Fields Models
Workshop on Fire Growth and Spread on Objects

Session Summary

Howard Baum, Chair

After the session, the discussion addressed several themes that serve as an effective summary. These fall under three main categories: under-ventilated fires, soot modeling, and pyrolysis models.

Current field models are based on one form or another of the “mixed is burnt” hypothesis. For example, the Fire Dynamics Simulator (FDS) uses a Mixture fraction variable to characterize combustion, with the option to terminate burning at a preset minimum oxygen concentration. The burning rate itself is set by the rate at which oxygen mixes into the flame zone. Models which respond more realistically to the local oxygen concentration are essentially non-existent.

Sooting tendency is another manifestation of oxygen deficiency. Currently, the soot formation rate is effectively prescribed either as a fraction of the fuel consumed locally or through a “state relation” connecting the soot concentration to the local value of the Mixture fraction. There is ample evidence, however, that the soot formation and oxidation rate processes occur on time scales that are quite similar to those associated with convective transport in fires. Simplified models of these rate processes suitable for use with models like FDS are needed. These models must represent rates observable for ``real'' materials. There was some question about the role of Halogens in these processes.

Finally, there was considerable interest in the development of “simple” pyrolysis models based on fire test data. It was argued that given the present state of knowledge, this remains the best way to characterize the ignitability and burning properties of real materials. A cautionary note that these models should be “physics based” was expressed.