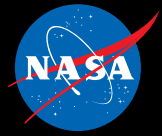


NASA Flight Opportunities

Suborbital Testing – A Path to Orbital Missions

John Kelly | August 2020

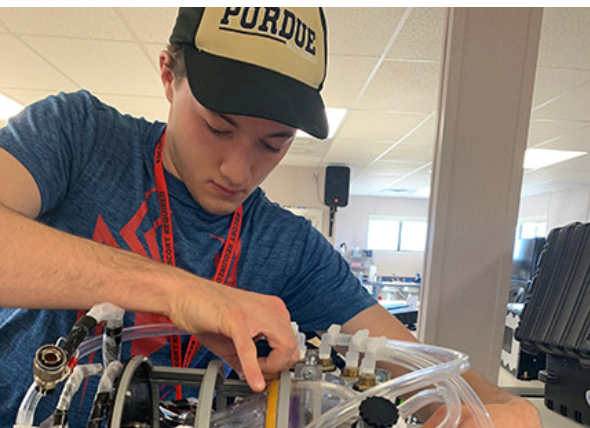


Flight Opportunities Mission

The Flight Opportunities program facilitates rapid demonstration of promising technologies for space exploration, discovery, and the expansion of space commerce through suborbital testing with industry flight providers.

Credit: Earth Science Systems

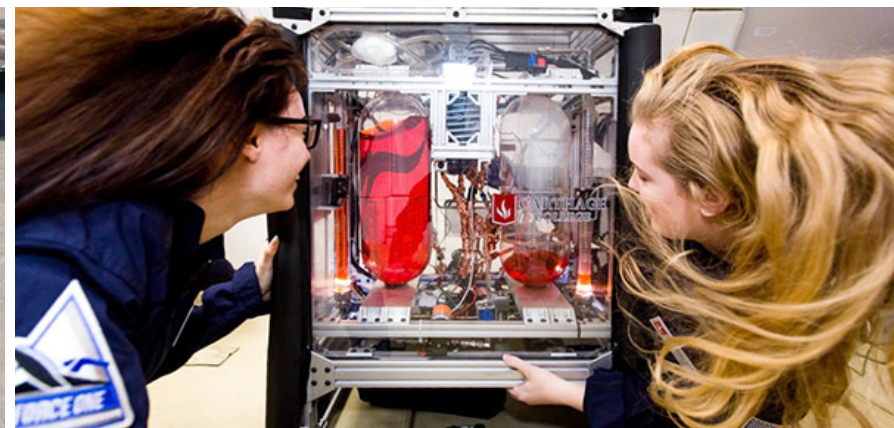
Credit: Blue Origin



Credit: Blue Origin



Credit: World View Enterprises



Credit: Kevin Crosby, Carthage College



Why fly in suborbital environments?

Evaluate performance in harsh conditions of space that are difficult to replicate in ground-based testing

