

SCIENCE

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NASA Announces New Dragonfly Drone Mission to Explore Titan

The quadcopter was selected to study the moon of Saturn after a “Shark Tank”-like competition that lasted two and a half years.

By David W. Brown

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NASA announced Thursday that it is sending a drone-style quadcopter to Titan, Saturn’s largest moon.

Dragonfly, as the mission is called, will be capable of soaring across the skies of Titan and landing intermittently to take scientific measurements, studying the world’s mysterious atmosphere and topography while searching for hints of life on the only world other than Earth in our solar system with standing liquid on its surface. The mission will be developed and led from the Applied Physics Laboratory at Johns Hopkins University in Laurel, Md.

“This revolutionary mission would have been unthinkable just a few years ago,” said Jim Bridenstine, the administrator of NASA, in a video statement announcing the mission.

The spacecraft is scheduled to launch in 2026. Once at Titan in 2034, Dragonfly will have a life span of at least two-and-a-half years, with a battery that will be recharged with a radioactive power source between flights. Cameras on Dragonfly will stream images during flight, offering people on Earth a bird’s-eye view of the Saturn moon.

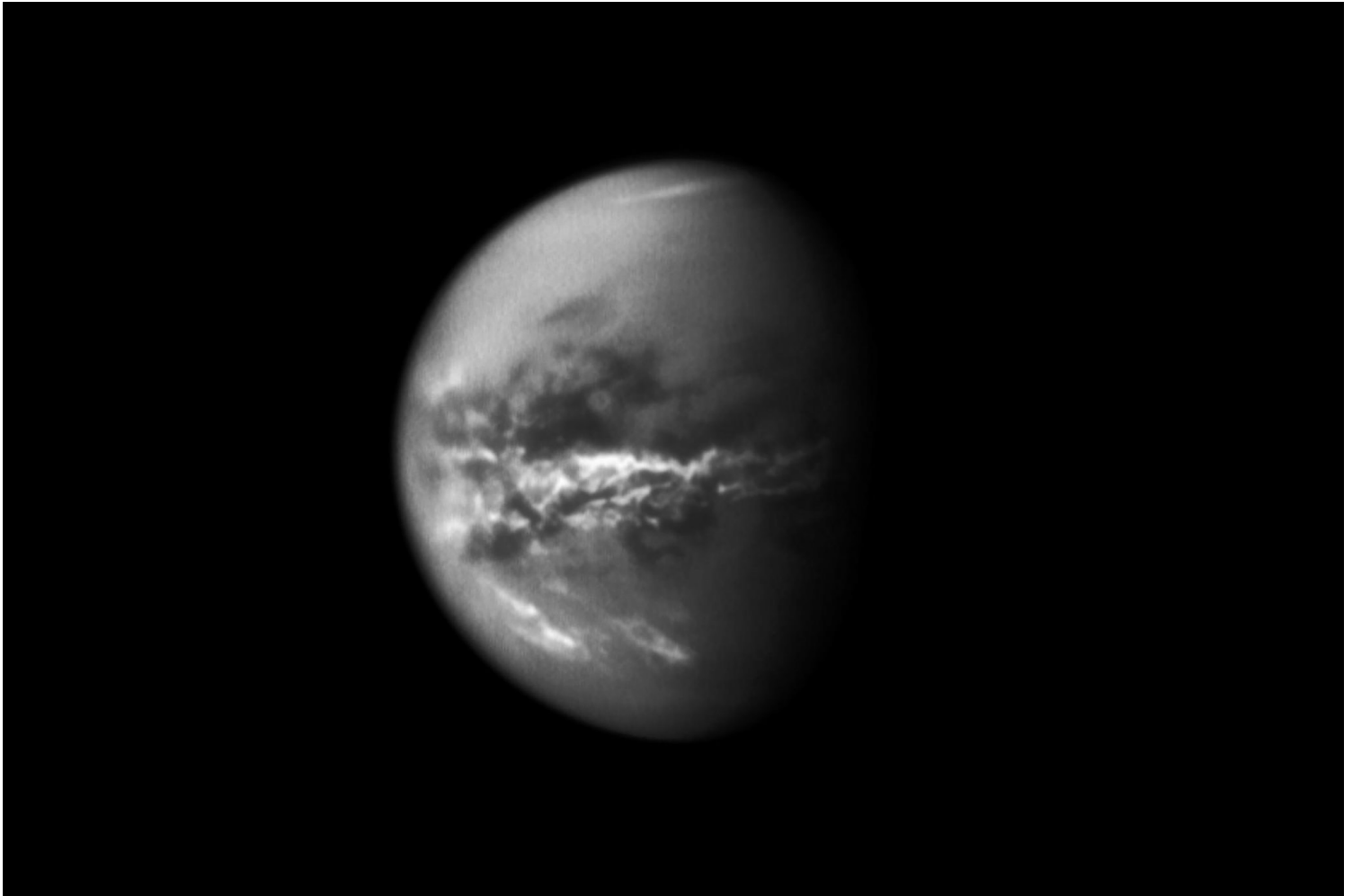
“We will be flying initially over dunes and then into rugged terrain,” said Elizabeth Turtle, who will lead the mission for the lab as its principal investigator. “We will take images with both downward-looking cameras along the ground track underneath Dragonfly as we fly over the surface, as well as forward-looking cameras, so we’ll be able to look out toward the horizon as well.”

