Solar Orbiter blasts off to capture 1st look at sun's poles

February 10 2020, by Marcia Dunn

In this photo provided by NASA, United Launch Alliance's Atlas V rocket, lifts off from Launch Complex 41 at Cape Canaveral Air Force Station in in Cape Canaveral, Fla., Sunday, Feb. 9, 2020. European Space Agency and NASA's Solar Orbiter rocketed into space Sunday night on an unprecedented mission to capture the first pictures of the sun's elusive poles. (Jared Frankle/NASA via AP)

Europe and NASA's Solar Orbiter rocketed into space Sunday night on an unprecedented mission to capture the first pictures of the sun's elusive poles.

"We're on the way to the sun. Go Solar Orbiter!" said Cesar Garcia Marirrodriga, project manager for the European Space Agency. "It's a fantastic moment ... it's like, well, we're unstoppable."

The $1.5 billion spacecraft will join NASA's Parker Solar Probe, launched 1 1/2 years ago, in coming perilously close to the sun to unveil its secrets.

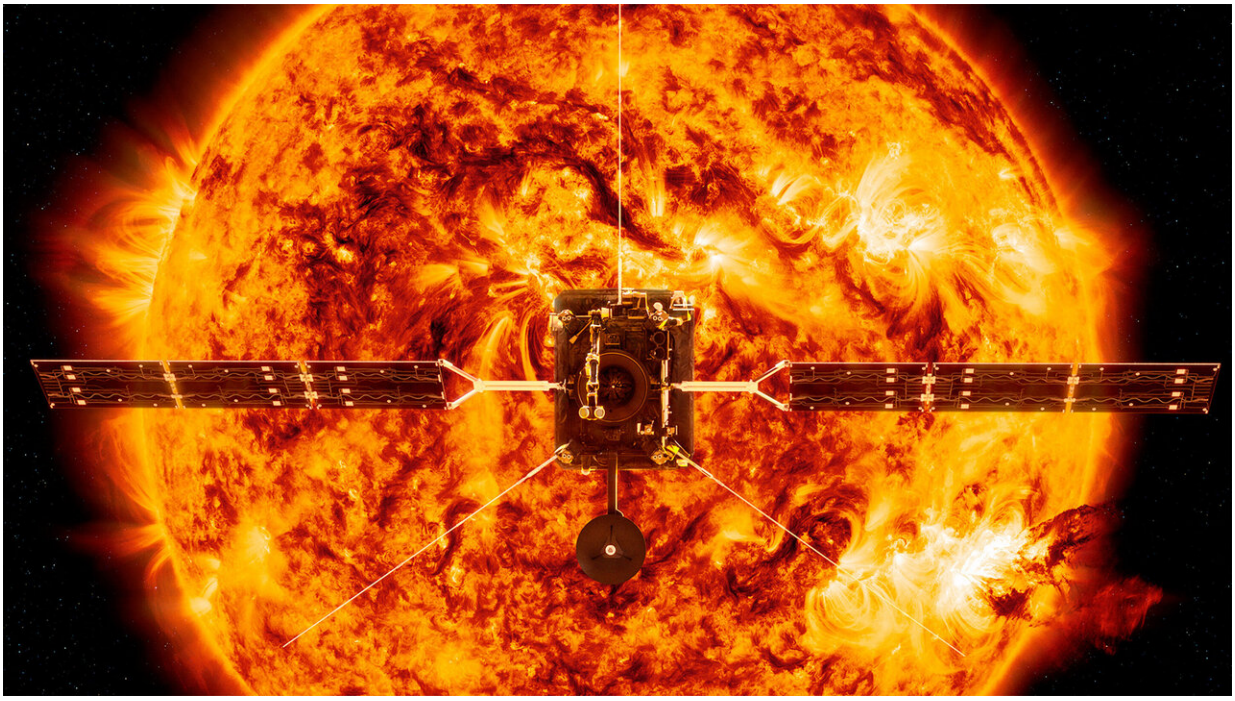
While Solar Orbiter won't venture close enough to penetrate the sun's corona, or crown-like outer atmosphere, like Parker, it will maneuver into a unique out-of-plane orbit that will take it over both poles, never photographed before. Together with powerful ground observatories, the sun-staring space duo will be like an orchestra, according to Gunther Hasinger, the European Space Agency's science director.

"Every instrument plays a different tune, but together they play the symphony of the sun," Hasinger said.

