



LabVIEW Software Porting/Upgrade

Example:

Shock Absorber Testing on a Cargo Hook Test Bench

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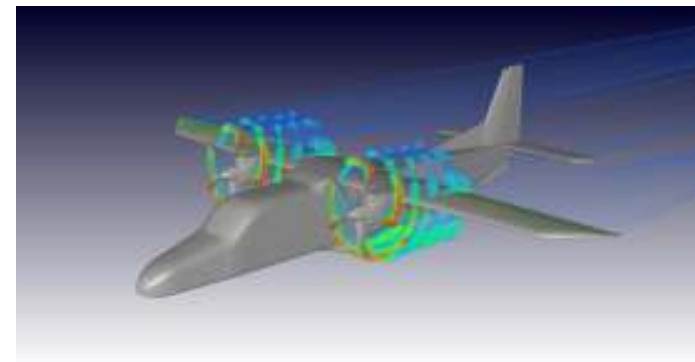
- RUAG Aerodynamics
- LabVIEW Software Porting/Upgrade
- Old Cargo Hook Test Bench functionality
- Shock Absorber Tests on the Cargo Hook Test Bench

RUAG Aerodynamics

- Low Speed Wind Tunnel Tests
- Model Design & Manufacturing

- Strain-Gauge Balances, Instrumentation
- Controlled Systems, Test Benches
- Wind Tunnel Accessories
- High Speed Hydraulic Engines

- Aerodynamic Engineering
- Flight Mechanic
- Wind Tunnel Consulting

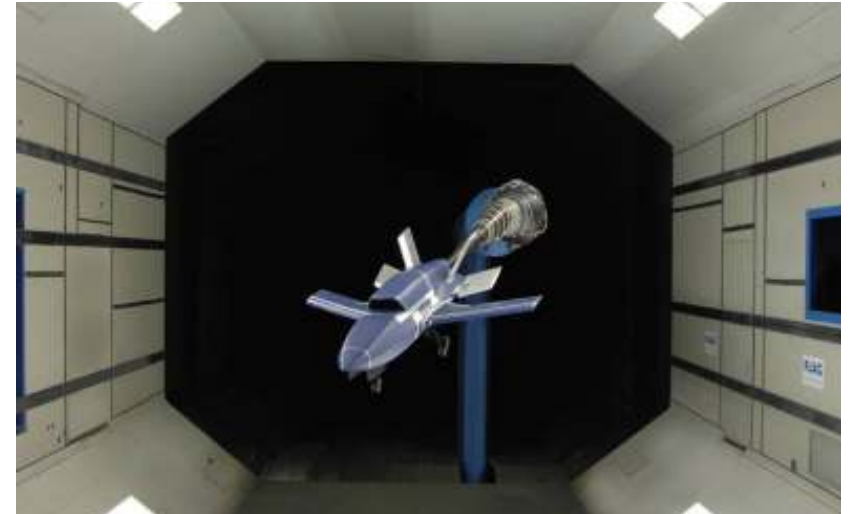


RUAG Aerodynamics

Large Wind Tunnel Emmen (LWTE)

Test Section 7 x 5 x 12 [m]

Max. Speed 245 [km/h]



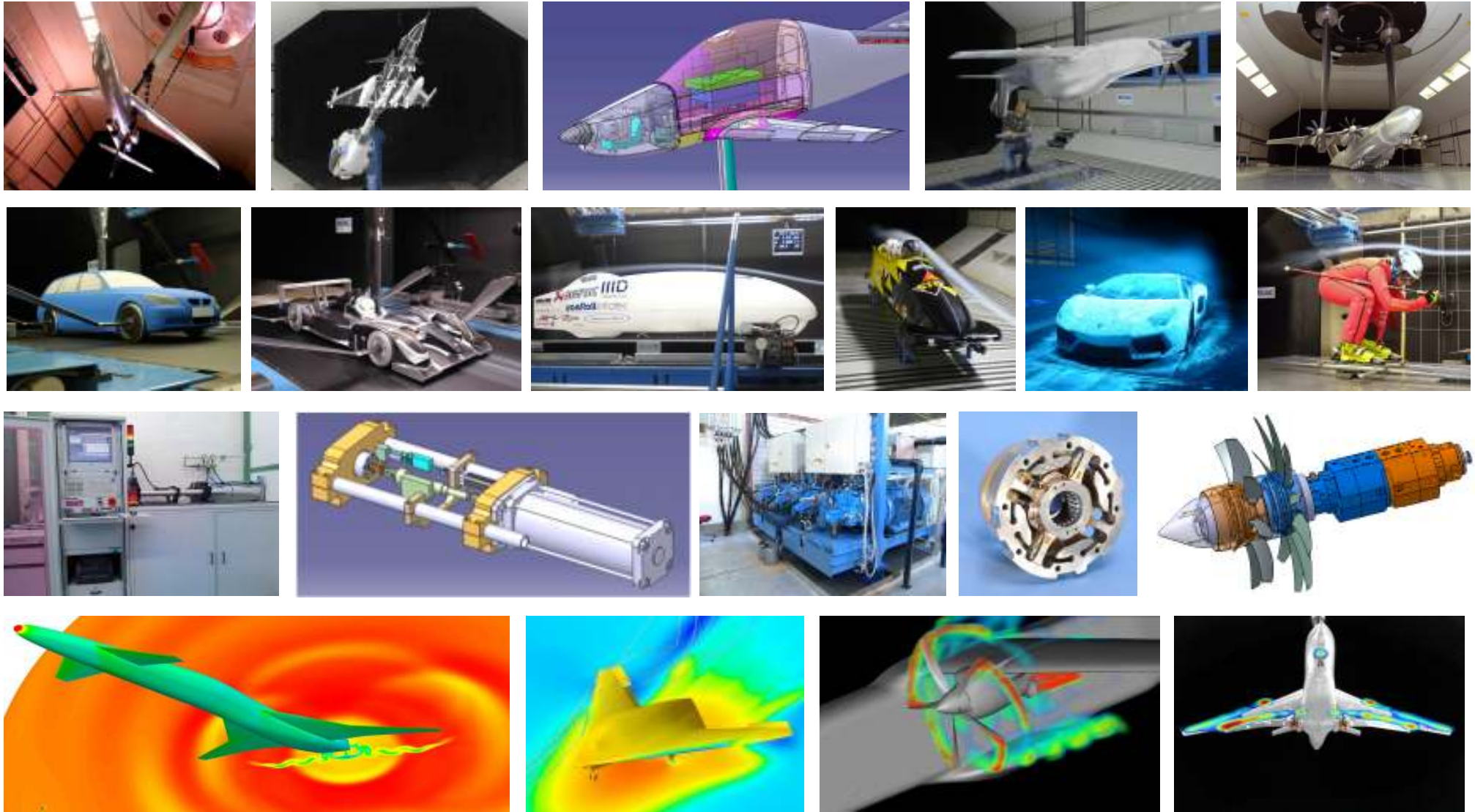
Automotive Wind Tunnel Emmen (AWTE)

