



Additive Manufacturing

Application opportunities by Airbus Helicopters

HELICOPTERS

Sophie FERRENDIER – Airworthiness department
5 November 2019

AIRBUS

Agenda

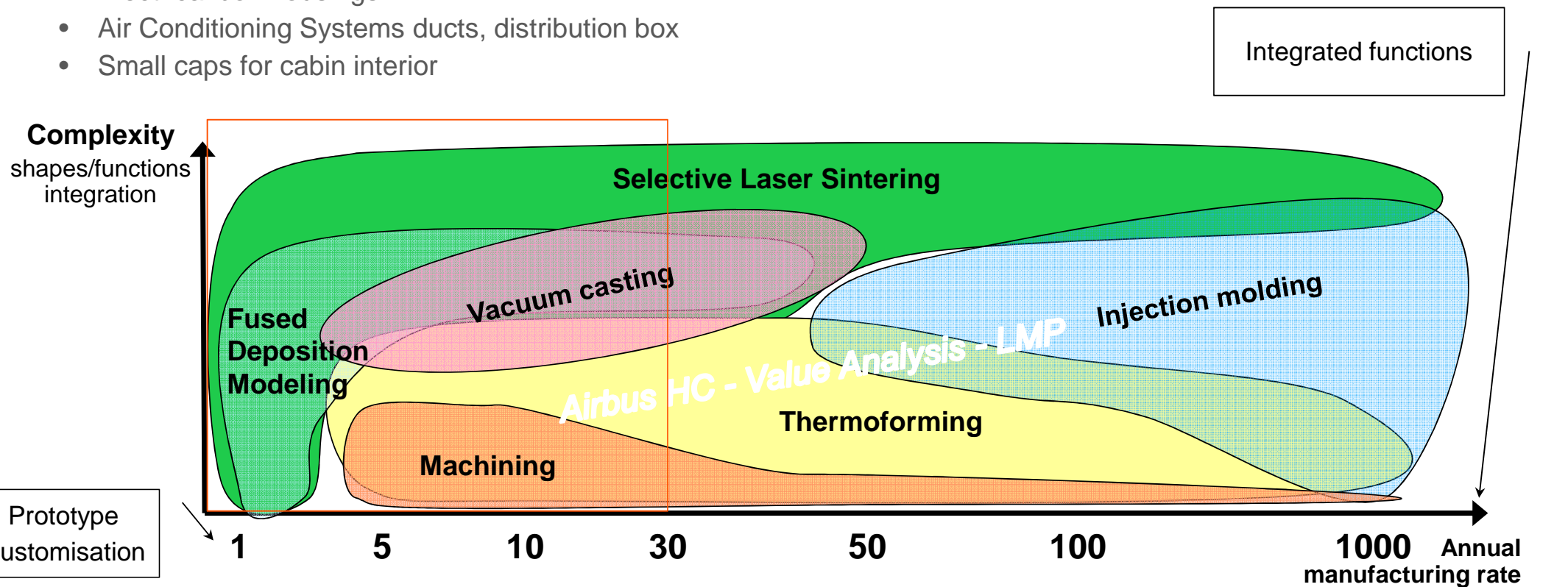
- AM application by Airbus Helicopters
- Organic AM
 - Introduction
 - Application examples
- Metallic AM
 - Application examples
- Qualification principles
 - Process qualification principles (organic - SLS)
 - Part (Blank) qualification principles (metallic)
- Metallic AM show stoppers for serial application
- Next step ?

AM application by Airbus Helicopters

AM material	Technology	Parts in service	Laser Power Bed Fusion Technology	Parts in service
Organic	Fused Deposition Modeling Qualified/Certified – non loaded parts Mean available	Around 1 400	Laser Power Bed Fusion Qualified/Certified – non loaded parts Mean available	Around 40 000
Metallic	Electron Beam Power Bed Fusion Under investigation	Tooling	Laser Power Bed Fusion Qualified/Certified – structural parts and non loaded parts Civil POA update in progress Mean available	Less than 50

