



ENGINEER
NEXT

VIP2017

The logo features the text "ENGINEER" in a smaller, white, sans-serif font above the word "NEXT" in a larger, white, sans-serif font. A yellow graphic element, resembling a stylized 'X' or a folded ribbon, is positioned between the two words. To the left of "NEXT" is a white rectangular box containing the text "VIP2017" in a white, sans-serif font. The entire logo is set against a blue background with diagonal stripes in various shades of blue, orange, and green.



Automation of System Test Rigs for Aircraft Landing Gears with NI VeriStand

IABG

Andreas Keil, Michael Karl



IABG Business Segments & Customers



AUTOMOTIVE



INFOCOM



MOBILITY, ENERGY & ENVIRONMENT



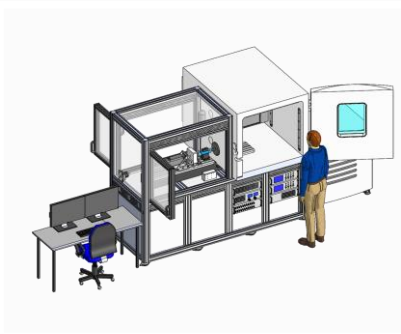
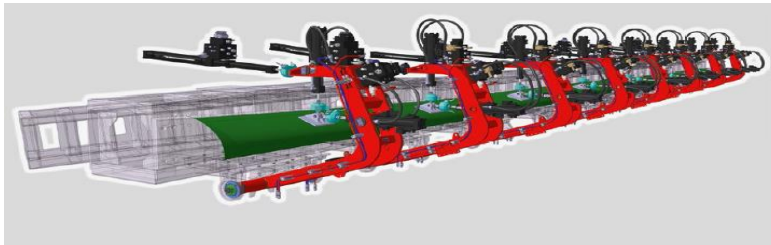
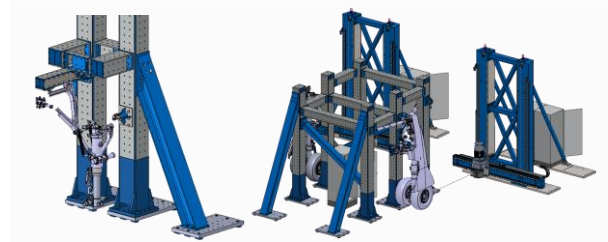
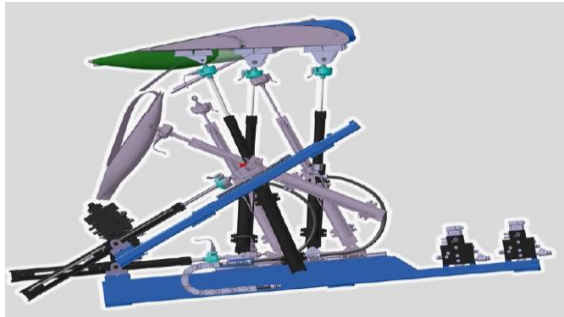
AERONAUTICS



