National Aeronautics and Space Administration

Flight Opportunities

Space Technology Mission Directorate (STMD)

NASA's Flight Opportunities Program strives to advance the operational readiness of innovative space technologies while also stimulating the development and utilization of the U.S. commercial spaceflight industry. Since its initiation in 2010, the program has provided affordable access to relevant space-like environments for over 100 payloads across a variety of flight platforms.

Suborbital Reusable Launch Vehicles (sRLV)

sRLVs enable a wide variety of experiments, such as testing algorithms for landing or hazard avoidance, or evaluating the response of systems to microgravity.

Typical vehicles include Masten Space Systems' Xaero/Xombie, UP Aerospace's SpaceLoft™ XL, and Virgin Galactic's SpaceShipTwo.

High-Altitude Balloon Systems

These systems facilitate impact studies on extended exposure to cold, atmosphere, and radiation.

Typical balloon providers include World View® Enterprises and Near Space Corporation (NSC).

Parabolic Aircraft

These platforms enable investigation of short-term exposure to reduced gravity, with typical missions flying approximately 40 parabolas providing several seconds of reduced gravity during the flight.

Vehicles utilized by the Flight Opportunities Program in the past include Zero G's G-FORCE ONE and NASA's C-9B.

How to Access Flight Opportunities

There are currently two paths for accessing flight test opportunities:

Space Technology Research, Development, Demonstration, and Infusion (REDDI)

Technologies can compete for flight funding through the REDDI NASA Research Announcement (NRA). Awardees receive a grant allowing them to directly purchase flights from U.S. commercial flight vendors that best meet their needs. The solicitation is biannual.

NASA Directed Payload

This path facilitates suborbital flight demonstrations for technologies under development by NASA and other government agencies. Flights are provided by NASA's contracted providers.

Test Flights for Mars Landing Technology

NASA's Jet Propulsion Laboratory (JPL) has developed cutting-edge technologies to enable spacecraft to land at a specific location with more precision than ever before. These technologies were tested on board the Autonomous Descent and Ascent Powered-flight Testbed (ADAPT), a high-tech demonstration payload built on Masten Space Systems' XA-0.1B "Xombie" vertical-launch, vertical-landing reusable rocket. The Xombie platform approximates Mars-like descent conditions, which are difficult to achieve through conventional flight test platforms. Two sophisticated lander technologies were recently tested, allowing the Xombie rocket to change the course of its descent and navigate by recognizing terrain features to successfully reach its target landing pad. This represents a huge step forward in future capabilities for safe and precise Mars landing, and demonstrates a highly effective approach for rapid, low-cost validation of new technologies for the entry, descent, and landing of spacecraft on any space target of interest.

JPL's technologies, tested on Masten's Xombie, are being considered for inclusion on the Mars 2020 Rover mission.

The Made In Space 3-D Printer was validated during parabolic flight testing.

3-D Printing In Space

Building spacecraft and objects on Earth and launching them to space is costly and logistically complicated. Made In Space has focused on the possibility of using additive manufacturing, or 3-D printing, to enable space-based manufacturing. Initial parabolic flights of the customized 3-D printer designed for use in microgravity were conducted in the summer of 2011. By making in-flight observations and modifying both the hardware and the software in between flights, the team was able to rapidly optimize the technology for operation in microgravity. As a result of the initial parabolic flights, Made In Space was awarded a Phase-3 SBIR grant to develop a 3-D printer for deployment onboard the ISS. In 2013, the prototype performed successfully during the microgravity test flights, and was deployed to the ISS in 2014.

Automatic Dependent Surveillance-Broadcast (ADS-B) for Tracking of Commercial Space Transportation

As commercial space operations in the U.S. increase, the operation of these vehicles must be accommodated within the National Airspace (NAS). The FAA is implementing ADS-B as the next-generation surveillance system for air traffic control, with full deployment planned for 2020. ADS-B is currently designed to monitor flights below 60,000 feet, however, using ADS-B to track flights above this altitude is under exploration. Starting in 2011, an ADS-B payload was designed by MITRE Corporation, ground tested on the Masten Xaero sRLV, and later flight tested on the Xombie sRLV. In 2012 and 2013, an ADS-B payload was "ruggedized" for suborbital rocket flight, then flown onboard the UP Aerospace SpaceLoft vehicle, each time with better performance. The lessons learned from these tests informed the design of an advanced experimental ADS-B payload, designed by Embry-Riddle Aeronautical University (ERAU) with FAA funding. During 2013, the ERAU payload was also flown onboard unmanned high-altitude balloons by Near Space Corporation. These increasingly complex demonstrations of ADS-B technology have shown its potential to permit the FAA to track high-altitude balloons and reusable launch vehicles in the NAS as they do aircraft.

The UP Aerospace SpaceLoft vehicle is just one of the many platforms used to mature the ADS-B technology.

NP-2015-11-33-AFRC

Stephan Ord, ***Technology Manager***
stephan.f.ord@nasa.gov | @nasafo