Mary Cooper was support staff for Denna Lambert for the SonicCloud/ Sony Hearing Loss experiment prototype on the December flight in Houston. She is getting her Masters in Aerospace Engineering and Computer Science from Stanford. She is a below-the-knee amputee and a champion athlete. © Zero-G photographer Tasha Dixon

Mission Possible

The Sky's the Limit for Disability Inclusion

BY LARRY GUTERMAN

On December 15, 2022, 14 disability ambassadors from around the world participated in a life-changing event—they boarded a specially outfitted, zero-gravity flight that enabled them to float weightlessly, while performing important in-flight accessibility experiments that set the stage for potential future space travel. The organization that launched this mission, AstroAccess, is dedicated to making space accessible to people with disabilities.

The Team

The impressive array of ambassadors on the flight included engineers, scientists, students and corporate leaders who are blind/low vision, deaf, wear prosthetic limbs, or have other disabilities. Their one common trait—they haven't let their disabilities stand in the way of their dreams. Among these intrepid adventurers were:

K. Renee Horton, Ph.D., who will be the keynote speaker at the Hearing Loss Association of America (HLAA) 2023 Convention in June and has worked as a space launch engineer at the National Aeronautics and Space Administration (NASA) for 12 years. Diagnosed with hearing loss at age 17 while serving in the U.S. Air Force, she had dreamed of becoming an astronaut, but shifted to engineering and physics following her diagnosis.

Victoria Garcia, an engineer who leads a team of 20 at NASA and is responsible for systems integration for the upcoming manned missions to the Moon; she was diagnosed with profound hearing loss at birth and now wears a cochlear implant (CI).

Sheila Xu, who is deaf, graduated from the Massachusetts Institute of Technology (MIT) and is now working on a combined graduate degree at the Harvard Kennedy School/ Wharton School of the University of Pennsylvania. She learned ASL in college, now wears a cochlear implant (CI) and dreams of starting a business that helps people with hearing loss and other disabilities.

Denna Lambert, lead for inclusion and accessibility at NASA's Innovation Partnerships Program, identifies as an individual with low vision. She pointed out that acute hearing was critical for her role and those with blindness in general, due to the enormous effort required to distinguish important auditory information from noise and enable successful navigation in physical surroundings.

Accessibility From the Start

AstroAccess is the brainchild of George Whitesides, former CEO of Virgin Galactic, Anna Voelker, co-founder and executive director of SciAccess, Inc., and H.R. Zucker, retired U.S. Air Force-rated aviator and Department of Defense space veteran. Among the mission's advisers and supporters are Cady Coleman, NASA astronaut (retired), who flew two space shuttle missions and spent six months on the International Space Station, and Johann-Dietrich Worner, former director general of the European Space Agency (ESA).

The organization has already flown two zero-gravity flights, chartering the Zero-G company's specially equipped planes, and is in conversations with the handful of companies that are competing to build NASA's new International Space Station, with an emphasis on accessibility and inclusion.

The December flight took place at Ellington Airport, next to the Houston Spaceport and NASA's Johnson Space Center, home to U.S. spaceflight training. At 25,000 feet, the Zero-G plane began flying 18 parabolic arcs. During each arc, a period of weightlessness occurred for 20 seconds, allowing the crews to test space travel accessibility requirements in a realistic environment.

Putting Technology to the Test

The in-flight research experiments were based around four crew focuses, called Blind, Mobility, Deaf and Hard of Hearing. The Deaf crew performed experiments testing the efficacy of using American Sign Language (ASL) in zero gravity. The blind crew performed a tactile graphics experiment, while the mobility crew demonstrated boarding a launch seat and safely fastening the harness, as a precursor for suborbital space missions.

In addition, the crew members with low vision and hearing loss used SonicCloud's sound personalization software, which enables users to precisely customize the audio based on their individual hearing abilities. The software ran on a Windows tablet in combination with Sony headphones, which greatly reduced background noise during the flight. This configuration was developed to allow them to hear and clearly understand spoken instructions above the din of voices and 90 decibels of engine noise.

As the co-lead of this experiment, co-founder of SonicCloud and someone with severe to profound hearing loss, I was thrilled to be part of an initiative demonstrating that with innovative technology and support, people with disabilities can lead and contribute at the highest levels of human endeavor. Co-lead and digital accessibility engineer Theo Shomsky pointed out that advances in space are driving technological innovation for the good of humanity on Earth.

