



## Opinion: The Time Is Ripe To Launch NASA's Interstellar Probe

[Aviation Week & Space Technology](#)

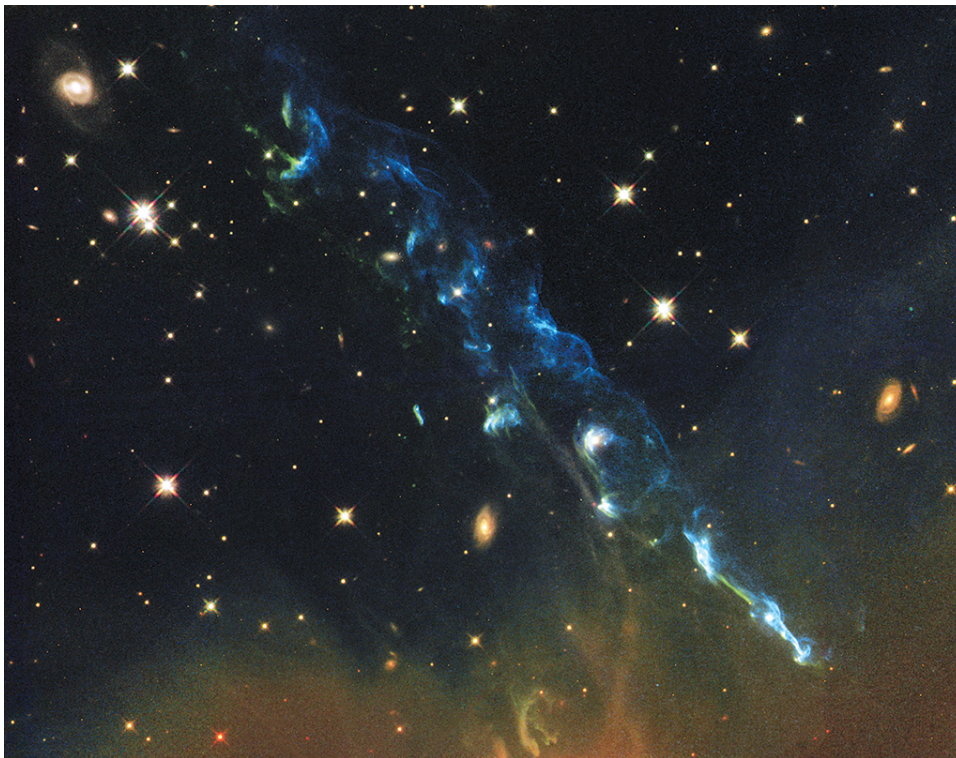
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Tue, 2017-11-07 04:00

Rarefied interstellar gas fills space between stars in our galaxy and envelopes the Solar System. Since the late 1970s, scientists and engineers have been exploring ways to send what is called the “Interstellar Probe” into that region to learn about the Sun’s galactic neighborhood. The latest decadal solar and space physics survey report (2012) of the National Academies’ National Research Council included the Interstellar Probe on the list of “imperatives for [NASA](#).”

After nearly 40 years, the time has come for this historic space mission, enabled by recent scientific discoveries, Space Launch System development and political priorities of the U.S. president.

Hot ionized gas of the expanding solar corona, the solar wind, streams with the speed of 300 mi./sec. (483 km/sec.) and rams into partially ionized interstellar gas, forming the interstellar boundary region of the Solar System. It surrounds our star, the Sun, at distances 80-200 times farther away from the Sun than planet Earth. Interplay among galactic cosmic rays, magnetic fields, waves, interstellar dust and acceleration of charged particles to high energies makes the physics of the boundary exceptionally complex.



Two [NASA](#) Voyager spacecraft are crossing the boundary region and measure in situ, or local, particles and fields. Both spacecraft will cease their operation in 10 years, however, due to gradually decreasing onboard electric power. Therefore, they will not explore the undisturbed pristine interstellar medium outside the boundary region. Two other NASA missions, the Interstellar Boundary Explorer (IBEX) and Cassini, have obtained all-sky maps of the

Solar System frontier remotely. These remarkable recent accomplishments have challenged our existing concepts and raised new fundamental science questions.

The Interstellar Probe will cross and examine in situ the interstellar boundary region and then plunge into the undisturbed interstellar medium that has never been visited by spacecraft. There, science instruments will determine detailed properties of the interstellar environment in our part of the galaxy and its effects on the Solar System.

To probe the nearby pristine interstellar medium, the spacecraft has to reach the region at least 250 times farther away from the Sun than our Earth. The Interstellar Probe velocity, as it leaves the Solar System, should be more than three times faster than velocities of the Voyagers, which are in excess of 30 mi./sec. Then the mission can be completed in 30-35 years after its launch, a typical working life span of a scientist and engineer. Senior specialists leading design and launch of the Interstellar Probe will not be likely to witness the end of the mission, but their students and junior colleagues will guide this exciting undertaking to fruition.

Achieving the required record-high spacecraft velocities is among the hardest problems in space exploration. This also places the Interstellar Probe into a category of expensive flagship science missions, with an estimated cost of several hundred million dollars.

The progress in development of NASA's Space Launch System (SLS) makes the Interstellar Probe technically feasible in the near term. Significantly more powerful than existing launch vehicles, the SLS can provide an indispensable initial boost to the Interstellar Probe. The spacecraft velocity can then be further increased, if necessary, by the proven technologies of subsequent planetary flybys and electric propulsion.

The SLS's primary objective is to send astronauts on exploration missions beyond low Earth orbit. NASA has not determined yet whether this launch system will loft space vehicles to the Moon, Mars, asteroids or somewhere else in the Solar System. The rudderless national human spaceflight program is ripe for reboot by a vision of exploration from the new president. Such new focus is particularly urgent because the U.S., embarrassingly, has not been able to fly astronauts into orbit since the last space shuttle flight.

Full qualification of the SLS for human spaceflight will take time, and the main exploration feats would occur during the next presidential administration. While focusing on the long-term space program, President Donald Trump can also achieve a spectacular accomplishment in space in the near future. The new SLS could realistically launch the Interstellar Probe on a unique exploration journey to our galactic neighborhood in six or seven years. Such a historic space mission will contribute to fulfilling the president's pledge to make the country proud again.

To paraphrase Neil Armstrong, that would be one modest step in interstellar exploration of our galaxy and one giant leap for the space program.

The time for the Interstellar Probe has come.

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*The views expressed are not necessarily those of Aviation Week.*

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**Source URL:** <http://aviationweek.com/space/opinion-time-ripe-launch-nasa-s-interstellar-probe>