A year after launch, the U.S. government's most unlikely space weather mission is ready for action

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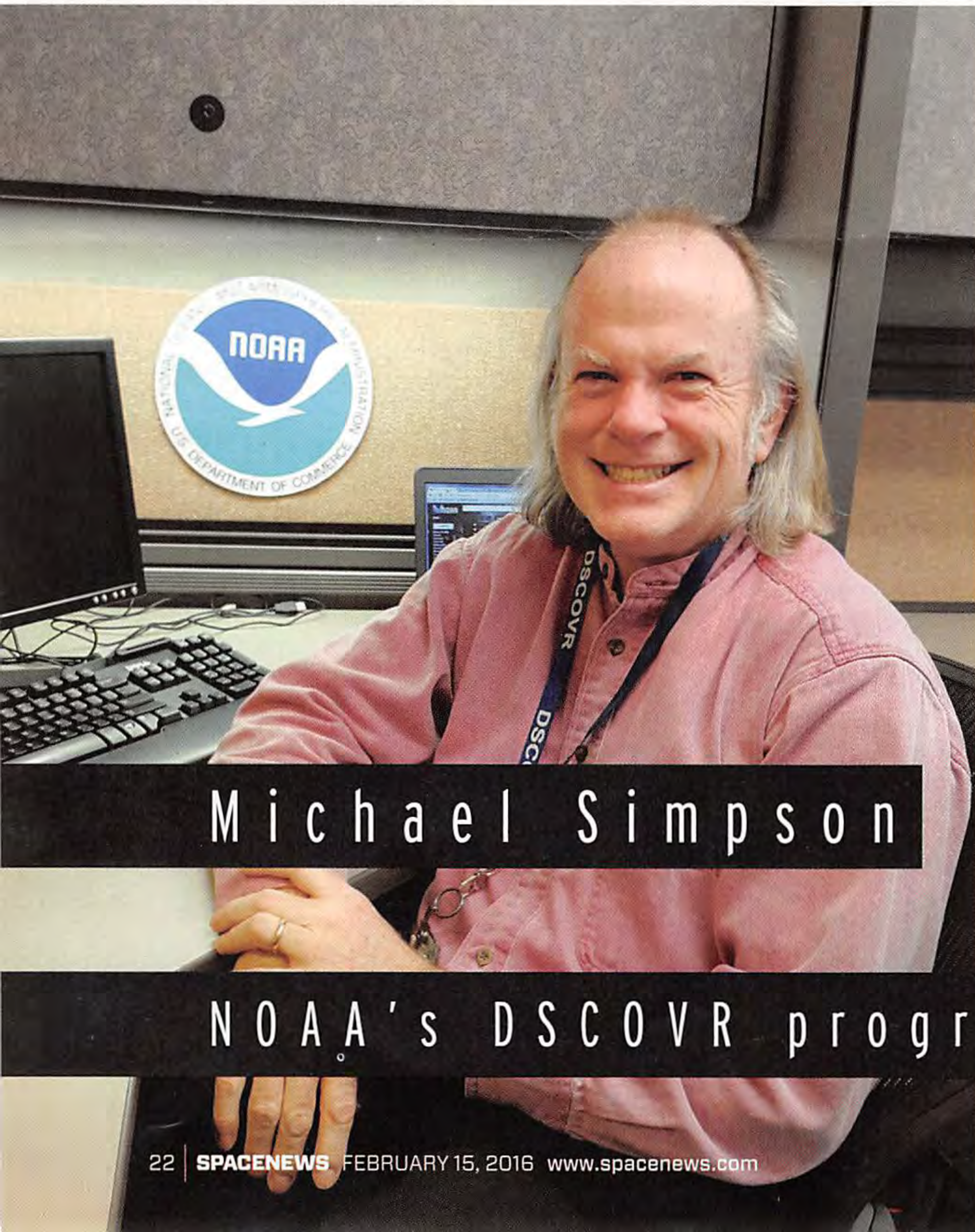
Saying DISCOVR traveled an unlikely path into orbit is an understatement. The satellite, conceived in 1990s as Triana — a NASA Earth observation mission proposed by then-U.S. Vice President Al Gore — was stored for nearly a decade at NASA's Goddard Space Flight Center before being resurrected as DSCOVR, a NOAA space weather mission. On Feb. 11, 2015, a SpaceX Falcon 9 rocket sent DSCOVR on the first stage of its journey to Earth-sun Lagrange point 1, about 1.5 million kilometers from Earth.

