

## KEYWORDS

Hydrocodes

Engineering Codes

Computational  
Fluid Dynamics

CFD

Numerical  
Simulation

Finite Volume  
Methods

Eulerian Methods

Lagrangian Methods

Arbitrary Lagrangian/  
Eulerian (ALE)  
Methods

Fluid Flow

Material Response

Deformation

Penetration

Fracture

**S**outhwest Research Institute® (SwRI®) develops and applies state-of-the-art computational tools using large-scale numerical simulations to solve a broad range of client problems. Tools include hydrocodes, engineering codes, and computational fluid dynamics (CFD) codes. The SwRI Computational Mechanics Section technical staff has expertise in structured and unstructured grid solvers using either finite volume or finite element methods. The Section maintains a large suite of codes for simulating compressible or incompressible flows, structural response and deformation, thermal and chemical reaction effects, and other complex physics such as turbulence modeling.

### Capabilities

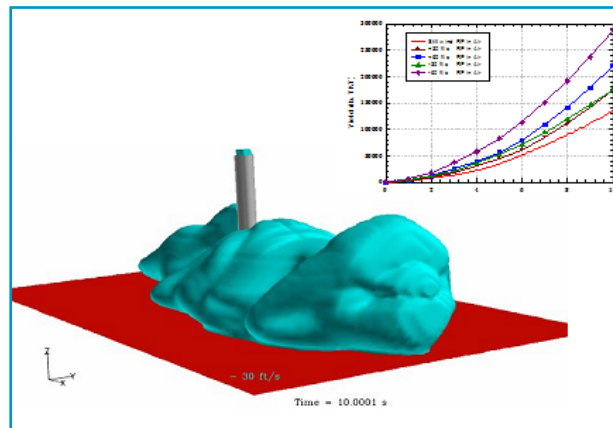
- Code development
- Code enhancement and modification
- Penetration mechanics
- Computational constitutive modeling
- Warhead modeling
- Computational fluid dynamics (CFD)
- Fluid-structure interaction
- Computational fracture mechanics
- Multiphase transport modeling
- Energetic material modeling
- Material behavior prediction
- Turbulence modeling
- Numerical uncertainty
- Numerical methods development

### Experience

- Development and implementation of physical models
- Simulation of large deformation, dynamic phenomena
- Simulation of large-scale processes and systems
- Application of computer programs to real-world problems
- Development of new algorithms for complex, multidisciplinary problems

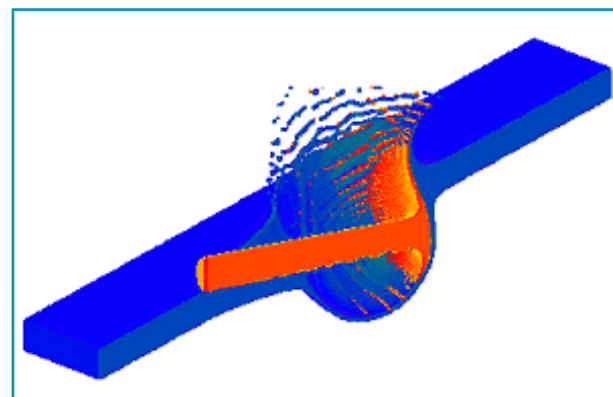
### Computational Tools

- High-end workstations (Unix, Linux, Windows)
- Parallel computers (Beowulf systems)
- Fast switched-ethernet and ATM networks
- Access to NSF, NASA, DOD and DOE supercomputers
- SwRI-developed codes
- Select commercial codes



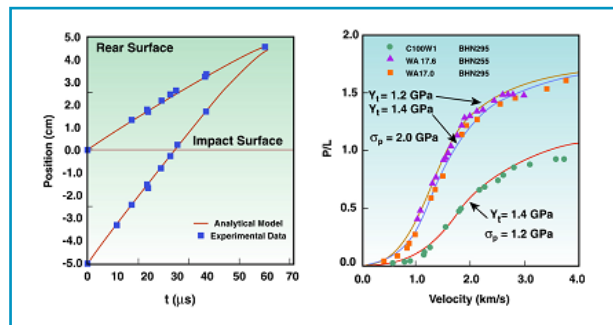
Simulation of release of fuel into the atmosphere (CFD simulation)

D014051



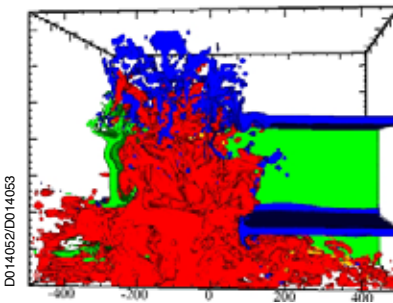
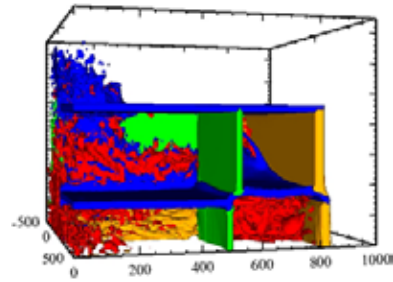
Simulation of penetration of a long rod into a yawed target (Hydrocode simulation)

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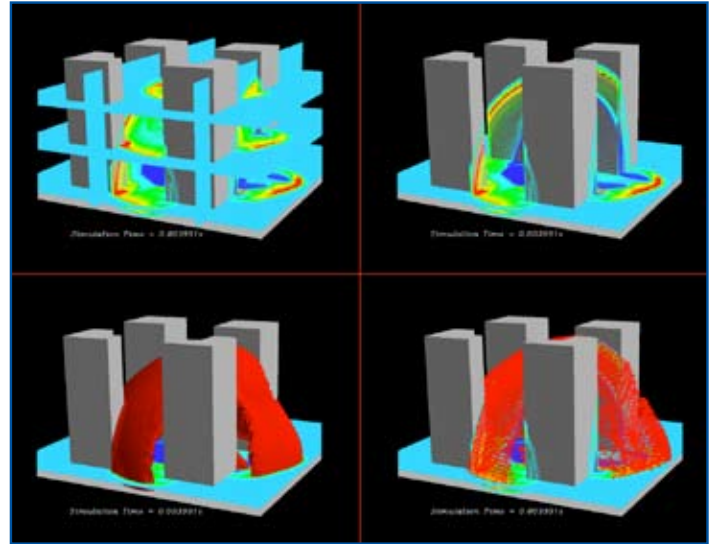


Walker-Anderson analytical model prediction of penetration (Engineering codes/tools)

D014054



*Simulation of detonation of an explosive device in a structure (Hydrocode simulation)*



*Simulation of high explosive detonation in an urban center (CFD simulation)*



*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. For additional information, please contact:**

Christopher J. Freitas, Ph.D., P.E.  
 Program Manager  
 (210) 522-2137  
 christopher.freitas@swri.org

James D. Walker, Ph.D.  
 Staff Scientist  
 (210) 522-2051  
 james.walker@swri.org

Computational Mechanics Section  
 Engineering Dynamics Department  
 Mechanical and Materials Engineering Division  
 Southwest Research Institute  
 6220 Culebra Road • P.O. Drawer 28510  
 San Antonio, Texas 78228-0510

Southwest Research Institute Website: [www.swri.org](http://www.swri.org)  
 Computational Mechanics Section Website: [www.compmech.swri.org](http://www.compmech.swri.org)