IMPROVEMENTS TO HIGH EXPLOSIVE FREE AIR CODE (HEFAC)

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The High Explosive Free Air Code (HEFAC) allows users to convert measured time-of-arrival (TOA) vs. range data from an explosive event to peak overpressure vs. range. The conversion is accomplished by solving the Rankine-Hugoniot shock jump conditions while invoking an air equation of state (EOS). Previous versions of the code were written in BASIC or Quick BASIC for use on DOS-operated computers. They used a table to compute shock pressure as a function of Mach number. Ambient atmospheric conditions could be user specified. The code has now been rewritten in FORTRAN and can be operated on modern personal computers. The tabular shock pressure-Mach number relation has been replaced with an analytic equation that invokes an air EOS. Gamma is now allowed to vary and is computed iteratively. Using a variable gamma improves the accuracy of the computation by taking into account the compressibility of air at high Mach numbers. Input and output formats have been made more user-friendly. Output now includes all hydrodynamic quantities computable from the shock jump conditions: peak overpressure, temperature, dynamic pressure, velocity, and density. Options have been included for invoking other air EOS formulations in addition to the Doan-Nickel formulations, including a National Laboratory (LANL) EOS, and options for running the inverse computation (converting peak pressure vs. range to TOA vs. range). Examples are given from recent high explosive tests comparing peak pressures derived from TOA data to measured peak pressures from active data sets.