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Test Cells for active Subsystems and Structures in AeroSpace Applications

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IABG Business Segments Activities

- IABG performs strength, fatigue and functional tests for the entire aircraft as well as for individual assemblies and structural components.

- In our ESA-coordinated space center, we offer comprehensive environmental test campaigns, qualification tests and technical analysis.

- In our Defense & Security division, we operate military simulation & test systems for analyses and conceptions.
Space

Analysis & conception
- Studies and system analyses
- Test specification, planning and implementation
- Quality management systems

Implementation
- Development, qualification and acceptance tests
- Testing facilities and plants
- Quality assurance systems

Operation
- IABG’s National Space Test Centre in Ottobrunn
- ETS (Test facilities ESA) in Noordwijk (NL) as Joint Venture with Intespace (F)
Aeronautics

Analysis & conception
- Structural integrity / fatigue testing including test concepts for structural tests
- Aircraft construction, design and certification
- Contribution to the aviation research project management

Implementation
- Test facilities for structural and fatigue tests of complete airframes or components
- Innovative automation solutions for test systems

Operation
- Test facilities for static and dynamic testing of complete airframes, assemblies and components in Ottobrunn / Dresden / Erding
Example: Structural Test on A350
IABG Test Cell Business

We
- develop test concepts
- plan & realize test facilities and test systems
- operate Tests Cells, test systems and simulations

With this background, we are engineering and realizing Test Cells for customers.
Modular Test Infrastructure (MOTIF)

- **flexible**
- **scalable**
- **mobile**
- **cost-efficient**

**Semi-mobile anchor rail system**
Reinforced concrete modules with anchor rails - scalable for individual customer requirements

**Modular lightweight hall**
Quick-assembly system, with removable walls to accommodate various test items

**Heating system**
To ensure the required temperature conditions

**Pneumatics – Compressed air reservoir**
Provisioning of compressed air to ensure resource-efficient operation

**Hydraulic pump station**
Hydraulic pumps incl. tanks and controls, accommodated in containers

**Pneumatic compressor station**
Pneumatic compressors in containers, incl. air dryers and power electronics

**Cooling system**
To control the oil temperature

**Electric power supply**
Transformer with low voltage distribution in containers
Iron Bird Loading Systems – examples

- Flap Loading System
- Slat Loading System
- Spoiler Loading Systems

- Mechanical setup and Interfaces
- Actuators & Sensors
- Automation System / Load Control Functions
Drop Tests Cell for Landing Gears

Performace Portfolio
- Drop tests on aircraft landing gears
- Roll tests, fatigue tests, slide tests, brake tests,
- Frequency response tests, tyre burst tests, tire tests
- Driving over baffle plates and bumps

Barrel
- Maximal circumferential speed 400 km/h
- Ø 4.0 m, Width 1.5 m, 29.500 kgm²
- 4Q-drive 130 kW (drive and brake)
- Surface: Grinded steel or coated with friction layer

Maximal barrel loading
- Vertical 560 kN, Lateral (axial) 200 kN (circumferential) 400 kN
- Drop mass (max.) 14.000 kg
- Drop height (max.) 11 m
- Sinking speed 7..10 m/s
Drop Tests for Landing Gears

0..560 kN
0..±400 km/h
0..11 m
Advanced Landing Gear Test Cell

1250 kW, 420 rpm

0..±125 mm

0..0..800 kN

0..±100 kN

0..±400 km/h
Advanced Landing Gear Test Cell

Operation Modes

- **Landing gear vertical dynamics**
  - with fixed drum
  - with free rolling wheel

- **Braking Maneuvers with controlled vertical loads**
  - at initial speeds values
  - at initial speeds with obstacles
  - at initial speeds with synthetic road excitation

- **Brake System interaction during landing/taxiing maneuver with measured road excitation**

- **Rolling during landing/taxiing maneuver with synthetic lateral excitation of the wheel**

1250 kW, 420 rpm

0..800 kN

0..±100 kN

0..±400 km/h

0..±125 mm
Functions, Control & Monitoring System

Core Functions
- Controllers
  - Displacement/ Force
  - Speed / Torque
- Measured Signals
  - Test Cell Signals
  - Specimen Loads & Deflections
- Plane Vibration Model
- Test Cell Automation

Requirements
- Concepts

Concept

Design & Implementation
- Mechanics
- Fluid Power
- Electrics/Electronics
- Functions

Validation

Integration

NI PXI Real Time HW

NI VeriStand

LabVIEW®

INERTIA
Control & Monitoring System Architecture
IABG provides test cells for aerospace applications.

The control, measurement and data acquisition platform is realized with National Instruments tools and products.

Thank you for your attention – we’re looking forward to a discussion!
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