

A fighter jet, likely an F/A-18 Hornet, is shown in flight against a backdrop of dark, misty mountains. The jet is angled upwards, with its cockpit canopy visible, showing a green light inside. The overall tone is dramatic and high-tech.

# Deployment of AM by introducing a process qualification for Non-structural parts

EASA 2<sup>nd</sup> Additive Manufacturing Workshop  
27-28 Sept 2017, Cologne, Germany

DEFENCE AND SPACE

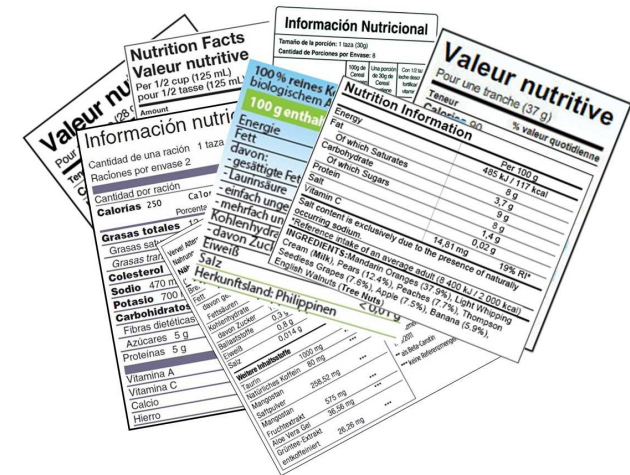
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27 September 2017

**AIRBUS**

# Deployment of AM by introducing a process qualification for Non-structural parts

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- Qualification strategies
- Value creation chart
- Justification of a process qualification for non-structural parts
- AM Materials for Non- Structural Parts
- Qualification approach for Low-strength alloys (Al-Alloys)

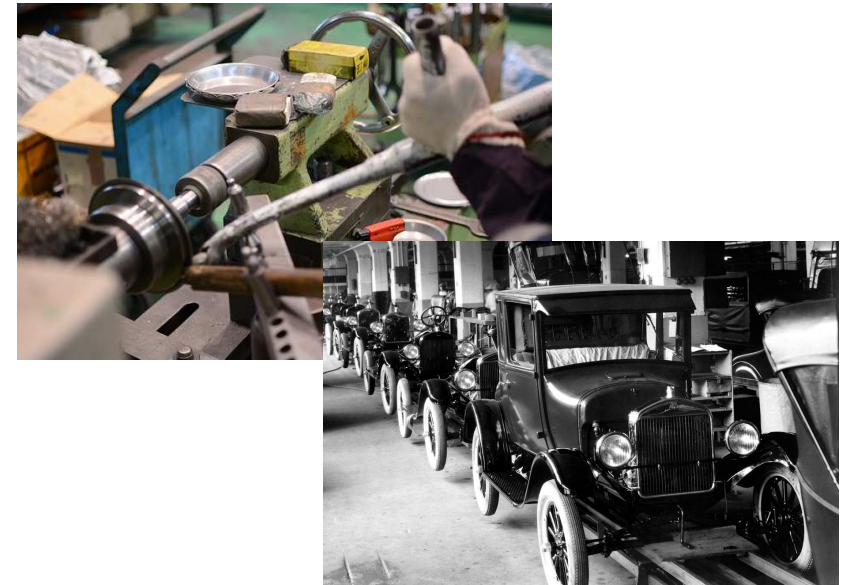


# Qualification strategies

# Deployment of AM by introducing a process qualification for Non-structural parts

	Pros	Cons
Part qualification	<b>Customized process</b>	<b>Longer lead time</b> to first part
	<b>Bounded uncertainty</b> of results at mass production	<b>Higher non-recurrent cost</b> for new parts
	<b>Tailored inspection</b> requirements specific for the type and usage of part	Any modification in the qualified batch or in the process requires a <b>re-qualification</b>
Process qualification	<b>Shorter lead time</b> to first part	Higher <b>cost of qualification</b> <sup>⌘</sup>
	Non-recurrent <b>costs limited</b> to the design of batch	Longer <b>qualification time</b> of the complete process
	More <b>agile response</b> to Production needs by modifying fabrication batches	Framework <b>precisely defined</b> is fixed; stability of results to be proven within framework

