





AEROSPACE  
AND DEFENSE

[germany.ni.com/aerospace-  
defence-forum](http://germany.ni.com/aerospace-defence-forum)

# Aerospace and Defense Forum 2017

An Industry Event Hosted by National Instruments

ZAL, Hamburg, Deutschland



# Dynamik in der globalisierten Flugzeugentwicklung

– Implikationen und Chancen aus der Sicht der IABG

Dr. Thomas Anderl  
Head of Department System & HiL Test Rigs



# IABG – Partner for Test & Qualification



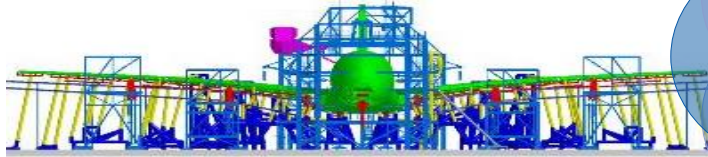
Materials Laboratory



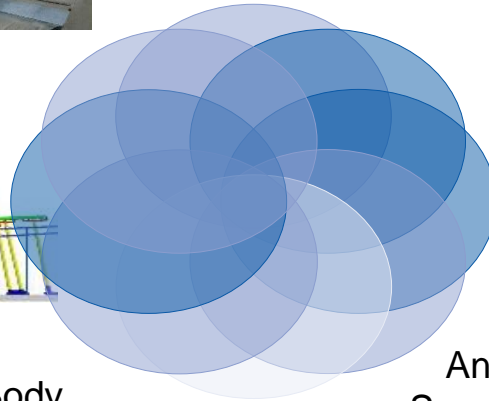
Fatigue Investigations  
Functional Testing  
Test Facility Operation



Structural Testing



Static and Cyclic Testing



Environmental  
Testing



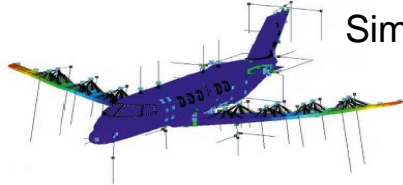
Analysis,  
Specification,  
Development



Impact Testing  
Shock & Vibration



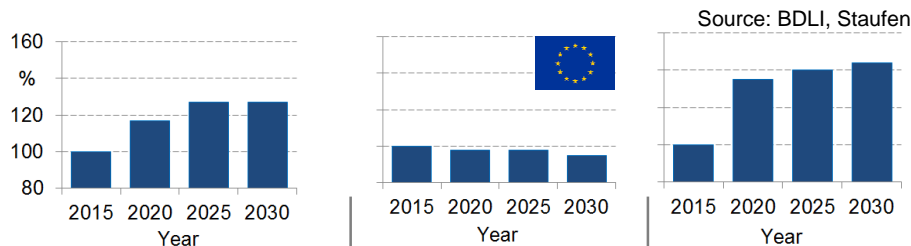
FEA / Multi Body  
Simulation



# Global Aeronautic Market – Prospects

- Increase of Air Passengers
  - 2016: ~ 3,8 bn
  - 2035: ~ 7,2 bn
- High Backloads and Demand for Passenger Aircrafts  
(..~35 000 until 2036)
- Increase of Competitive Pressure in all Markets


















- Expected Key-Market Development from German Aeronautic Industrie's point of view



## Key Success Factors

- ➔ Economic Efficiency
- ➔ Dynamic Market Response

# Mid & Large Aircraft Development Projects

Year	Incremental Innovation Cost, Efficiency & Performance Improvements											Disruptive Technologies →		
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026-2030	
 AIRBUS	 A350-900	 -800  A320NEO	 -1000 XWB										 A3X0	 A380NG
 BOEING				 B737 MAX			 B777 NG							 Y1
<b>BOMBARDIER</b>	 CS 100	 CS 300												
 中国商飞 COMAC	 ARJ21				 C919									 C929

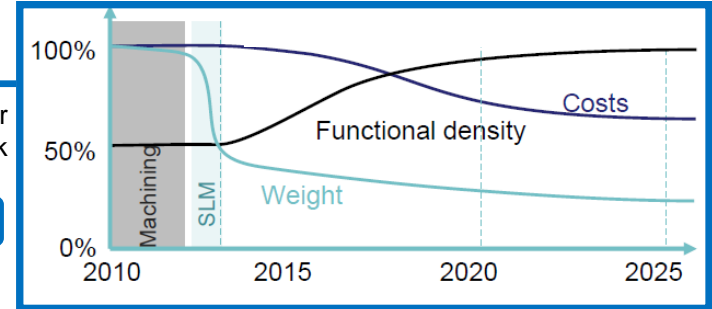
Source: BDLI, McKinsey & Company



# Technology Main Streams – 3 examples

Year	2010	2020	2030	2040
New Engines				
Aerodynamic Efficiency				
Capabilities		Effective & Virtual Design & Testing		
Innovative Structures		Additive Manufacturing		
Industrialization				
Cabin & Cargo				
Efficient Operation			more Electrical Aircraft	
Avionic & Systems				
Maintainance				
Alternative Energy				