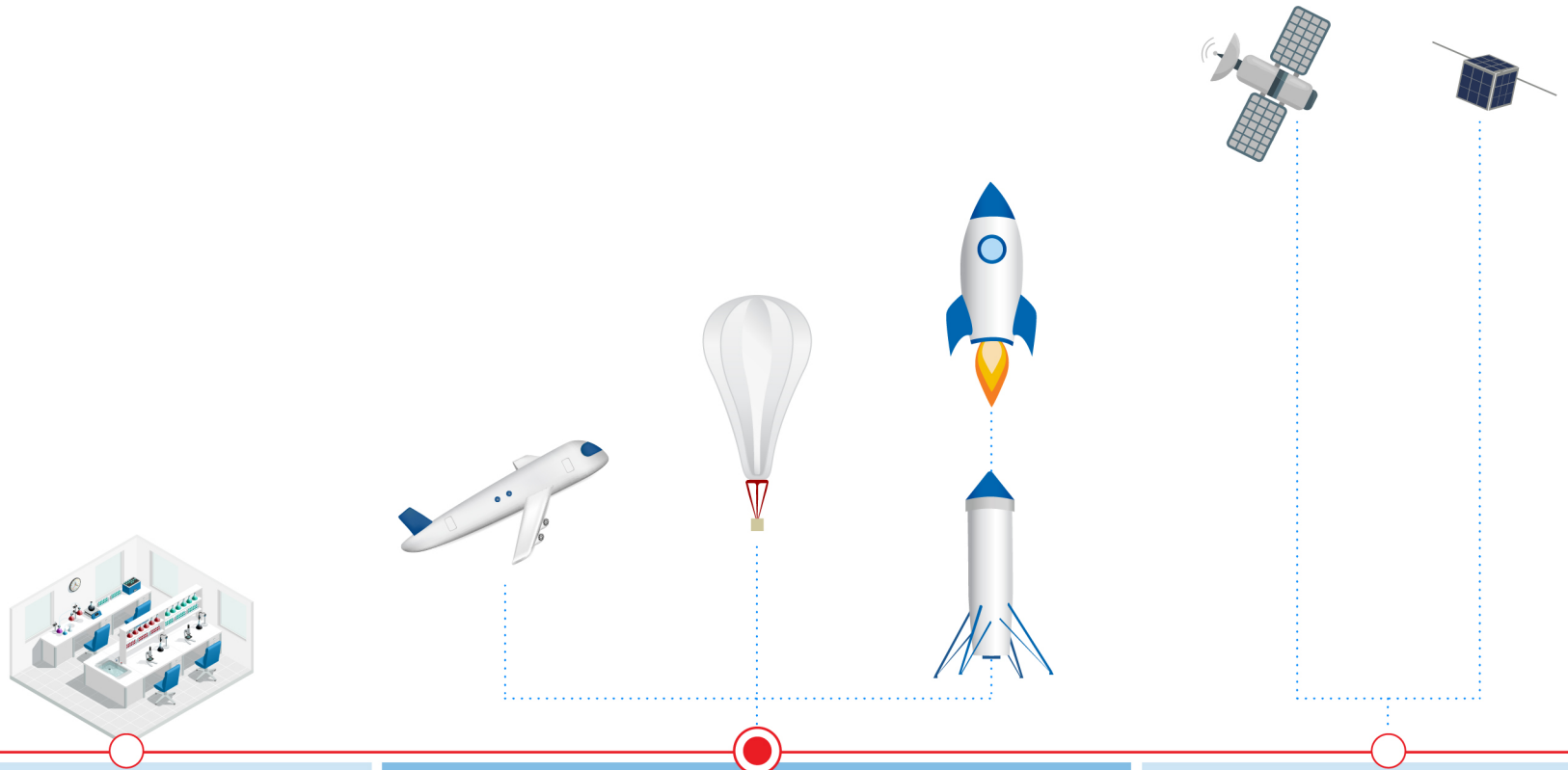
Obtain data to increase technology readiness level (TRL) and gain more assurance of success for future missions

Refine experiment to reduce risk for orbital missions (CubeSat, International Space Station, lunar mission, etc.)





Suborbital flights – a step on the way to orbit



LABS, UNIVERSITIES, ETC.

GROUND

PARABOLIC
AIRCRAFT

HIGH-ALTIITUDE
BALLOONS

ROCKET-POWERED
VEHICLES

SUBORBITAL FLIGHTS

INTERNATIONAL
SPACE STATION

CUBESAT

ORBITAL MISSIONS



Opportunity: Tech Flights Solicitation

- The Technology Advancement Utilizing Suborbital Flight Opportunities solicitation (“Tech Flights”) is an appendix to NASA’s SpaceTech REDDI research announcement
- Awards and agreements for flight tests are open to researchers from industry, academia, and non-profit research institutes
- Awardees select a flight provider of their choice and work directly with this provider
- Tech Flights 2020 Topics
 - Supporting Sustainable Lunar Exploration and the Expansion of Economic Activity into Cislunar Space
 - Fostering the Commercialization of Low-Earth Orbit and Utilization of Suborbital Space
- [Tech Flights 2020 Solicitation](#)



Flight Opportunities by the Numbers

BETWEEN 2011 AND TODAY*...