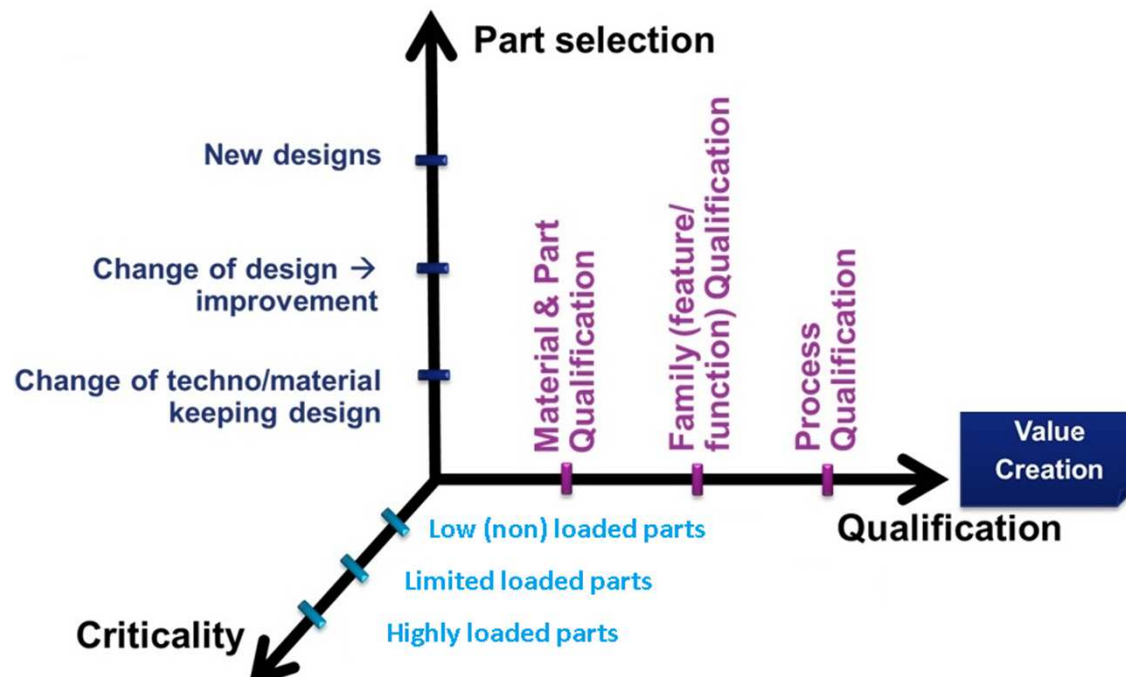
⌘ Qualification of the complete process



# Value creation chart



# Deployment of AM by introducing a process qualification for Non-structural parts



A proper design can add value by:

- Exploiting the freedom that AM technologies provide
- Adapting to the inherent restrictions of AM technologies