e.g. A380 spoiler actuator valve block



Source: BDLI

# More Electric Aircraft – and some remarkable Electric Aircrafts

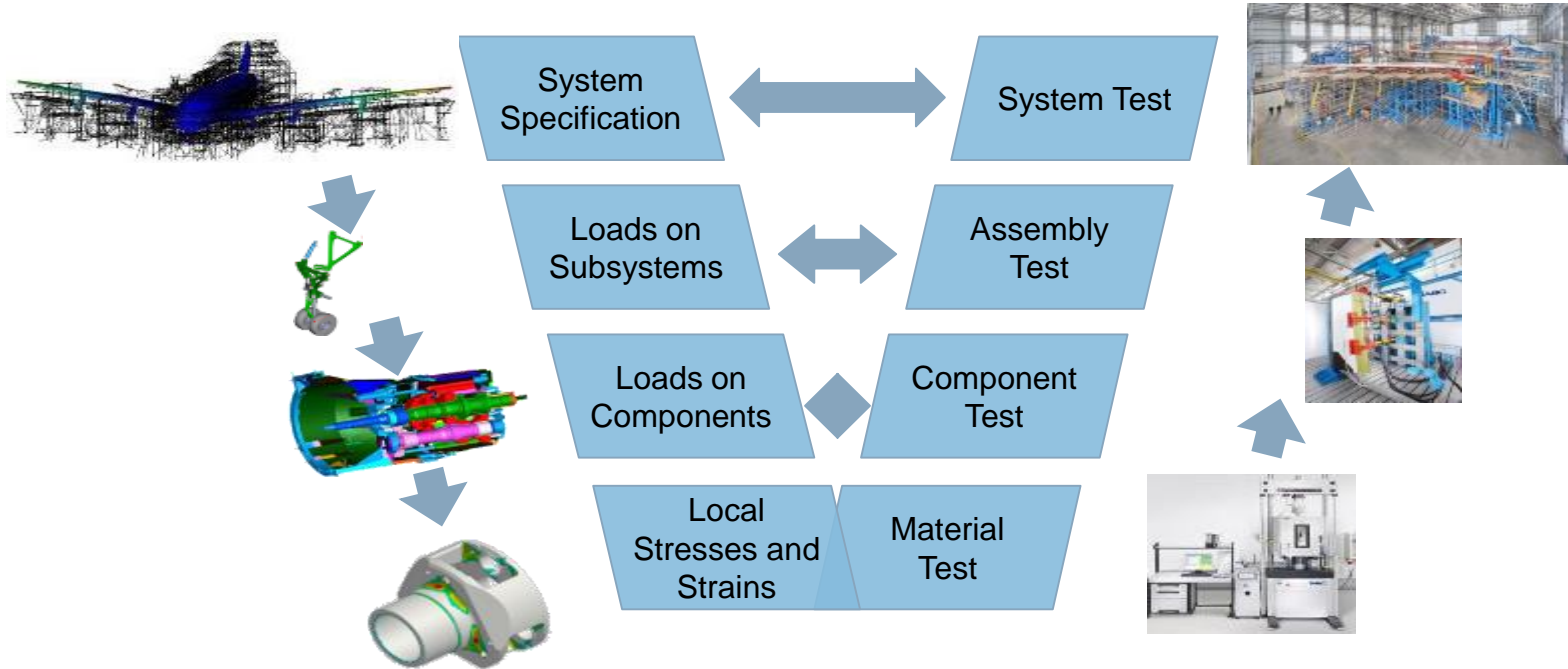




# Some Conclusions for IABG Strategy

- ➔ Extend Core-Business to new Customers (local & global)
- ➔ Extend Services
  - ➔ Provide Services for new Technology Streams (e.g. Additive Manufacturing, Electric Actuators) & new Markets (e.g. China)
  - ➔ Transfer Defense Services to Aeronautics (e.g. Life Cycle Management, Logistic Support)
  - ➔ Transfer Aeronautic Services to other Branches (e.g. Wind Power)
- ➔ Establish Partnership with Customers, Suppliers & Development Partners
- ➔ Operate as Strategic Partner for European & International Industry

