootbedrijven en de sector transport & logistiek
hard raken. Als de investeringsgroei in 3D de komende

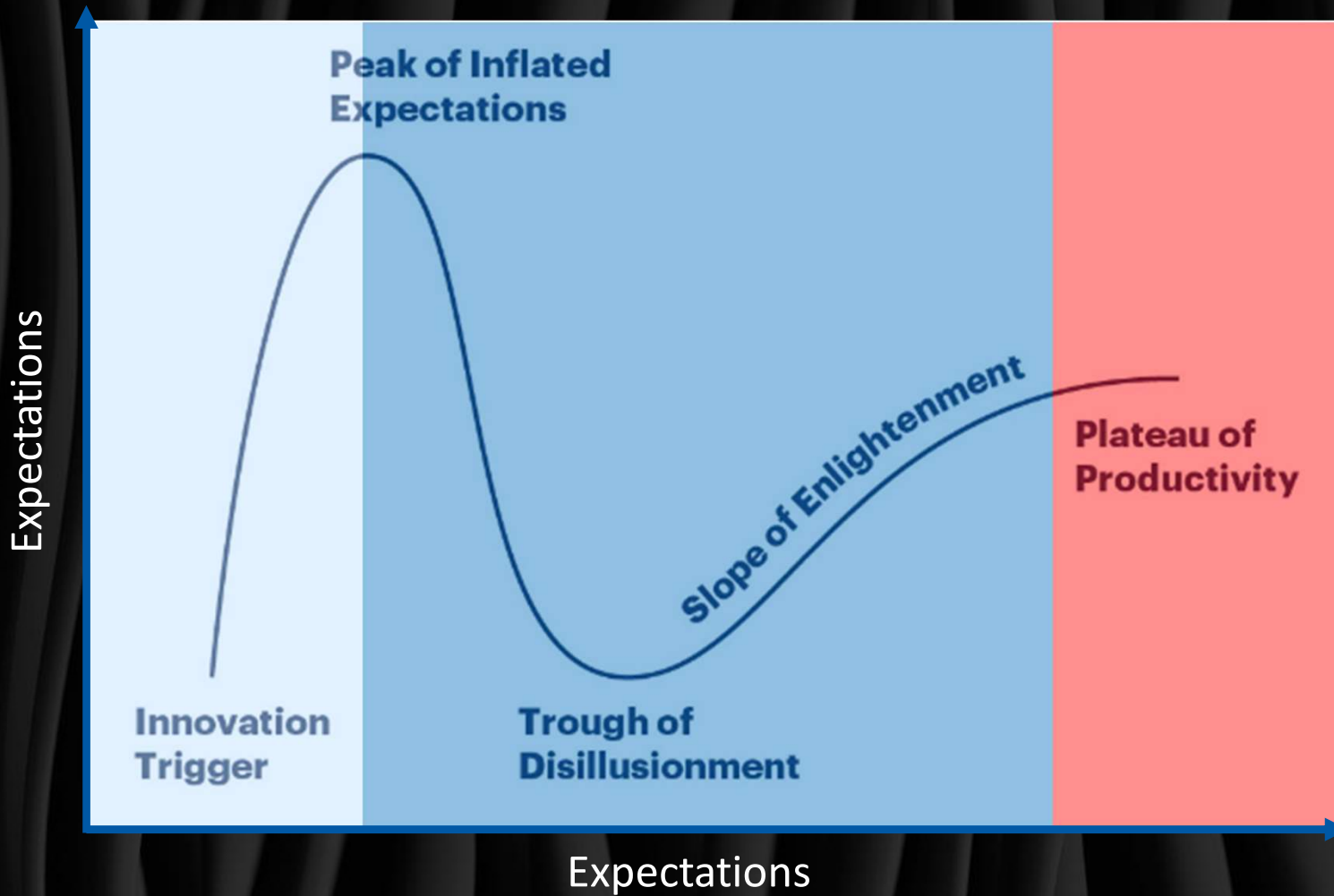
3D-PRINTEN RAMP VOOR LOGISTIEK NEDERLAND



'Impact 3D-printing op wereldhandel nadelig voor
Nederland'

