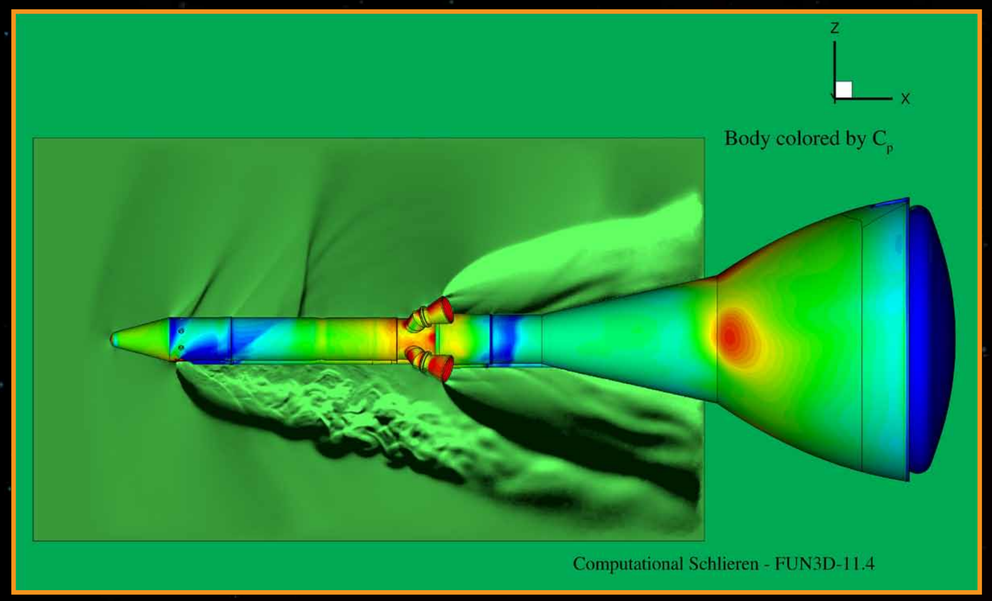
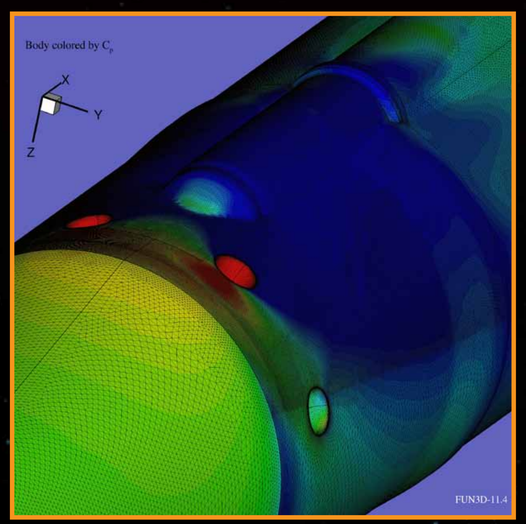
National Aeronautics and Space Administration

Simulation of Jet Plumes for Orion Launch Abort



Simulated Schlieren image formed from a hybrid Reynolds-Averaged Navier-Stokes/large-eddy simulation solution, showing the downstream development of the attitude control motor plumes. *Jan Carlson, NASA/Langley*



Surface mesh detail around attitude control motors. *Jan Carlson, NASA/Langley*

Computational fluid dynamics (CFD) simulations support the design and analysis of launch abort capabilities for NASA's Orion Multi-Purpose Crew Vehicle (MPCV). During ascent, the Launch Abort Vehicle must remain controllable at all times and speeds.

CFD simulations of jet plumes from abort and control motors are performed to help system designers assess whether a particular design is viable. CFD efforts have supported the NASA Engineering and Safety Center's (NESC's) safety investigations into design and analysis processes for the Orion MPCV. Our work includes investigations into:

- Simulations of jet plume interactions, which demand very sophisticated flow-physics models and challenging calculations
- Assessment of time-accurate simulations of jet interactions versus typical time-averaged simulations
- Time-accurate, large-scale simulations of jet plume structures to accurately assess design viability

The physical model fidelity and accuracy required to simulate the jet interaction phenomenon requires significant computational resources. The NASA Advanced Supercomputing facility provides the high-end computing capability needed to run our complex numerical models. The NESC is able use independent simulations such as these to evaluate the design tools and methodologies of NASA projects.

Jan Carlson, Bill Jones, NASA Langley Research Center

www.nasa.gov

SPACE EXPLORATION
AERONAUTICS RESEARCH MISSION DIRECTORATE

scan for more info

Demo 43 / Matt / Sue