# End-to-End Support in Simulation & Testing of Systems



# End-to-End Support for the Aeronautics Industry



Testing - Services

Certification Support

Logistics Support

Life Cycle Cost Management

Analysis and Simulation

Configuration Management

Engineering Support

Training

# Core & more/additional international Business



**BOMBARDIER**



 **AIRBUS**



 **PILATUS**



  
**中国商飞  
COMAC**



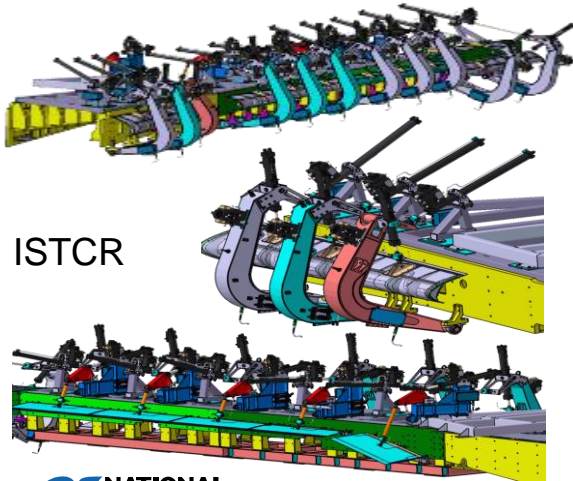
- Static & Fatigue Tests
- Ground Load Calibration
- Qualification Tests of the horizontal and vertical Tail Unit
- Flight Tests

# Full Scale Tests (Bombardier\* CSeries\* Aircraft Tests)

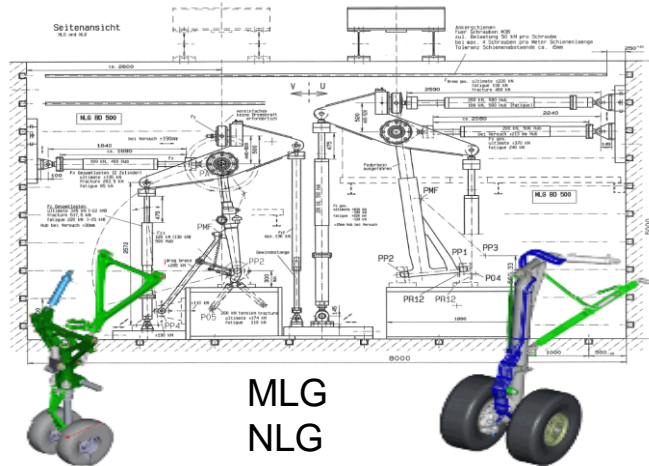
- Contributions to the Integrated Systems Test and Certification Rig (ISTCR)
- Static & Fatigue Tests of the Main and Nose Landing Gear (Liebherr Aerospace)
- Performance of the Full-Scale Durability and Damage Tolerance Test (DADTT)



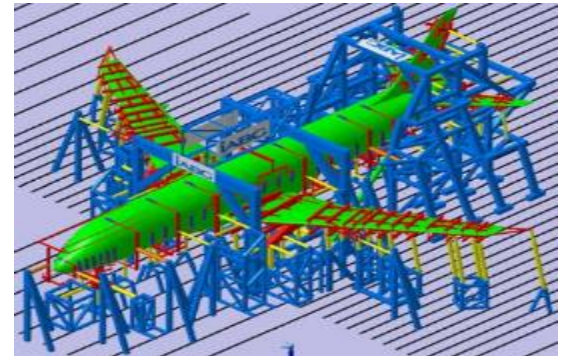
\* Bombardier and CSeries are trademarks of Bombardier Inc. or its subsidiaries



ISTCR



MLG  
NLG



DADTT



# IABG Service for Virtual Testing



AUTOMOTIVE



INFOCOM



MOBILITY, ENERGY & ENVIRONMENT



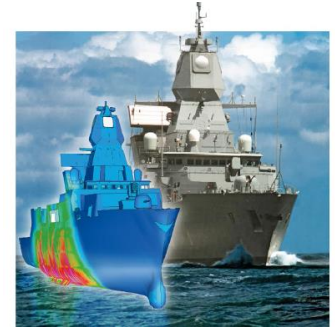
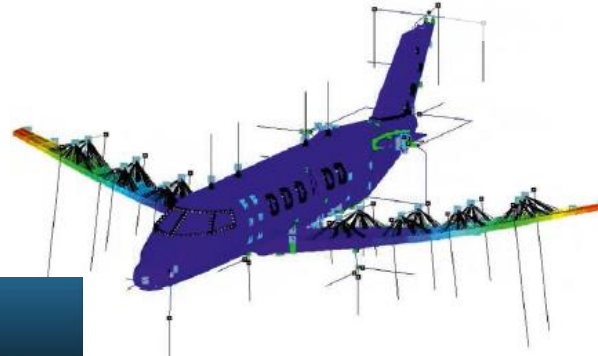
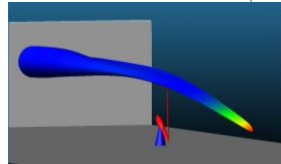
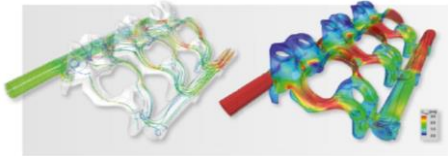
AERONAUTICS



