

SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems Technologies (5)

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USING LIGHT GAS GUNS TO LAUNCH SUB-ORBITAL PAYLOADS

Abstract

Two-stage light gas guns are powerful accelerators, which are mainly used for terminal ballistics research, for example to simulate space debris and micrometeoroids hypervelocity impacts on spacecraft components. Light gas guns, as operated by the Fraunhofer Ernst-Mach-Institute (EMI), are capable to accelerate projectiles with masses in the kilogram range to velocities of several kilometres per second. Such exit velocities achieved are sufficient to cover the delta-v demand of sub-orbital missions. Thus, an application of light gas guns for upper atmospheric research or hypersonic flight and re-entry experiments seem to be feasible with state-of-the-art technology. This paper presents the concept of using light gas guns as a launcher system for sub-orbital payloads. The peculiarities of light gas guns are described and the system performance, which also considers the option of a projectile integrated rocket motor, is put into perspective to competing gun-launch systems. Implications on the payload design, which are driven by high short-term acceleration loads, are discussed against the background of EMI's experiences with ballistic telemetry and compact sensor systems.