

Sandia Package Testing Capabilities

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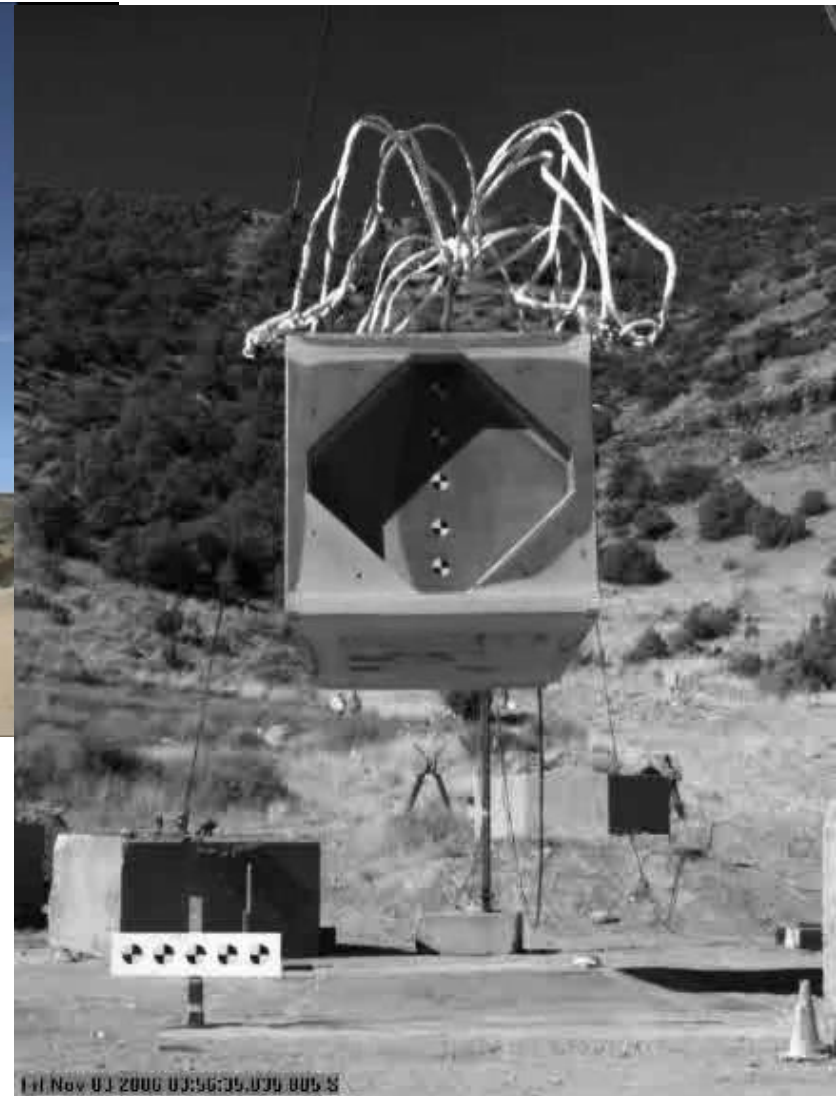
Background

- Sandia has a long history of performing package testing for multiple purposes
 - Certification tests
 - Scenario tests
 - Extra-regulatory tests
 - Material characterization tests
 - Risk assessments