SPACE



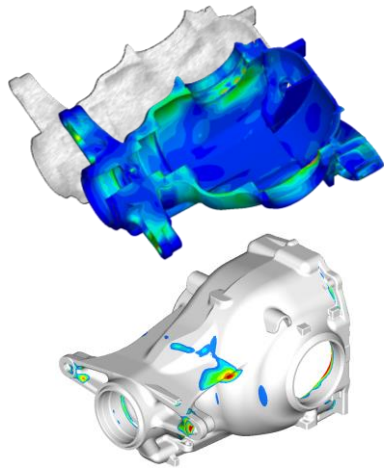
DEFENCE & SECURITY



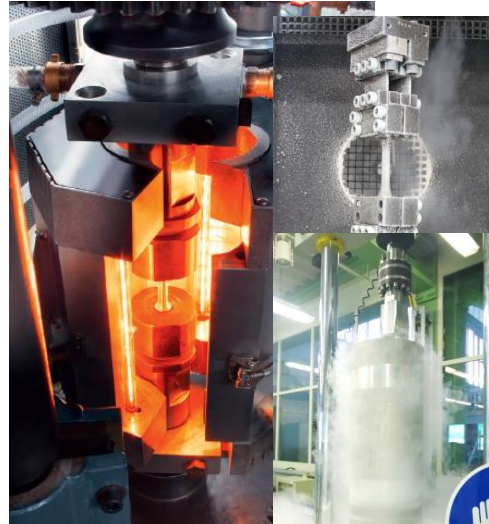


# IABG Service for Additive Manufacturing

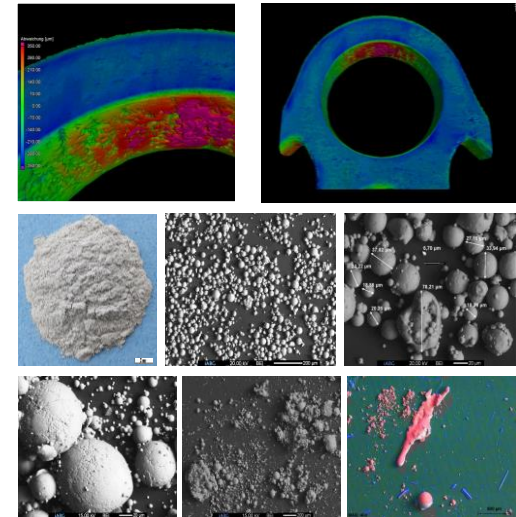
## Design & Virtual Testing



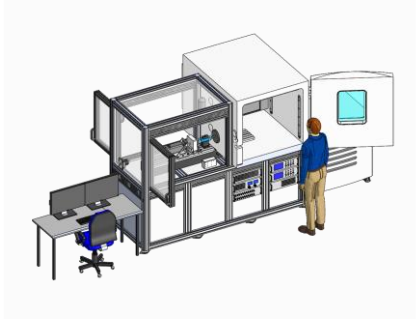
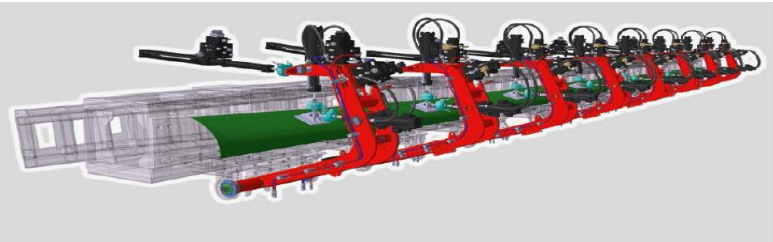
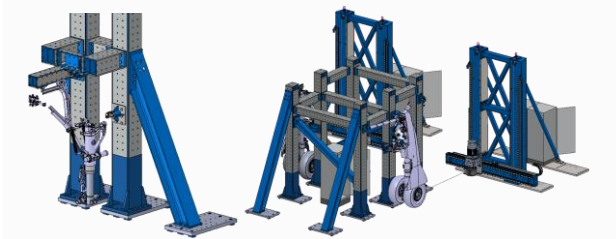
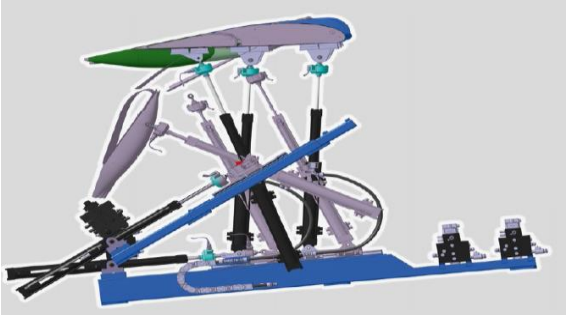
## Testing



