

KEYWORDS

Weapons Effects

Terminal Ballistics

Penetration
Mechanics

Armor Mechanics

Material Response

Numerical Simulation

Transient Dynamics

Transient Data
Collection/Analysis

Computational
Fluid Dynamics

CFD

Homeland Security

Southwest Research Institute® (SwRI) engineering dynamics specialists study the nonlinear response of materials (solids and fluids), structures, and natural and engineered systems—in particular, the behavior of materials and structures subjected to large deformations at high strain rates—often to failure. SwRI's integrated approach uses experimental, analytical, and computational techniques to understand and solve problems for clients.

Research activities include fundamental investigations, concept feasibility, applied studies and analyses, developmental studies, and software development and applications. The SwRI staff use their depth of experience, capabilities, and creativity to *solve problems* utilizing state-of-the-art facilities, equipment, and computational software.

Weapons Effects

- Warhead modeling
- Blast effects
- Full-scale bomb (arena) testing
- Mine blast analysis & testing
- Chem-bio agent defeat
- Structural dynamic analysis
- Design trade-off analysis
- Transient loads structural testing
- Fluid-structure interaction
- Fragility function development
- Security engineering
- Safety analysis

Terminal Effects

- Penetration mechanics
- Armor mechanics
- Armor design & testing
- Hypervelocity impact analysis & testing
- Ballistic modeling
- Concept & package evaluation
- Product improvement
- Birdstrike & foreign object testing

Materials Response and Characterization

- Dynamic loading & material deformation
- Constitutive modeling
- Failure initiation & propagation

Computational Fluid Dynamics

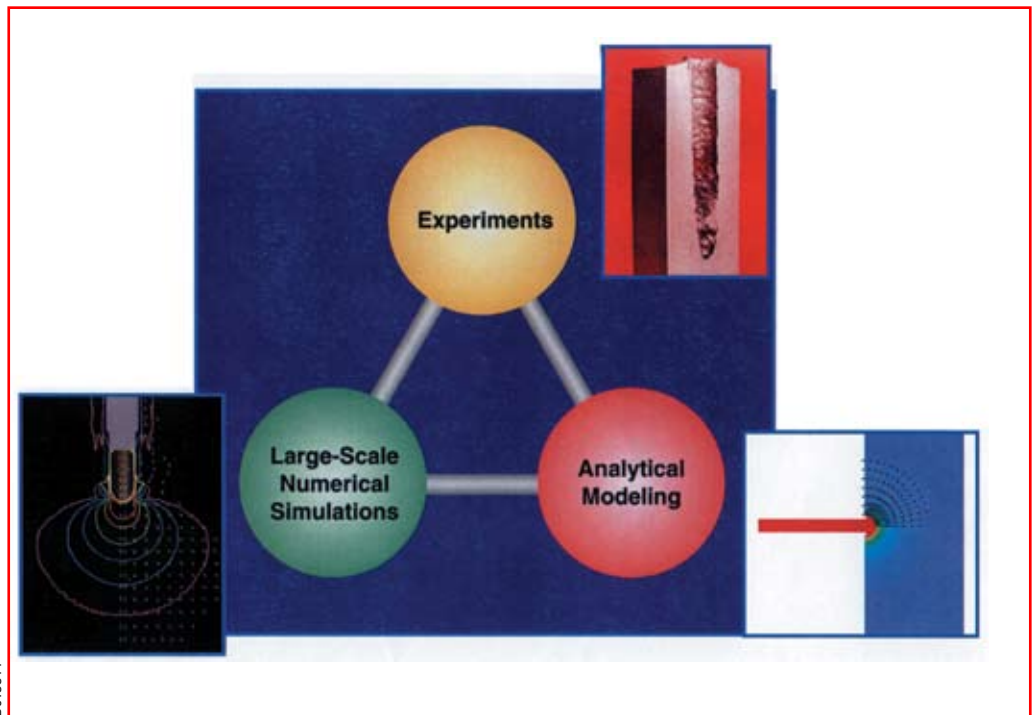
- Parallel computing
- Gas dynamics
- Space weather
- Turbulence modeling
- Multiphase flow
- Free surface flow
- Subsurface flows
- Particle/droplet dynamics
- Dispersion processes
- Turbomachinery analysis
- Code development
- Uncertainty analysis

SwRI operates and maintains the Ballistics and Explosives Range on the San Antonio campus. This 10-acre facility permits a wide variety of experimental programs to be conducted, including explosive loading, hazards evaluation and mitigation, foreign object damage, ballistic impact, armor testing, and hypervelocity impact. SwRI technicians provide expert support in the handling of explosives, firing of gas and powder guns, and high-rate electronic data collection. Range activities are supported with a complement of equipment including an on-site machine shop, digital data acquisition and transient recorders, high-speed imaging equipment, and data processors.

State-of-the-art hydrocodes and computational fluid dynamics (CFD) codes are used routinely to analyze and solve problems for clients. Three Beowulf cluster systems support SwRI's computational activities.



*Sectioned
aluminum
targets after
impact by
a 7.62-mm
APM2 bullet*



D013944

SwRI personnel use an integrated approach—experiments, numerical simulations, and analytical modeling—to understand and provide solutions to client problems



Southwest Research Institute is an independent, nonprofit, applied engineering and physical sciences research and development organization using multidisciplinary approaches to problem solving. The Institute occupies 1,200 acres in San Antonio, Texas, and provides more than 2 million square feet of laboratories, test facilities, workshops and offices for more than 3,300 employees who perform contract work for industry and government clients.

**We welcome
your inquiries.**

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