

Solar Probe Plus: NASA solar study mission moves to next design stage

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(PhysOrg.com) -- Two-thousand-degree temperatures, supersonic solar particles, intense radiation – all of this awaits NASA’s Solar Probe Plus during an unprecedented close-up study of the sun.

The team led by the Johns Hopkins University Applied Physics Laboratory (APL), which has been developing the spacecraft for this extreme environment, has been given the nod from NASA to continue design work on the probe, building on the concepts it created during an initial design effort. In NASA mission parlance, the team has moved from design Phase A to Phase B.

"Solar Probe Plus is an extraordinary mission of exploration, discovery, and deep understanding," says Lika Guhathakurta, the Living with a Star program scientist at NASA Headquarters. "We cannot wait to get started with the next phase of development."

After launch, slated for 2018, Solar Probe Plus will orbit the sun 24 times, gradually moving in toward the sun with each pass. The small car-sized spacecraft will zip through the sun's atmosphere as close as four million miles from our star's surface – exploring a region (and facing conditions) no other spacecraft ever has encountered. The probe will include five science investigations specifically designed to solve two key questions of solar physics -- why is the sun's outer atmosphere so much hotter than the sun's visible surface, and what accelerates the [solar wind](#) that affects Earth and our solar system?

As the spacecraft approaches the sun, its revolutionary carbon-carbon composite heat shield and other components must withstand temperatures exceeding 2,550 degrees Fahrenheit and impacts from hypervelocity dust particles. Its science instruments will survey the most abundant particles in the solar wind – electrons, protons and helium ions – and measure their properties; image the solar wind; measure the electric and magnetic fields, radio emissions and shock waves that course through the sun's atmospheric plasma; and inventory the elements in the sun's atmosphere.

“Solar Probe Plus will be a historic mission, flying closer to the sun than any previous spacecraft,” says Nicky Fox, Solar Probe Plus project scientist at APL. “Encountering the sun's atmosphere [or corona] for the first time, Solar Probe Plus will understand how the corona is heated and how the solar wind is accelerated. Solar Probe Plus will revolutionize our knowledge of the physics of the origin and evolution of the solar wind.”

In addition to the heat shield, the APL team will continue testing and development of other tricky aspects of spacecraft design. For example, engineers will build and test a flight-like active cooling system designed to keep the solar arrays at safe operating temperature throughout the orbit. Most spacecraft parts will be subjected to high-velocity dust tests that simulate the pelting they'll face flying through swarms of high-energy particles near the sun. “Solar Probe Plus presents technical challenges like no mission before it,” says Andrew Driesman, Solar Probe Plus project manager at APL. “Over the next 26 months, our goal is to get these technologies to the point where we have full scale prototypes that we can test in a realistic environment.”

Solar Probe Plus is part of NASA's Living with a Star program, designed to understand aspects of the sun and Earth's space environment that affect life and society. The program is managed by NASA'S Goddard Space Flight Center in Greenbelt, Md., with oversight from NASA's

Science Mission Directorate's Heliophysics Division. The Johns Hopkins University Applied Physics Laboratory, in Laurel, Md., manages a mission team that includes the University of California Berkeley, Southwest Research Institute, Smithsonian Astrophysical Observatory and the Naval Research Laboratory. APL will also build and operate the [Solar Probe Plus](#) spacecraft.

More information: For more information on the mission, visit solarprobe.jhuapl.edu

Provided by Johns Hopkins University

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