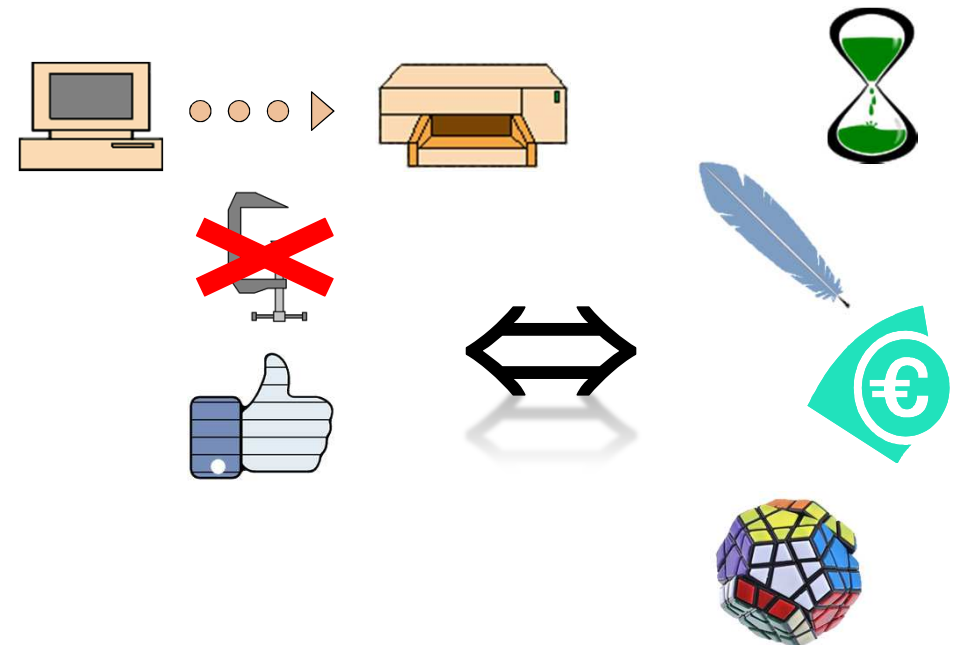
A process qualification represents the most agile way to introduce a new design in Production line

# Justification of a process qualification for non-structural parts

# Deployment of AM by introducing a process qualification for Non-structural parts

## Characteristics of AM technologies and AM parts:

- The part to be fabricated comes directly from a 3D model
- The fabrication does not require any additional tool or jig, apart from the own machine and its fixtures
- The process consists of the addition of layers deposited and compacted one over the previous

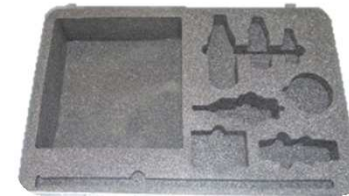




# Deployment of AM by introducing a process qualification for Non-structural parts

## Considerations about Non-structural parts:

- Function-driven: Most of the material is intended to provide volume but not necessary strength
- Optimisation would lead to ludicrous thicknesses due to the low loads if other requirements are not considered
- Handling of part imposes minimal thicknesses or lattice structures



## Deployment of AM by introducing a process qualification for Non-structural parts

Benefits of employing AM for Non-structural parts:

- Lead time reduction for first part
- NRC reduction
- Availability to manufacture high complexity parts (otherwise impossible) ⇒ RC Reduction



# AM Materials for Non- Structural Parts

# Deployment of AM by introducing a process qualification for Non-structural parts

## AM Materials for Non-Structural Parts:

### ➤ Plastic

- PEEK/PEKK, PEI, Nylon,...

### ➤ Metallic Alloys

- Low-strength alloys ( Al-Alloys)

TARGET PARTS: No loaded/ Low-loaded parts with no impact in safety

# Qualification approach for Low-strength alloys (Al-Alloys)

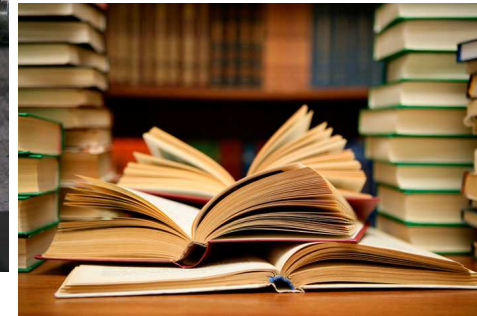


# Deployment of AM by introducing a process qualification for Non-structural parts

Qualification approach for Low-strength alloys (Al-Alloys)

## TIPS TO CONSIDER

- Well known Alloy in other forms
- Intermediate strength and good mechanical properties
- Good experience and knowledge concerning heat treatments and weldability
- Availability in the portfolio of all the machine manufacturers at a (relative) low price



# Deployment of AM by introducing a process qualification for Non-structural parts

## Qualification approach for Low-strength alloys (Al-Alloys)

How to reduce effort?

