



Additive Layer Manufacturing for Airbus Products

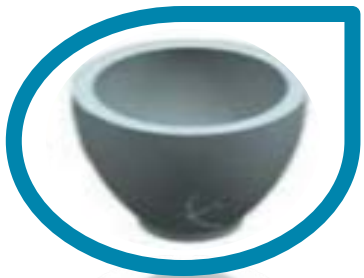
John VAN DOESELAAR – Executive Expert Structural Integrity
Airbus Structures Engineering

Global manufacturing meeting - Cologne - November 17, 2017

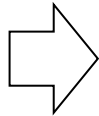
AIRBUS

What is Additive Layer Manufacturing?

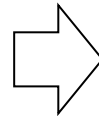
Additive Layer Manufacturing is a technology that enable
creating the MATERIAL while creating the PART



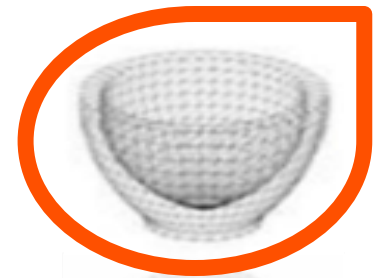
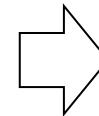
3-dimensional CAD File



Sequence of 2-dimensional
slices

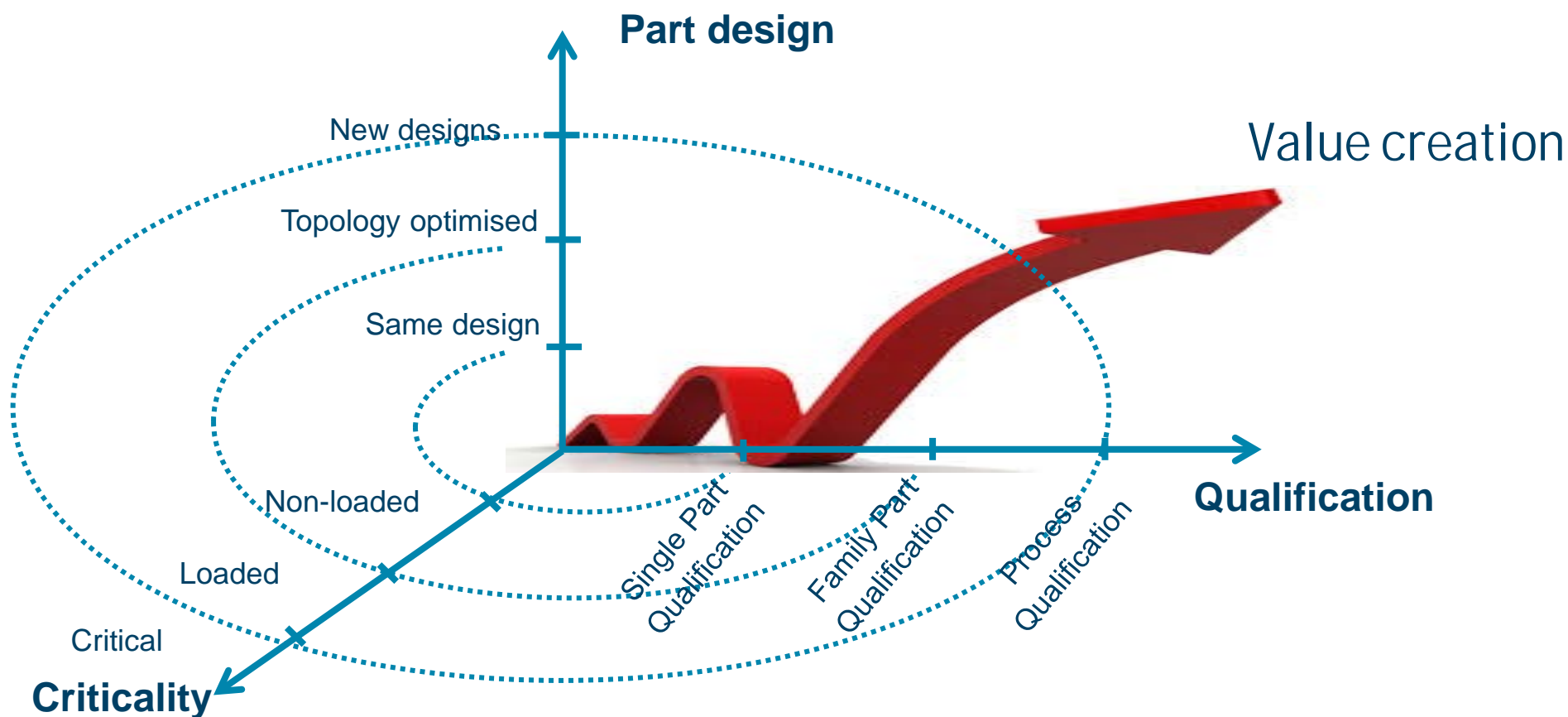


Each slice is formed &
bonded to the previous layer



The 3-dimensional shape is
constructed from the 2-
dimensional slices
(from STL file)

ALM Metallic Alloys Powder Bed Technologies: Step by Step Introduction



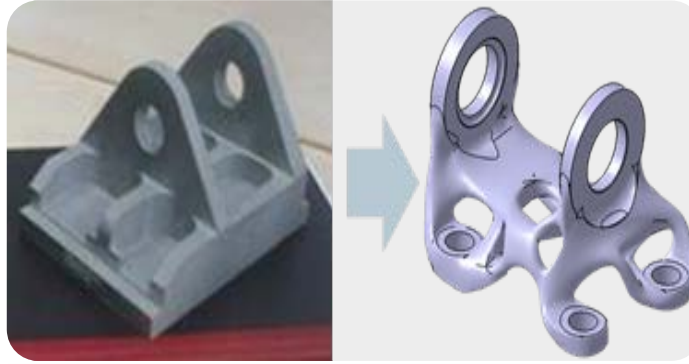
Confidence building with Programs & Regulators

Potential for Value Creation all along the Program Lifecycle



New Program Development

- Functional Prototyping
- Long Lead Time Items
- Ease of Design Evolution



Pre Serial & Serial Production

- Mitigate Supply Disruption
- Optim. Parts Production (RC, weight)
- More Integrated Structures