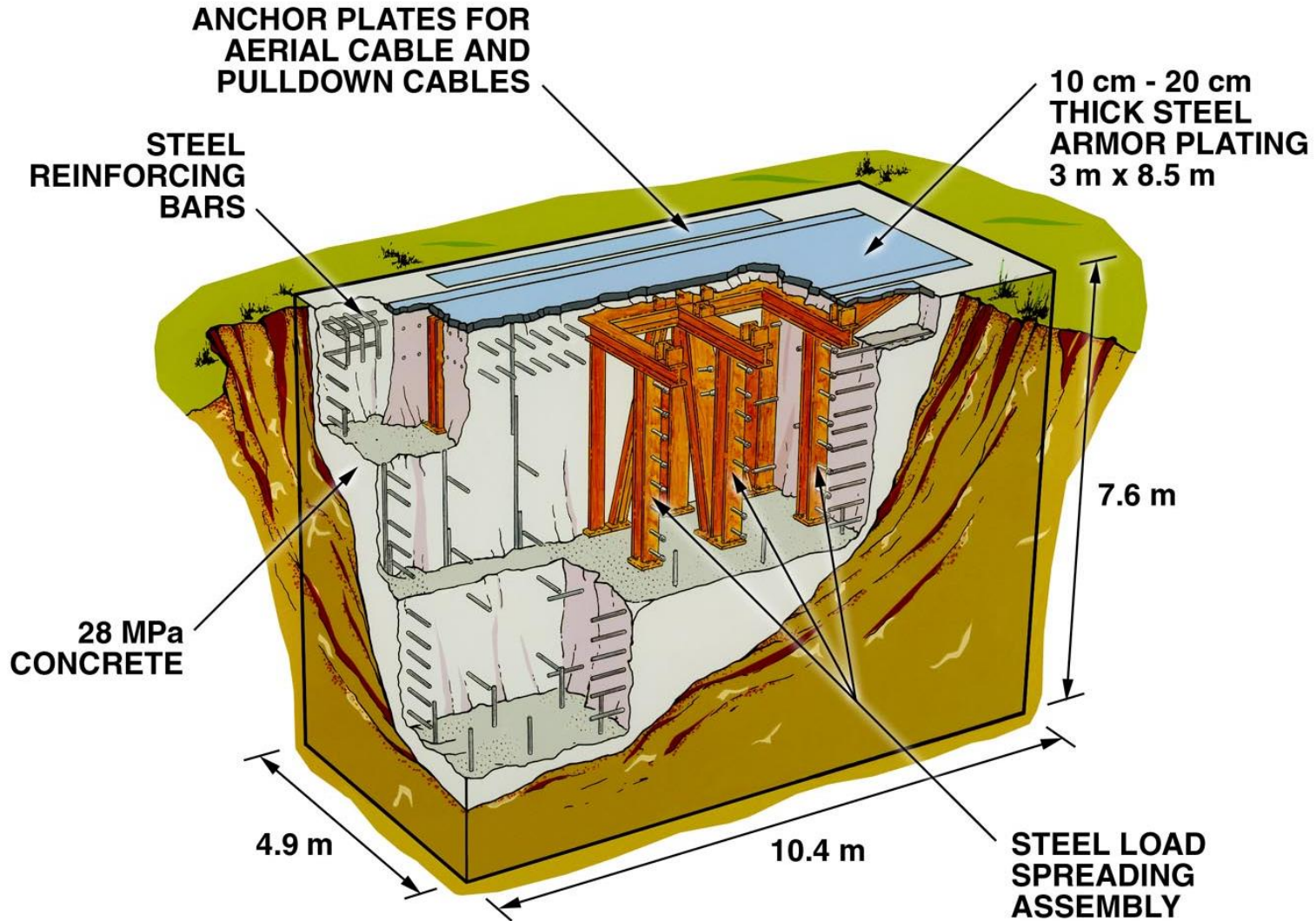
- This capability builds on our testing expertise as the lead lab for system testing for the Nuclear Weapons Program

- Testing capabilities have been used extensively for benchmarking of codes used in risk assessment (e.g. NUREG-2125) and for demonstrating regulatory testing severity