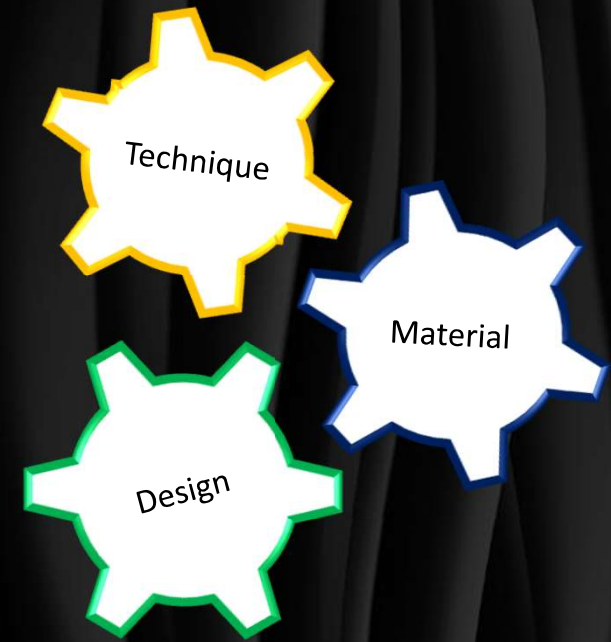
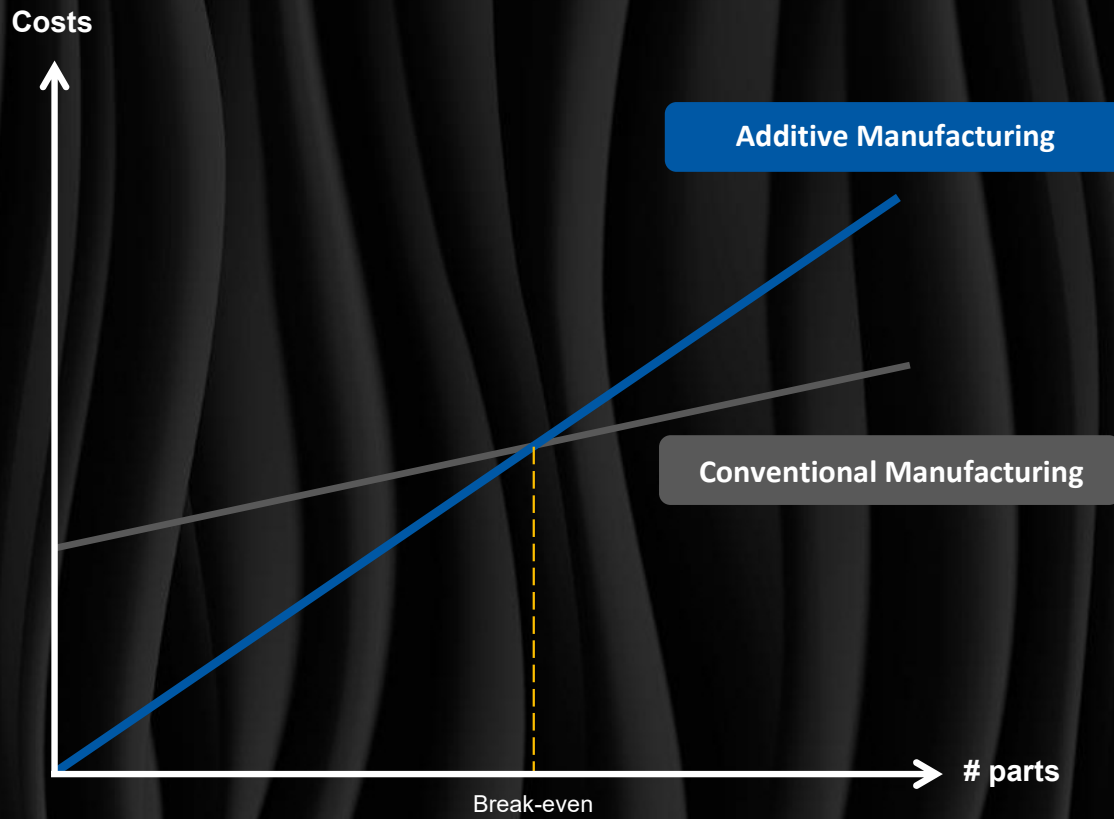


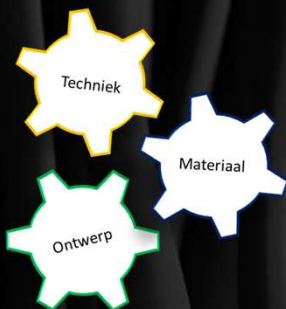




'Gartner Research's Hype Cycle diagram' by Jeremy Kemp is licensed under CC BY-SA 3.0

Tipping point..