Organic AM

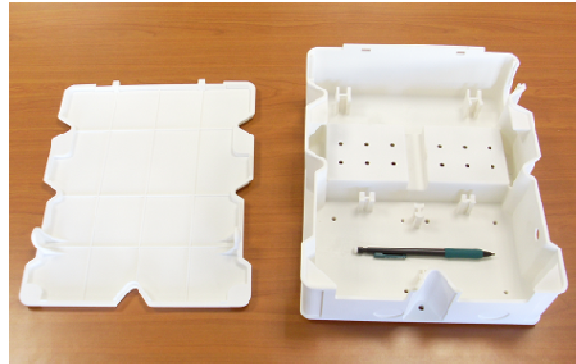
- Mainly SLS (PA12) due low quantities with a first serial application in 2003 for air duct
- Usage – non structural parts
 - Electrical box housings
 - Air Conditioning Systems ducts, distribution box
 - Small caps for cabin interior



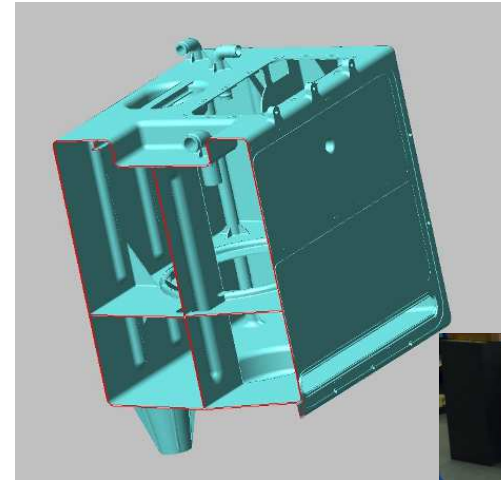
Organic AM – SLS Serial application examples



ECS Distribution box



Electrical box housing



Fire fighter retardant tank



Function integration



Cost saving (can reach 50% reduction versus prepreg)

Metallic AM – Power Bed Fusion - Serial application examples

- AH is involved in many research projects related to metallic AM since a decade but part qualification process was certified in July 2019 only for civil H/C when already applied on military programs since years
- Application is limited to structural and non-structural parts, no PSE for short term.



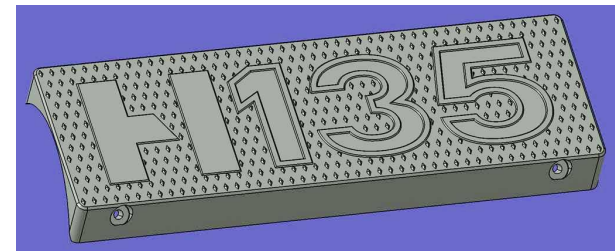
MGB pump valve oil deflector and
pumps oil collector for EC155 B1
and AS565 MBe (delivered)
Titanium T40



Air Intake for AS565 MB
Titanium T40
Lead time: - 75%



H160 Door handles
Alu AS10



H135 Pilot footstep antiskid
Titanium T64

Metallic AM – Tooling application / Development examples

- Metallic AM is much used for prototyping to validate design concepts (around 30 different designs have been tested)
- Launching project to promote metallic AM usage for tooling parts



Tooling fittings
T64



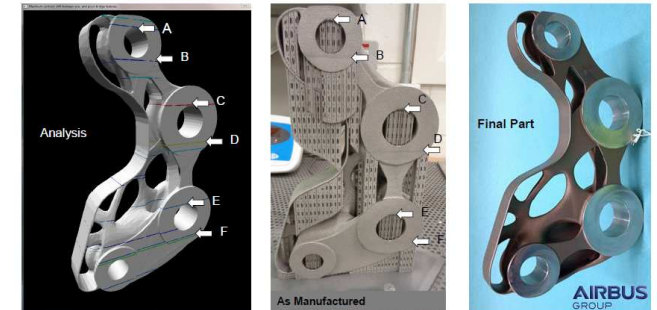
Tooling for MGB bench
Titanium T64 (EBM)



