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Modeling of what may happen after a Thermal Explosion YEHUDA PARTOM, Retired — When thermal explosion happens in a small region of an explosive body, the events that follow, and their overall resultant violence may be quite diverse, like 1) slow decaying deflagration wave; 2) fast non decaying shear wave; and 3) strengthening shear wave that builds up to shock initiation and detonation. The outcome of a thermal explosion depends on: 1) the sensitivity (or reaction rate) of the explosive; 2) the temperature field throughout the explosive body at the time of thermal explosion; 3) the geometry of the explosive body; 4) the location of the thermal explosion point in the explosive body; and 5) the degree of confinement of the explosive body. To model what may happen after a thermal explosion we use our PDSR (= Pressure Dependent Shear Reaction) together with our TDRR (= Temperature Dependent Reaction Rate) reactive flow models. For each computational cell these two models work in sequence. Initially there is a shear reaction handled by PDSR. If, as a result, pressure and temperature there go beyond the threshold for reaction out of hot spots, TDRR takes over irreversibly (for that cell), to compute shock initiation and detonation. We present computed examples of outcomes of different thermal explosion events.

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