LS
Laser Sintering

PA, PA-GF, PA-Alu filled, TPU



SLA
Stereo Lithography Apparatus

Epoxy based



MJF
Multi Jet Fusion

PA-12



FDM
Fused Deposition Modeling

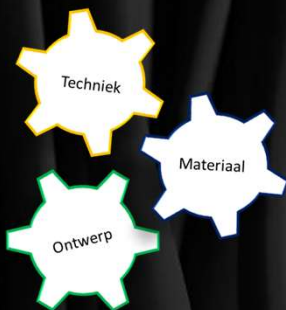
ABS, PC/ABS, PC, Ultem



SLM
Selective Laser Melting

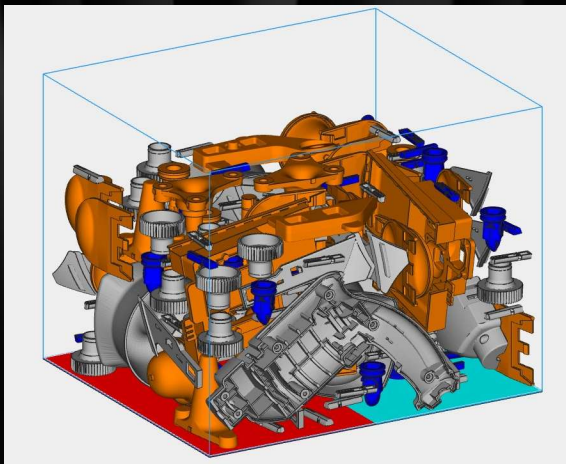
AlSi10Mg - TiAl6V4 - 316L - IN718





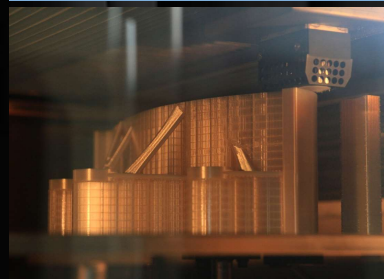
LS Laser Sintering

PA, PA-GF, PA-Alu filled, TPU



FDM Fused Deposition Modeling

ABS, PC/ABS, PC, Ultem



Aerospace Manufacturing

materialise
innovators you can count on

The Additive Evolution

materialise
innovators you can count on

1990s

2000s

2010s

2020s

Technology & materials

Applications

Productivity

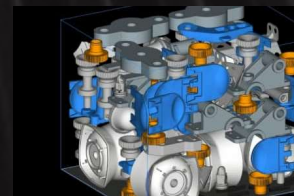
Supply chain integration



making it
work



making it
meaningful



making it
worthwhile



making it
accessible

Materialise and the aerospace industry

- ▶ Holder of an EASA 21.G Production Organization approval
- ▶ Only supplier operating two Airbus-approved 3D printing technologies: FDM and SLS
- ▶ Supporting the aero industry in defining design values based on material allowables



The promise of lightweight...

