GSE and Tools Engineering Services

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• Head Of GSE & Tools design & engineering

Expertise details
• Industrial Engineering
• Tooling design
• Innovation management
• Aircraft maintenance

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Expertise details
• Mechanical Engineering
• Tooling design
• Aircraft maintenance
• Maintenance planning
Airbus GSE and Tools

**Publication**
Technical documentation
AMM, TEM, CRM,....

**Lease & Sales**
Forecast tools for IP
Lease, sale, repair

**Engineering**
Tool definition, validation, technical support and Services

**TECHNICAL DATA & TOOL ENGINEERING**

**PROVISIONING & SUPPLY**
GSE and Tools Engineering Services

Experts in tooling design and support

- Design in context, test on aircraft and customised technical data

Tailored tools and tool approvals

Benefit from Airbus expertise in tooling design
Specific GSE and Tools numbers

<table>
<thead>
<tr>
<th>A/C programme</th>
<th>Number of tools</th>
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<tbody>
<tr>
<td>A300</td>
<td>1778</td>
</tr>
<tr>
<td>A320</td>
<td>1150</td>
</tr>
<tr>
<td>A340-A330</td>
<td>1866</td>
</tr>
<tr>
<td>A380</td>
<td>1105</td>
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<tr>
<td>A350</td>
<td>744</td>
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GSE Innovations
NDT inspection by non-specialist

**LineTOOL:** go/no go composite delamination assessment tool
- Prevent flight delay and cancellation due to lack of Non Destructive Testing expert personnel availability
- Provide quick and reliable statement
- Already available and used by several Operators

**LineMAP:** Damage Localisation
- Accurate location of damage on A/C fuselage, automatic integration in A/C DMU (Digital Mock-Up)
- Damage location tracking and report generation
- Already available and used by several operators

**LineSIZING:** Damage sizing and reporting
- Easy to use device, enable B1 or equivalent mechanics to perform damage sizing on A350 monolithic CFRP.
- Ultrasonic C-scan, automatic damage size measurement.
- Enhanced damage tracking and automatic report creation.
A350 CFRP damage reporting

LineSIZING - Measurement
  - CFRP damage measurement by B1 mechanic

LineMAP – Localisation
  - Accurate localisation using 3D data

66% time reduction

Fast and accurate damage report without NDT specialist
For hard and intermittent electrical faults
SWITS

Smart Wiring Trouble Shooting
- Quickly detect and localise electrical faults
- Limit A/C grounding time for wiring troubleshooting
- OI occurrence reduction
- Reduced troubleshooting cost
- Faster troubleshooting
- Reduced NFF events

Avg. Costs per A/C (in $ (USD))

<table>
<thead>
<tr>
<th></th>
<th>Current Practice</th>
<th>SWITS Automatic Solution</th>
<th>SWITS Automatic &amp; Expert solution</th>
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</thead>
<tbody>
<tr>
<td>Avg. Costs per A/C</td>
<td>-35%</td>
<td>-70%</td>
<td></td>
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</tbody>
</table>
Electrical Hoist Kit: optimising your engine installation

- Reduced number of mechanics for an engine installation
- Limit overloading risks
- Compatible with all Airbus Bootstraps
- Already available and used by several Operators

30% cost saving

Reduced elapsed time
Maintenance task optimisation
Return on investment

Example ROI

Electrical Hoist Kit

Engine positioners

Electrical Hoist kit
LANCE – Automated shock absorber servicing

Automated shock absorber servicing

Accurate oil and gas replenishment of Landing Gears

- Remove all risk of incorrect servicing due to nitrogen gas absorption
- Fast and fool proof, single-point service
- The only solution for automatic fluid and gas quantity in one equipment

Benefits and cost savings

- Check and replenishment of gear fluid "Weight on Wheels"
  - No maintenance jacking required
- Fluid removed under vacuum
  - No need to extend and compress the gear
- No ‘H’ dimension check required
  - More accurate and less operator error
- Fluid and nitrogen replenishment in one operation
- Accurate nitrogen charging
  - Reduces error due to nitrogen absorption.
Future developments

GSE DRONEs for INSPECTION:
GSE based on Automatic Drone technology for Inspection of A/C upper surfaces
- Indoor automatic A/C inspection
- Faster Inspection
- Less equipment and resources
- Stronger inspection repeatability
- Automatic picture analysis, automatic report generation and damage tracking.
- Available mid 2018

Augmented Reality:
- Component location for maintenance, repair and troubleshooting
- Proof of concept. Industrial solutions under study

Up to 50% time saving for aircraft inspection with drone
Removal and installation operations

**Business Seats R/I:** Protect your A/C and operators.
- Only 2 people required to install large business seats
- Reduces the risk of workers' injuries (MSDs)
- Reduces the risk of cabin damage

**Galleys R/I:** Protect your A/C and operators
- Ergonomic solution, can be used with reduced amount of workers
- Avoids damage to aircraft structure and systems above galleys
- Saving time compared to disassemble galley completely

**Instrumented Smart Shackle Kit:**
Enhance your bootstrap system
- Engine R/I operation loads control optimised
- Decrease human error and allows load tracking
- Easy to install with current bootstrap systems
Maintenance operations

**GSE Geo-Location:** Your GSE always located.
- Geo location of the GSE & Tools without having to pre-equip maintenance hangars
- Optimises resource allocation, avoid material loses
- Prototype available, industrialisation in progress, commercially available mid 2018

**Inflatable Shelters:** Perform maintenance everywhere
- Avoid use of hangar slots for some maintenance operations
- Engine shelters, fuselage shelters and clean rooms (for composite repair) available
- Full kit including shelter, temperature control, ground power, sized for the operation to perform (engine, door, wing)
- Tool available and already used by several Operators
Conclusion

GSE innovations reduces maintenance cost

By using new technologies we are working to optimise your maintenance.

Airbus offers you a range of services around tooling actively dedicated to enhance your maintenance operations.
Thank you