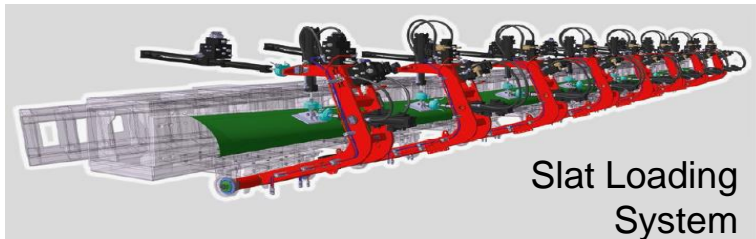
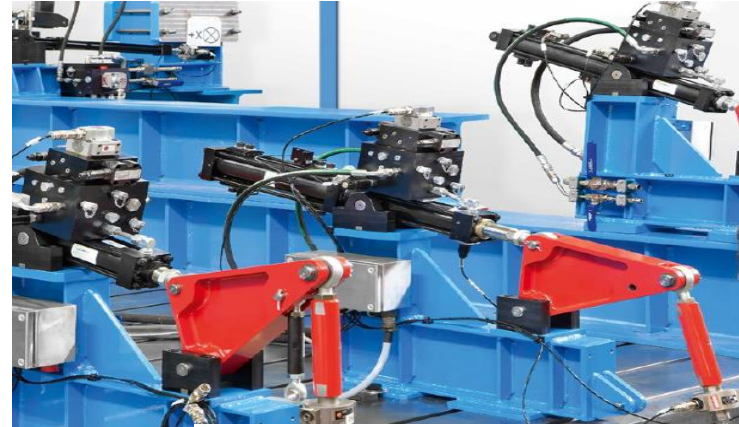
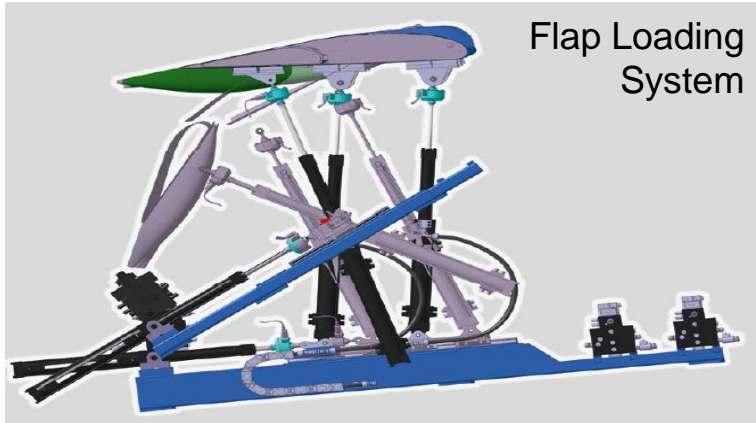
## Damage and Material Analysis