Test Section 2.45 x 1.55 x 3.80 [m]

Max. Speed 215 [km/h]



RUAG Aerodynamics



LabVIEW Software Porting/Upgrade

Motivation for Porting or Upgrading

- Enhanced Functionality for existing Applications
- New LabVIEW Version
- New OS (e.g. Windows NT, 98, 2000, XP to W7/W8)
- Obsolete Hardware Platform or new Drivers (DAQ to DAQmx etc.)
- ...

➤ **Motivation for Porting/Upgrade of
Cargo Hook Test Bench**

LabVIEW Software Porting/Upgrade

Enhanced functionality for existing Applications

- New Toolkits or Functions within LabVIEW
- Use your Vi's in old LabVIEW Applications (save for previous)

	Possible Save for Previous Version(s)													
LabVIEW Version	5.0	5.1.x	6.0.x	6.1	7.0	7.1.x	8.0.x	8.2.x	8.5.x	8.6.x	2009	2010	2011	2012
5.0														
5.1.x	X													
6.0.x	X		X											
6.1			X											
7.0				X										
7.1.x					X									
8.0.x						X								
8.2.x							X							
8.5.x							X	X						
8.6.x							X	X	X					
2009							X	X	X	X				
2010							X	X	X	X	X			
2011							X	X	X	X	X	X		
2012							X	X	X	X	X	X	X	
2013							X	X	X	X	X	X	X	X

LabVIEW Software Porting/Upgrade

- Read the Upgrade Notes
- Known Issues
- Bug Fixes & new Bugs
- Use the .bld Script Converter .bld => .lvproj
- Just run the Code with the new LabVIEW Version?



These upgrade notes describe the process of upgrading LabVIEW for Windows, OS X, and Linux to LabVIEW 2013. Before you upgrade, read this document for information about the following topics:

- The recommended process for upgrading LabVIEW
- Potential compatibility issues you should know about prior to loading any VIs you saved in a previous version of LabVIEW
- New features and behavior changes in LabVIEW 2013

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Upgrading to LabVIEW 2013

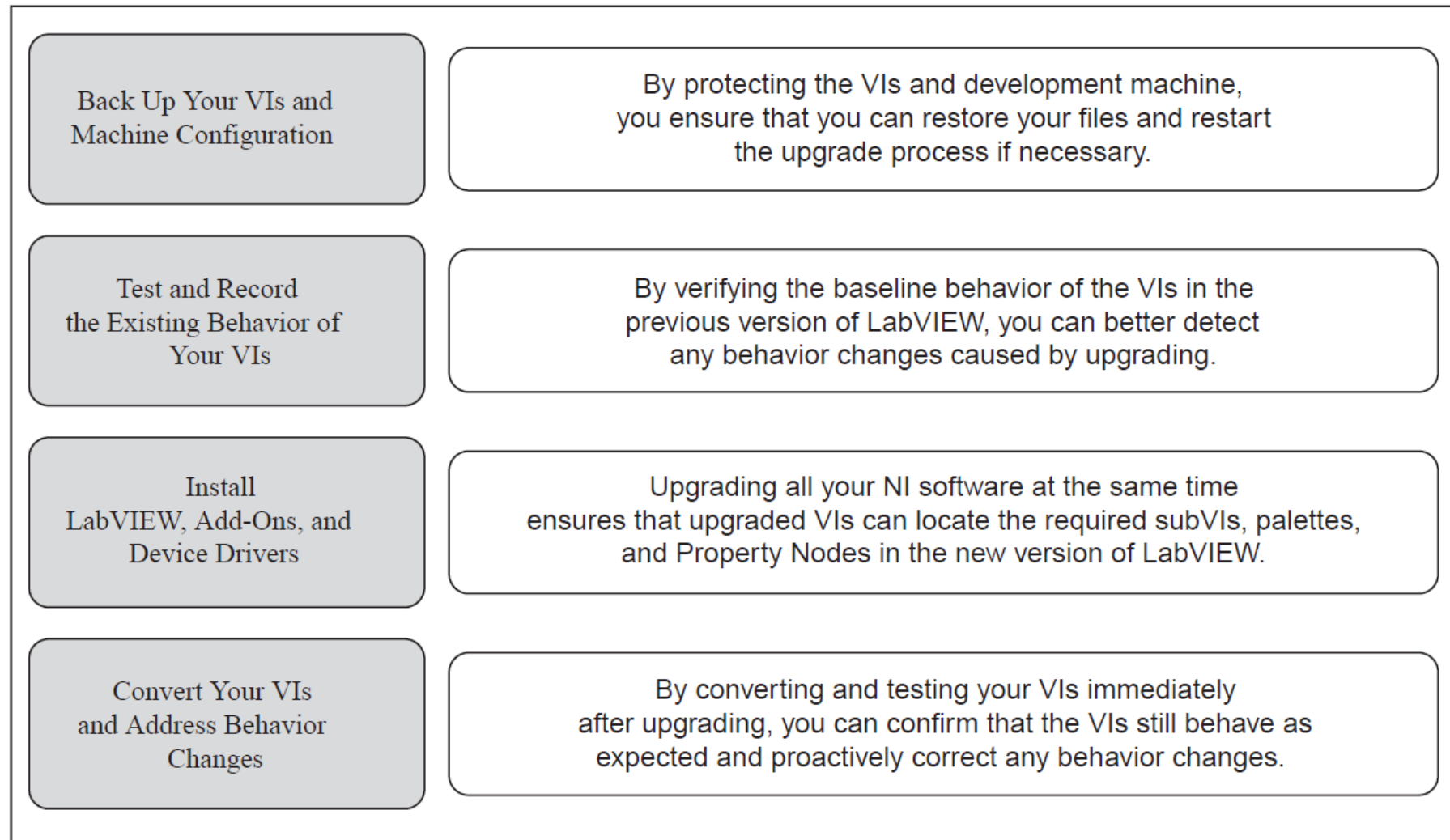
Although you can upgrade small applications to a new version of LabVIEW by installing the new version and then loading your VIs, National Instruments recommends a more rigorous upgrade process to ensure that you can detect and correct upgrade difficulties as efficiently as possible.



