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A simple URANS approach for secondary combustion of HE detonation products GERARD BAUDIN, LAURENT MUNIER, DGA/Centre d'Etudes de Gramat — The detonation of a high explosive (HE) charge in air generates a high-speed compressible turbulent flow and detonation products (DP) - air combustion. The classical Unsteady Reynolds Averaged Navier Stokes (URANS) approach involves too many parameters impossible to identify separately for such an application. We propose a simplest formulation to describe the turbulent combustion due to DP-air interpenetration, considering that the turbulent flow contains symmetric vortices. The Reynolds averaged reactive Euler equations analysis and thermodynamic requirements lead to an equation for the turbulent entropy production due to the DP-air combustion and an equation of state similar to ideal gas for turbulent variables (turbulent pressure, energy, temperature and entropy). Considering an infinite chemistry rate, a quasi-steady solution is derived in spherical geometry and embedded in a 1-D spherical ALE code based on a Godunov scheme and HLLC solver to calculate the fireball radius and air-blast parameters. The numerical solution behaves correctly comparing to experimental data for CHNO and CHNOAl HE.

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