

Airbus Customer Services

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***AIRBUS
RAPID SPARES***

**EASA Workshop
Cologne 28-29 September**



AGENDA

- ✓ Introduction - Industry Context
- ✓ Airbus approach for AM Spares
 - ✓ Value proposition
 - ✓ Rapid Spares initiative
 - ✓ Pilot Cases
- ✓ Challenges
- ✓ Way Forward



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Voices of Customers – End User Expectations for in-service



"We would like to print cabin parts that are very hard to get"



"We printed 5,000 armrests in 2 weeks"



"We would like to change the design of parts we have issues with today"



"Very pleased with the printed armrest covers"



"We are in a remote location"



"what is OEM position on Airline direct use of AM?"

Customers expect to significantly reduce their Spares inventory, logistics, cost and lead time with the use of AM.

Situation within the Industry

- Development of AM Standards will benefit any AM player and facilitate Authority approvals.
- Distinct challenges for AM airworthy parts vs GSE and Tooling
- “Airline only” approach through reverse engineering is possible but tedious, and limited to traditional carriers with strong engineering capabilities in house.
- Many airlines “experimenting” with local 3D print shops and universities
- MROs and in general non OEM companies with own DOA and POA willing to enter the business through reverse engineering



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Airbus Customer Services– ALM Value Proposition

Airbus Proprietary Parts (Spare Parts)

Up to 3,000 candidates until 2025



- Reduced production cost and lead time for small batch sizes
- Solutions for Out-of-Production parts and other S/C issues
- Reduced Inventory through on-demand production

Airbus Proprietary Tools/GSE

Up to 260 tools by 2025



Customized Parts Tailored to Airline/OEM needs

Target > 200 projects by 2025



- Additional Revenues
- Increased Customer Satisfaction

Long term vision: On-Demand Production = “Zero Stock”
 ALM is seen as a key technology for this vision

What is Rapid Spares Initiative?

Rapid Spares within Airbus is a project aiming at establishing an **end-to-end processes** for **Additive Manufacturing Spares**.

Main objectives

- ✓ Focus on key aspects for Spares (fit and function)
- ✓ Optimization and weight saving as an opportunity but not the driver
- ✓ Develop specific engineering capabilities
- ✓ Optimize internal way of working
- ✓ Develop and re-use of AM knowledge
- ✓ Establish technology deployment plan for spares
- ✓ Secure Intellectual Property protection for Proprietary parts design

Key Enabler for Airbus Value Proposition

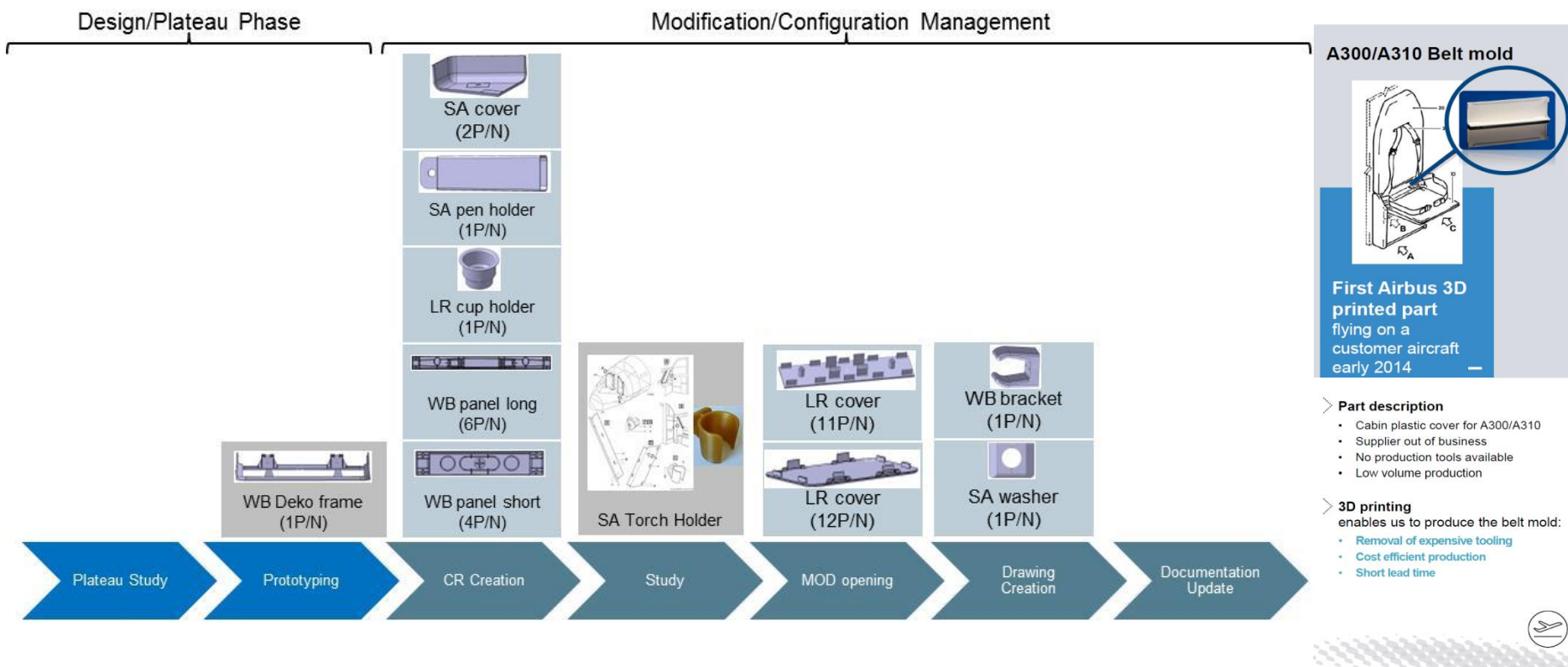
Philosophy

Taking advantage of privilege position for Airbus proprietary parts for their re-design into AM parts for:

- ✓ **Design data and Baseline Certification availability of part to be redesigned**
- ✓ **Engineering & Airworthiness skills and organization (DOA)**
- ✓ **Production organization (POA)**
- ✓ **Qualified processes, materials and machines developed for serial parts Production.**
- ✓ **Authorized Release Certificate (EASA Form 1)**
- ✓ **Development and In-service experience**

Deployment in a step by step approach

Pilot Cases Process





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Challenges

Technology & Engineering

- Different design principles and stress data for each different AM technology
- Intensive investment in Engineering training
- Slight changes in material properties makes one-to-one replacement difficult in some cases
- Extensive post-processing (paint-ng, heat-treatment, machining), with low level of automation

Data transfer

- Future geographical and/or organizational separation of the design and production organizations requires a secure transfer of approved design data (i.e. a build file).
- A direct link between the design data and the printer hardware is required with no interference. It must be ensured that the design data cannot be tampered with.
- Design may only be printed on a qualified printer and must not be re-printed without control.
- A more complex approach is to trigger the correct post-processing steps and their parameters as they are not digitalized today

Business

- printing would need to be significantly faster (shipping a part from one of the Airbus warehouse around the world is usually done in less than 24 hours for urgent cases.)
- Local Printing in comparison to centralized printing would offer an availability/lead time advantage for Airbus' spare parts supply.
- significant capital expenditure for industrial 3D printers and the related post-processing steps (machine center, hot isostatic pressing, etc.) requires a high utilization
- Intellectual property protection for design & printing data



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Way Forward

Step by step approach...

- ✓ for technology deployment right after its qualification
- ✓ for part complexity
- ✓ for part criticality
- ✓ Printing only at Airbus premises or Qualified Suppliers
- ✓ in continuous feedback loops with Authorities

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