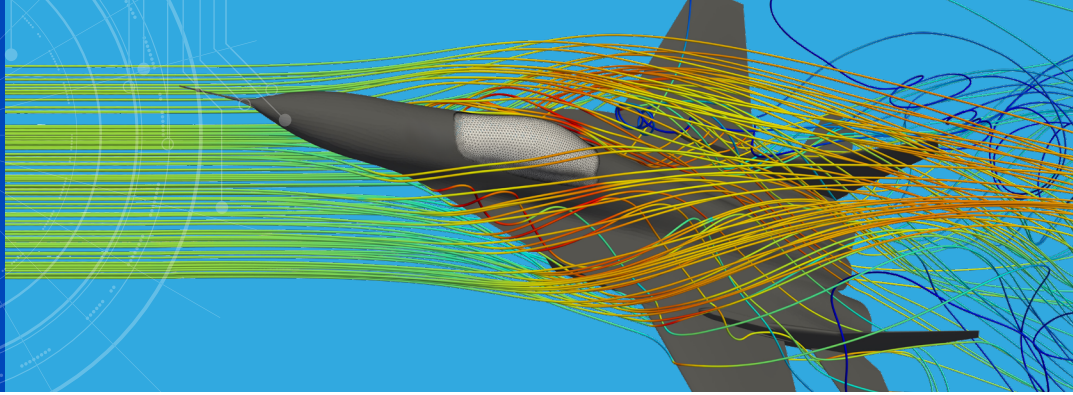




SOUTHWEST RESEARCH INSTITUTE



# Computational Fluid Dynamics

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.

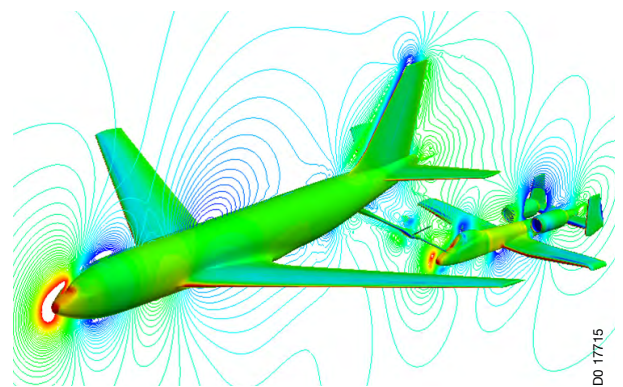
## Applications

- 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

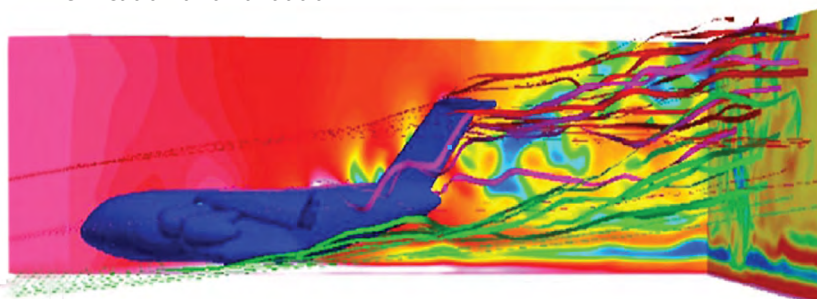
## Capabilities

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.

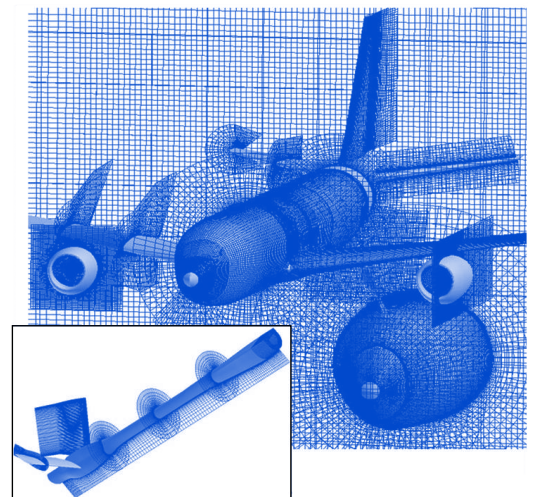
The Engineering Dynamics Department staff has the expertise to develop, enhance and apply CFD codes to existing or new classes of problems, within the client's cost and schedule constraints. An integrated approach using physical experiments, numerical simulations and analytical methods is routinely employed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