This Actually IS Rocket Science

Whitesides recounted that he had wanted to become an astronaut as a child—he loved drawing pictures of Saturn rockets—but realized that his "terrible eyesight" would disqualify him. Following graduate school, Whitesides worked for the co-founder and CEO of Orbital Sciences, David Thompson, and quickly climbed the space career ladder, eventually becoming chief of staff of NASA at the White House during the Obama administration, where the recurring debate centered around ways NASA could best collaborate with the private sector.

Below: Entire AstroAccess Team © Raquel Natalicchio

Above: Dwayne Fernandes, an Australian entrepreneur, maneuvers in zero gravity to investigate navigation techniques for future space vehicles and space stations onboard AstroAccess' disabled research parabolic flight conducted on December 15, 2022 at Ellington Field in Houston, Texas. Flight doctor Sheyna Gifford in background. © Zero-G photographer Tasha Dixon

George Whitesides, former CEO of Virgin Galactic, is one of the three co-founders of AstroAccess.

John Kemp, a renowned disability advocate and a co-founder of the American Association of People with Disabilities (AAPD), floats with four prosthetic limbs outreached. He holds his new book, Disability Friendly: How to Move from Clueless to Inclusive. *© Zero-G photographer Tasha Dixon*

It became clear that NASA would likely never be in a position to fund another moonshot without the support of commercial participation. The decision was made to scrap the space shuttle program and engage in creative partnerships that led to deals with SpaceX, Boeing, Virgin Galactic and others, with the goal of jump-starting the next generation of space travel. The strategy bore fruit: NASA is currently preparing its first manned moonshot in more than 50 years, while SpaceX has its sights set on Mars and multiple companies are vying to build a new space station—in which AstroAccess hopes to play a role.

Shooting For the Stars

Whitesides had been thinking for years about doing something for people with disabilities in space—his uncle, now in his 70s, has used a wheelchair since an accident in his 20s left him with a spinal cord injury. After stepping back from Virgin Galactic, he had time to think about philanthropy and met Zucker and Voelker, who was then a student in astronomy and astrophysics. As all three were thinking along similar lines, they began collaborating, with the knowledge that parabolic flights—those reproducing zero-gravity conditions—were possible. George credits Anna with "opening the aperture to a diversity of disability" beyond mobility issues to include hearing loss, blindness, neurodiversity and others; thus, the project was born.

When Whitesides, who is running for Congress in California in 2024, is asked about the future of accessibility in space, he responds that hopefully within the next two years, we'll be able to fly one or more people with a disability into space on a suborbital flight and ultimately, an orbital flight. "And that's people staying in space for days, maybe even weeks or months," he emphasizes.

Whitesides adds, "I think that this is totally doable … We only leave or explore off Earth once. So how we leave is really important, because we can embed our identity into space … and into our future. If you drop a rock into a still lake, you see echoes that reverberate across that lake, that galaxy. If we can embed into that expanding wave a sense of universal design accessibility that includes all of humanity, that's exciting. And if AstroAccess can contribute a little bit to that process, then that's a worthy thing to do." HL

Larry Guterman is a feature film director (Cats and Dogs *for Warner Bros.,* Antz *for Dreamworks, as director of sequences*)*, who also has hearing loss. He is a member of the HLAA board of directors and is co-founder of SonicCloud, a technology company dedicated to personalizing sound on phones and computers for people who have hearing loss.*

Below: Michi Benthaus (center) is pursuing a Masters in Aerospace Engineering with a focus on space and astrophysics at the Technical University of Munich. She is a sports enthusiast who loves wheelchair tennis and go-karting. Next to her as her support staff is retired NASA astronaut Cady Coleman, who is also an adviser to AstroAccess. © Zero-G photographer Tasha Dixon

Below: Ambassador Victoria Garcia (center), who has hearing loss, listens to flight instructions using the hearing assistive technology prototype consisting of Sony headphones and SonicCloud sound personalization experimental software. © Zero-G photographer Tasha Dixon

Eric Ingram, a returning flyer from AstroAccess' inaugural 2021 mission, practices getting in and out of a 5-point harness attached to a simulated space capsule seat. Eric and his fellow crew members demonstrated that individuals with mobility disabilities can safely and independently get into and out of a suborbital spaceflight seat. He is joined by astronaut and aerospace executive Sirisha Bandla.
© Zero-G photographer Tasha Dixon