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THE XP SPACEPLANE AS A MULTI-ROLE SUBORBITAL RESEARCH PLATFORM

Abstract

This paper describes the use of a reusable horizontal takeoff and landing spaceplane developed for the suborbital space tourism market as a low cost, flexible and responsive intermediate duration microgravity laboratory. The XP spaceplane being developed by Rocketplane Global (RGI) is a fully reusable suborbital vehicle about the size of a mid-sized business jet. It takes off and lands from conventional runways using J-85 afterburning turbojets and ascends to a 13 km altitude under airbreathing thrust before igniting its LOX / kerosene rocket engine for the ascent to space. After a 70 second main engine burn the XP has accelerated to Mach 3.5 and climbed to about 50 km altitude at rocket engine cut-off. Thereafter a ballistic coast carries the vehicle to its 104 km apogee and back to atmospheric re-encounter at 50 km again. The coast phase lasts about three to four minutes, and it is during this time that the XP is in the microgravity environment.

The XP spaceplane has a redundant environmental control and life support system providing a shirt-sleeve environment for the crew and passengers as well as a benign and user friendly environment for the payloads mounted in the cabin. In addition, researchers and payload developers have the ability to fly with their payloads and operate them directly during the flight through a standard Ethernet or USB interface. The interior cabin volume can be configured to carry up to 12 standard ISS Express Rack lockers in a single supporting rack structure, or up to 8 lockers when removing the four rear seats and substituting the seats with four NASA KSC FastRack payload support units

The 1,000 kg or more of payload mass that would normally be distributed across the three rows of cabin seating can be consolidated into an external payload which is mounted on a centerline rail on the belly of the vehicle between the main landing gear. The external payload interface contains power and data connections with the internal vehicle systems routed to the payload specialist workstation. Earth observation sensors, astronomy instruments and sample collection systems can all be mounted in these external payload modules, which can either stay on the vehicle throughout the flight or can be released during the coast phase to apogee. Upper stage rocket kick motors can also be utilized for these external payloads to provide up to 10-15 minutes of microgravity or even reach low Earth orbit.