NASAfacts

Flight Opportunities

NASA's Flight Opportunities program facilitates rapid demonstration of promising technologies for space exploration and the expansion of space commerce through suborbital flights from industry partners. The program matures capabilities needed for NASA missions while strategically investing in the growth of the U.S. commercial spaceflight industry. Flight Opportunities is funded by NASA's Space Technology Mission Directorate (STMD).

Demonstrating and maturing promising space technologies

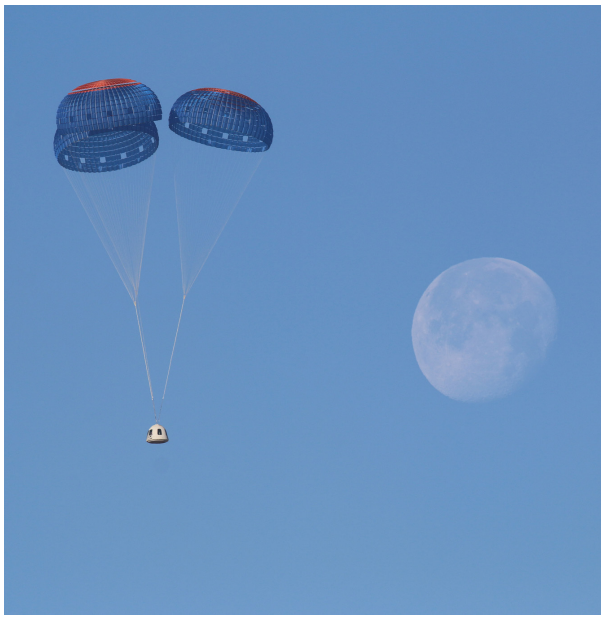
Flight demonstrations on suborbital vehicles take technologies from ground-based laboratories into relevant space-like environments to increase technology readiness and validate feasibility while reducing costs and technical risks of future missions. For the purposes of maturing technologies for future space exploration, a relevant environment typically means exposure to suborbital space. Often referred to as "the edge of space," this environment is usually at an altitude at least 50 miles above sea level and/or replicates some of the conditions encountered in space, such as:

- Microgravity conditions, including weightlessness
- Limited re-entry conditions
- Challenging landing conditions
- High-altitude solar exposure
- Radiation
- Extreme temperatures and vacuum
- Intense spacecraft vibrations

By understanding how their payloads respond to these conditions, researchers are able to confirm their designs or make necessary refinements and improvements to mature their experiments before moving on to much more expensive orbital deployments, such as small satellites or lunar missions.

Leveraging commercial vehicles

Flight Opportunities facilitates the purchase of commercial flight services for the demonstration of qualified technologies on rocket-powered suborbital vehicles, high-altitude balloons, and parabolic aircraft.



Blue Origin New Shepard NS-10 crew capsule landing. Credit: Blue Origin

Rocket-powered vehicles

These platforms include both suborbital reusable launch vehicles (sRLVs) that reach high altitudes and lander vehicles that specialize in entry, descent, and landing (EDL) technologies closer to the ground. Both of these classes of vehicles are typically recoverable and reusable after launch.

High-altitude balloons

Large balloon systems reach a minimum altitude of 16.5 miles and can typically sustain the longest duration of the suborbital platforms—hours, days, or even weeks at a time. This makes them ideal for payloads that benefit from extended periods of data collection.

Parabolic aircraft

These modified airplanes achieve periods of variable gravity through a series of maneuvers called parabolas. These aircraft are ideal for demonstrating technologies that need to operate in zero gravity.

Supporting both external and government researchers

External researchers can compete for flight funding through NASA's Tech Flights solicitation. Awardees receive a grant or enter into a cost-share agreement, through which they can select a commercial flight provider that meets their needs for demonstrating a promising space-based payload. These investments help advance technologies of interest to NASA, while supporting commercial flight platform providers and expanding utilization of low-Earth orbit (LEO).

The solicitation is open to U.S.-based non-government organizations (e.g., academia, research institutes, private sector) and Federally Funded Research and Development Centers (with the exception of NASA's Jet Propulsion Laboratory) as well as non-U.S. researchers partnering with a U.S.-based entity as the lead.

Transitioning to orbital missions

Often, technologies matured through Flight Opportunities transition to missions in LEO that allow further validation of technical readiness beyond the threshold of suborbital demonstration.

Facilitating in-space manufacturing

An additive manufacturing (3D printing) facility designed by Made In Space was matured through Flight Opportunities and is now installed on the International Space Station. Manufacturing of critical components in space can reduce operational costs and improve on-site repair capabilities for long-duration human exploration missions.

Parabolic flights enabled maturation of Made In Space's additive manufacturing facility. Credit: NASA

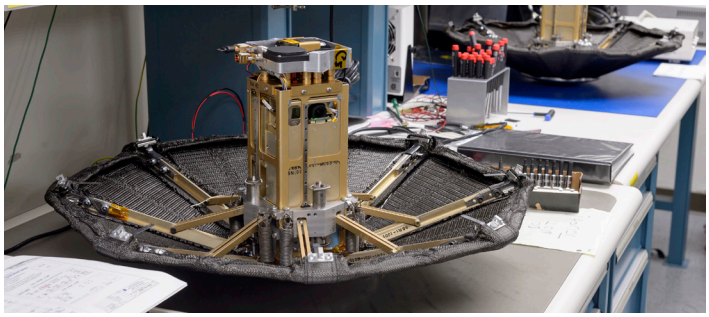
Enabling simpler planetary sample collection

Flight Opportunities facilitated a successful demonstration by Honeybee Robotics of its PlanetVac planetary sample collection system in the Mojave Desert, where ground conditions resemble those that researchers expect to encounter on planetary bodies. PlanetVac successfully collected more than 300 grams of simulated regolith and NASA is now considering its feasibility for a future Mars sample return mission.

Honeybee Robotics' PlanetVac attached to Masten Space Systems' Xodiac lander. Credit: NASA

Testing a mechanically deployable heat shield

NASA's Ames Research Center successfully demonstrated its Adaptable Deployable Entry and Placement Technology (ADEPT) through suborbital testing with Flight Opportunities. The foldable, umbrella-like heat shield opens to make a round, rigid structure with a diameter larger than the rocket it fits into. ADEPT could enable future NASA missions that require extra-large aeroshells to protect spacecraft destined to land on the surface of other planets—without requiring larger rocket fairings.



Ames researchers tested ADEPT via a flight on UP Aerospace's SpaceLoft rocket. Credit: NASA

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