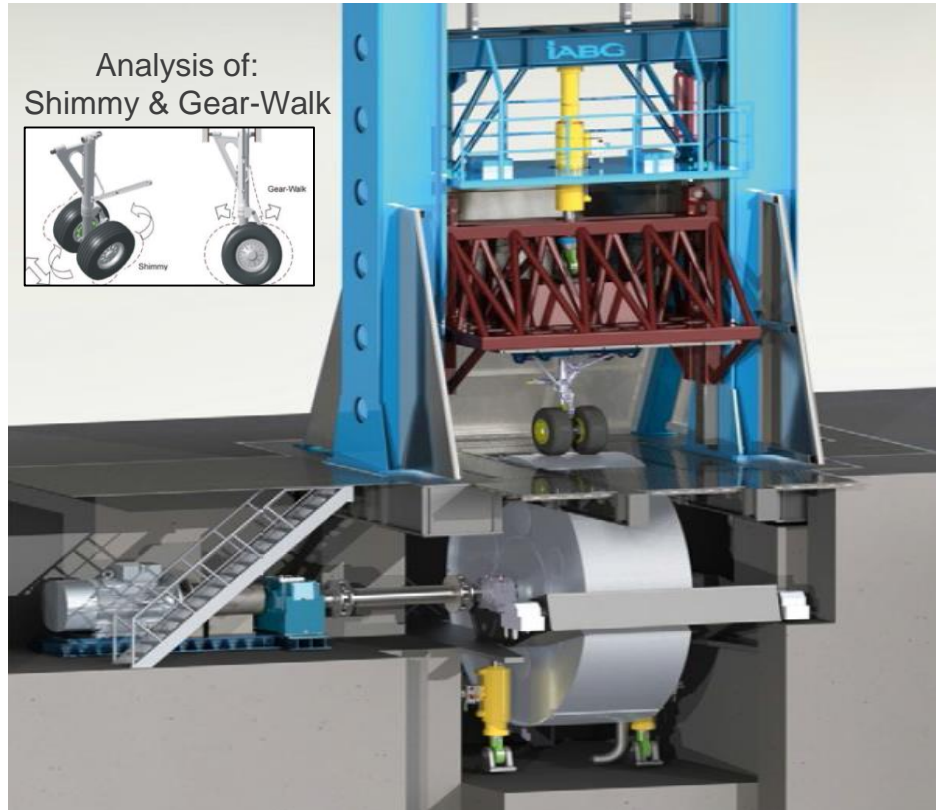
SPACE



DEFENCE & SECURITY

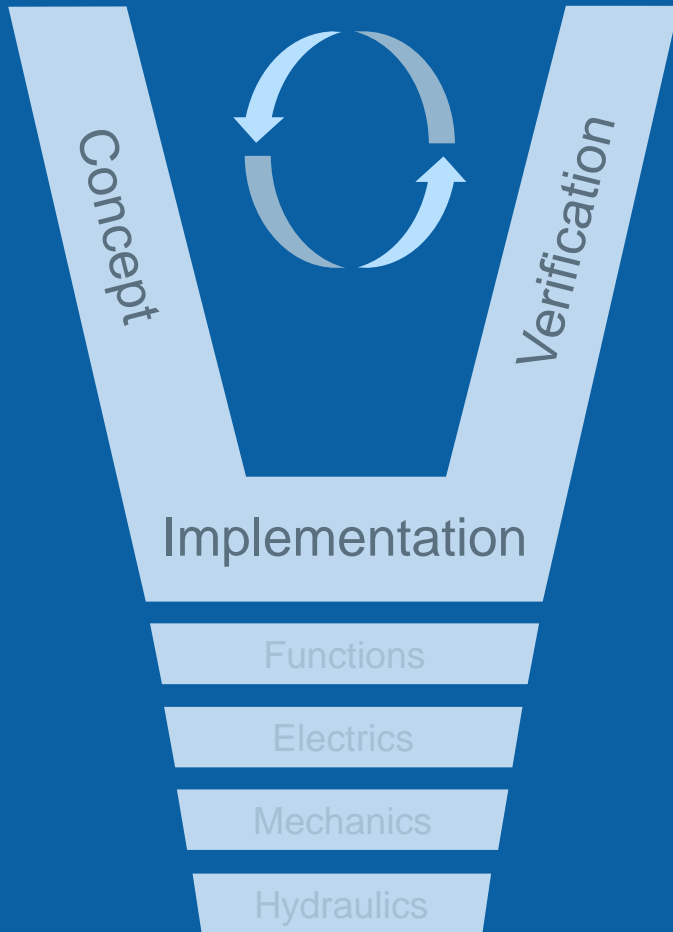


Advanced Landing Gear Test Cell



Testing Goals

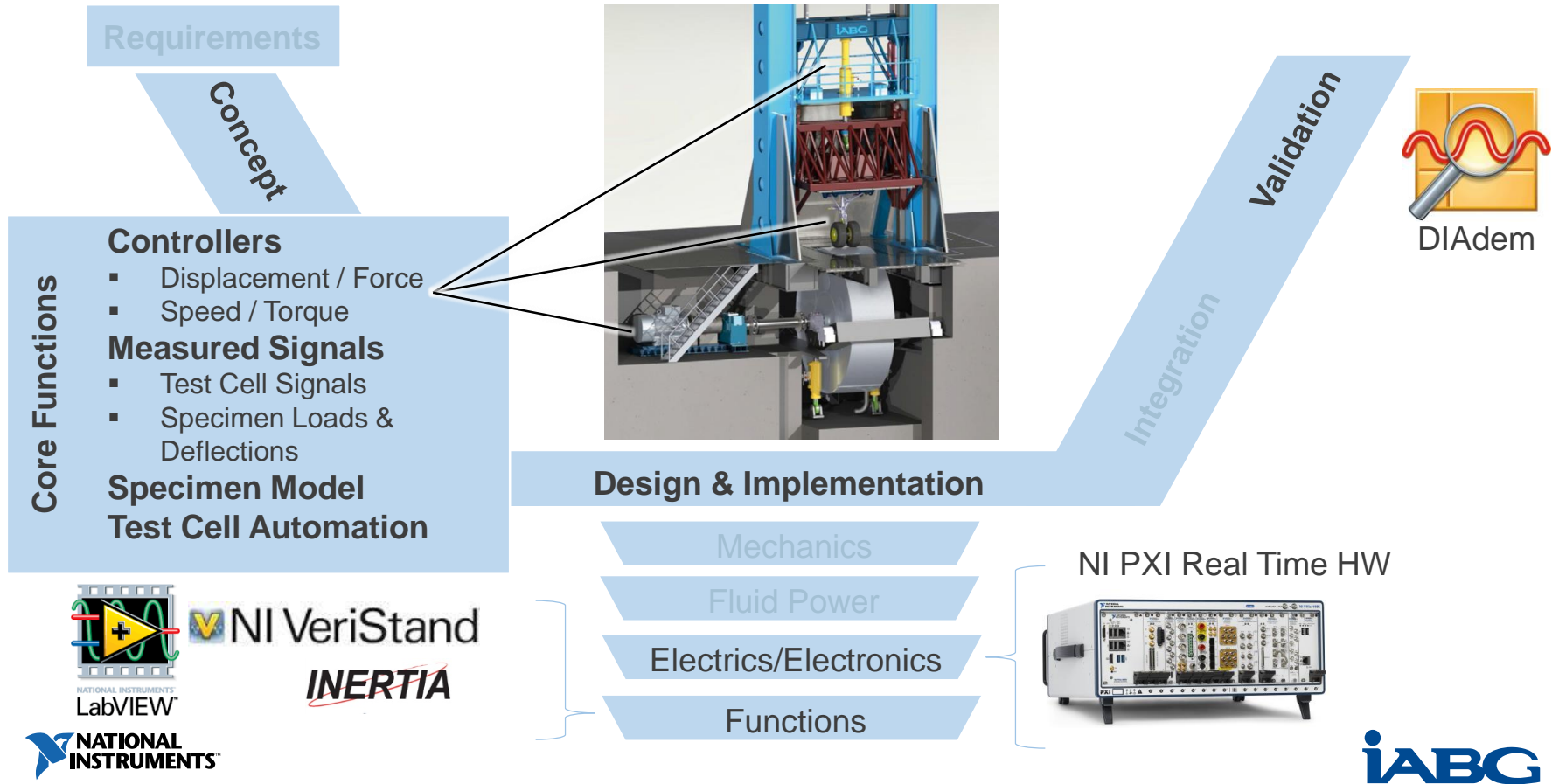
- **Landing gear vertical dynamics**
 - with fixed drum
 - with free rolling wheel
- **Braking Maneuvers with controlled vertical loads**
 - at initial speeds values
 - at initial speeds with obstacles
 - at initial speeds with synthetic road excitation
- **Brake System interaction during landing/taxiing maneuver with measured road excitation**
- **Rolling during landing/taxiing maneuver with synthetic lateral excitation of the wheel**