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Titan has long intrigued planetary scientists. On Christmas Day 2004, NASA’s Cassini spacecraft sent a probe, Huygens, to the moon’s surface. It landed in one piece, revealing a world analogous to a primordial Earth — Dr. Turtle described it as, “eerily familiar on such a different and exotic world.” Rather than water, Titan’s seas are filled with liquid methane.

In addition to a camera, Dragonfly will carry an assortment of scientific instruments: spectrometers to study Titan’s composition; a suite of meteorology sensors; and even a seismometer to detect titanquakes when it lands on the ground. Drills in the landing skids will collect samples of the Titan surface for onboard analysis.

“Titan is an incredibly unique opportunity scientifically,” Dr. Turtle said in an interview in April before NASA’s announcement. “Not only is it an ocean world — an icy satellite with a water ocean in its interior — but it is the only satellite with an atmosphere. And the atmosphere at Titan has methane in it, which leads to all sorts of rich organic chemistry happening at even the upper reaches of the atmosphere.”



Titan, captured by NASA's Cassini spacecraft. NASA

Part of the Dragonfly mission is to study whether the moon of Saturn could now be, or once was, home to life.

Because of the nature of its atmosphere, Titan is a very Earthlike place. Chemically, it is very much like our world's primordial past. The surface pressure of Titan is one-and-a-half times the surface pressure of Earth, and the same sorts of interactions between air, land and sea take place. Titan thus has familiar geology. Methane on Titan plays the role that water plays here. Its methane cycle is analogous to Earth's water cycle. It has methane clouds, methane rain and methane lakes and seas on the surface.

“There’s going to be a tremendous change in the fabric of how we see Titan as a world,” said Dr. Ralph Lorenz of Applied Physics Laboratory, the Dragonfly project scientist in an April interview. He predicted that features of Titan will be, “recognizable, but different in flavor from what you see on Earth and Mars.”

That might include the things that wiggle. Complex organic molecules fall from its atmosphere onto the surface of Titan, gather over long periods of time and can be processed further. If cryovolcanoes erupt on Titan’s surface, as data from the Cassini spacecraft suggests, the organic material can mix with liquid water. Sunlight, at the same time, drives the moon’s photochemistry, introducing energy to a system primed for life.

“We have all these ingredients necessary for life as we know it, and they’re just sitting there doing chemistry experiments on the surface of Titan. That’s why we want to send a lander there,” said Dr. Turtle.

The rotocopter comes after years of studying alternative concepts for studying Titan, such as a conventional orbiter or lander, a hot-air balloon and even a boat. Because it takes about two hours for a signal from Earth to reach Titan, Dragonfly is designed to fly and land autonomously; onboard hazard-detection will keep it safe

“One of the things great about Dragonfly is that we are not inventing anything. We are just applying technology already developed for other things to a new problem,” says Dr. Turtle.

Dragonfly is similar in size to a Mars rover, or about the size of a large lawn mower. Where a Mars rover is limited to inching forward over a decade or longer, however, for the Dragonfly team, Titan’s sky and the drone’s nuclear fuel source are the limit.

“We have the capacity, over the mission’s lifetime, to go hundreds of kilometers. One of the advantages we have is that we can always scout the next site. We can fly ahead, look at it, see what kind of terrain there is, and decide whether we want to go there or elsewhere,” said Dr. Turtle.

The spacecraft has been under consideration for two-and-a-half years in NASA’s class of science missions, called New Frontiers, which are supposed to cost less than \$1 billion. The competition, held between multiple institutions in government and academia, is not unlike a “Shark Tank” for deep space exploration.

Earlier winners of the New Frontiers competition include the New Horizons spacecraft, which visited Pluto; Juno, which now orbits Jupiter; and Osiris-rex, which will soon collect a sample from the asteroid Bennu and return it to Earth.

NASA has announced other new missions recently. Last week, the agency said twin missions — Punch and Tracers — would seek to further scientific understanding of the sun. And in May, the Trump administration renewed its drive to return astronauts to the moon in 2024, renaming the mission Artemis and seeking an additional \$1.6 billion in funds for NASA as a down payment.

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