# IABG Test Cells & HiL-Test Rigs for Aeronautic Systems

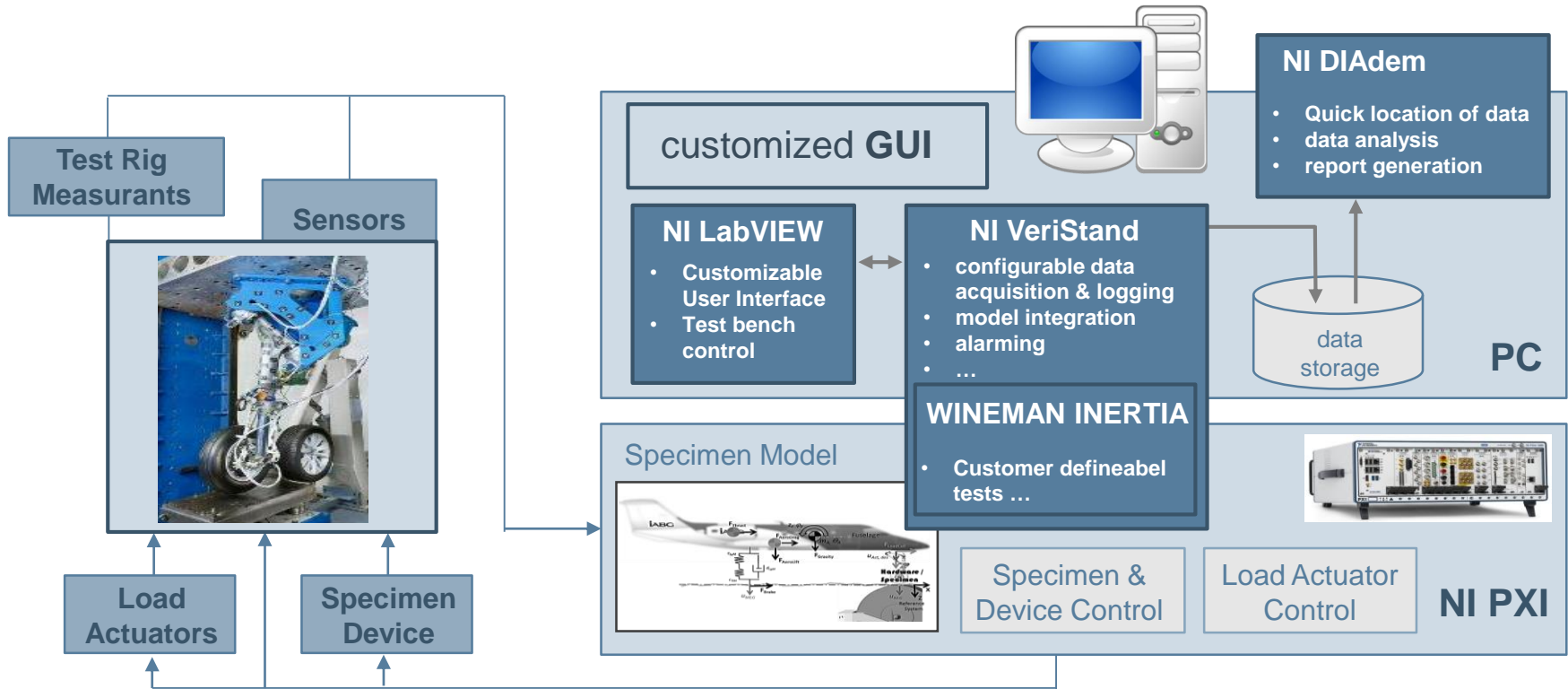


# Iron Bird Loading Systems – examples



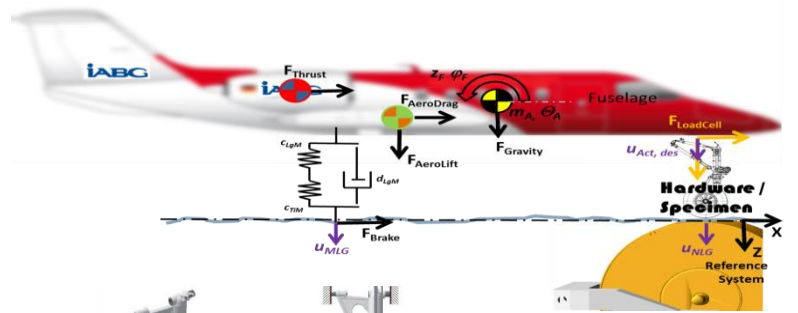