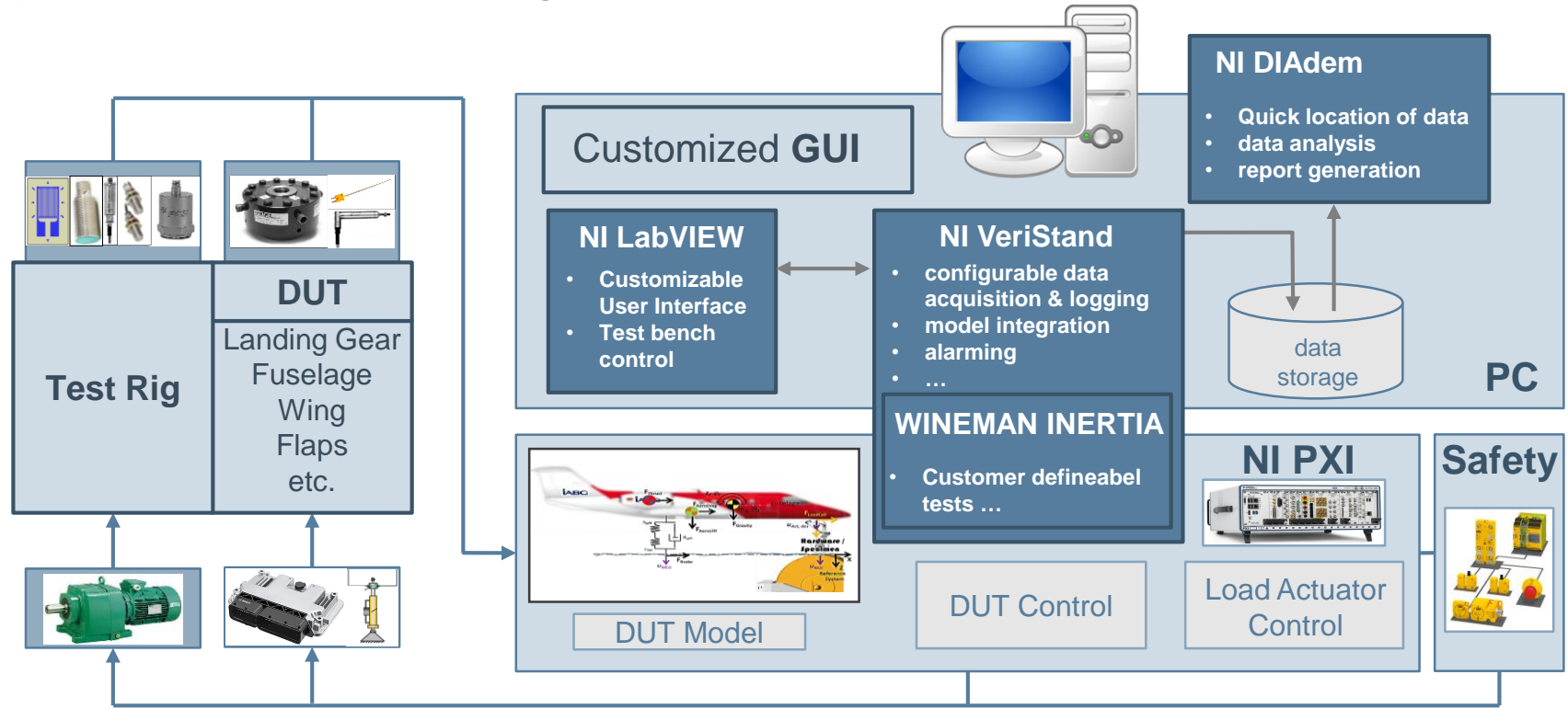
Automation Platform Requirements

- Applicable standards EN ISO 9001 / DIN EN 9100
- A modular platform assignable to similar applications (for customers and IABG)
- Possibility of specimen-models integration
- Consistent tools for test rig applications and further developments
- High scalability of software functions
- High personal and machine safety level

