From Submarine to Mars Explorer, Discovery is this Navy Veteran's Mission

NASA's Perseverance Mars rover looks back toward its tracks on July 1, 2021 (the 130th sol, or Martian day, of its mission), after driving autonomously 358 feet (109 meters) – its longest autonomous drive to date. Taken by one of the rover's navigation cameras, the image has been processed to enhance the contrast. *NASA / JPL-CALTECH*

When the Perseverance rover landed on Mars on Feb. 18, cheers and applause filled mission control at NASA's Jet Propulsion Laboratory in Pasadena, California. In the crowd celebrating was Matt Wallace, who as a young naval submarine officer plied the depths of the seas before journeying into a long career exploring space and the vast unknowns of the Red Planet.

Wallace had faced similar stress the day Perseverance was launched atop a United Launch Alliance Atlas Rocket V that blasted off from Cape Canaveral, Florida, on July 30, 2020. As the Mars 2020 deputy project manager and then project manager, he helped guide the rover's mission to further explore Mars. He knew the planet well, starting as a power systems engineer on the Mars Pathfinder Sojourner vehicle and later working on the Spirit, Opportunity and Curiosity rover missions.

But landing Perseverance was just as exciting and nerve wracking.

"That's the thing you worry the most about. It's so complex, and Mars always throws a surprise at you," he said. "It was a big moment for everybody. Having been in this program as long as anybody, it was a particularly proud moment for me."

The project team includes 2,000 people in Pasadena at JPL, a

research and development center funded by NASA and managed by Caltech and more than 1,000 contractors around the country. “It’s been exciting and gratifying, both for me and for the team to understand that what they do is important,” Wallace said, adding, “I’m very, very proud.”

The team includes about 20 military veterans. “They really come to the table with a lot of great skills and great focus,” he said. “They tend to fit in very well. A lot of what we do requires teamwork.”

Wallace is particularly heartened by the broad public support and global interest in the Mars mission.

“The level of public excitement is off the charts,” he said, compared to Sojourner, the first to land and capture images of Mars’ dry, rock-strewn red landscape. “I think people are coming out of this year of COVID, and they’re looking for something that everyone can cheer for.” They include his former academy classmates.

“I heard from every single one of my 19th Company classmates,” Wallace, a 1984 graduate of the U.S. Naval Academy, said with a chuckle. “It had been on the news here and there, and people caught that.” He also appeared in a May 2020 CBS “60 Minutes” segment about the Mars launch and in the academy’s magazine.

Wallace, left, making lieutentant junior grade on the USS Albuquerque. *MATT WALLACE*

Naval Interests

Wallace was just a toddler when the first U.S. attempts to reach Mars succeeded when the spacecraft Mariner 4 took grainy photographs of craters on its surface. As a young boy, he watched the televised Apollo missions to the moon and read books by Ray Bradbury, whose collection of science fiction writings includes “The Martian Chronicles” series about Mars and Martian life.

His father served in the U.S. Air Force, and while growing up around the Washington, D.C., area, Wallace listened to stories about the military, including one about a successful submerged trek under the North Pole by the nuclear-powered submarine USS Nautilus (SSN-571). “It intrigued me,” he recalled, and considerations about military service led to the Naval Academy.

“I just kind of fit into the Navy’s nuclear power program,” he said. At the academy, he got involved in telerobotics, which furthered his interest in space and is key to NASA’s space programs, including Mars.

Wallace graduated with a degree in systems engineering and, after initial training, reported to the Los Angeles-class attack submarine USS Albuquerque (SSN 706) at Naval Submarine Base New London, Connecticut.

The nuclear-powered submarine was relatively new, having commissioned into the fleet in 1983. But it was the Cold War, and the crew and boat stayed busy training and operating at sea. “It didn’t feel like training a lot of the time,” he said. “It felt like preparation. We had a very high op tempo … 75% op tempo.”

Still, he said, “I loved it. I really enjoyed it. I was single, and I could spend 75% of my time at sea and one of three days on ship when we were in port.”

Wallace was drawn to the boat’s engineering and mechanics. “The submarine is a very complex system,” he said, “and you have to learn all the engineering and reactor systems and qualify” in areas including weapons, communications, navigation and sensors. “I really enjoyed that multidiscipline.”

He learned about leadership, starting off with a small radar team, and the need for people with technical expertise who can operate well under pressure and as a team. “You absolutely

have to figure out how to stay calm [and] make good decisions when everything is falling apart," he said.