Tip This process is especially beneficial for large LabVIEW applications that control or monitor critical operations; cannot afford extended down time; use multiple modules, toolkits, or drivers; or are saved in an unsupported version of LabVIEW. Refer to the National Instruments website

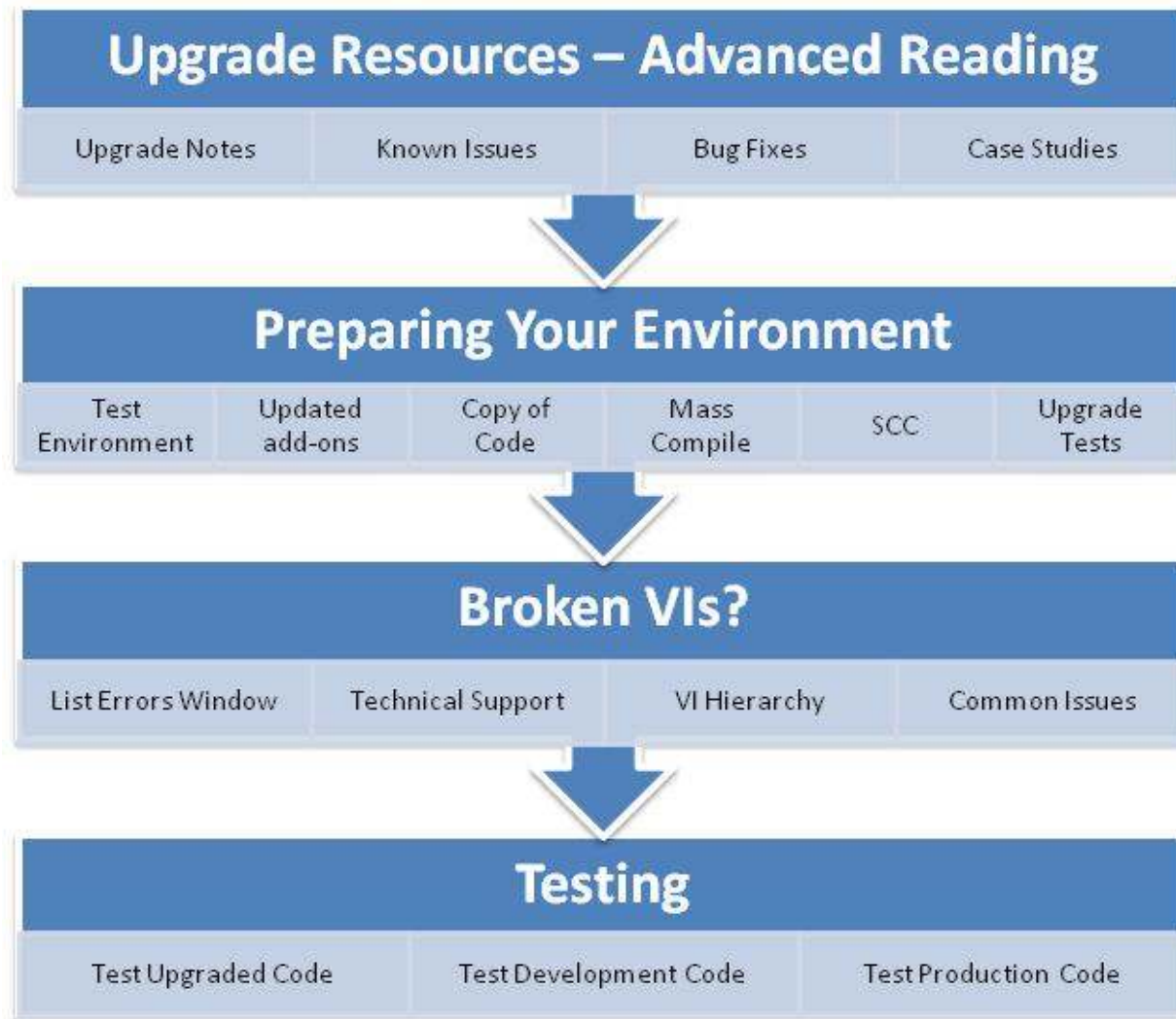
LabVIEW Software Porting/Upgrade

- Recommended Upgrade Process from NI (Upgrade Notes)



