# Explosive Materials Hazards Evaluation

Southwest Research Institute® (SwRI®) offers a full range of experimental and analytical services to evaluate explosive materials hazards. State-of-the-art resources include:
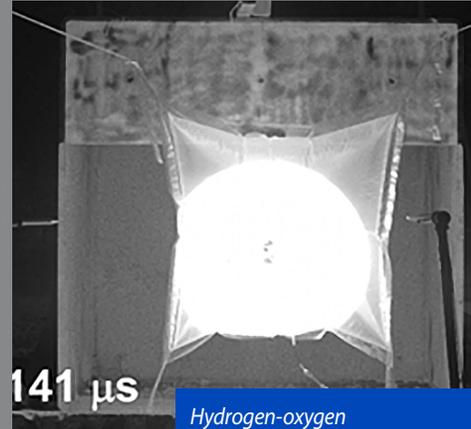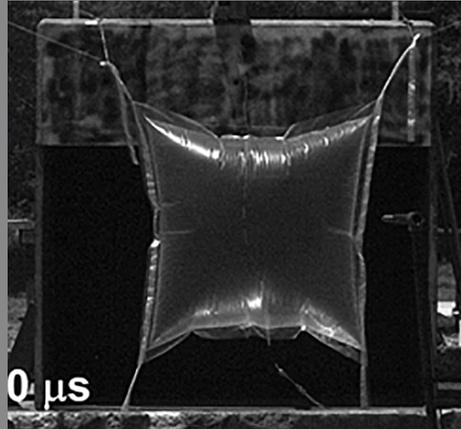
- Fire research facilities (large and small scale)
- Explosive and propellant test ranges
- Vapor flammability and explosion test facilities
- Computer modeling software

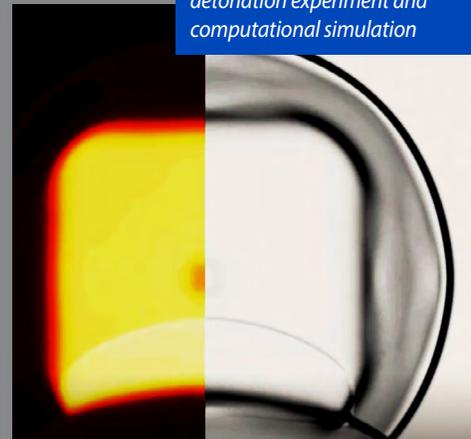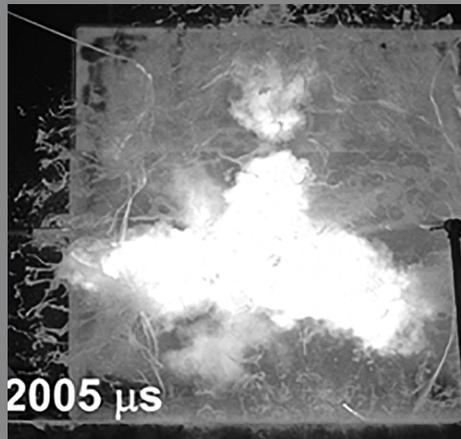## Gas and Vapor Explosibility Characterization

SwRI has the ability to determine the relationships among fuel, oxidants, diluents, temperature, and pressure with respect to ignitibility. Triangular flammability diagrams can be developed for various temperatures and pressures that graphically depict regions of danger and safety. Data can be used for completion of Safety Data Sheets or to improve the safety of chemical processes.

## Standard test procedures include:

- Various ASTM Flash Point Tests
- ASTM E1232 – Temperature Limit of Flammability
- ASTM E681 – Concentration Limits of Flammability of Chemicals (Vapors and Gases)
- ASTM E918 – Limits of Flammability of Chemicals at Elevated Temperature and Pressure
- ASTM E2079 – Limiting Oxygen (Oxidant) Concentration in Gases and Vapors
- ASTM E659 – Autoignition Temperature of Liquid Chemicals
- ASTM G125 – Liquid and Solid Material Fire Limits in Gaseous Oxidants
- ASTM G72 – Autogenous Ignition in a High-Pressure Oxygen-Enriched Environment

*Top photo: Discovery Channel Curiosity: What Destroyed the Hindenburg?, 1/10th Scale Replica Experiment*



*Hydrogen-oxygen detonation experiment and computational simulation*



*NIST Dispersion and Burning Behavior of Hydrogen Released in a Full-Scale Residential Garage in the Presence and Absence of Conventional Automobiles*

Advanced science. Applied technology.

## Blast Effects and Explosion Mitigation

SwRI has extensive facilities for simulation and measurement of small- to large-scale fires, blasts and explosions. SwRI's remote test site allows the safe simulation of explosions too severe to perform on the Institute grounds. Blasts can be measured and viewed with an extensive array of equipment, including:

- High-speed blast pressures and sound levels
- High-speed color video
- Infrared and thermal imaging
- High-speed strain and acceleration
- Sonic velocity jet-fire apparatus

## Explosion Mitigation

Once fire and explosion hazards have been adequately characterized, steps must be taken to reduce the likelihood of a catastrophic event. Explosion mitigation services include:

- Active and passive fire protection material design and testing
- Explosion vent modeling and testing
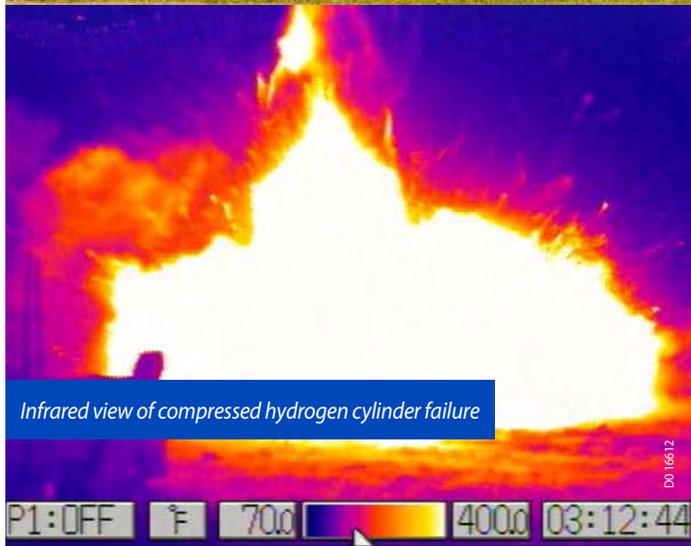- Passive and reactive armor testing

## Hazardous Material Storage and Transportation

SwRI performs testing in accordance with the United Nations Recommendations on the Transport of Dangerous Goods – Manual of Tests and Criteria. Testing includes classification for:

- Explosives (Class 1)
- Flammable liquids (Class 3)
- Flammable/self-heating solids (Class 4)
- Oxidizing substances (Class 5)
- Ammonium nitrate fertilizers (Class 9)

## Additional testing includes:

- Deflagration/detonation propagation
- Deflagration/detonation inside packaging
- Heating and explosions under confinement
- Explosive power



*Catastrophic failure of a compressed hydrogen cylinder installed on a vehicle*



*Infrared view of compressed hydrogen cylinder failure*

A Department of SwRI

## We welcome your inquiries. For more information, please contact:

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