

SPECIAL DOUBLE ISSUE  
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ADVENTURES  
IN THE AIR

# AIR & SPACE

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# Spaceflight

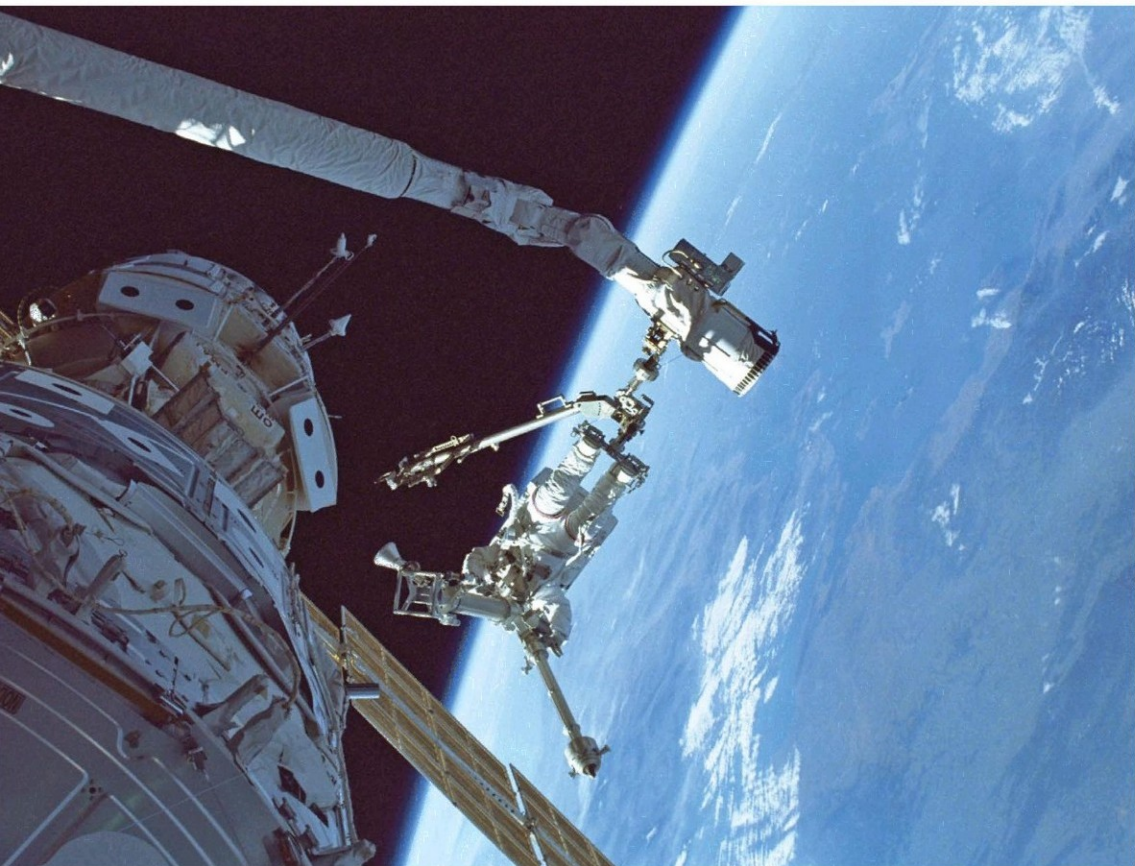
AN ASTRONAUT ADJUSTS TO HIS ENVIRONMENT.

by Dan Barry

↓ Almost 200 miles up, on STS-96, Tamara Jernigan installs a crane on the ISS. Dan Barry assisted on the EVA, a task less fluid than working inside.

