

KEYWORDS

Compressible Flow

Incompressible Flow

Heat Transfer

Multiphase Flow

Reactive Flow

Turbulence Models

Fluid-Structure
Interaction

Uncertainty Analysis

Numerical Methods

Algorithm
Development

Parallel Computing
Methods

Nonlinear Modeling
and Simulation

Solution Verification

Simulation Validation

Grid Convergence

Explosive Hazard
Analysis

Hydraulic Transient
Analysis

Vehicle Aerodynamics

Subsurface Transport
Modeling

Southwest Research Institute® (SwRI®) has been applying advanced computational fluid dynamics (CFD) simulation tools to the solution of client problems for more than 25 years. SwRI has internationally recognized expertise in algorithm development, modeling and simulation of a wide range of applied engineering problems, as well as the ability to perform fundamental analyses to discover the underlying physical processes that control system response.

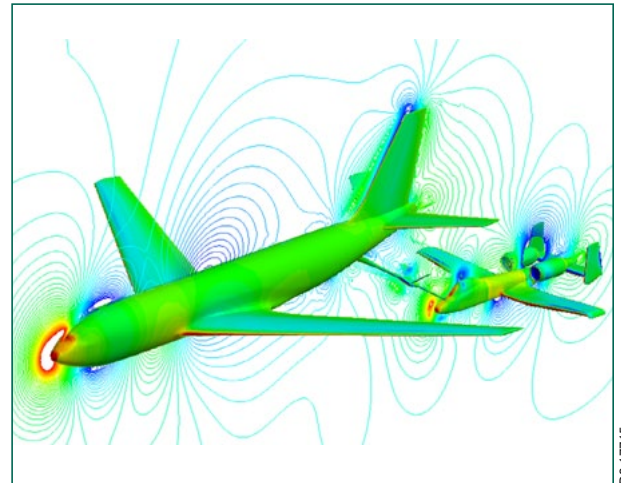
Applications

- First-principles analysis of complex fundamental flows
- Multiphase flow in complex pipeline systems with phase change
- External aerodynamic analysis for a range of body shapes
- Atmospheric dynamics for dispersion
- Turbomachinery dynamic flows analyzing stall and surge characteristics
- Turbulent mixing of chemical species with reaction kinetics
- Explosive hazard analysis for dispersed phase mixtures and condensed explosives
- Fluid-structure interaction with six-degrees-of-freedom dynamics
- Simulation of subsurface flow through porous and fractured materials and wellbores
- Turbulent flows accounting for cavitation and phase change
- Particle and droplet dynamics
- Verification and validation

Capabilities

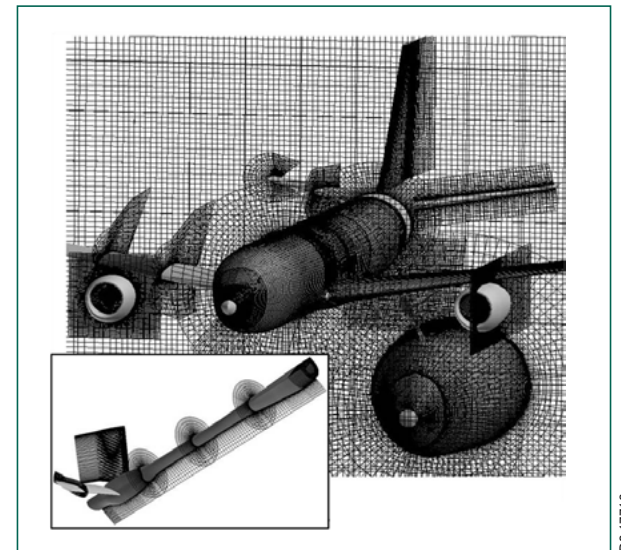
SwRI maintains a suite of CFD software and computer resources which provide a broad foundation to support modeling and simulation projects of widely different sizes and scope. A suite of software development tools and compilers are also maintained.

The Engineering Dynamics Department staff has the expertise to develop, enhance and apply CFD codes to existing or new classes of problems, within the client's cost and schedule constraints. An integrated approach using physical experiments, numerical simulations and analytical methods is routinely employed to investigate and solve complex nonlinear fluid flow and heat transfer problems.



