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A BUSINESS CASE ANALYSIS FOR 2ND GENERATION POINT-TO-POINT SUBORBITAL TOURISM AND RESEARCH SPACEFLIGHTS

Abstract

Rocketplane Global, Inc.(RGL) is continuing its preliminary engineering and development effort for its Mach 12 spaceplane design, based on a 20 year legacy of systems engineering for a variety of high Mach suborbital spaceplanes. The first stage reusable launch system is capable of delivering up to 2,000 kg to a 800 km polar orbit and can deliver over 2,500 kg to the ISS orbit, which enables the disruptive reduction in launch price to less than $20 million for a 2 ton LEO satellite or deployment of multiple 150 kg microsats from a dispenser.

While the first stage spaceplane is 100% reusable and designed for daily flight operations, the second stage needed to get payloads to orbit is expendable. Consequently, the internal payload bay of the Phoenix spaceplane is quite large at 3m diameter x 9m long – about the same size as a large business jet interior. The Phoenix launch system stages at Mach 12 (half orbital velocity) and about 150km altitude. Therefore, the Phoenix spaceplane has the ability to greatly expand the microgravity operating environment with this high Mach flight profile and more than double the duration of high quality microgravity flight time. Preliminary estimates are between 6 and 7 minutes of 10-3 or better microgravity, with a flight range that can extend over 1,500km.

The large payload bay will be configured with a reusable pressurized payload bay laboratory module which would be equipped with standard ISS rack systems and experiment hardware. Researchers will be able to fly tended experiments inside the research module, since the spaceplane is piloted and therefore human rated from the beginning. For tourism flights the racks would be replaced with up to 24 passenger seats, and be available for daily flight operations should customer demand support this. Commercial operations of this new P2P suborbital spaceplane could begin in 2024 or 2025, and provide a new spaceflight experience much different from first generation systems. The biggest question at this point is whether the microgravity research and tourism markets will grow large enough to be able to support high throughput systems such as the proposed Phoenix microgravity research lab, or become part of a coupled research / tourism business model using a common pressurized payload bay module and jointly supported suborbital flight operations. This paper will provide an economic analysis of this 2nd-Gen P2P suborbital spaceflight business model as well as demand projections.