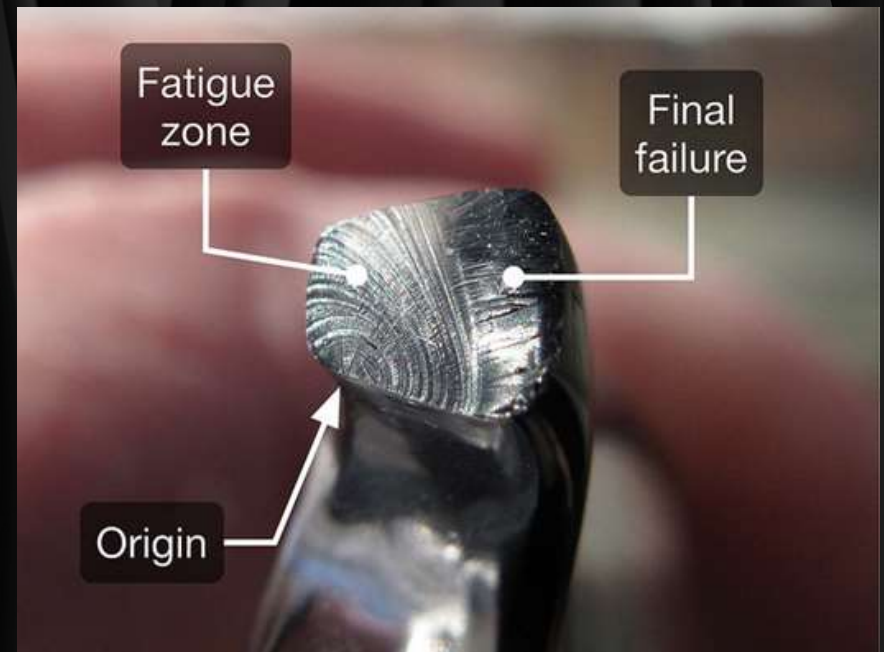
1
pound

removed from
an airplane

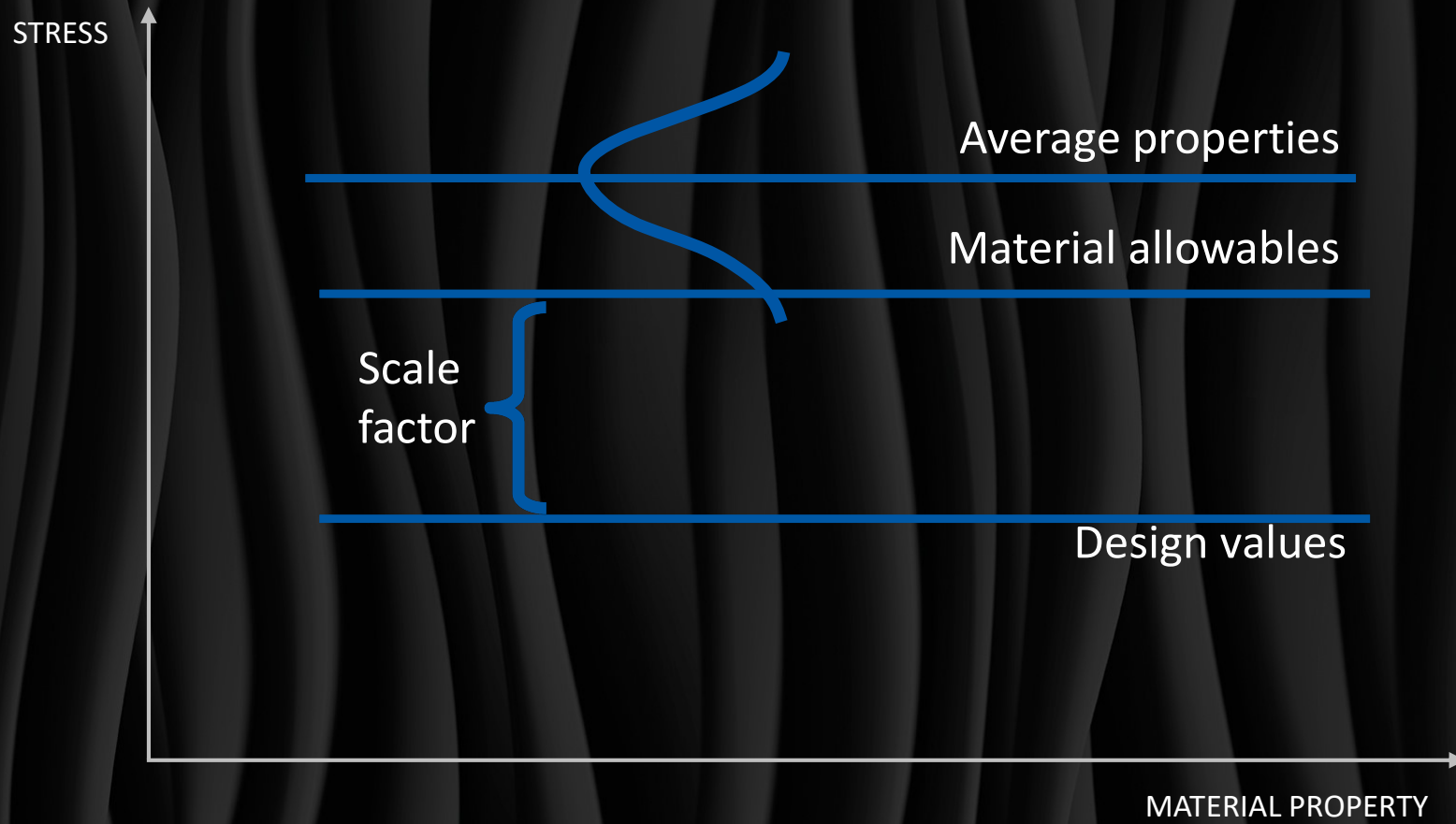
SAVES

14,000 gallons
of fuel each year. ⁽¹⁾

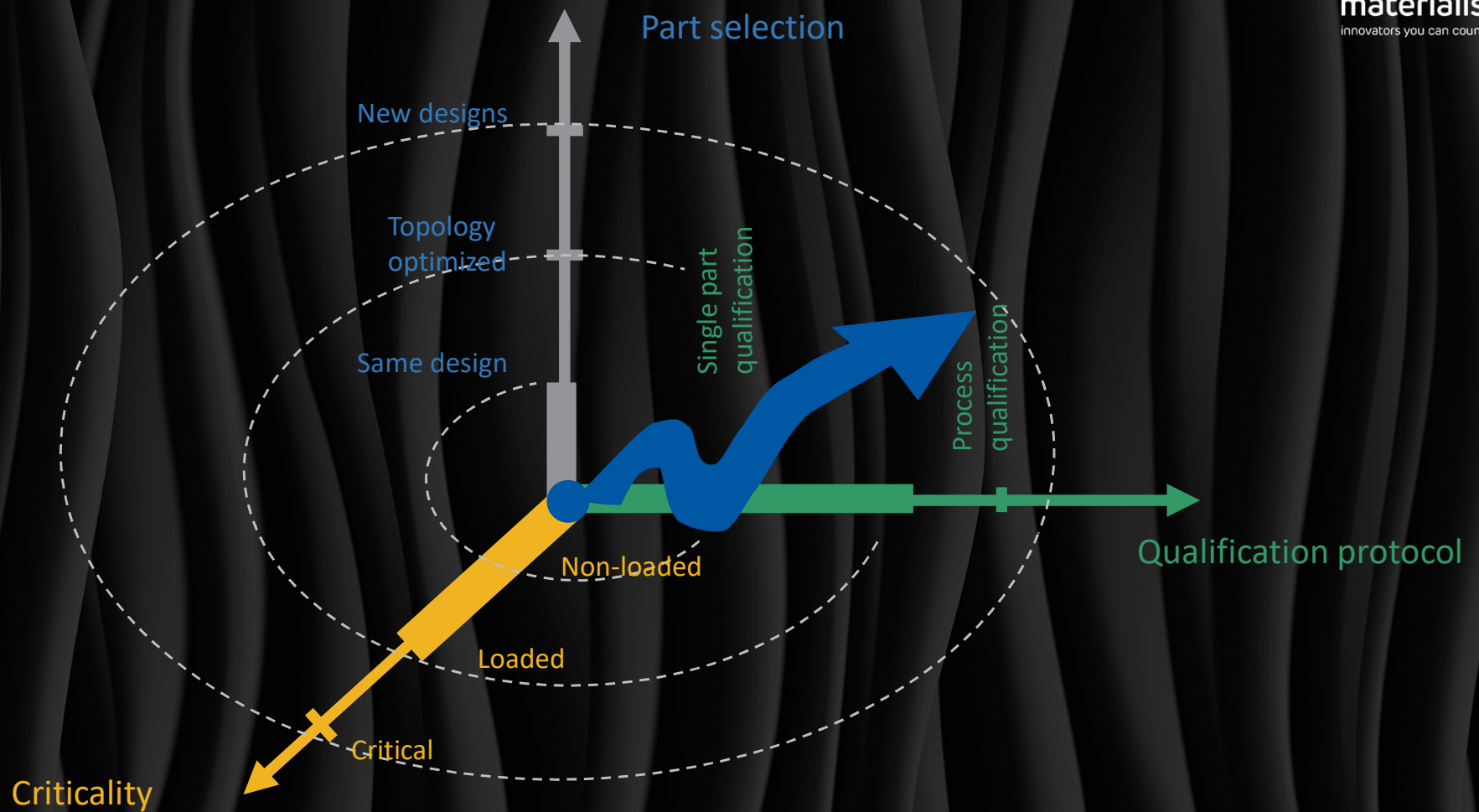
... vs the reality of safety



- ▶ Overall process stability (induced defects)