EC120 Clean sky HCE demonstrator
Inconel 718

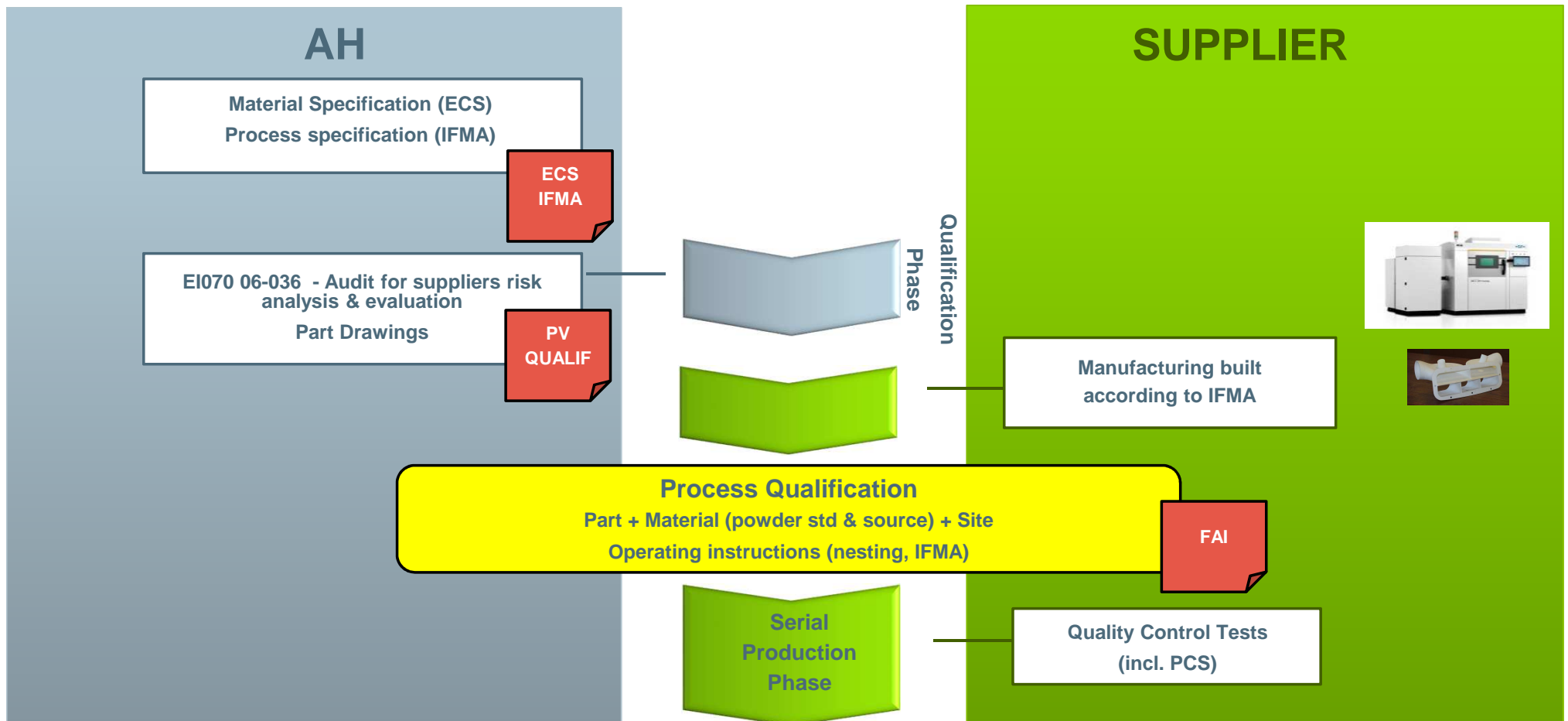


Air pipe
Alu

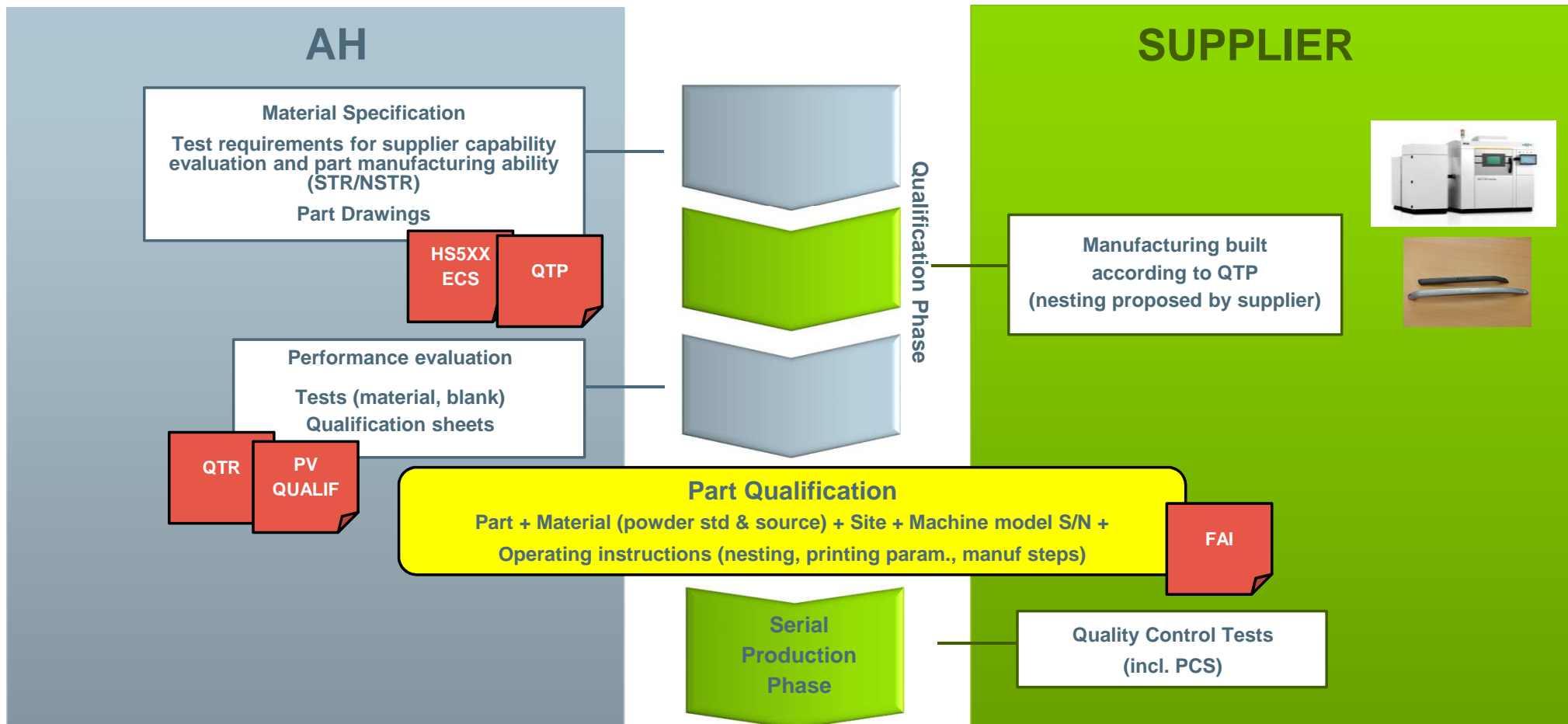


Fitting for blade with topology optimisation
T64

Process Qualification Principles (Organic AM - SLS)



Part (Blank) Qualification Principles (Metallic AM)



Part qualification process certified in 2019

Metallic AM – Show stoppers for serial application

- Metallic AM is seen for serial application as an alternate manufacturing mean which will save time for missing FAL and S&S parts
- Due to worldwide marketing around “3D printing”, production, S&S and customer think that AM is like any conventional manufacturing mean that we can switch to w/o any justification especial for non loaded part
 - ⇒ Issuance of blank drawing and final drawing through design change is omitted as well as qualification of the supplier for customer delivery whatever is the part classification
- Conclusion:
 - Although AH is very active in European research project, very few parts are in service
 - AM is interesting for mock up and prototyping
 - New analysis of the potential application for tooling

Metallic AM – Next step ?

Next step could be: **make metallic AM profitable for H/C application**

- need to move to family and/or process qualification to reduce lead-time depending on part classification and on longer term to be able to only think process qualification
- agree with authorities no to manage metallic AM as a special process for non-structural parts but to manage it as organic AM with no NDT, none or reduced PCS and a very reduced part qualification phase.

Thank you