- Powder cost is not the driver
- Qualification tailored and limiting the scope of the applications (suitable for intended use)
- Post processing adjusted to part criticality

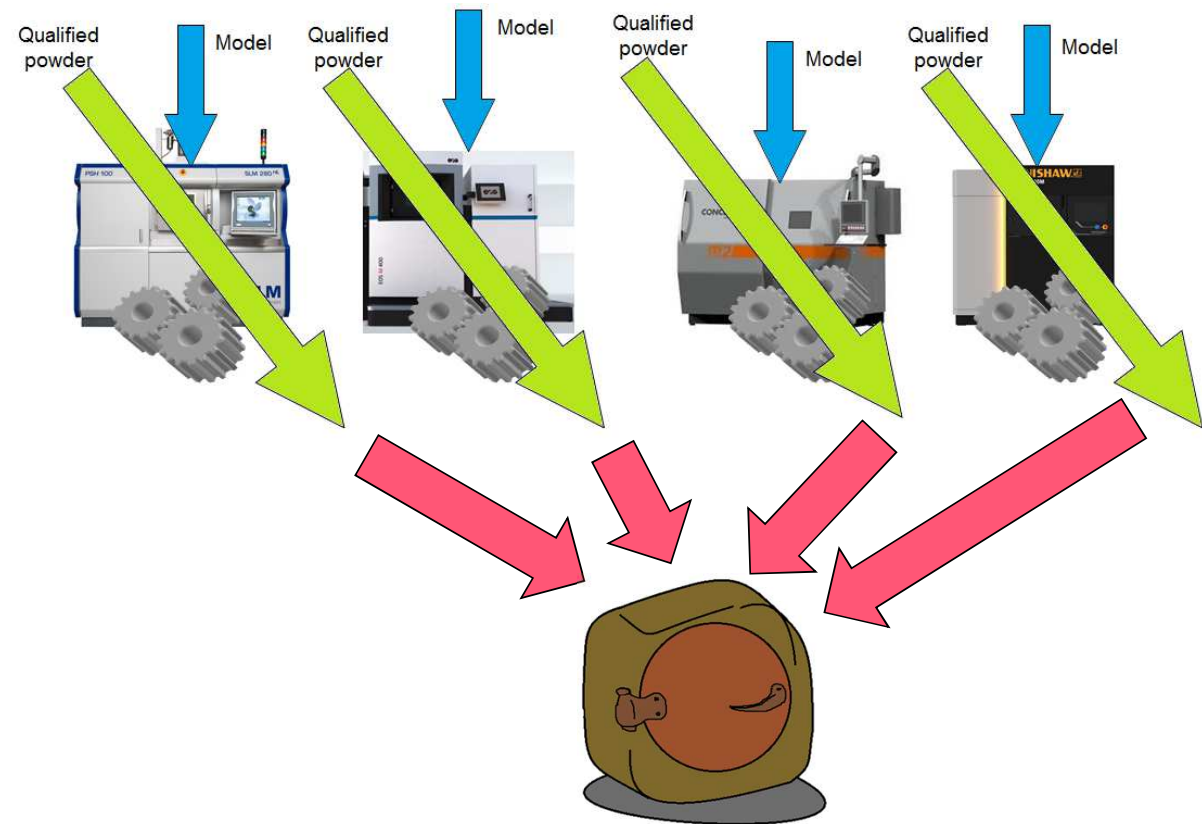


# Deployment of AM by introducing a process qualification for Non-structural parts

## Qualification approach for AlSi10Mg

### Approach

- One powder
- Several machines at specific operating conditions
- A common heat treatment
- Rationalized post-processing



Thank you