Laboratories accredited according to ISO 17025.
Applus Laboratories

- LGAI & Applus+ Headquarters
- 650,000 ft² of Laboratories
- More than 450 engineers & qualified people
- Multi-technological knowledge

INNOTESTING 2015

- Engineering
- Metrology
- Composites Lab
- High pressure hydraulics
- Environmental testing
- Chemical lab
- Fire
- Acoustic
- Vibration
- EMC & Electricity
- IT SW
- Materials & Processes
INNOVATION WITH INDUSTRIAL SENSE

- Be a solutions provider for the aeronautical sector in different technologies.
- Participate in complete projects, adding value from the early stage of the product development.
- Integrate the knowledge from different partners to create a complete and “able to implement” solution.
- Support our customers in their continuous improvements activities.
The requirements

- Single shear and double pin Test
- Cyclic shear loading tests at 77K
- From ~2MN to ~9.7MN
- Measurements
  - displacements between the specimen, front plate and back plate.
  - measurement of the electrical resistance of the low-voltage insulation during cyclic shear loading at 77K
  - determine dimensional changes and assess possible damage at the interfaces
Single and double shear pin assembly
- Structural material is the stainless steel
- Overall weight is about 3 Tn.
- Low-voltage insulation on the pin hole
MTS 15 MN

Actuator rating dynamic forces: ±15MN
Stroke: 400mm
Maximum test space: 8100mm
Width between columns – front: 2000mm
Strong Floor maximum side: 11500mm
N₂ boiling temperature -196°C
- Boiling is an effective heat transfer mechanics
- High temperature exchange
- Film boiling
- Not very effective heat exchange mechanism (from 100-1000 W/m²K)
- When temperature of the part is -130°C Nucleated boiling
- More effective (from 5,000-10,000 W/m²K)

Cool down type 5,5 hours
- Room temperature after test 24 hours after the total emptying of the climate chamber

Thermocouples will be screwed on the prototype.
- Displacement sensors will be mounted to measure realtime displacements between the pins and the plates
- One of the displacement sensor support is made of an electrical isolator in order to insulate the sensor from the prototype.
- The wires are fixed on the tooling and guided to the outside by a tube attached to the side of lateral plate.
Risk Assessment

- Skin burning in case of direct contact or projection
- Asphyxia due to oxygen displacement
- Liquid Nitrogen spill over
- Explosion in case of pressure increase due to uncontrolled liquid evaporation

### IPE
- Mandatory face protection
- Mandatory hand protection

### Information
- Attention - Danger
- Attention - Hazardous
- Attention - Oxygen deficiency
- Attention - Danger of freezing

### Active safety methods
- Security valves to assure a safe Nitrogen conduction
- Emergency shutdown button
- Oxygen detectors
Multi-Technology Test supported by different Applus Laboratories

- Mechanical Laboratory
- Materials laboratory
- Simulation and engineering office
- Test Bench department
- Chemistry department
- Safety certification office

Good partnership with our subcontractors

- Cryogenic gases provider
- Tooling manufacturing provider
- Machine manufacturing provider
QUESTIONS?

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