Since then, DSCOVR has experienced problems, including "more frequent anomalies than anticipated … when the mission was initiated," according to NOAA's 2017 budget request sent to Congress Feb. 9. With many of those problems resolved, DSCOVR will soon start to feed its observations of solar wind activity into the National Weather Service's Space Weather Prediction Center, which provides alerts and warnings of solar activity that could disrupt communications and damage power grids. *SpaceNews* discussed the mission with Michael Simpson, NOAA's Deep Space Climate Observatory (DSCOVR) Program Manager for the National Oceanic and Atmospheric Administration's National Environmental Satellite, Data and Information Service. Simpson, a graduate of the Air Force Academy, spent more than a decade working on Air Force space and satellite programs before moving to NOAA in 1998.



Michael Simpson

NOAA's DSCOVR program manager

NOAA

Why is the DSCOVR mission important?

The Space Weather Prediction Center provides alerts and warnings that allow the power infrastructure industry, airlines and others to prepare for geomagnetic storms and atmospheric effects that could severely damage the power grid, transportation, communications to planes flying over the polar regions and other GPS-related operations. We have a source of that information now: NASA's Advanced Composition Explorer, but it was launched in 1997. It's showing its age. We needed something more reliable that could last further into the future. DSCOVR is filling that role and is going to give us higher cadence on a lot of measurements as well.

Do you see any signs of DSCOVR's age, since it was stored for about a decade?

From what we've seen there are no direct impacts attributable to the years in storage. The calibration of instruments took a little longer than we planned originally, but we are reaching the end of that tunnel. We will finalize the calibration and begin the full operational mission in the spring.

What has been challenging about this mission?

It was a challenge taking what was essentially designed to be a research spacecraft and turning into an operational solar weather focused mission that provides critical data to our nation and to global users. That whole thing has a lot of subsets. Doing higher reliability checks. Checking the parts that went into the spacecraft. Trying to ensure we did everything we could here on Earth before we get to orbit and can't work on it anymore. It was a challenge to make sure it was well-suited to being at Lagrange point 1 for a long time.

Extensive checking took place after you removed the spacecraft from storage?

That's right. NASA did subsystem checks on it. It went through environmental testing all over again. It did its full integration and test checkout. It went through additional checks as it was integrated on the launch vehicle. It was never integrated on the space shuttle, which was originally suppose to launch it.

NOAA's budget request refers to frequent anomalies. How you are addressing the problems?

Most satellites require corrections and adjustments as they transition to operations, and DSCOVR is no different. NOAA is managing DSCOVR and continuing to work to bring the satellite to full operational capacity, which we expect will meet the requirements for current and new space weather forecasts.

What have you accomplished since its launch?

We've traveled a million miles to L1. We've transitioned from the NASA development, launch and checkout of the spacecraft and instruments to NOAA operations.

On the popular side, what gets so much press — and even tweets by the president — are the images of Earth and the lunar transit. That was the original intent of DSCOVR when it was first imagined as Triana: to look back at Earth and see things from a new perspective.

How long did it take DSCOVR to reach Lagrange point 1?

About 117 days. As it was on its way out there, the NASA engineering team did the commissioning of the spacecraft and the instruments.

What's ahead for DSCOVR?

We are pretty much wrapping up the commissioning phase and getting ready for the data operations phase. It's on a five-year mission.

What instruments does DSCOVR carry?

The Plasma-Magnetometer is the instrument NOAA considers primary and the reason we wanted to get DSCOVR up there. It measures proton velocities and the magnetic field at Lagrange point 1. The secondary mission sensors are NASA Earth sensors. The Earth Polychromatic Imaging Camera looks back at Earth and studies various science aspects: the ozone, aerosol levels, cloud dynamics, and properties of land and vegetation. Also looking back at Earth is the National Institute of Standards & Technology's Advanced Radiometer. It studies Earth's radiation budget, how much radiation is reflected back off the Earth. That is a key component to a lot of climate studies. There's also an electrostatic analyzer to measure the velocity and characteristics of electrons.

Why is the Plasma-Magnetometer important to NOAA?

Its high temporal resolution will lead to better understanding and modeling of solar activity forecasts and warnings. Rather than once every minutes, we get data back every few seconds.

Does DSCOVR use the same instruments as Triana would have?

Yes. But the magnetometer is in a different place.

Why is that?

There is about a four-meter boom that sticks out from the spacecraft. When the space weather mission became primary, we determined that we would have to move the magnetometer out to the end of the boom in order to maintain magnetic field observations at the level we needed without interference from the spacecraft's own magnetic field. There were some modifications made but essentially the same sensors are on it as were on it in the very beginning. **SN**