Supported **193** successful flights

Enabled **689** tests of payloads

262 technologies in the portfolio

12 active commercial providers





Autonomous Flight Termination System (AFTS)

NASA's Kennedy Space Center

What It Is

AFTS is a subsystem that allows a rocket to independently determine if it is off course and, if necessary, self-destruct. It uses configurable software-based rules implemented on redundant flight processors using data from redundant GPS/inertial measurement unit (IMU) navigation sensors.

Why It Matters

Off-course rockets can place people and property in danger. AFTS eliminates many of the time-consuming and costly measures historically taken to monitor launches and issue destruction commands, such as ground personnel, transmitters, telemetry receivers, and radar.

Transition Outcomes

AFTS has been transferred to at least 35 recipients, including Dept. of Defense agencies and industry, including Rocket Lab and SpaceX, and is the focus of a NASA collaboration with the Italian Space Agency.

FLIGHT TEST MILESTONES

- Obtained data about GPS receiver performance that led to critical design modifications
- Advanced technical readiness to TRL 9

NASA TX10: Autonomous Systems



Photo credits: NASA (left), UP Aerospace (right)

FLIGHT PROVIDER

- UP Aerospace



Radiation-Tolerant Computing System

Montana State University

What It Is

Called “RadSat” for short, this system is implemented on a commercial off-the-shelf field programmable gate array and provides a reconfigurable and redundant architecture and robust, self-healing capabilities.

Why It Matters

Radiation-tolerant computing will be needed on the Moon, where the lack of atmosphere as well as the magnetic field and radiation from the Sun will be a challenge for most terrestrial electronics.

Transition Outcomes

Selected for NASA’s CubeSat Launch Initiative, the Undergraduate Student Instrument Project, and as a payload on a lander being developed under NASA’s Commercial Lunar Payload Services contracts.

FLIGHT TEST MILESTONES

- Tested the power and data logging systems
- Enabled evaluation of thermal control analysis and data analysis systems
- Confirmed that system was robust enough to survive tumultuous launch conditions

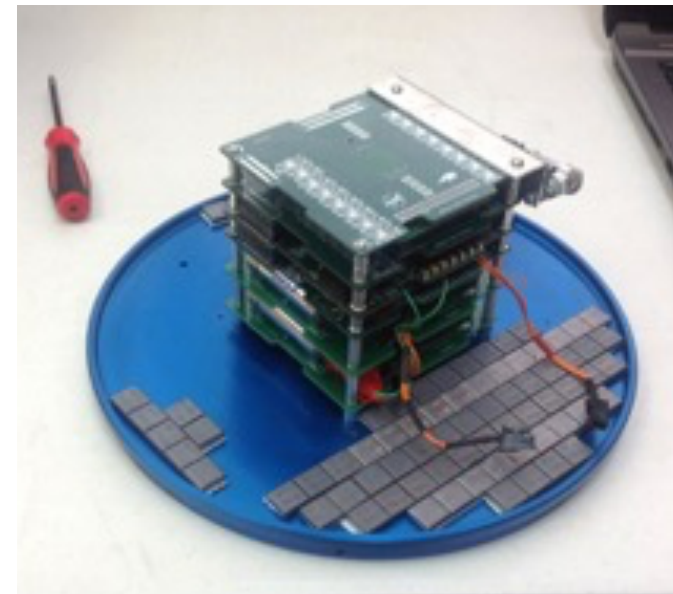


Photo credit: Montana State University

FLIGHT PROVIDERS

- UP Aerospace
- Near Space Corporation



Thank you! Or Questions?



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