STRUCTURAL SCHEME OF A LASER-INITIATED PYROCARTRIDGE FOR USE IN ADVANCED AEROSPACE SYSTEMS AND ITS JUSTIFICATION BY NUMERICAL SIMULATION METHODS

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Abstract: The paper briefly analyzes the advantages and prospects for the development of laser-initiated pyrotechnics, the existing developments in this area and their current problems. A structural scheme of a laser initiated pyrocartridge, a scheme for focusing light to initiate a pyrotechnic charge, and a method for implementing control of the pressure pulse generated by it are proposed. Numerical simulation methods have been used to study the behavior of the pyrocartridge design under static high-pressure loading and the possibility of generating various pressure pulses in the working volume of spacecraft pyrounits during the outflow of gases from the pyrocartridge after charge initiation.

Keywords: laser initiation; optic fiber; pyrocartridge

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Figure Captions

Figure 1 Investigated design of suggested laser-initiated pyrocartridge: *1* — case; *2* — optical insert; *3* — pyrotechnic charge; *4* — cap; *5* — ring nut; *6* — sleeve with optical fiber; *7* — optical fiber; and *8* — nut

Figure 2 Optical scheme of suggested laser-initiated pyrocartridge

Figure 3 Anti-hail pyrocartridge manufactured by the JSC Murom Apparatus Producing plant

Figure 4 Boundary conditions for static mechanical numerical analysis of the design of a laser-initiated pyrocartridge

Figure 5 Results of simulation: structural stresses of housing (*a*) and of optical insert (*b*)

Figure 6 Results of simulation: deformations (structural displacements) of structural stresses of housing (*a*) and of optical insert (*b*)

Figure 7 Designs of laser-initiated pyrocartridges with a ring nut with a channel of cylindrical cross section (*a*) and cylindroconical cross section (*b*)

Figure 8 Initial conditions for modeling of the process of compressed air outflow through the ring nut

Figure 9 Time histories of overpressure in the working volume of the bomb when compressed air flows through the channel of the ring nut: *1* — nut with a cylindrical channel; and *2* — nut with a cylindroconical channel

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