- ▶ Properties created upon fabrication
- ▶ Surface quality as-built
- ▶ Complex structures
- ▶ Inspection cost



A step by step approach



Product drivers for AM

- 1 Design Freedom
- 2 Cost effectivity vs complexity
- 3 Low volume manufacturing

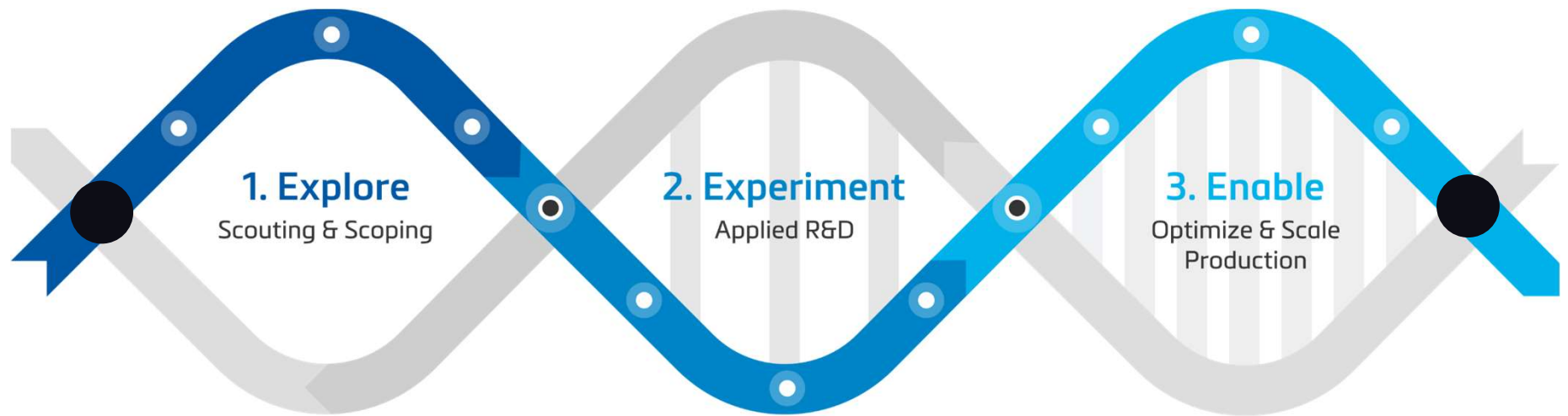


Business drivers for AM

- 1 Digital Supply Chain
- 2 Rapid Time to Market
- 3 Functionality, Integration & Volume
- 4 Meaningful customization

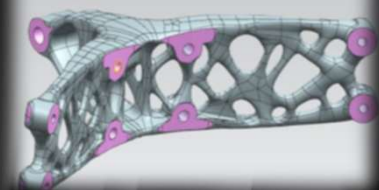
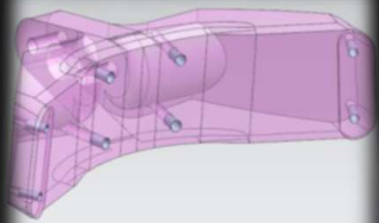