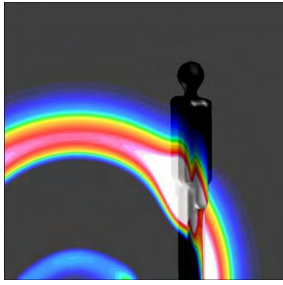
Simulation of aerial refueling



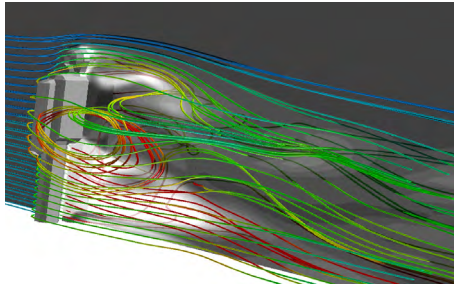
Aerodynamic simulation of airflow distribution around an aircraft during a pitching maneuver; wake region of aircraft is visualized by streamline ribbons



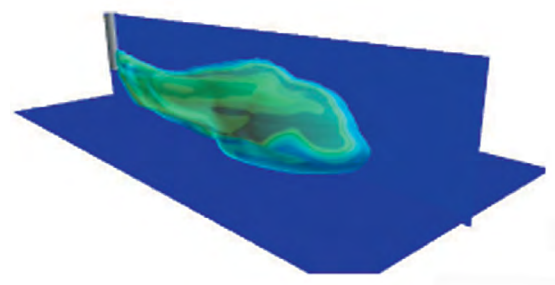
Complex grid generation including overset grids



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

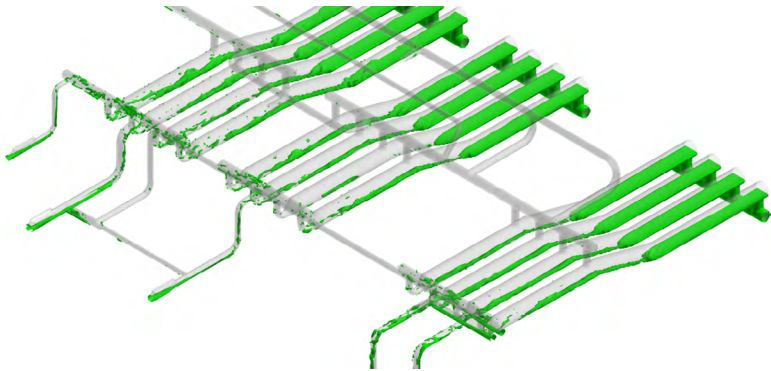


D0 17718



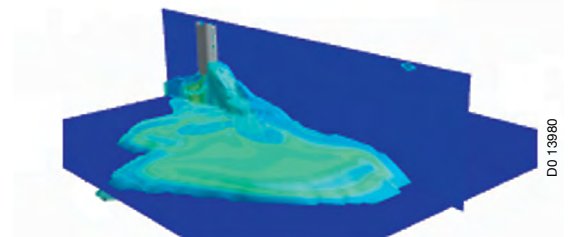
Simulated Time – 10 s

Wind Speed – 30 ft/s



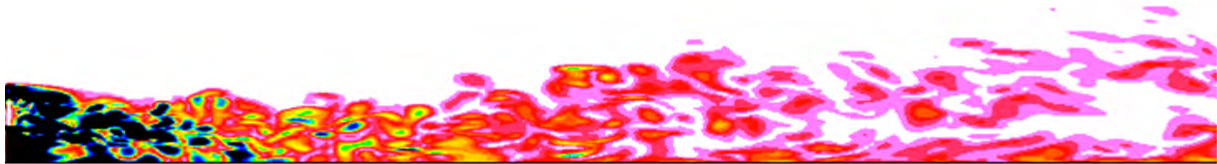
D0 17719

*Multiphase flow in large-scale piping system*



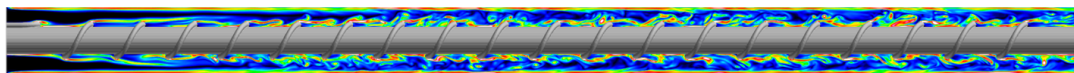
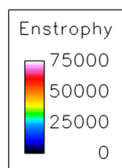
D0 13980

*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*



D0 17720

*Dispersion of chemical species downwind of a bluff body*



D0 17721

**Vorticity  
Magnitude**

*Flow through complex devices*

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

**Sydney Chocron**

Institute Engineer

210.522.3698

[sydney.chocron@swri.org](mailto:sydney.chocron@swri.org)

Engineering Dynamics Department

Mechanical Engineering Division

**[engdyn.swri.org](http://engdyn.swri.org)**

## SOUTHWEST RESEARCH INSTITUTE

Southwest Research Institute® is a premier independent, nonprofit research and development organization. With eleven technical divisions, we offer multidisciplinary services leveraging advanced science and applied technologies. Since 1947, we have provided solutions for some of the world's most challenging scientific and engineering problems.

210.522.2122

[ask@swri.org](mailto:ask@swri.org)

Like. Share. Follow. Listen.



©2025 Southwest Research Institute.  
All rights reserved.

Designed & printed by SwRI MPS 18-0625 274534 tp