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SURROGATING SUB-SCALE MUNITIONS WITH SIMPLE CASED CYLINDERS FOR AIRBLAST PREDICTION PURPOSES

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Historically, attempting to gather airblast measurements (pressure and impulse) around cased munitions has been very risky and expensive due to the damaging nature of high-velocity fragments, which in many cases precede the arrival of the shock wave being measured. Facilities such as the Instrumented Blastpad, built by the Air Force Research Lab, Munitions Directorate (AFRL/MN) at Eglin Air Force Base, Florida, now provide the capability to acquire these measurements without placing the instrumentation hardware at risk from fragment strike. However, there is still considerable cost associated with the manufacture of exact sub-scale models of inventory munitions due to the complexity of their shapes (non-cylindrical bodies, internal and external ogives, etc). Furthermore, it is desirable from a modeling and simulation standpoint to be able to accurately characterize a wide range of munition shapes with a few simple devices. As a result, sub-scale munition bodies are often surrogated as simple, right circular-cylinders. It is then assumed that the airblast field from the surrogate "cased cylinder" would be very similar to that of the realistic sub-scale munition. Cased cylinders have the benefit of being less expensive and time-consuming to manufacture, but the suitability of surrogating realistic sub-scale munitions with cased cylinders has not been firmly established with either experiment or calculation.

A series of experiments was devised that involved both generic sub-scale munitions and carefully designed cased cylinder surrogates. Three tests of each configuration were performed on the AFRL/MN Instrumented Blastpad, producing measured airblast fields of peak pressure and peak impulse for each. These airblast fields were then inspected to determine if the cased cylinder surrogates produced an airblast field that was satisfactorily similar to the generic sub-scale munition. A description of these experiments and a discussion of the results are presented in this paper.