LabVIEW Software Porting/Upgrade

- <http://www.ni.com/white-paper/7417/>



LabVIEW Software Porting/Upgrade

OS Upgrade

- Windows Version Compatibility
- OS Settings, Firewall etc.
- Different “home” Directories...
 - Most LabVIEW applications just run in just one specific directory!
 - That behavior is not caused by LabVIEW!

Microsoft Windows OS Version

	95	98	2000	NT 4.0	ME	XP x86	Vista	Windows 7	Windows 8
5.1.1	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible			
6.0.2	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible			
6.1	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible	Compatible		
7.0		Compatible	Compatible	Compatible	Compatible	Compatible	Compatible		
7.1			Compatible	Compatible	Compatible	Compatible	Compatible		
8.0			Compatible			Compatible	Compatible		
8.2.0			Compatible			Compatible	Compatible		
8.2.1			Compatible			Compatible	Compatible		
8.5.x			Compatible			Compatible	Compatible		
8.6.x			Compatible			Compatible	Compatible		
2009			Compatible			Compatible	Compatible	Compatible	
2009 SP1			Compatible			Compatible	Compatible	Compatible	
2010						Compatible	Compatible	Compatible	
2011						Compatible	Compatible	Compatible	
2012						Compatible	Compatible	Compatible	Compatible
2012 SP1						Compatible	Compatible	Compatible	Compatible
2013						Compatible	Compatible	Compatible	Compatible

Compatible Version

LabVIEW Software Porting/Upgrade

Obsolete Hardware Platform or new Drivers

- Obsolete Hardware

- Create a new driver with same Vi in- and output
- e.g. FP to cRIO – you can't just run all the old code on a cRIO
- Use cRIO scan engine, shared variables, create aliases of I/O variables...

- Traditional NI-DAQ to NI-DAQmx

- First use a LabVIEW version which supports both DAQ Drivers
- Replace the NI-DAQ functions with NI-DAQmx
- Test your application
- Upgrade to the latest LabVIEW version
- Again test your complete application and verify that everything correctly runs

Cargo Hook Test Bench



Cargo Hook - Old GUI «Release Tests»

Testing the mechanical/ electrical Releases with varying Loads and Voltages

- Motor with worm gear and a spindle to apply a force to the test item
- Motor control with a frequency converter using analogue input and RS232
- Power supply for cargo hook electrical release using RS232
- Create reports



Cargo Hook - Old GUI «Tensile Tests»

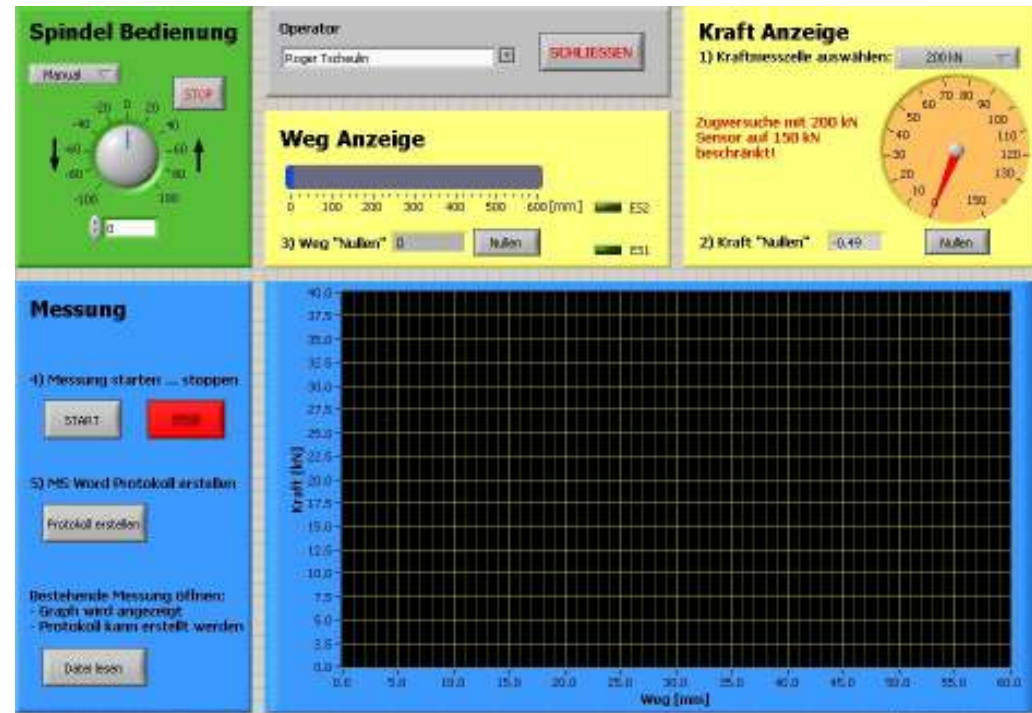
Tensile Testing is also done with the Cargo Hook Test Bench

With respect to highest accuracy different load cells with ranges of 2 kN, 20 kN and 250 kN are used