In-Service

- Repair Solutions
- Spare Parts
- Supplier Obsolescence

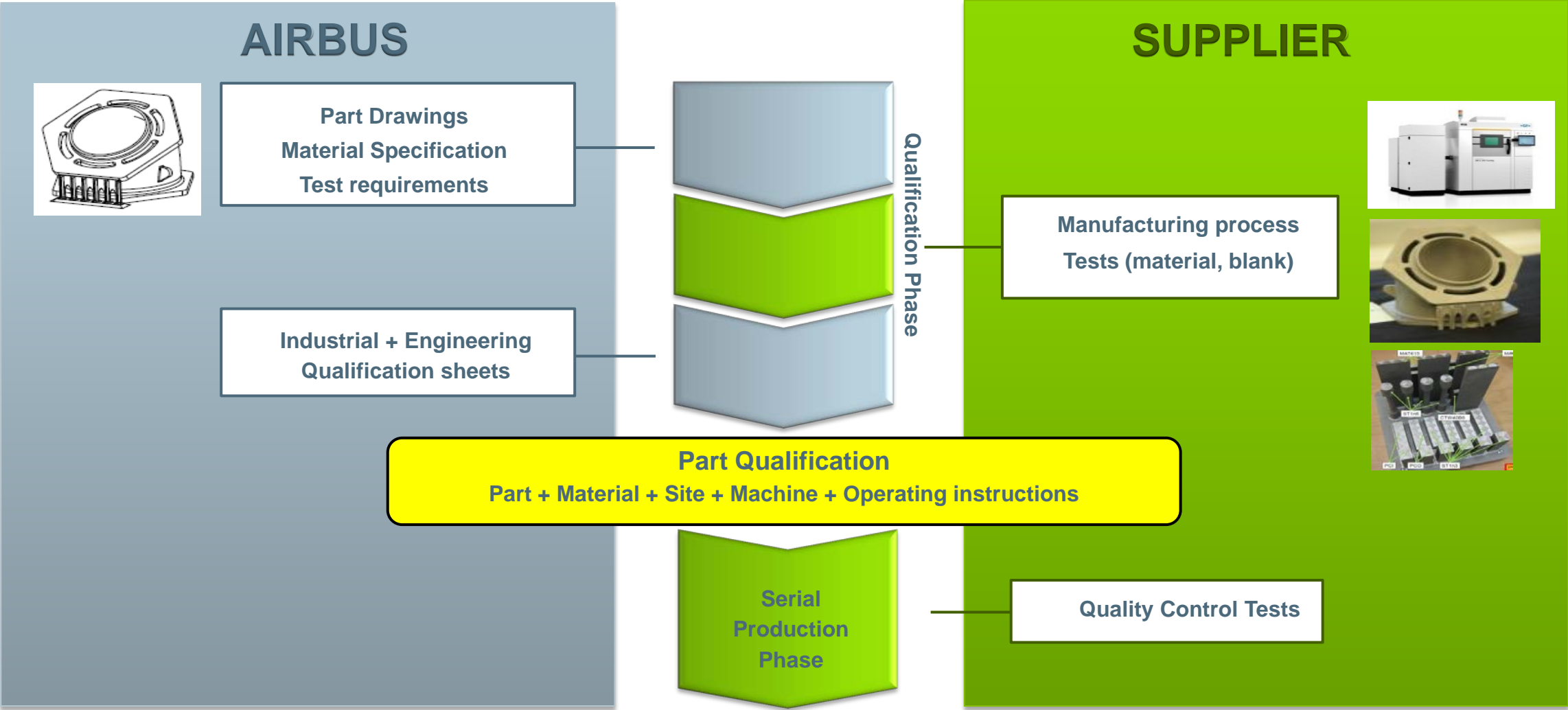
Low Volume / High Mix

Development Time & NRC Driven

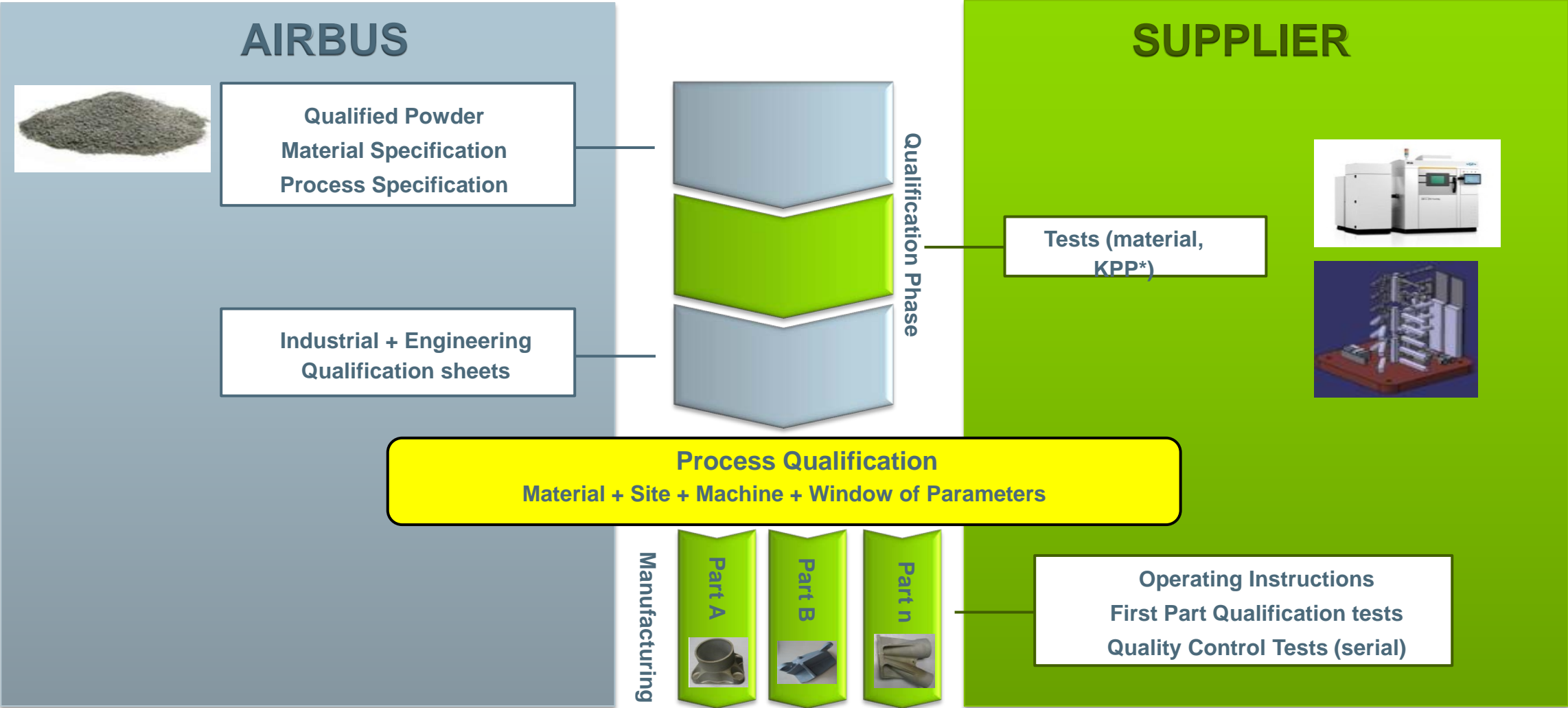
High Volume

Production Cost & Performance Driven

Single Part Qualification



Process Qualification



ALM : DOA/POA link

DOA phase : manufacturing route freeze

As per EASA Certification memo CM-S-008:

- Material, key production parameters and variations frozen during qualification
- Design data (part definition dossier) pushed to POA for manufacturing

Manufacturing route defined through qualification tests specific to a given part number



Drawing
Test requirements

Manufacturing route frozen in definition dossier :

- Material specification
- Product Key Characteristics
- Key Process Parameters



Drawing
Material
Product KC
Process KPP

ALM : DOA/POA link

POA phase : reproduce manufacturing route frozen in definition dossier

Manufacturing route frozen in definition dossier , copy / paste into manufacturing:

- Material specification → defined powder + checks according definition dossier
- Product Key Characteristics → checks according definition dossier
- Key Process Parameters → listed by Engineering, monitored under QC

Manufacturing cannot make changes without re-qualification:

- Any voluntary change in manufacturing route to be submitted for design approval prior to implementation
- Unexpected change in product quality or manufacturing route lead to a concession



Drawing
Material
Product KC
Process KPP

ALM : Parts inspection

Part characteristics inspection today

Parts quality today secured through :

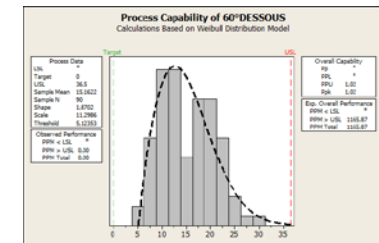
- Manufacture and test cut-up production parts or specimens
- Quality Inspections (NDT , visual, penetrant, dimensional)