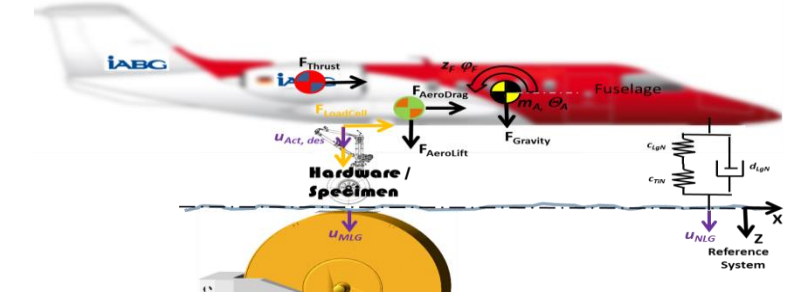
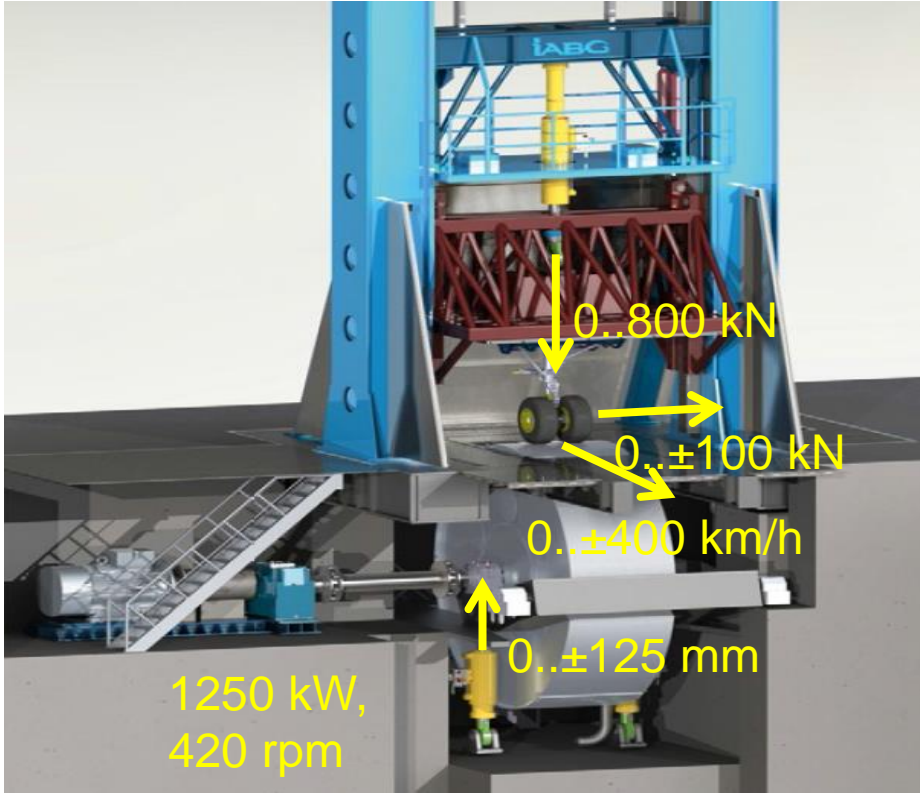
- Mechanical Setup and Interfaces
- Actuators & Sensors
- Automation System / Load Control Functions

