# CRATERING, GROUND SHOCK AND AIR BLAST ENVIRONMENTS FROM HEMISPHERICALLY CAPPED CYLINDERS

HENNY,R.W.;MELZER,S.L.

This paper describes the results of the PRE-DICE THROW II Charge Development Program and compares its crater, ground shock, and air blast environments to ten recent hemispherically capped cylindrical events. To develop a more effective and efficient combined HE blast and shock source, a charge development program was conducted by AFWL in 1976. This program, guided by previous large field trials, small shaped charge tests and hydrodynamic calculations consisted on 28 explosive detonations of C-4, ANFO, and TNT at 1-pound, 1/2-ton, and 5-ton yields. The objective was to develop a new charge configuration using ANFO that would provide blast and shock data compatible with the existing TNT surface tangent data base, while significantly reducing the associated fireball/air blast anomalies.
The final charge design was a hemispherically capped 0.75:1 cylinder of bagged multiply detonated along the center line. Fireball/air blast anomalies were significantly reduced and air blast and ground shock rec-
ords followed the TNT standard. While apparent crater profiles were in reasonable agreement, volumes were 23% high and crater morphology and subsurface deformations were visibly different.

Although test objectives were met for the dry sandy media used, questions remained with respect to larger yields and other media. Analysis of 10 recent events - PRE-DICE THROW II (100 tons on snad/clay with shallow water table, DICE THROW (500 tons on a dry gypsum lake bed), MISERS BLUFF II (7-100 tons events an a river valley alluvium with a intermediate water table) and MILL RACE (500 tons an dry desert alluvium) - provide the basis for assessing these questions.
Analysis shows air blast and air induced ground motions to be predictable, calculable and consistent with the TNT data base. In addition, these environments are noticeably more uniform with azimuth, probably the result of fewer fireball anomalies.

Cratering efficiencies, even when normalized to TNT, increase with decreasing yields and wetter geologies, while differences between the TNT and ANFO craters persist with the latter exhibiting larger outward displacements near the surface. Crater and direct induced ground motions are consistent with the craters but magnitudes are generally lower than the TNT data base.