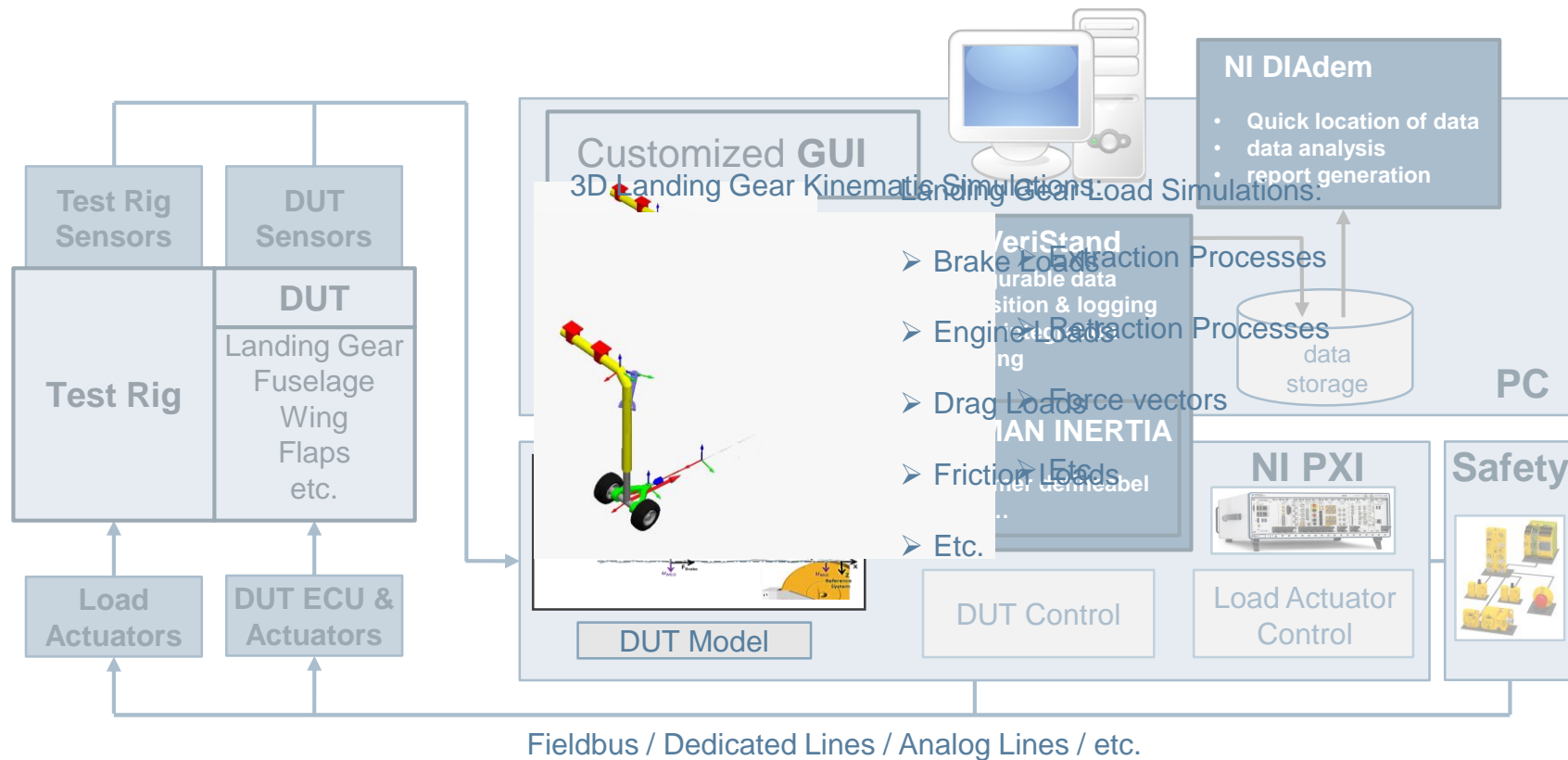
Automation Platform based on NI Toolchain & HW