# IABG Automation Platform for System & HiL-Test Rigs

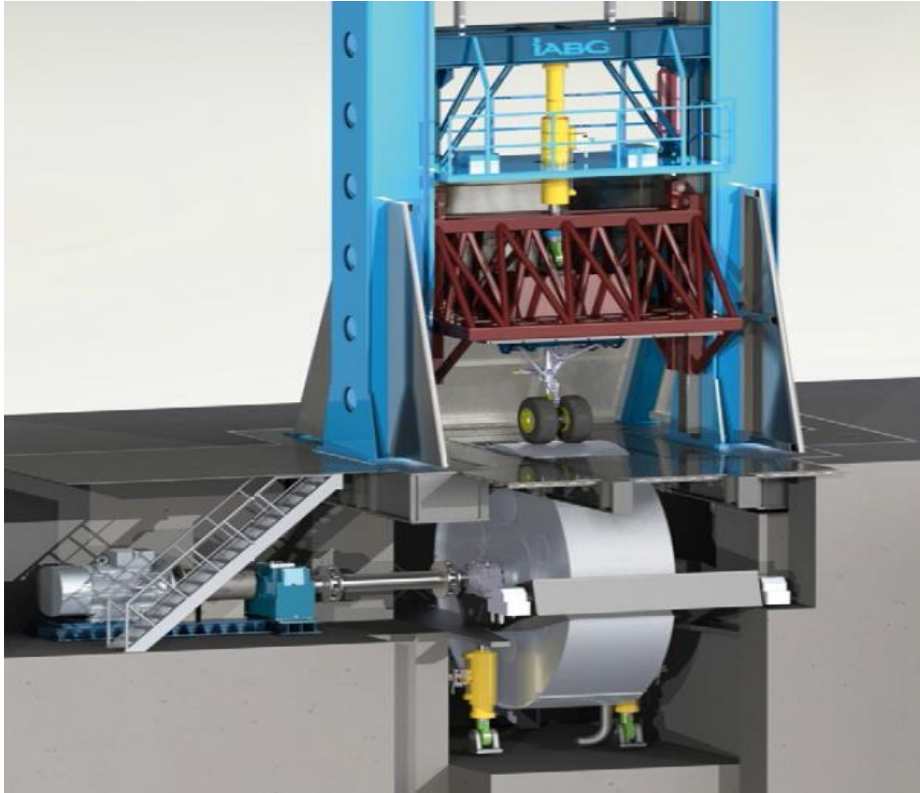




# Advanced Landing Gear Test Cell



# Advanced Landing Gear Test Cell



## Operation Modes

### Landing gear vertical dynamics

- with fixed drum
- with free rolling wheel

### Braking Maneuvers with controlled vertical loads

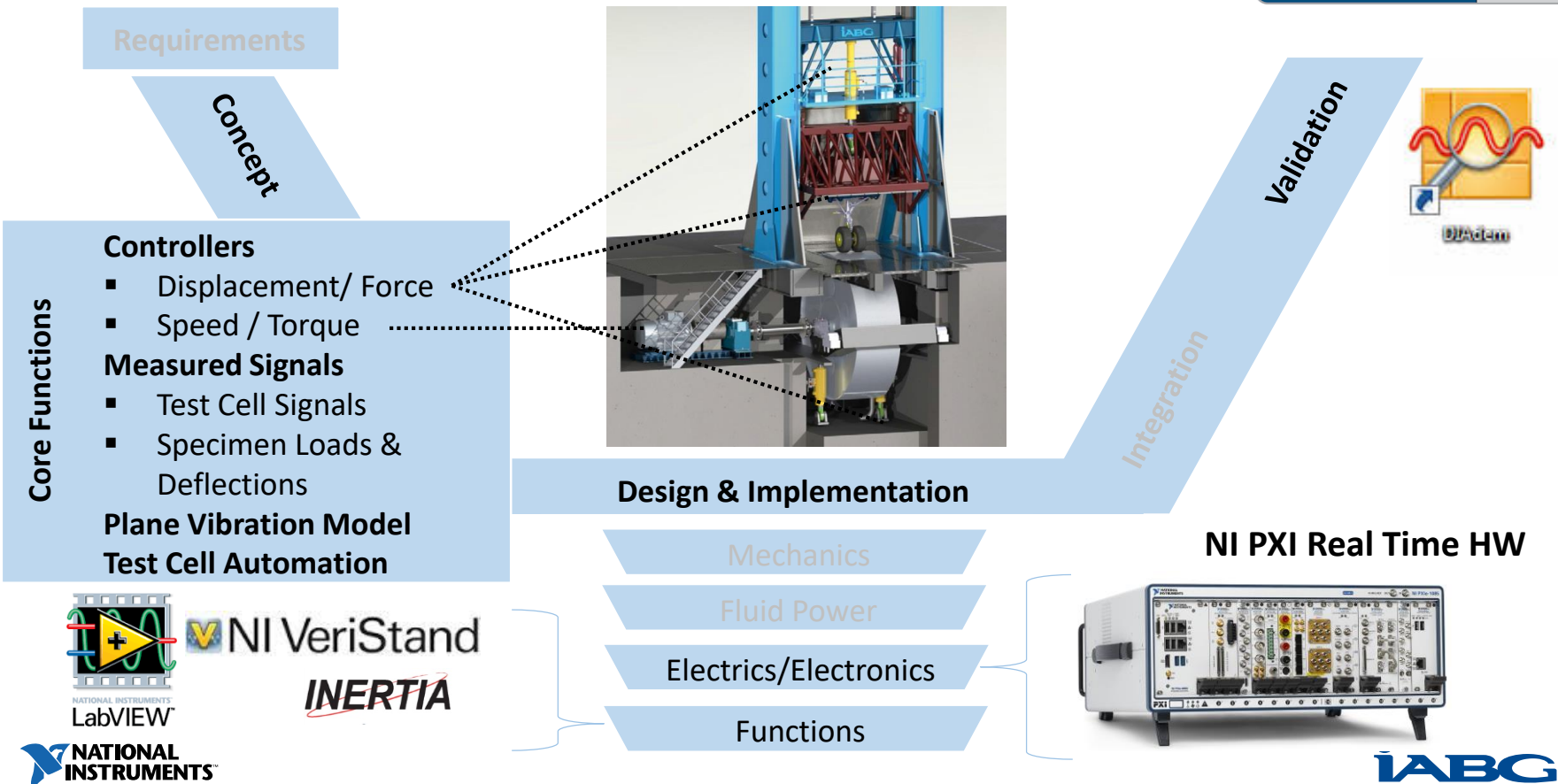
- at initial speeds values
- at initial speeds with obstacles
- at initial speeds with synthetic road excitation

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

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



# Functions, Control & Monitoring System



# Summary



AUTOMOTIVE



INFOCOM



MOBILITY, ENERGY &  
ENVIRONMENT



AERONAUTICS



SPACE



DEFENCE & SECURITY

## IABG provides End-to-End Support for Aeronautic Industry

- Experimental testing (structural, functional & flight tests, product qualification)
- **HiL- and System Test Rigs**
- **Engineering Support (Design, Virtual Testing, Functional Safety)**
- **Structural Monitoring and Damage Analysis**
- Provision of the test infrastructure

**and is strategic partner for the international Industry.**



AEROSPACE  
AND DEFENSE

[germany.ni.com/aerospace-  
defence-forum](http://germany.ni.com/aerospace-defence-forum)

# Aerospace and Defense Forum 2017

An Industry Event Hosted by National Instruments

ZAL, Hamburg, Deutschland

