Air-Launched Suborbital Research Platform for Small Payloads

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Abstract

As novel approaches to suborbital flight open the doors to new types of scientific experiments, the lack of a small, responsive launch system can hinder access to space for small payloads. To address these needs within the high altitude, microgravity, and hypersonic research communities, Generation Orbit is developing GOLauncher 1, an air-launched platform designed for dedicated launch of small payloads on suborbital trajectories. The mission architecture is built on the pillars of fast, flexible, and dedicate launch services catering directly to small payload developers. A discussion of the air launch architectures for suborbital space access is conducted, leading to a description of the GOLauncher 1 concept of operations including payload integration, flight to the launch point, launch, and payload recovery. One of the key enabling technologies for GOLauncher 1 is the LOX/Paraffin hybrid rocket motor. As part of a single stage rocket system, this element allows for tailored ascent thrust profiles and low cost manufacturing. Further details of the GOLauncher 1 system are discussed herein including geometry, performance, and payload accommodation. Finally, development plans and future flight opportunities will be outlined.

Mission Architecture

Air-launch for space access has been studied for many years, and further has been successfully implemented as an operation system through Orbital Science's Pegasus. When applied to the problem of developing a dedicated launcher for nanosatellites and small suborbital experiments, air-launch offers a mix of reduced costs and mission flexibility not possible in ground-launched systems. Bringing low operating costs, commercial availability and significant excess performance, The Gulfstream G-III business jet is utilized as the carrier aircraft for GOLauncher 1.

Hybrid Motor Technology

GO is utilizing advanced hybrid motor technology to bring mission flexibility and low cost to the GOLauncher 1 system. Over the past 14 years, Space Propulsion Group has worked to perfect the performance, consistency, and manufacturing of LOX/Paraffin hybrid motors. These motors offer substantially increased performance and reduced costs over traditional hybrids thanks to improved regression rates, allowing for simplistic grain geometries.

Figure 1: GOLauncher 1 takes off for a suborbital research flight.