

BLAST RESPONSE OF TROPOSCATTER ANTENNAS

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Troposcatter antennas were tested in the MISERS BLUFF operation to the Mast environment produced by a surface detonation of 120 tons of ANFO explosive. Twelve AN/TRA-37 antenna systems were exposed to the blast wave at various incident overpressure levels and orientations relative to the blast. These antennas consist of a ten foot diameter parabolic reflector dish suffered on the convex side with sixteen radial ribs and a pinned ended fifteen foot tubular mast secured to the ground by two sets of four cables. Two of the tested antennas were instrumented to measure pressure and strain time histories on the reflector dish and mast. These two antennas were located at the anticipated 2 psi incident overpressure level at head-on and tail-on orientations. The other antennas were placed at locations to receive various levels of damage.

For the pre-test calculations an analytical pressure model was developed for predicting the blast-induced loads on the circular parabolic reflector dishes as they encounter shock waves directly from the front and rear. The developed aerodynamic formulas express the time and spatial variations of the pressure loading and his time variation of the total force on the dish. The total force time history is applied to the top of the mast in a structural response model of the mast and nonlinear cable system. The stresses, strains and displacements of this mast model are determined using the NASTRAN computer code for pre-test calculations. The pressure time history was applied to shell models of the stiffened reflector dish using the PETROS 3.5 computer code for pretest calculations. The pre-test calculations indicate that at the 2 psi incident overpressure level the two antennas were in the region of threshold of permanent damage.