B77 Computerized Fire Simulations for Use in Fatal Fire Investigations

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The goals of this presentation are to develop a conceptual understanding of fire modeling, model capabilities and the application of fire models to investigations.

In conjunction with NIOSH (National Institute for Occupational Safety and Health), NIST (National Institute of Standards and Technology) has developed computer based fire simulations to assist in the understanding of the fire behavior in a number of line of duty death (LODD) incidents. The fire simulations provide insight into the fire growth and the spread of fire and hot gases through the structures.

The Building and Fire Research Laboratory at NIST has developed a computational fluid dynamics (CFD) fire model using large eddy simulation (LES) techniques. This model, called the NIST Fire Dynamics Simulator (FDS), has been demonstrated to predict the thermal conditions resulting from a compartment fire. A CFD model requires that the room or building of interest be divided into small threedimensional rectangular control volumes or computational cells. The CFD model computes the density, velocity, temperature, pressure, and species concentration of the gas in each cell. Based on the laws of conservation of mass, momentum, species, and energy the model tracks the generation and movement of fire gases. FDS utilizes material properties of the furnishings, walls, floors, and ceilings to compute fire growth and spread.

A scientific visualization program, Smokeview, has been developed by NIST to display the results of a FDS model computation. Smokeview produces animations or snapshots of FDS results.

A new feature of Smokeview allows the viewing of FDS output in 3-dimensional animations. An iso-surface is a three dimensional version of a contour elevation often found on topographic maps. Animated isosurfaces are used to visualize the movement, spread, and leading boundaries of the fire. Both models are available at no cost from www.fire.nist.gov.

This presentation will include a discussion on the type of information and material that should be collected at the scene in order to use FDS, a discussion of the uncertainties in the model, and methods for evaluating the model results. A case study will be presented to show how FDS/Smokeview can be used successfully in an investigation.

Fire, Computer Modeling, Death

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