Solar Orbiter was made in Europe, along with nine science instruments. NASA provided the 10th instrument and arranged the late-night launch from Cape Canaveral.

Nearly 1,000 scientists and engineers from across Europe gathered with their U.S. colleagues under a full moon as United Launch Alliance's Atlas V rocket blasted off, illuminating the sky for miles around. Crowds also jammed nearby roads and beaches.

The rocket was visible for four full minutes after liftoff, a brilliant star piercing the night sky. Europe's project scientist Daniel Mueller was thrilled, calling it "picture perfect." His NASA counterpart, scientist Holly Gilbert, exclaimed, "One word: Wow."



This illustration made available by NASA depicts the Solar Orbiter satellite in front of the Sun. On Sunday, Feb. 9, 2020, NASA and the European Space Agency have planned to launch the spacecraft on a mission to the sun to get close-

up views of its polar regions. (ESA/ATG medialab, NASA/SDO/P. Testa (CfA) via AP)

NASA declared success 1 1/2 hours later, once the Solar Orbiter's solar wings were unfurled.

Solar Orbiter—a boxy 4,000-pound (1,800-kilogram) spacecraft with spindly instrument booms and antennas—will swing past Venus in December and again next year, and then past Earth, using the planets' gravity to alter its path. Full science operations will begin in late 2021, with the first close solar encounter in 2022 and more every six months.

At its closest approach, Solar Orbiter will come within 26 million miles (42 million kilometers) of the sun, well within the orbit of Mercury.

Parker Solar Probe, by contrast, has already passed within 11.6 million miles (18.6 million kilometers) of the sun, an all-time record, and is shooting for a slim gap of 4 million miles (6 million kilometers) by 2025. But it's flying nowhere near the poles. That's where Solar Orbiter will shine.

The sun's poles are pockmarked with dark, constantly shifting coronal holes. They're hubs for the sun's magnetic field, flipping polarity every 11 years.

Solar Orbiter's head-on views should finally yield a full 3-D view of the sun, 93 million miles (150 million kilometers) from our home planet.

"With Solar Observatory looking right down at the poles, we'll be able to see these huge coronal hole structures," said Nicola Fox, director of NASA's heliophysics division. "That's where all the fast solar wind

comes from ... It really is a completely different view."

To protect the sensitive instruments from the sun's blistering heat, engineers devised a heat shield with an outer black coating made of burned bone charcoal similar to what was used in prehistoric cave paintings. The 10-foot-by-8-foot (3-meter-by-2.4-meter heat shield is just 15 inches (38 centimeters) thick, and made of titanium foil with gaps in between to shed heat. It can withstand temperatures up to nearly 1,000 degrees Fahrenheit (530 degrees Celsius).

In this wide angle and long exposure shot, United Launch Alliance's Atlas V rocket, lifts off from Launch Complex 41 at Cape Canaveral Air Force Station in in Cape Canaveral, Fla., Sunday night, Feb. 9, 2020. Europe and NASA's Solar Orbiter rocketed into space Sunday night on an unprecedented mission to capture the first pictures of the sun's elusive poles. (Malcolm Denemark/Florida Today via AP)

Embedded in the heat shield are five peepholes of varying sizes that will stay open just long enough for the science instruments to take measurements in X-ray, ultraviolet, visible and other wavelengths.

The observations will shed light on other stars, providing clues as to the potential habitability of worlds in other solar systems.

Closer to home, the findings will help scientists better predict space weather, which can disrupt communications.

"We need to know how the sun affects the local environment here on Earth, and also Mars and the moon when we move there," said Ian Walters, project manager for Airbus Defence and Space, which designed and built the spacecraft. "We've been lucky so far the last 150 years," since a colossal solar storm last hit. "We need to predict that. We just can't wait for it to happen."

The U.S.-European Ulysses spacecraft, launched in 1990, flew over the sun's poles, but from farther afield and with no cameras on board. It's been silent for more than a decade.

Europe and NASA's Soho spacecraft, launched in 1995, is still sending

back valuable solar data.

Altogether, more than a dozen spacecraft have focused on the sun over the past 30 years. It took until now, however, for technology to allow elaborate spacecraft like Parker and Solar Orbiter to get close without being fried.

Fox considers it "a golden age" for solar physics.

"So much science still yet to do," she said, "and definitely a great time to be a heliophysicist."