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Fuel-Air Explosive Simulation of Far-Field Nuclear Airblasts

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Abstract: Fuel-air explosions (FAE) have been investigated in the context of far-field nuclear airblast simulation. The objective of the investigation is to determine the feasibility of a reusable FAE simulator at the one kiloton level. Two issues have been researched in parallel efforts. These are the mechanisms by which largescale FAE **clouds** of controlled shape can be reliably and repeatedly formed and detonated, and the quality of nuclear airblast simulation that is achieved when such FAE **clouds** are detonated. The formation of hemispherical **clouds** by simultaneous, impulsive liquid fuel injection through a large number of radially directed, centrally clustered nozzles is discussed in detail. Specific fuel dispenser designs are considered and use experience with two of these is described. Survey experiments dealing with the atomization and penetration characteristics of large-diameter, implulsively formed single liquid jets are discussed. Small-scale hemispherical cloud formation experiments are also discussed. A new reusable facility for testing FAE simulation of nuclear airblasts at the 1/4-ton scale is described. Preliminary surface-burst experiments at that scale using propylene oxide and heptane as fuels are discussed. The results from these experiments are scaled and compared with 1 kt nuclear curvefits. The agreement is judged to be reasonable at this scale. Numerical calculations of the airblast that emerges from a detonated heptane-air cloud have also been carried out.

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