“RESPONSE OF CYLINDRICAL SHELLS SUBJECTED TO AIR BLAST; EXPERIMENT AND ANALYSIS"

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In order to verify the accuracy of numerical predictions from a nonlinear Dynamics finite element code, a series of highly instrumented, composite, circular-cylindrical shells were subjected to air blast and the experimental results were then compared with numerical predictions. The experiments were conducted in a blast-tube at the Defense Research Establishment Suffield, Ralston, Alberta, Canada, and they were designed with the intent of eliminating sources of ambiguity between the experimental configuration
and numerical model of that configuration. This paper presents a synopsis of the blast-tube experiments, as well as a comparison between the experimental results and numerical predictions.

Five cylinders were built by using a four-ply laminate of fiber-glass/epoxy prepreg. The experimental configuration consisted of a composite test cylinder with a rigid cylinder mounted securely at each end, and this assembly was attached to both sides of the blast-tube. During an experimental run, complete pressure time histories could be recorded around the circumference of the one rigid cylinder, a pressure time history was recorded at the leading edge of the second rigid cylinder to check for symmetry, and a comprehensive strain-history of the composite cylinder was recorded. Twenty-three experiments were conducted on the cylinders, with overpressures varying from 1.4 to 13.5 psi. This overpressure range was
sufficient to ensure that both linear and nonlinear responses of the test cylinders would occur. In order to obtain qualitative comparison, high-speed photography was used to record the cylinder response.

The numerical-experimental comparisons were obtained by using the recorded pressure-time histories as the input to the nonlinear dynamics finite element code. The finite element strain predictions are then compared to those recorded in the experimental runs.