

## **SIMULATION OF NUCLEAR EXPLOSION-GENERATED STRESS WAVES UTILIZING GUN PROPELLANTS**

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Measurements of stress waves generated by contained nuclear detonations in volcanic tuff indicate that, per kiloton of nuclear yield, stress waves have risetimes on the order of 5 ms and total durations on the order of 100 ms when the radial stresses are the order of 100 MPa. The attempts to duplicate these risetimes and durations in this stress regime in small or intermediate size experiments using high explosives have been generally unsuccessful. This is because of the rapid detonation rates of conventional high explosives. A new technique using explosives and gun propellant mixtures has proven successful in attaining the nuclear generated risetimes in a tuff simulant designed to match the properties of the volcanic tuff typically found at nuclear detonation sites.

This paper compares propellant detonation rates with those of some typically high explosives, compares the constitutive properties of volcanic tuff and tuff simulant, and discusses the test geometry and results of a set of intermediate-scale experiments.