

## **SHOCK TUBE TECHNIQUE FOR DETERMINING LOAD UNDER PROTECTIVE CLOTHING**

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Injuries from fragments and small arms are the principle cause of casualties in combat. The cloth ballistic vest is critical for protection of soldiers from fragments and small arms fire. Current U.S: Army policy advocates its widest possible use in combat. Studies have been conducted which show an increase in lung weights as well as increases in intrathoracic pressures when the cloth ballistic vest is worn in blast overpressure environments. An estimate of the injury enhancing effects of the ballistic vest has been reported. The report suggested the vest reduces the peak pressure by 25% required to induce a degree of injury. Studies were undertaken to analyze the effects and to determine a reasonable injury mechanism. Various materials and multiple layers of materials were attached to a surface. A 12" diameter compressed air driven shock tube was used to provide a variety of ballistic loads against the materials. The loads developed under the materials were measured directly with PCM 102M piezoelectric pressure transducer. For all materials tested, the developed loads increased as a function of the number of layers to a level where an increase in the number of layers resulted in a decrease in the developed load. Kevlar, however, produced the greatest increase in developed load with the greatest developed load occurring at the number of layers in the cloth ballistic vest.

A technique had been described for using a 12" diameter compressed air driven shock tube for evaluating the load enhancing effects of various material and layers of materials. This data will be useful for formulating injury predictions when various types of clothing or ballistic vests are worn.