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SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Small Launchers: Concepts and Operations (7)

Author: Mr. Mark Kaufman
Aerojet Rocketdyne, United States, mark.kaufman@rocket.com

SPARTAN - NANO-LAUNCH VEHICLE CONCEPT

Abstract

Space Vector Corporation (SVC) and Aerojet Rocketdyne proposes to develop a realistic Nano/Micro Satellite Launch Vehicle (NMSLV) capable of putting 20+ kg into low earth orbit defined as circular, 400-450 km altitude. Not since Scout was retired in 1994 has the United States or any other nation had the ability to launch dedicated miniaturized satellites into low earth orbit. A new breed of low cost nano-satellites weighing 20 kg or less are now common but sit on shelves due to lack of affordable access to orbit. Advancements in solid rocket motor propellants/cases over the years along with new developments in avionics have simplified the problem to the point that dedicated small launchers can again be built to meet this swelling demand at an attractive price. Space Vector Corporation in collaboration with Aerojet Rocketdyne is leading the development of a responsive, small 3-stage vehicle capable of ground, air, or sea launching nano/micro satellites into equatorial and polar orbits. The 1.32 m diameter by 10.3 m long vehicle with gimbaled thrust vector control can also be used as an inexpensive high fidelity target, interceptor and conventional strike vehicle. Some key development milestones and technologies that will help make the Spartan vehicle a reality include: • A suite of lightweight, radiation tolerant avionics packaged within a 30" diameter wafer that can be tested as a single unit eliminating costly individual component acceptance testing. • Incorporating wireless communication between the stages to eliminate complex and heavy cable harnesses, separation connectors, and raceways. • Consolidation of launch consoles and land lines into a single tablet computer "iLaunchPad" that communicates wirelessly with the vehicle during checkout and launch. • Utilization of a 4th stage axial propulsion system that can be turned off or nulled to allow precise insertion into the desired circular orbit. • Supplying power to the various subsystems using state-of-the-art aerospace grade Lithium-Ion Polymer batteries that replace expensive one-shot Silver-Zinc primary batteries yet still provide long stand times without the need for recharging. • Optimizing airframe structures for weight but retaining manufacturability and avoiding exotic materials to reduce recurring cost. • Low cost production of motor cases, flexseal joints, and propellant pouring techniques. • Development of low cost thrust vector control actuators and components optimized for launch vehicle use rather than high dynamic missile applications.