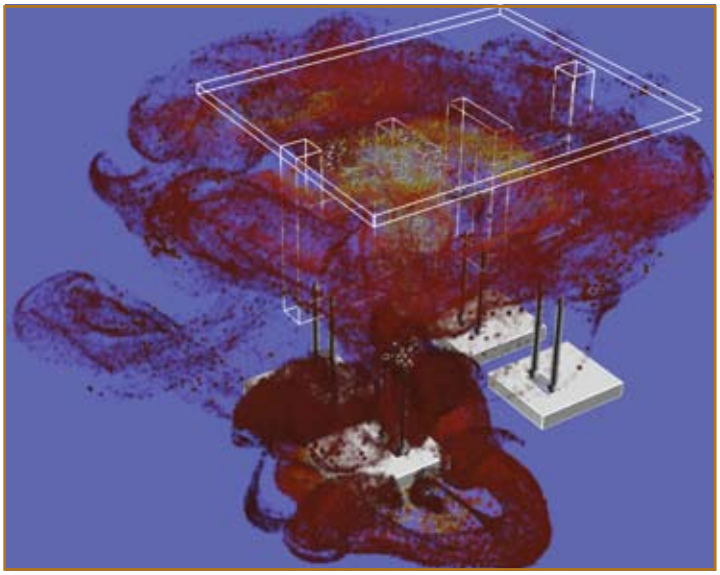
Space Travel

CFD Support for Vehicle Assembly Building (VAB) Fire Scenario Analysis

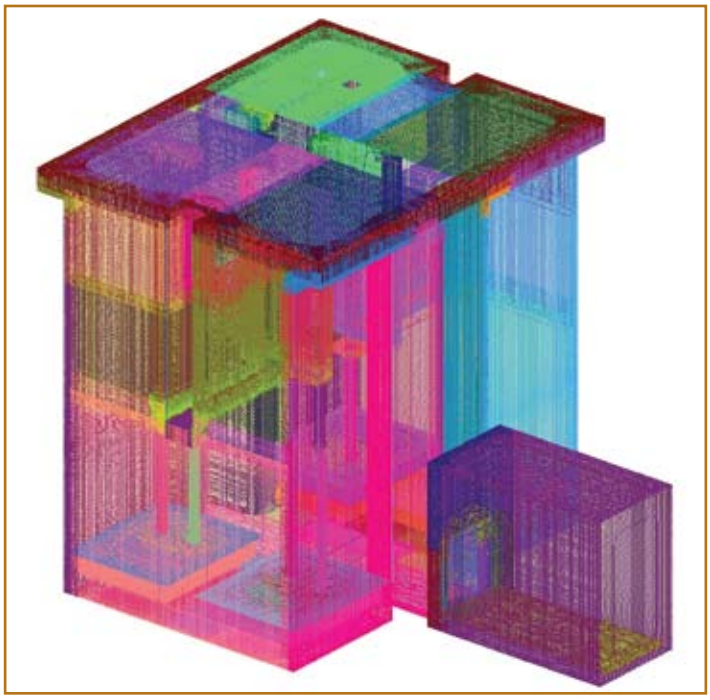
To support upcoming space exploration missions, NASA modeling and simulation experts are providing a computational framework for simulating ground operations for future launch vehicles at NASA Kennedy Space Center (KSC). This work includes:

- Determining whether the Vehicle Assembly Building (VAB) at KSC, used for the Space Shuttle, is properly equipped to safely handle the storage of significantly more fuel required for the Agency's next-generation vehicles
- Developing the capability to employ high-fidelity computational fluid dynamics (CFD) tools to predict the effects of various VAB fire scenarios to:
  - Help determine the probability of subsequent ignition of solid rocket boosters (SRBs) held in any of three bays in the VAB after one SRB accidentally ignites in the fourth bay
  - Identify the maximum possible heat flux generated in the case of other SRBs igniting—and the resulting effects on nearby structures at KSC
- Generating time-dependent temperature, heat flux, and plume concentration data for radiative heat transfer modeling, which will be used to determine quantity-distance safety critieria between the VAB and surrounding buildings

This work demonstrates the ability to predict the consequences of potential accidents in the VAB, with the aim of improving safety measures for ground operations. The ability to model the complex dynamics of a rocket ignition inside a building is an amazing feat of science and engineering. Built on principles found in physics, mathematics, and computer science, these computations are only made possible by the availabilty of modern supercomputing resources.



Instantaneous particle traces in a fire scenario where one incomplete solid rocket booster (SRB) has been ignited adjacent to another incomplete SRB.



Overset grid surfaces on the Vehicle Assembly Building.

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