IABG Automation Platform Solution for System & HiL-Test Rigs



IABG Automation Platform Solution for Model Integration



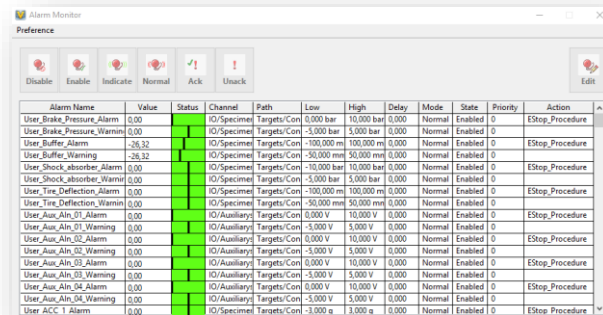
IABG Automation Platform Solution for Human Machine Interfaces



- Application specific HMI (LabVIEW environment)
- Customizable Workspace (VeriStand environment)

Integrated Function based on NI VeriStand Framework

- Alarm Management & Real-Time Procedures
- Embedded Data Logging
- INERTIA Test Editor from Wineman
- Signal Calibration
- And more...

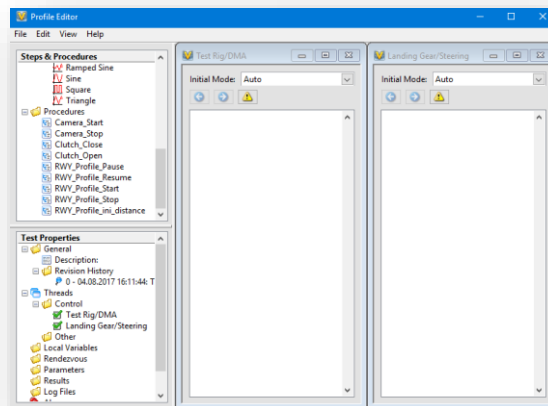


Alarm Monitor

Preference

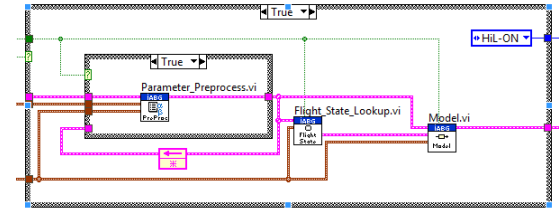
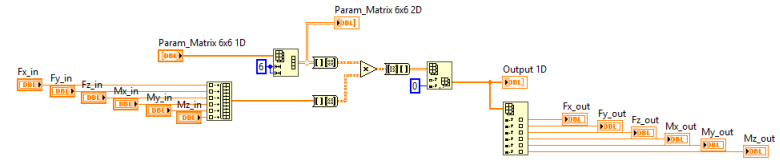
Disable Enable Indicate Normal Ack Unack Edit

