Assessment of FDS unstructured geometry capability on FAA Boeing 747 cargo compartment fire tests

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Abstract

The Fire Dynamics Simulator (FDS) is a simulation tool used in the design of fire protection systems in buildings and civil structures, forensic studies and wildland fires, among others. Recently, simulation capability for non-grid aligned unstructured geometries has been implemented within FDS. These geometries are defined by surface triangulations that need not conform to the structured fluid grid employed by FDS. An objective for developing this new capability is targeting scenarios such as aircraft cabin and compartment fires. In this talk we will assess the complex geometry unit within one such fire scenario: the series of tests performed on fire in the overhead compartment of a Boeing 747 aircraft at the FAA W. J Hughes Technical Center. These experiments were designed to evaluate heat and smoke transport in compartment with complex geometry obstructions. Temperatures were monitored at the ceiling location. The results from the fire test and simulation will be used to guide the placement and certification of temperature sensors and smoke detectors in transport and cargo aircraft. We will discuss the equations and techniques used to implement high performance simulation with complex geometry within FDS, and will assess these advances modeling said compartment tests. Comparison of numerical results with experimental data will be provided.