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

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TECHNICAL CASE STUDIES AND STRATEGIC ASSESSMENTS OF AIR-LAUNCH SPACE TRANSPORTATION SYSTEMS

Abstract

SpaceWorks Enterprises, Inc. (SEI) continues to examine various aspects of air-launch space transportation solutions (utilizing an aircraft as the first stage of a suborbital or orbital space launch system). This includes technical design studies, mission operations studies, market assessments, and overall business case development for both government and commercial customers. This paper provides a discussion of the overall benefits of air-launch, a short examination of some of the markets for these systems (from nanosatellites to small satellites), summaries of multiple design studies from SpaceWorks in this area, and strategic considerations going forward based upon this experience. Example programs/projects (some of which are ongoing) that will be reviewed here include the following: DARPA RASCAL (Responsive Access, Small Cargo, Affordable Launch), PhantomPhoenix, NanoLauncher, ALSET (Air Launch System Enabling Technology), Generation Orbit (GO Launcher), DARPA/NASA HLS (Horizontal Launch Study), and DARPA ALASA (Airborne Launch Assist Space Access). Case studies are provided of the various concepts that SpaceWorks led or assisted on for many of these projects. A wide assortment of air-launch carrier aircraft have been examined and include the following: F-14, F-4 II, SU-27, F-15, G-III, C-130, 747-SCA/-400, and dual C-5s. These projects also examined various rocket propulsion systems including solid, liquid, and hybrid solutions. Specific case studies from a decade of ongoing investigation will be provided that then result in various strategic conclusions about the benefits and implementation of air-launch space transportation systems. These conclusions include observations on the air-launch carrier aircraft, system implementation, Concept of Operations (CONOPS), launch site, regulatory environment, and commercial transition of such systems.