Possibility to create reports

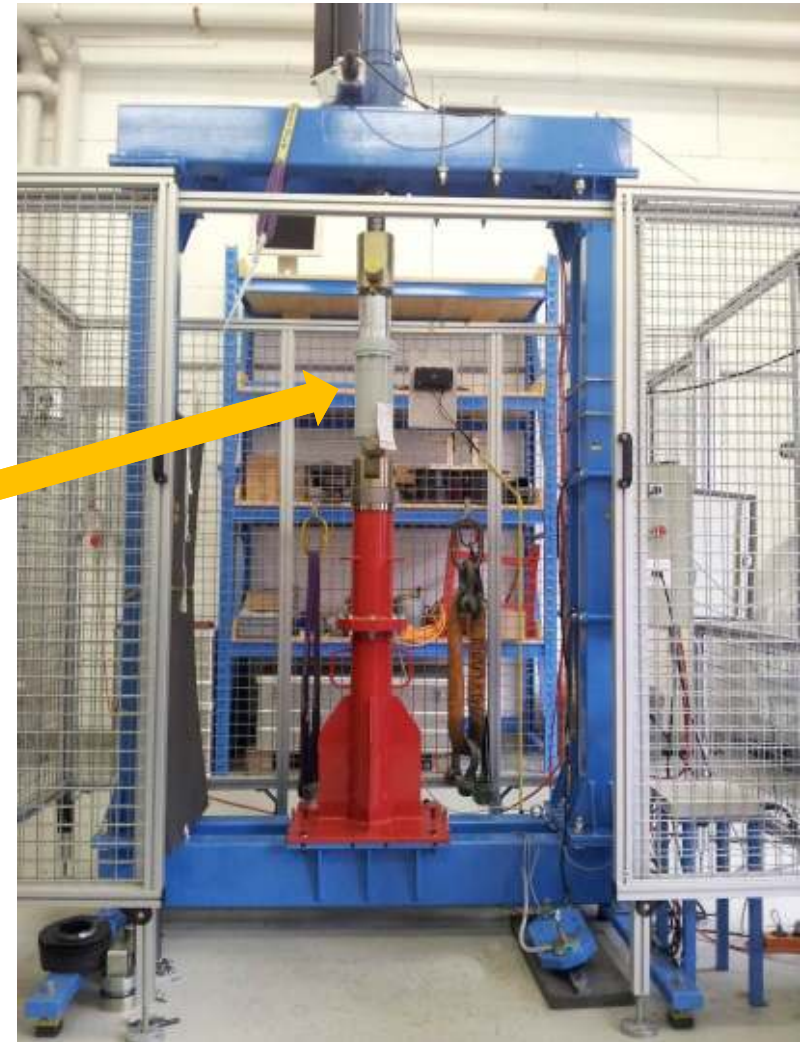
Examples of tensile testing

- REGA lifebelts
- Cables
- Windlass
- ...



Shock Absorber Tests

- Test shock absorbers of main/nose landing gear from DO 328 after MRO with up to 220'000 N
- Record load stroke curve



Shock Absorber Tests

Initial Idea


- Don't "touch" or upgrade the existing Software and PC used so far
- Install a new PC which is compatible to the existing PC with PCI-DAQ card and SC-2345
- Create a new application for shock absorber tests

Software Functionality

- Closed loop control of position, velocity, and force using frequency converter (RS232 interface), encoder and load cell feedback
- Overload protection
- Visualization of measured load stroke curve and tolerances (minimum, optimum, maximum)
- Report generation to Excel, pdf and printer