Certification 9m Drop Test

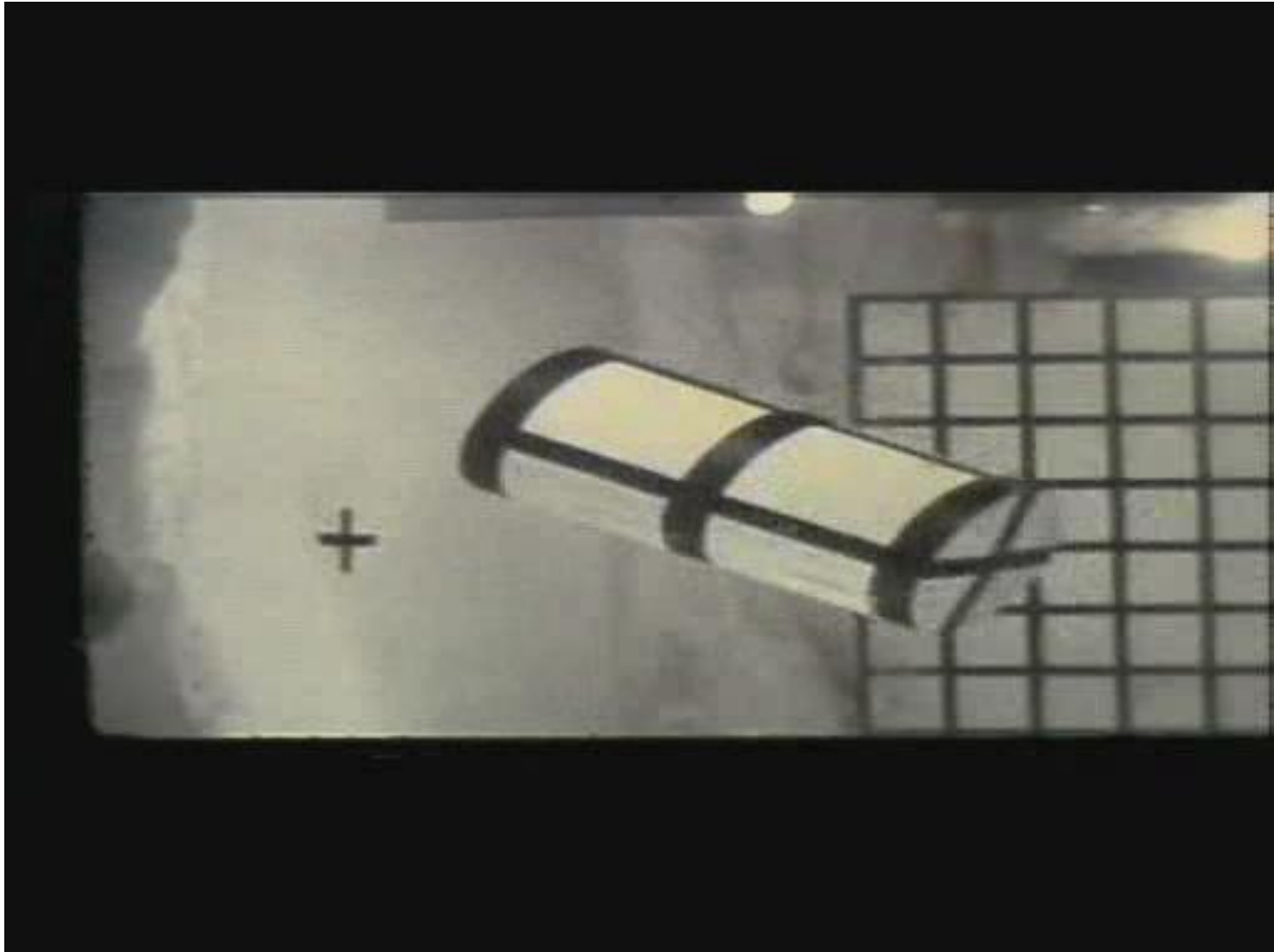


Unyielding Target for Drop Tests



910 Tonne Armored Target at Sandia National Laboratories

Air Transport Package Impact Test



Certification Fire Test



Train Impact Scenario Test



Extra-Regulatory Tests