Alarm Name	Value	Status	Channel	Path	Low	High	Delay	Mode	State	Priority	Action
User_Brake_Pressure_Alarm	0.00		IO/Specimen	Targets/Con	0.000 bar	10.000 bar	0.000	Normal	Enabled	0	EStop_Procedure
User_Brake_Pressure_Warning	0.00		IO/Specimen	Targets/Con	-5.000 bar	5.000 bar	0.000	Normal	Enabled	0	EStop_Procedure
User_Buffer_Alarm	-26.32		IO/Specimen	Targets/Con	-100.000 m	100.000 m	0.000	Normal	Enabled	0	EStop_Procedure
User_Buffer_Warning	-26.32		IO/Specimen	Targets/Con	-50.000 m	50.000 m	0.000	Normal	Enabled	0	EStop_Procedure
User_Shock_absorber_Alarm	0.00		IO/Specimen	Targets/Con	-10.000 bar	10.000 bar	0.000	Normal	Enabled	0	EStop_Procedure
User_Shock_absorber_Warning	0.00		IO/Specimen	Targets/Con	-5.000 bar	5.000 bar	0.000	Normal	Enabled	0	EStop_Procedure
User_Tire_Deflection_Alarm	0.00		IO/Specimen	Targets/Con	-100.000 m	100.000 m	0.000	Normal	Enabled	0	EStop_Procedure
User_Tire_Deflection_Warning	0.00		IO/Specimen	Targets/Con	-50.000 m	50.000 m	0.000	Normal	Enabled	0	EStop_Procedure
User_Aux_Aln_01_Alarm	0.00		IO/Auxiliary	Targets/Con	0.000 V	10.000 V	0.000	Normal	Enabled	0	EStop_Procedure
User_Aux_Aln_01_Warning	0.00		IO/Auxiliary	Targets/Con	-5.000 V	5.000 V	0.000	Normal	Enabled	0	EStop_Procedure
User_Aux_Aln_02_Alarm	0.00		IO/Auxiliary	Targets/Con	0.000 V	10.000 V	0.000	Normal	Enabled	0	EStop_Procedure
User_Aux_Aln_02_Warning	0.00		IO/Auxiliary	Targets/Con	-5.000 V	5.000 V	0.000	Normal	Enabled	0	EStop_Procedure
User_Aux_Aln_03_Alarm	0.00		IO/Auxiliary	Targets/Con	0.000 V	10.000 V	0.000	Normal	Enabled	0	EStop_Procedure
User_Aux_Aln_03_Warning	0.00		IO/Auxiliary	Targets/Con	-5.000 V	5.000 V	0.000	Normal	Enabled	0	EStop_Procedure
User_Aux_Aln_04_Alarm	0.00		IO/Auxiliary	Targets/Con	0.000 V	10.000 V	0.000	Normal	Enabled	0	EStop_Procedure
User_Aux_Aln_04_Warning	0.00		IO/Auxiliary	Targets/Con	-5.000 V	5.000 V	0.000	Normal	Enabled	0	EStop_Procedure
User_ACC_1_Alarm	0.00		IO/Specimen	Targets/Con	-3.000 g	3.000 g	0.000	Normal	Enabled	0	EStop_Procedure



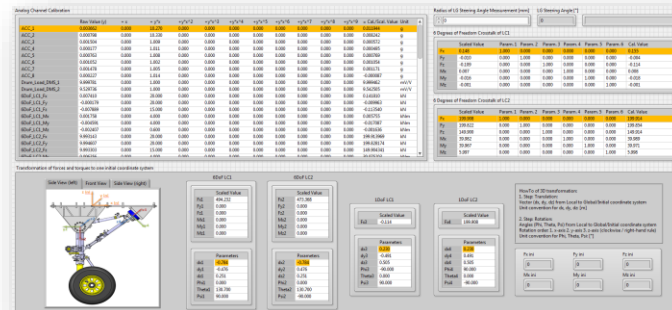
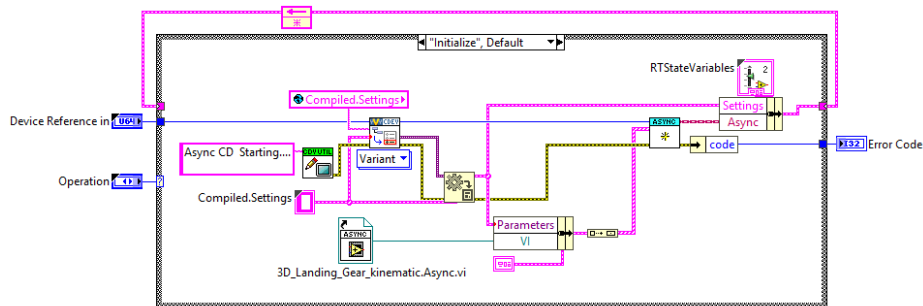
Integrated Models in NI VeriStand Framework