Shock Absorber Tests

Realized Solution Step 1

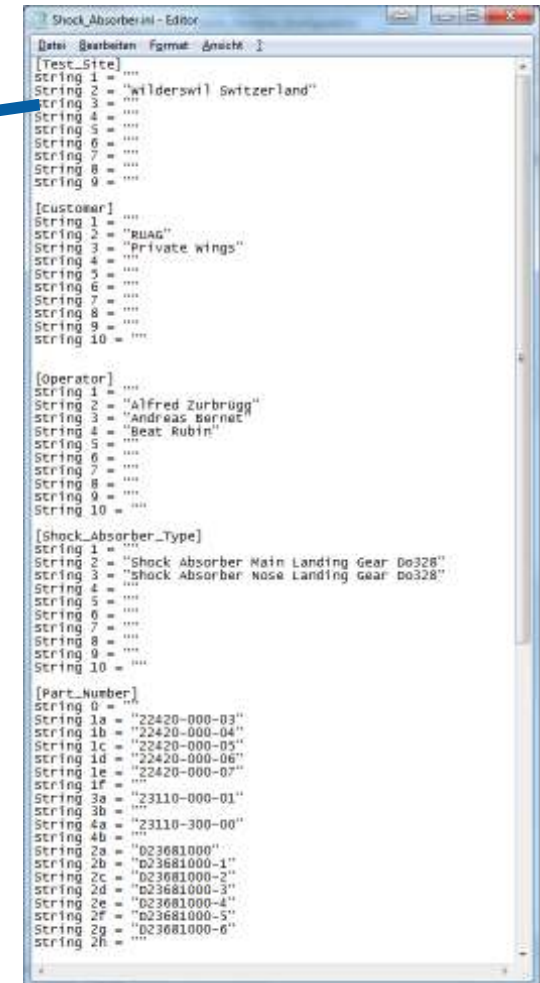
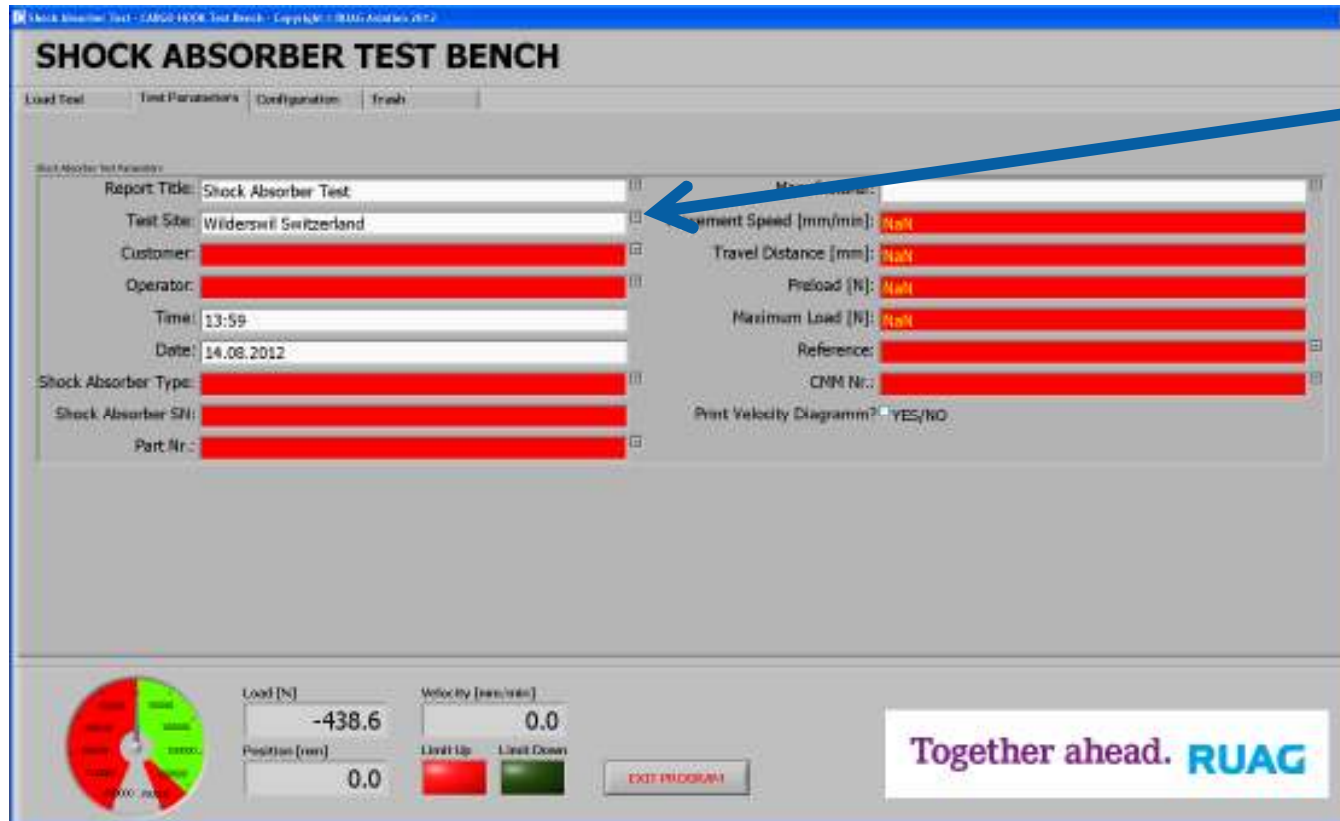
- New PC with a PCI-DAQ card only for shock absorber tests
 - Closed loop of position, velocity, and force, overload protection
 - Load individual test tolerances from excel files
 - Visualization of measured load stroke curve and tolerances (minimum, optimum, maximum)
 - Report generation to Excel, pdf and printer
- Existing motor too weak  only 165 kN instead of required 220 kN

Realized Solution Step 2

- Replacement of motor and frequency converter by a servo motor and drive
- Creating RS232 drivers for the new drive
- Cargo Hook and Tensile Test: Software porting from LabVIEW 7 with «NI-DAQ» to LabVIEW 2011 «NI-DAQmx»
- Replacement of old frequency converter drivers by new drivers in all applications
- Run all three applications on a single PC