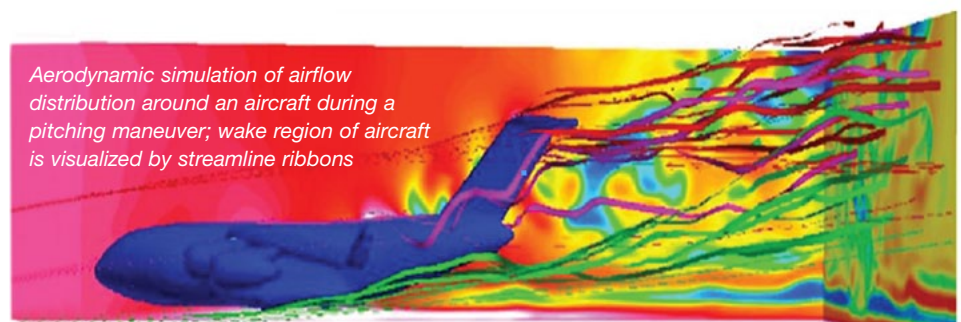
Simulation of aerial refueling

D0 17715



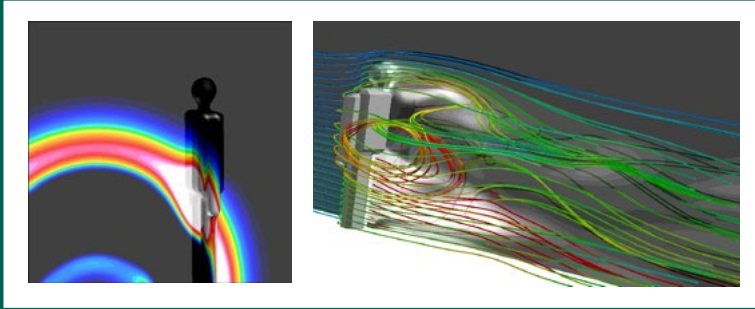
Complex grid generation including overset grids

D0 17716



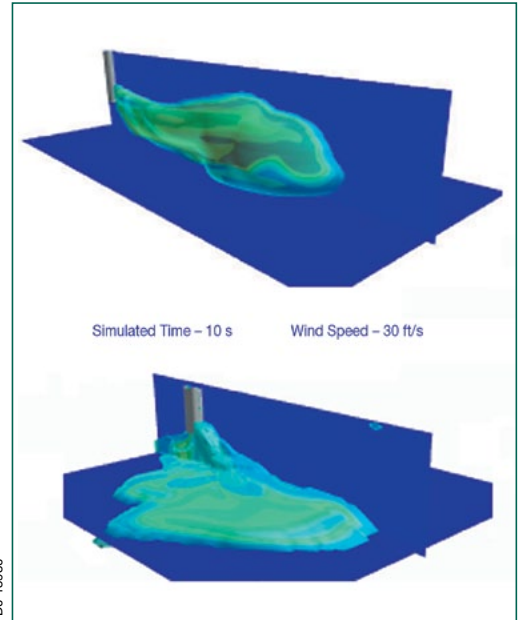
Aerodynamic simulation of airflow distribution around an aircraft during a pitching maneuver; wake region of aircraft is visualized by streamline ribbons

D0 17717



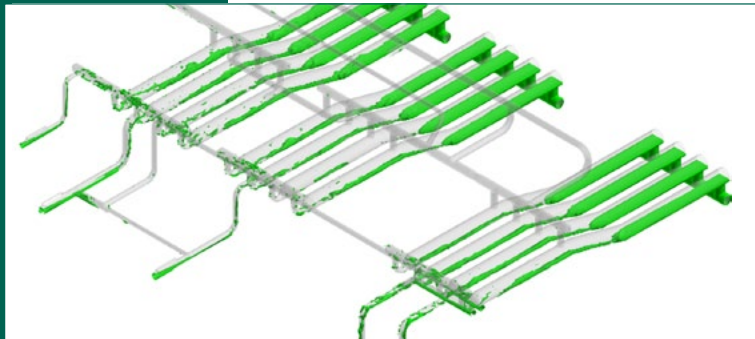
DO 17718

Blast wave propagation around a human form; evaluation of injury mechanics



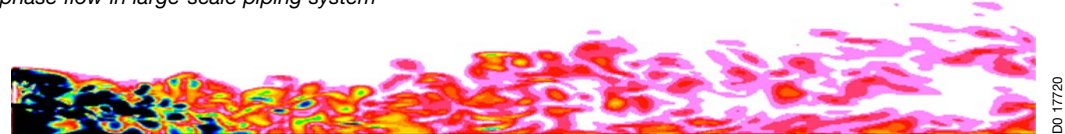
DO 13980

Simulation of development of a fuel/air plume with low-density fuel (top) and higher-density fuel (bottom) released from a tank; contours display the explosive yield potential within the plume



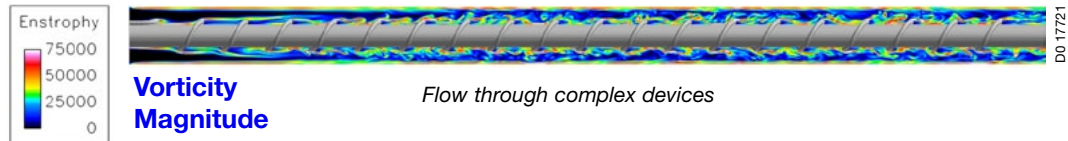
DO 17719

Multiphase flow in large-scale piping system



DO 17720

Dispersion of chemical species downwind of a bluff body



DO 17721

Flow through complex devices



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 3,000 employees who perform contract work for industry and government clients.

We welcome your inquiries.
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