

PYROTECHNIC SHOCK TESTING, EXPERIMENTS AND NUMERICAL SIMULATIONS

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Launch vehicles and spacecraft's use a number of pyrotechnic devices during their missions. During flights, stages and boosters separation of the launcher are performed by means of fast cutting devices using high explosive charges (electro-explosive devices or EED). Detonation of these cutting devices produces a so-called pyrotechnic shock which causes the dynamic loading of the launcher structure and its components. In order to verify critical components, such as electro-pneumatic components, it is necessary to perform pyrotechnic shock qualification tests.

Several manufacturers have collected real shock levels on different components by means of real scale model tests. These shock levels, translated into the shock response spectrum (SRS), is reproduced in laboratory conditions using a high explosive charge and a so-called pyrotechnic shock plate.

This paper compare two different practical set-ups for pyrotechnical testing of components, one using linear detonating cords as explosive device located on the pyrotechnic shock plate and the other using spherical composition C4 explosive device in free air . Results from both set-ups are compared in terms of time history signals, frequency contents and shock response spectrum (SRS).

Next to experimental tests, numerical simulations of these two set-ups are also performed using finite element codes ANSYS. The results from experiments are used for the tuning of the numerical models. Results from experiments and numerical simulations are compared and fully commented in this paper.