Shock Absorber Tests

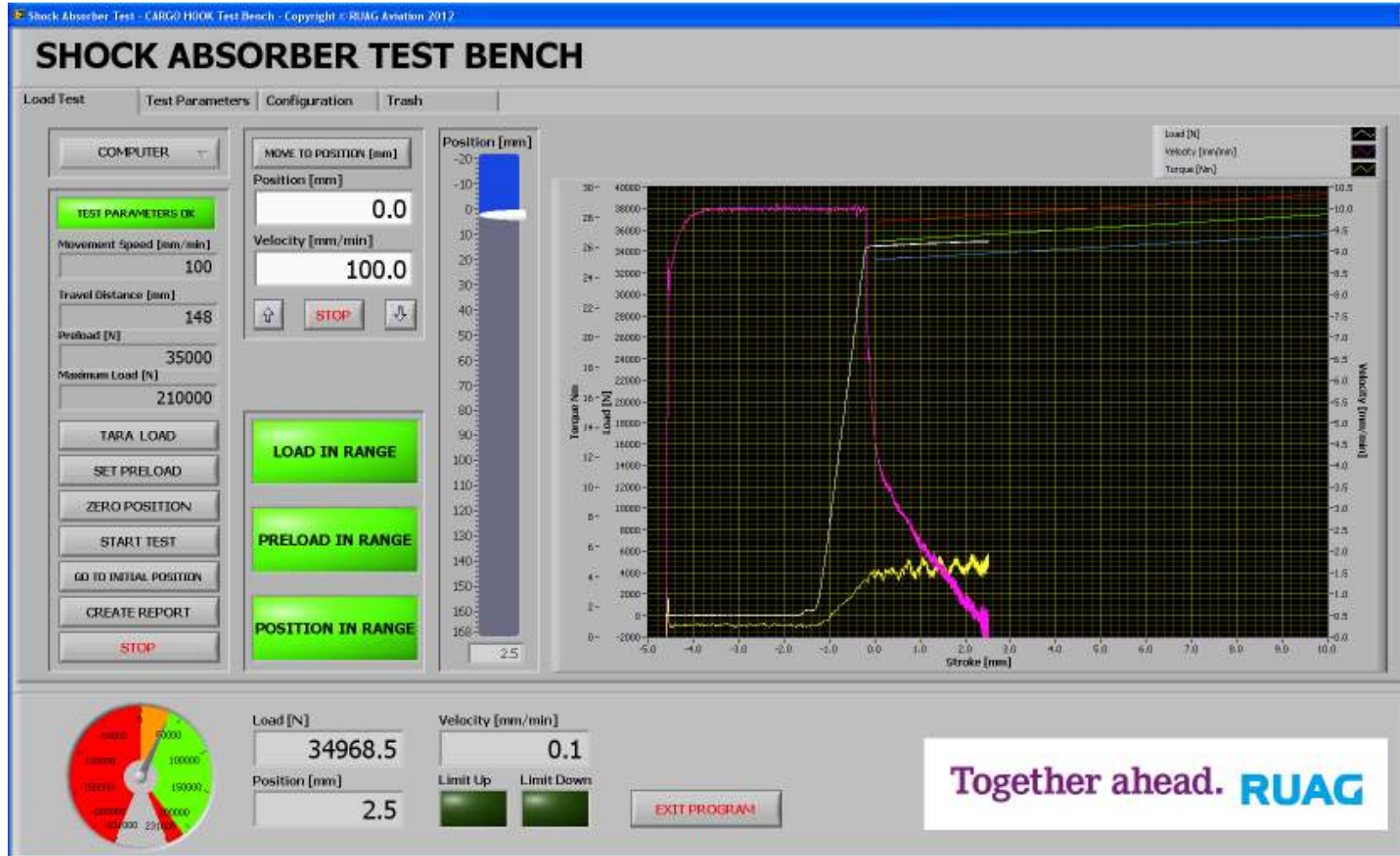
- Test Parameters



- INI File => Property Node => ComboBox

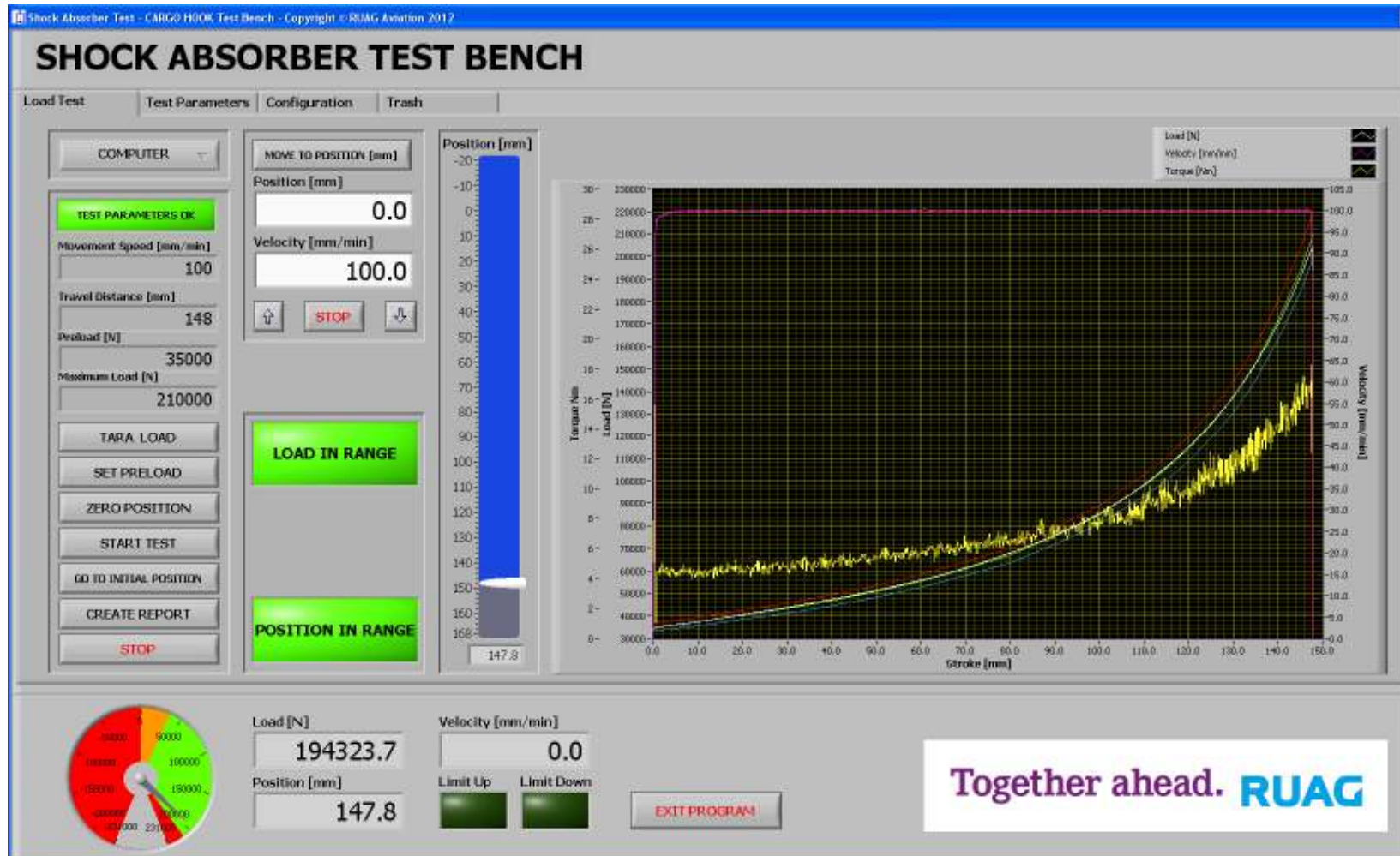
Shock Absorber Tests

- GUI during automatic Preload Adjustment



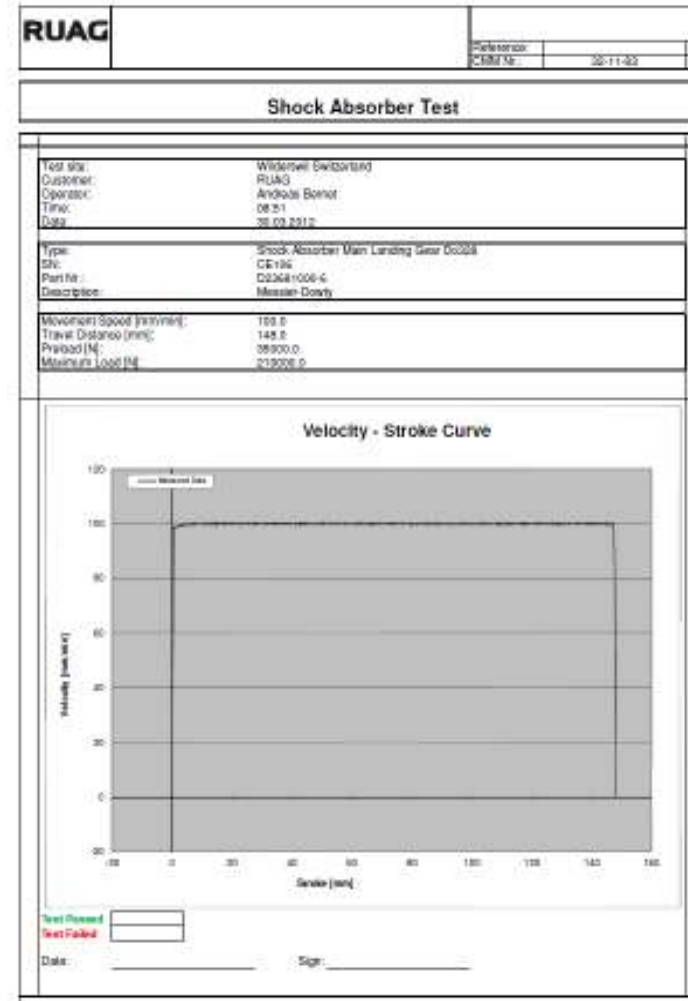
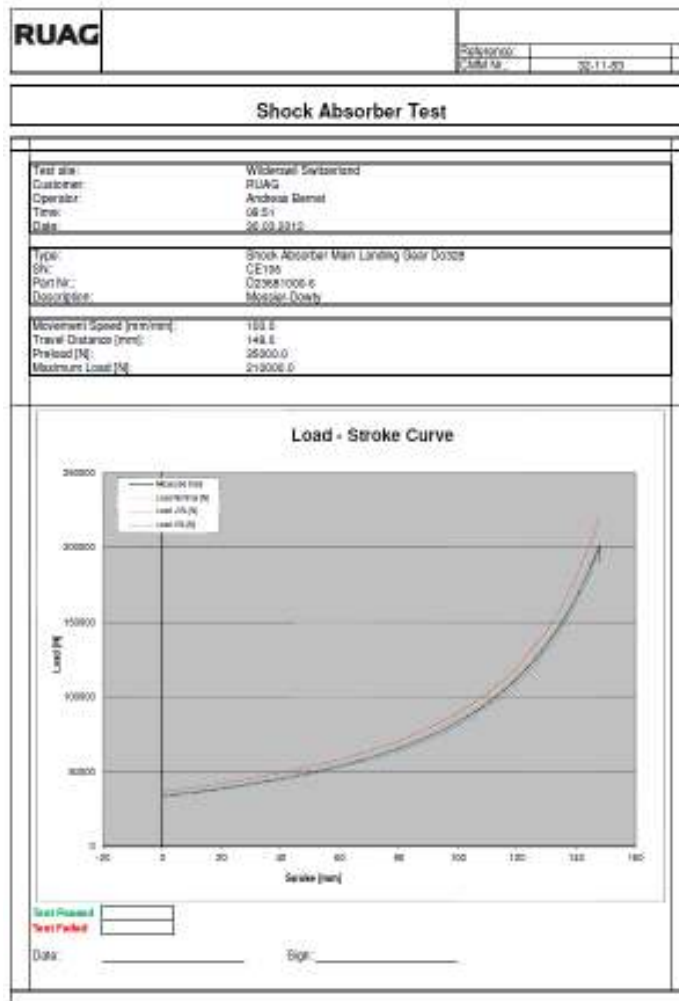
Shock Absorber Tests

- GUI during Load Stroke Test



Shock Absorber Tests

- Report Generation using Excel



References

- National Instruments:

<http://www.ni.com/support>

<http://zone.ni.com/>



- LAVA User Group:

<http://lavausergroup.org/>

- OpenG Libraries – Hundreds of free, reusable VIs from the OpenG Community

<http://jkisoft.com/vipm/download/>





Thank you for your attention!