The additive manufacturing journey



Business drivers for AM

Functionality



Volume



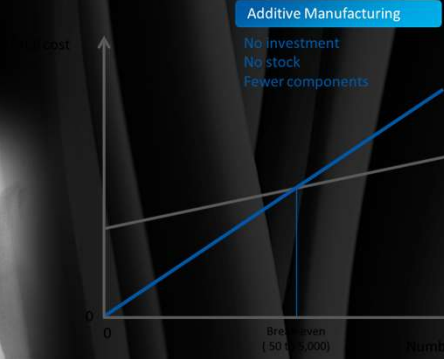
Customization



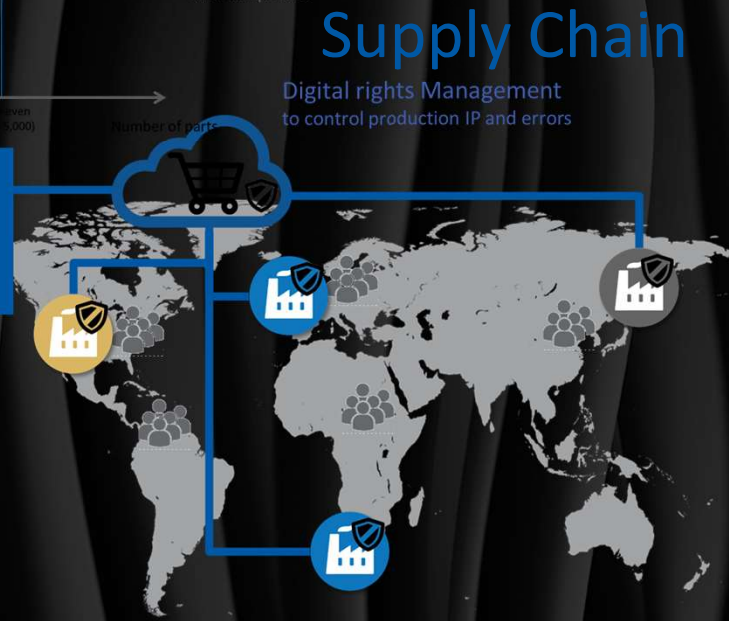
Complexity



Cost Effectivity



- ### Distributed Manufacturing
- Print on demand
 - Scaling production
 - Minimal ecological footprint



Rapid TTM



A high-angle, close-up view of an airplane's wing and tail section, extending from the bottom left towards the top right. The sun is low on the horizon, creating a bright, golden glow that illuminates the clouds and the wing's surface. The sky transitions from a deep orange near the sun to a dark blue at the top. The wing's structure, including rivets and panels, is clearly visible.

Inspiring Aerospace Cases

The logo for Materialise, featuring a blue triangle pointing to the right above the word "materialise" in a lowercase, sans-serif font.

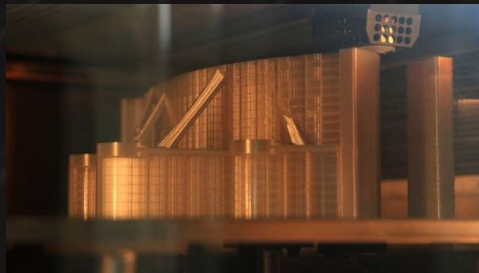
materialise
innovators you can count on

Airbus

Overhead Cabin Spacer Panel

- ▶ Minimal Lead Time
- ▶ Designed for AM: 15% Lighter
- ▶ Airbus Cabin Interior Finish

Printing



Post-processing



Expleo

Boeing 737 dado panel repair kit

- ▶ Designed for AM, repair instead of replacement
- ▶ Improved panel strength
- ▶ Design collaboration between EASA 21.J DO Expleo and 21.G PO Materialise



Lift Aircraft: 62 Optimized Ti64 Components

materialise
innovators you can count on



LIFT
AIRCRAFT

HEXA TITANIUM AM PARTS



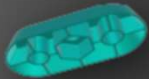
1 MOTOR PYLONS



5 SEATBELT JOINT



2 BEAM ROOT CONSOLES



6 CENTROPLANE ANCHOR



3 DOWN BOLT CONES



7 CABIN JOINTS



8 FUSELAGE ANCHOR



9 UNDERCARRIAGE JOINTS

Improved buy-to-fly ratio for material usage | Battery life improvements

The image features a black background with a subtle, wavy, fabric-like texture. A large, bright blue diagonal shape cuts across the frame from the top right to the bottom left. The word "Questions" is written in white, sans-serif font within the blue area.

Questions

Explore our services
and contact us at
mtls.me/aero

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APPLICATION SPOTTING

DESIGN CONSULTING

QUALIFICATION PARTNERSHIPS

MANUFACTURING SERVICES



@materialisenv



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/company/materialise