THREE-DIMENSIONAL MODELING OF SHOCK WAVE FORMATION AND THROWING OF METAL SHELLS BY HIGH-ENERGY COMPOUNDS

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Abstract: The problem of destruction and throwing of a metal shell with the formation of shock waves as a result of the rapid decomposition of a high-energy compound is considered. Mathematical models are formulated to describe the main phenomena, a method for numerical solution is developed taking into account the specific features of flows at different stages of the development of the process. Computational procedures are implemented in the form of program codes intended for performing calculations on high-performance systems. It is shown that the calculation results are in good agreement with the experimental results.

Keywords: numerical simulation; formation of shock waves; throwing of a metal shell

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Figure Captions

Figure 1 Schematic of a high explosive in a shell

Figure 2 Scheme of prototype placement

Figure 3 Prototype geometry. Dimensions are in millimeters

Figure 4 Pressure fields at different moments of time: (*a*) $t = 0.015$ ms; (*b*) 0.03; and (*c*) $t = 0.08$ ms

Figure 5 Pressure fields for three instants of time preceding the restructuring of the grid. Computational domain size: (*a*) $1 \times 1 \times 1$ m; (*b*) $1.6 \times 1.6 \times 1.6$; and (*c*) $2.4 \times 2.4 \times 2.4$ m

Figure 6 Pressure profiles at a distance of 1 (*a*), 2 (*b*), 2.8 (*c*), and 5.8 m (*d*): *1* — experiment; and *2* — simulation

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