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Experimental Benchmarking of Fire Modeling Simulations

Final Report

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DOE Patent Clearance Granted
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Summary

A series of large-scale fire tests were performed at Sandia National Laboratories to simulate a nuclear waste transport package under severe accident conditions (Figure 1). The test data were used to adjust the Container Analysis Fire Environment (CAFE) computer code (Figure 2). CAFE is a computational fluid dynamics fire model that accurately calculates the heat transfer from a large fire to a massive engulfed transport package. CAFE will be used in transport package design studies and risk analyses.

To date, this project has received $142,708 of co-funding and continuation funding from four different agencies. This support is roughly equal to the $149,784 received from EPSCoR. This funding supported 6 master’s degree candidates and four undergraduate students. This work has been reported in eight refereed publications (two in archival journals and six in reviewed conference proceedings) and five invited lectures. Summaries of the co-funding, student support, and publications are given below.

Co-Funding and Continuation Funding

State of Nevada, Agency for Nuclear Projects, “HLW Highway Transportation Safety Issues: Shipping Cask Performance in Severe Accident Fire Environments,” #00/01.0006, 5/00 to 6/00, PI: M. Greiner, $52,000.


Sandia National Laboratories, “Package Performance Study Peer Review Panel,” 1/02 to 12/02, PI: M. Greiner, $5,288.


Students Supported
Masters Degree Candidates
  M. Alex Kramer (completed 12/01)
  H. Ju (completed 8/01)
  N. Are (anticipated completion 5/03)
  S. Umapallli
  V. Govindaraju
  H.S. Sunkara

Bachelor Degree Students
  M. A. Kramer (completed 5/99)
  K. Davis (anticipated completion 5/02)
  K. Parker (anticipated completion 5/02)
  A. Broch (anticipated completion 5/02)

Publications
Refereed Journals


Refereed Conferences


Invited Lectures (Not associated with refereed conference publications)


Figure 2. Three-Dimensional Computational Fluid Dynamics simulations of a fire engulfing a massive object with wind performed using CAFE. CAFE will be used in nuclear waste transport design and risk studies.