NUCLEAR BLAST VULNERABILITY OF AIRBREATHING PROPULSION SYSTEMS: LABORATORY MEASUREMENTS AND PREDICTIVE MODELING

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The work discussed in this paper is divided into two major tasks: (1) development of a simple computer code for predicting the blast-induced pressure transacts in an engine and (2) description of an ongoing experimental program in which shock waves (of overpressure up to 5 psi at sea level conditions and higher overpressures at altitude) are directed down the inlet of an operating G.E. J-8S turbojet engine. The computer model [task (1)] consists of a conical diffuser, two-stage compressor, tailpipe, and converging nozzle. The program logic is written so that a single code with appropriate switches allows use of the simplified or full equations with or without compressibility effects. The pressure pulse may be either at the inlet or tailpipe. The equations are integrated with a Runge-Kutta-Merson fifth-order method having an internally variable time step.

The experimental program [task (2)J utilizes an available J-8S turbojet engine located in the test section of the Calspan Ludwieg tube facility to perform nuclear blast-inlet/engine experiments utilizing state-of-the-art
techniques. The engine is instrumented with eight pressure transducers at four axial locations. The pressure transducers have a free response on the order of 40 kHz. The experimental results derived from these experiments will be used in conjunction With the previously mentioned computer code to establish the predictability of the overall engine response to the internal blast wave propagation.