



# Pathfinder Technology Demonstrator

## Demonstrating Novel CubeSat Technologies in Low Earth Orbit

NASA's Pathfinder Technology Demonstrator (PTD) project will test the operation of a variety of novel CubeSat technologies in low-Earth orbit, providing significant enhancements to the performance of these small and effective spacecraft. Each of the planned five PTD missions consists of a 6-unit (6U) CubeSat weighing approximately 25 pounds (11 kilograms) and measuring 12 inches x 8 inches x 4 inches (30 centimeters x 20 centimeters x 10 centimeters), comparable in size to a common shoebox. Equipped with deployable solar arrays, the PTD spacecraft bus will provide each mission with at least 45 watts of on-orbit-average power.

The PTD project—led by NASA's Ames Research Center at Moffett Field, California, in collaboration with NASA's Glenn Research Center in Cleveland, Ohio—will benefit future missions by demonstrating the operation of new subsystem technologies on orbit. These include propulsion systems that provide the capability to maneuver small science platforms and send small spacecraft to deep space; novel technologies to stabilize spacecraft and laser communications systems that will greatly increase the amount of data that can be transmitted from the spacecraft to the ground. Flight qualification and demonstration of these technologies will also increase small spacecraft mobility and capability for direct infusion into future science and exploration missions.

The PTD-1 mission currently under development and slated for launch in 2019, will demonstrate a propulsion system with a water-based propellant. While in orbit, the system separates onboard water into hydrogen and oxygen propellants by applying an electric current through the water. The propulsion system uses the on-orbit power provided by the arrays to power the miniature water electrolysis system. The demonstration will test propulsion performance through programmed changes in spacecraft velocity and altitude executed by the water-fueled thrusters.



*Pathfinder Technology Demonstrator-1 (PTD-1) Spacecraft Concept, courtesy of Tyvak NanoSatellite Systems, Inc.*

The PTD mission is managed and funded by the Small Spacecraft Technology (SST) program within the Space Technology Mission Directorate. The SSTP expands U.S. capability to execute unique missions through rapid development and in space demonstration of capabilities for small spacecraft applicable to exploration, science, and the commercial space sector. The SSTP will enable new mission architectures through the use of small spacecraft with goals to expand their reach to new destinations, and challenging new environments.

**For more information about the SSTP, visit:**

[www.nasa.gov/directorates/spacetech/small\\_spacecraft](http://www.nasa.gov/directorates/spacetech/small_spacecraft)

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