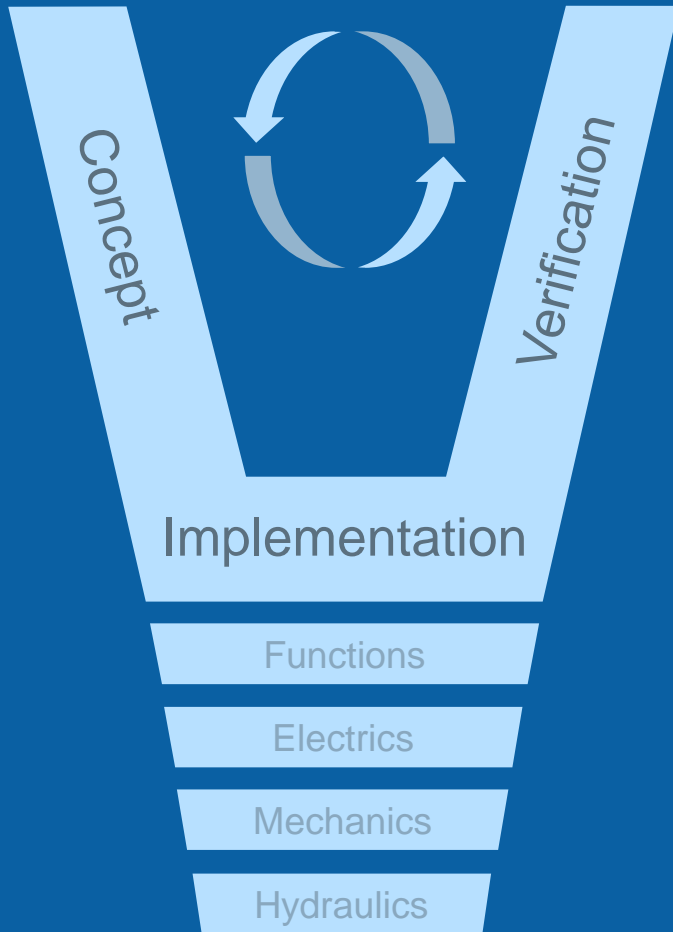
- Aircraft Simulation by HiL-Model (Model)
- 3D Coordinats Transformation (Model)
- Machine & Hydraulic Feedback Control (Model)
- Test-Rig Management (Model)
- Filters, Signal scaling and Crosstalk (Model)



Integrated Tools in NI VeriStand Framework

- Test-Rig Status Logging in Console (Custom Device)
- Post-Mortem Analysis (Custom Device)
- Calibration Tool (Workspace Tool)



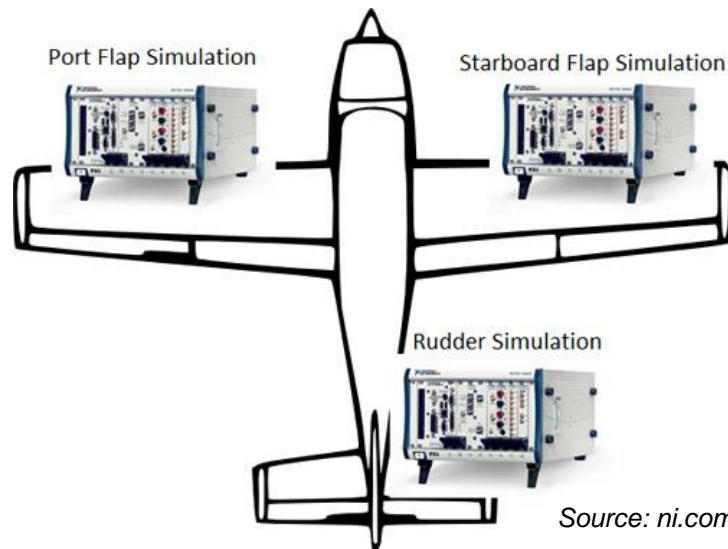


Automation Platform Requirements

- Applicable standards EN ISO 9001 / DIN EN 9100 ✓
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- High scalability of software functions ✓
- High personal and machine safety level ✓

Next Steps

- Embedded CMS with NI Safety
- Decentralisation of Control & Monitoring System
- Separation of System Control and HiL-System to give scalable solutions



Source: ni.com

Summary



AUTOMOTIVE



INFOCOM



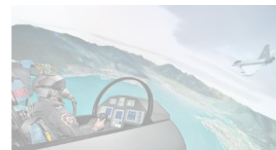
MOBILITY, ENERGY &
ENVIRONMENT



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DEFENCE & SECURITY



The Automation Platform for Landing Gear Test Rigs

- is based on VeriStand as core
- provides extension capabilities for customer specific requirements
- offers a powerful & flexible solution for Aeronautic System Test Rigs