36m drop test, with 4 times the energy of the regulatory impact

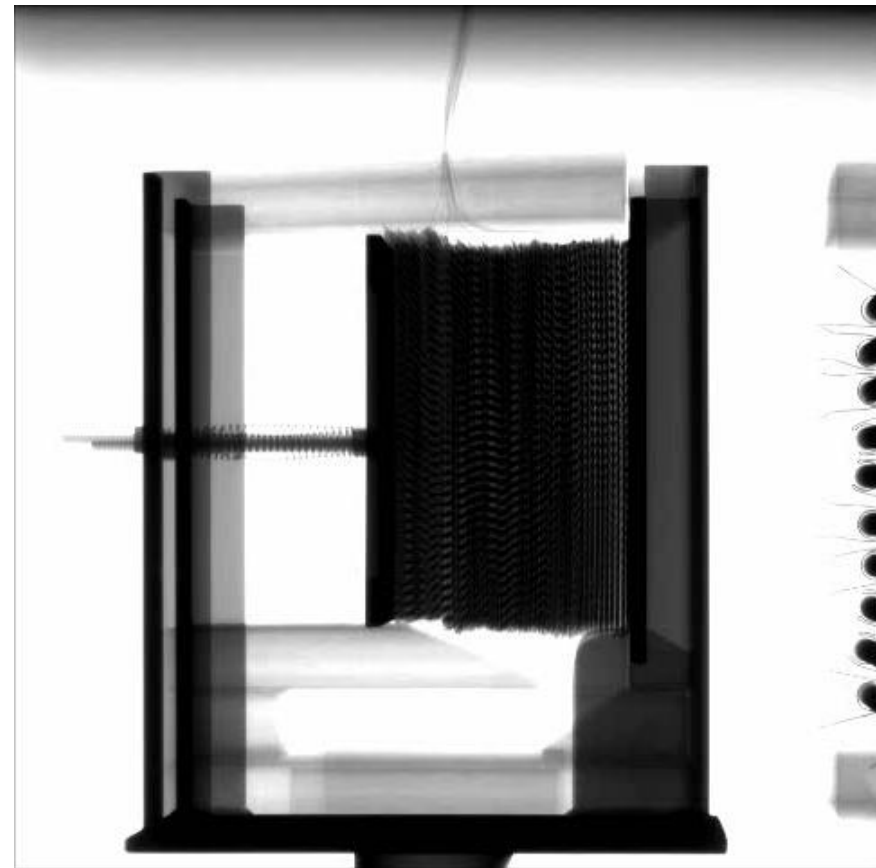
Jet Impact Scenario Test



Material Characterization Tests



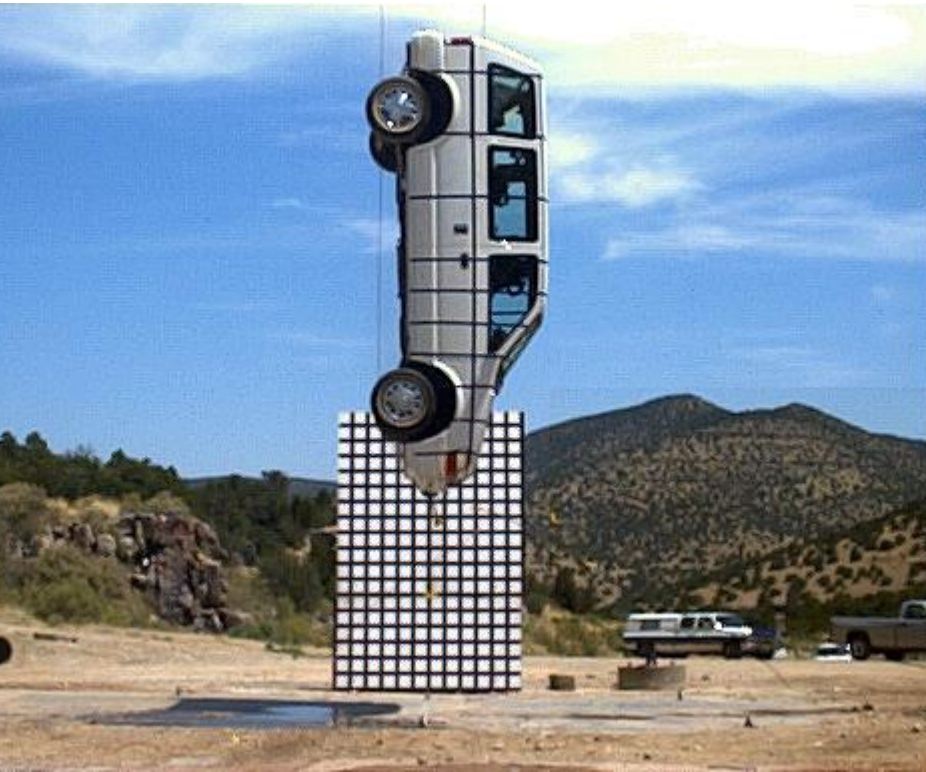
Dynamic crush strength of energy absorbing material