Part characteristics inspection way forward

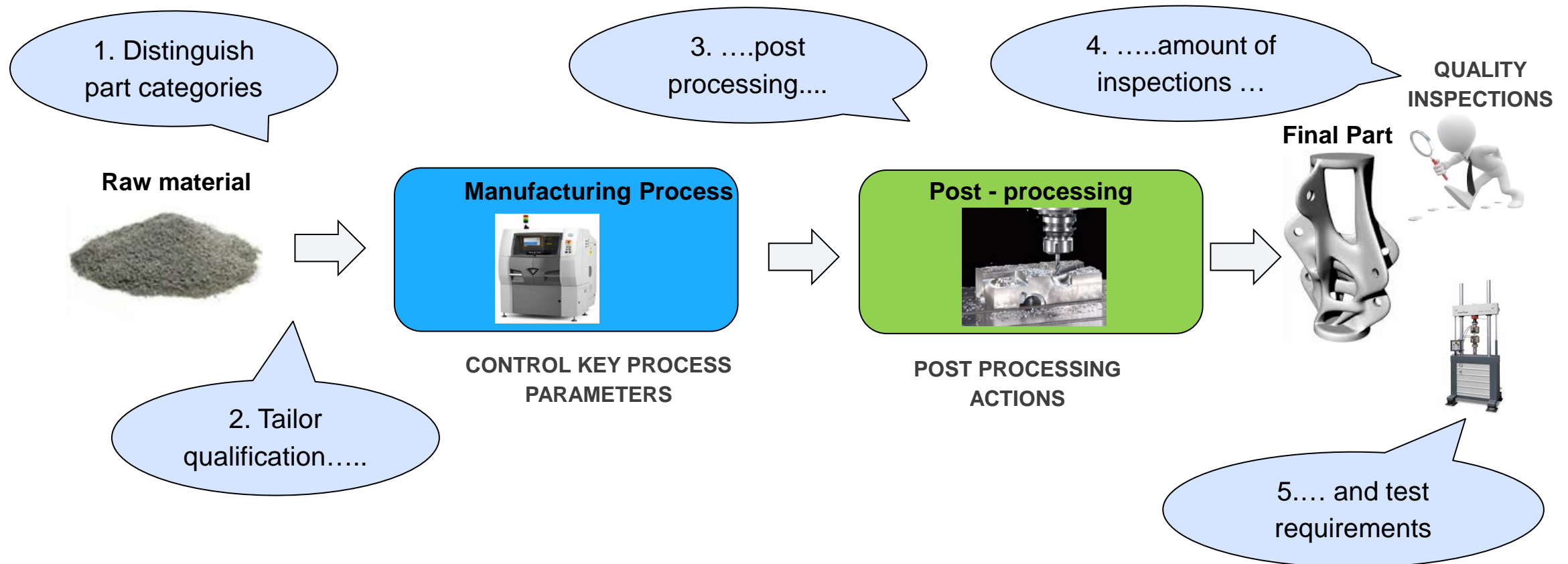
Parts quality will be based on material and process monitoring

- Powder material secured by supplier conformity certificate
- Quality inspection and specimen test tailoring
- Part characteristics secured by real time in-process monitoring (laser speed , temperature ...)



Challenges: Tailoring of requirements

Currently high level of requirements in Qualification and Serial production
Tailor requirements to part categories as technology matures



Conclusion

EASA certification memo CM-S-008 considered

DOA: on track step by step introduction

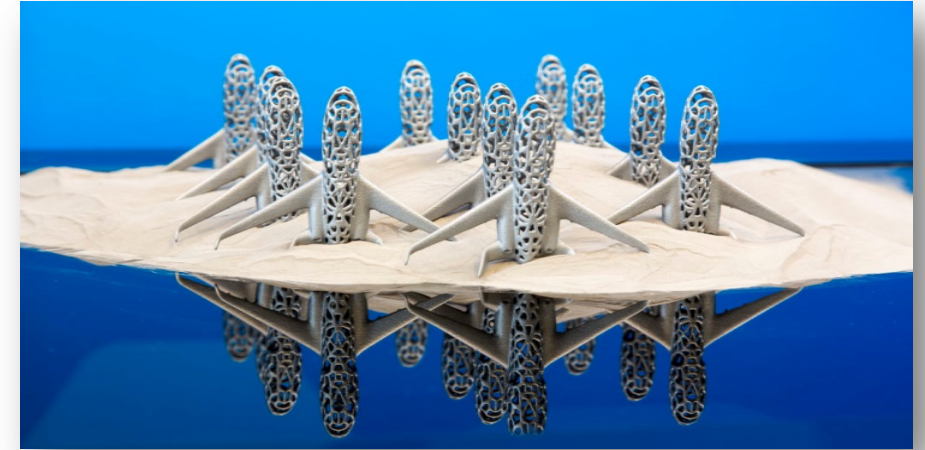
POA: Significant change submitted to EASA, under investigation

Interface DOA/POA => Reproducing a frozen manufacturing route

Currently high level of requirements in Qualification and Serial production

=> Tailor requirements to part categories as technology matures:

- Qualification
- Post processing treatment
- Quality inspections
- Process control specimens



A wireframe model of an Airbus A380 aircraft is shown from a front-on perspective. The aircraft is rendered in a light gray wireframe against a black background. A bright, glowing light source is positioned directly in front of the cockpit, creating a strong lens flare effect. Surrounding the cockpit and the upper part of the fuselage is a dense, vertical column of small, white, particle-like objects, resembling a simulation of air flow or a sensor's field of view. The wings extend horizontally to the left and right, and the landing gear is visible at the bottom.

Thank you for your attention