It also taught him how to work with a diversity of people. "Your crew comes from all different backgrounds across the country," he said. "I had to understand that really quickly as a JO [junior officer] on a submarine and figure out how to make that connection.

"That part of my career was so informative and so important to me," he said of his five years in the Navy, which provided him "a lot of skills that I still use today."

From Sub to Space

Wallace received a master's degree in electrical engineering from California Institute of Technology in Pasadena and was attracted to the challenge of space missions that demand people skilled in problem-solving, innovation and out-of-the-box thinking, so he landed work at JPL. He joined engineers and scientists tackling the problems and challenges of space flight to Mars and found similarities from his time undersea.

"The ocean is not always a friendly environment. There's danger lurking in the ocean, especially when you are training to be in a highly unsafe environment," he said. "Space is very much the same," with dangers from radiation, cold temperatures, dust and loss of communications, and "they both require very highly reliable engineering systems."

After Sojourner, Wallace led the assembly and test team for the twin Mars rovers Spirit and Opportunity missions that landed on Mars in 2004, and was a flight system manager for the 2012 Curiosity mission. Much like the military, the Mars project "feels like another way to serve," he said. "It's something bigger than just doing the job, to be doing something with a lasting influence … for the future. And that's what exploration is about. It's about learning things you don't know.

“It’s a hard business,’ he added. “It’s a very challenging domain to work in, like the military. This is not a 9-to-5 job. There is no textbook you can get to tell you know to land on Mars.”

Ancient Life

Discovery and science – specifically astrobiology – are at the heart of the Mars mission to search for ancient microbial life that may have existed 3 billion years ago. “I was intrigued by the challenge … and the notion of looking for ancient life on Mars,” Wallace said. “At first, it seemed like a very unlikely technical rationale for going to the planet.”

But Curiosity found evidence of liquid water on Mars, with a neutral pH pointing to a once-habitable environment. “We are very seriously looking for evidence that life evolved on Mars at the same time that life was evolving on Earth. To me, that is just such a fundamental, transformational, scientific conclusion to learn that life could have evolved somewhere other than Earth.”

Perseverance landed in the Jezero Crater, which NASA scientists think was once a river delta, for a planned two-year exploration. With the autonomous helicopter Ingenuity, the rover on June 9 began its scientific work exploring and collecting dust, dirt and rocks that might contain microbes. Those samples, placed into 43 titanium tubes, are the reason for the next big mission to bring them to Earth for analysis and research.

NASA and the European Space Agency are working on that return mission, launching a spacecraft to Mars in 2026 at the earliest. “There’s an interesting crossover coming up. In order to get the samples off the surface of Mars, we have to essentially launch a small rocket into orbit, and it looks a lot like a surface-to-air missile,” Wallace said. For the development of that rocket, already underway, “we’ve been

talking about which aspects of the industrial community and the military community could help with that.”

Matt Wallace, deputy project manager, NASA’s Jet Propulsion Laboratory, participates in a Mars 2020 post-launch news conference at NASA’s Kennedy Space Center in Florida on July 30, 2020. *NASA / JPL-CALTECH*

New Posting

On June 7, Wallace ended his tour as Mars 2020 project manager and became JPL’s deputy director for planetary science.

“From Sojourner to Spirit and Opportunity to Curiosity to Perseverance, Matt has played key roles in the design, construction and operations of every Mars rover NASA has ever built,” Jennifer Trosper, the new project manager, said in a June 9 NASA news article. “And while the project is losing a great leader and trusted friend, we know Matt will continue making great things happen for the planetary science community.”

Wallace is particularly excited about one mission, the Europa Clipper, an orbital spacecraft under development that will travel to Jupiter and study its mysterious, icy moon to look for signs of life. Clipper, expected to launch in 2024, could help identify ice and water, according to NASA. It’s no easy mission as the planet’s high radiation levels will require armored equipment and systems.

Another mission is the August 2022 launch of a spacecraft to the asteroid Psyche in the belt between Mars and Jupiter in the hope of new insights into how Earth and other planets formed. It’s expected to begin circling the asteroid and begin sending imagery and scientific data sometime in 2026.

“I’m looking forward to it,” Wallace said of his new role. “There’s a lot of great staff in the planetary sciences directorate … and a lot of research and development.”