

High Environmental Compatibility Cargo Projectile

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ABSTRACT

The goal of this technological research program is the realization of a demonstrator of a cargo projectile, that is a projectile able to carry a generic payload of about 3 kg over distances not above 300 m. The features requested to the projectile are, briefly, high precision, low cruise speed and high environmental compatibility.

Such a research program can be considered involved in the study activities about non-lethal weapons. In fact, the system performs the function of carrying a non-lethal payload extremely useful for military (but also civil) operations (i.e. sensors, tear-gases, machineries able to switch off piston-engines), ensuring, in the meanwhile, some requirements to be satisfied, necessary in many military applications: accuracy, short deployment and employment times, stealthiness.

The paper presents a conceptual design of the system including the projectile and its launcher. First of all, the probable scenarios in which the use of the cargo projectile could be advantageous are discussed. Next, a configuration of the projectile is proposed, showing its inertial properties and geometrical characteristics. An aerodynamic analysis is presented, including stability evaluations and trajectories simulation. The latter is a significant aspect, because the trajectories can be either ballistic or controlled by use of a parachute system, according to the particular use of the projectile and to the needed precision. Some different launch mechanisms are proposed (based upon compressed-air, a rocket device, an elastic device) and a general structural analysis of the projectile is described. Finally, conclusions are stated and future development studies are proposed with regard to performances improvement and adaptability to other scenarios.

An additional goal for the paper is to show the system high environmental compatibility, due to its non-lethality characteristics and to the possibility, in many scenarios, to recover the projectile after its landing for multiple utilization with different payloads.

Keywords: Cargo – Payload – Environmental – Compatibility