Thermal properties of insulation material

Risk Assessment

Comparison of an unyielding target to a concrete target - minivan



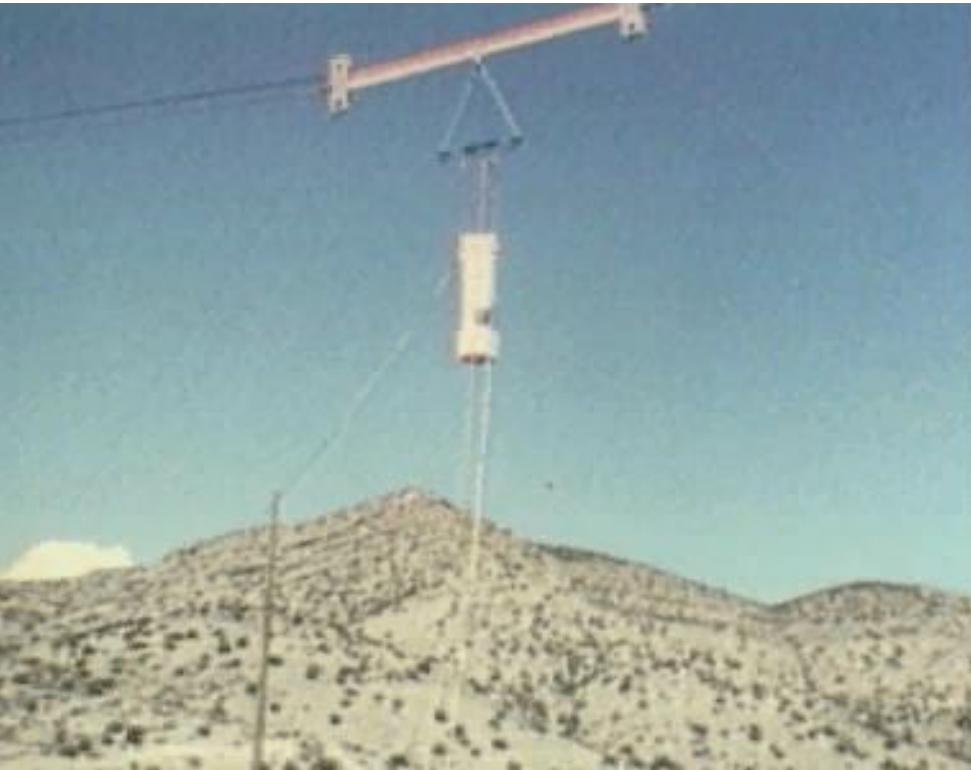
Unyielding Target



Concrete Target

Risk Assessment

Comparison of an unyielding target to a concrete target - cask



Unyielding Target



Concrete Target

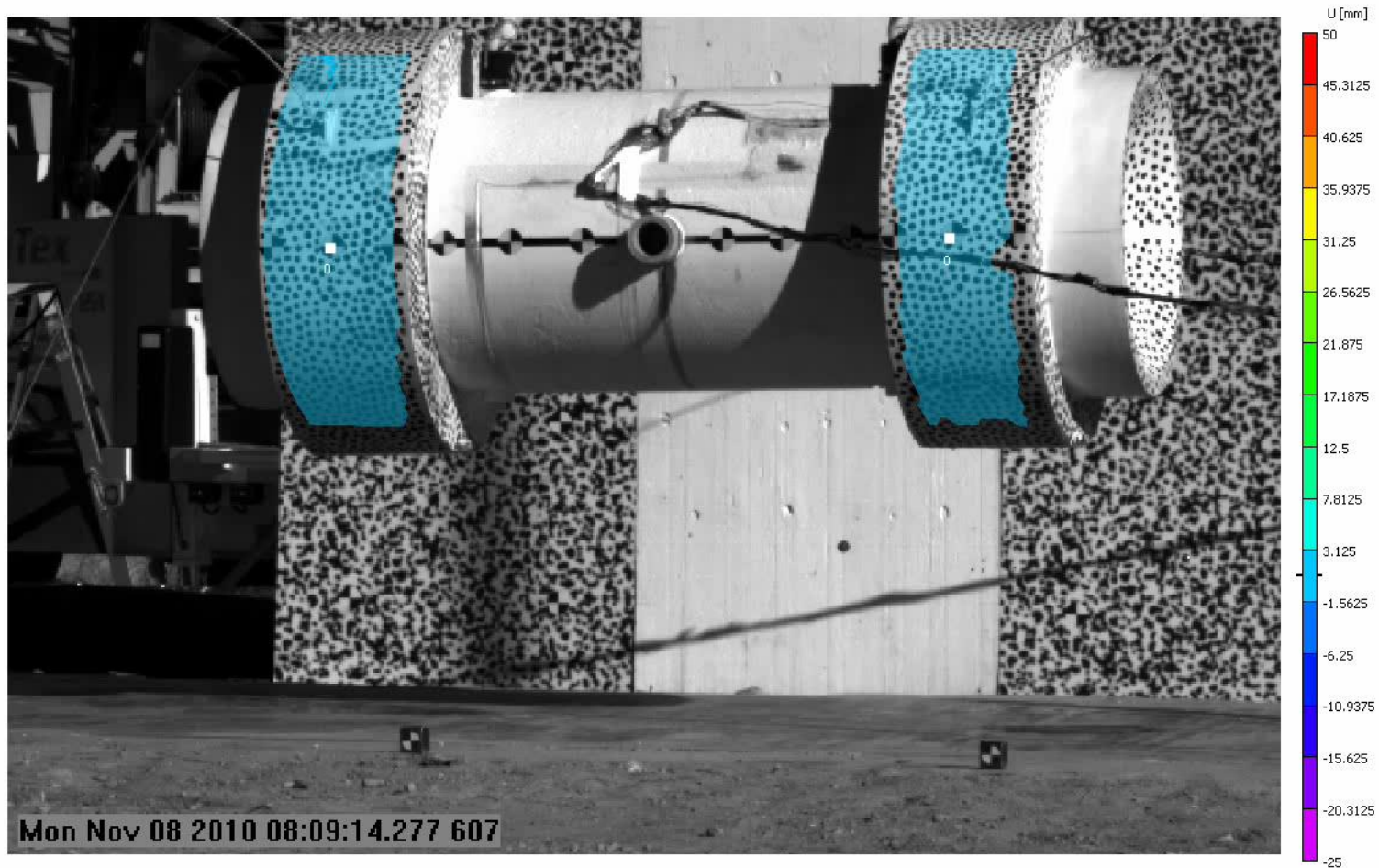
Mobile Instrumentation and Data Acquisition System (MIDAS)

- 168 channels of piezo-resistive type gages
- 100 channels of thermocouple data
- NQA-1 compliant
- GPS based time code generator provides event timing with $10\ \mu\text{s}$
- Export triggers to support other data functions, such as photometrics
- Follows detailed procedures using calibrated equipment



Photometric Capabilities

- Digital Image Correlation (DIC) allows high-speed movies of tests to become data



Conclusions

- Sandia has the NNSA mission of lead lab for systems level testing
- Many of the facilities developed for weapons testing can also be used for package testing
- The testing expertise transfers from weapons testing to package testing
- Package testing requires more than just picking it up and dropping it
- You have seen a sample of the testing capabilities at Sandia. We can recreate almost any environment necessary for package testing.