

***Development of a Smoke Transport Model to Enhance the Certification of
Fire Detection Systems in Aircraft Cargo Compartments***

Fire Science and Technology
Sandia National Laboratories

(submitted to the Fire and Cabin Safety Research Conference)

Current regulations require that the detectors alarm within one minute of the start of a fire and at a fire size that produces temperatures significantly below those that will substantially decrease the structural integrity of the airplane. In-flight and ground tests are required to demonstrate compliance with the regulations. Ideally, a physics based Computational Fluid Dynamics (CFD) tool, which couples heat, mass and momentum transfer, could be used to decrease the time and cost of the certification process by reducing the total number of both in-flight and ground experiments by providing a mechanism by which optimal experiments are designed. To meet this need, a CFD based smoke transport model is being developed to enhance the certification process by determining worst case locations for fires, optimum placement of fire detector sensors within the cargo compartment, and sensor alarm levels needed to achieve detection within the required certification time. The model will be fast-running to allow for simulation of numerous fire scenarios in a short period of time. In addition, the model will be user friendly since it will potentially be used by airframers and airlines not expected to be experts in CFD. Following verification of this CFD code, full-scale experiments will aid in the validation of the code and will gauge the reliability of using such a formulation to increase the efficiency of the aircraft fire detection system certification process by decreasing the total number of ground and flight experiments.