ON MY FIRST SHUTTLE FLIGHT, I learned to float. On my second, inside the space station, I learned to fly. For three days my job was to move bags of equipment from the Spacehab laboratory module at the back of *Discovery* to the Zarya module at the end of the station. In those three days I learned a brand new sport—flying. It is magical. The only difference between the movies

and real life is that you can't change direction in midflight. I learned how to push just right so that I flew without tumbling and without crashing. I learned to carom off walls to move around an obstacle. I learned to compensate for a heavy bag I was carrying. I arranged trains of multiple bags, flying in formation, with me as the shepherd. It was exhilaration beyond imagination. ▣



NASA



# Release Mechanism

JOY RIDE IN A SPECIALLY MODIFIED 727.

by Patricia Trenner

*At \$6,700 plus tax, the series of 15 parabolas flown by Zero G Corporation's Boeing 727 is the most expensive roller coaster on, er, above Earth. Air & Space magazine's intrepid reporter went along in 2009.*

\_\_\_\_\_ AT 24,000 FEET OVER THE ATLANTIC, east of Long Island, aboard G-Force One, Boeing 727-200 (at the time, the only 727 spiffed up with winglets). Thirty souls on board.

"First parabola. Mars gravity, one-third of Earth's gravity. Try some push-ups."

Oh, piffle. This is nothing.

"Second parabola. Lunar gravity, one-sixth of Earth's gravity. Try gentle bounces on your knees."

Eh.

"First zero-G parabola. When I say 'coming down,' get your feet on the floor and lie down."

Jesus Chr—What is THIS? Grab the rope! Hold on!

"Coming down."

Dive for floor. Don't move head. Stare at spot on ceiling. Breathe. Breathe.

"Second zero-G."

EEK! Drifting up. Don't flail! Be graceful. Float across fuselage. Look out, midair, midair! "Sorry!"

"Coming down."

WHAM! Bodies keel over like bowling pins.

"Next zero-G."

Whееее! Look, it's raining M&Ms. An orb of water wobbles by. Someone gobbles it up. Laughter. Squeals. Shrieks.

"Coming down."

Uh-oh. Pinned against ceiling. Not good. Grab the rope. GRAB THE ROPE! WHOMP!

"Next zero-G."

Why am I not swanning around, serene and gymnastic, like the women in the promo video?

"Coming down."

Am I scared? Is this fun?

"Next zero-G."

Oh! Oh! I get it! I GET IT! Easy...easy. Sweep arms back. Swan dive. Yes! Bank left. Don't hit the floor! WHEEEEEEE!

"Next zero-G."

Hold on to the rope. Somersault. Cartwheel. Back flip. WOO-HOO!

"Coming down."

Ooh. Sick sacks are out. Some people are not at all happy. Don't stare.

"Last zero-G. Make it last!"

Nooooo! Not when I'm just getting the hang of it! Wow, this is a LONG one. Spin. Tumble. Cartwheel.

"Coming down. Okay, everybody sit up against the wall."

Just about everyone is as limp as a deflated balloon. Man, I could use a cigarette. ■

↑ Thanks to Zero G Corporation, hundreds of people who have never been to space have experienced weightlessness, if only for a few moments.



Håvard Fjær Grip

## A Helicopter Hovers on Mars

*Håvard Grip led the development of the flight control system for Ingenuity, the robotic helicopter that since April has been achieving flights of increasingly longer distances over the Red Planet's desolate terrain. Grip is Ingenuity's chief pilot.*

↑ *Ingenuity's team celebrates the news that the helicopter completed its first flight on April 19. Håvard Grip is in the foreground.*

**IN THE EARLY HOURS OF APRIL 19, 2021,** I sat in a brightly lit room at NASA's Jet Propulsion Laboratory with a group of colleagues, all of us shifting nervously in our seats. The moment we had spent years preparing for had arrived. Would we make history? Or would our dreams end in a thousand pieces on the surface of a planet 150 million miles away?

Being a Martian helicopter pilot means many things that are familiar to every pilot. It means being an expert on the functioning and performance of your aircraft. It means understanding how it will respond to the tiniest gust or twitch of the controls. It means keeping track of your surroundings: the terrain, the weather, the atmospheric density, where the sun is positioned in the sky. It means carefully planning the details of each flight: where to go, how high and how fast to fly, and how aggressively to maneuver.

But flying a helicopter on Mars also means something different. Those minute and precise adjustments of the controls—they are not something you're doing in the moment. They are something you did in the past. Over seven years prior to that day, I led the aerodynamic analysis and the development of *Ingenuity's* flight control system, writing thousands of lines of code dictating exactly how the helicopter should react to those unexpected gusts.

So on that April morning, all I could do was wait and hope that all those painstakingly written lines of code would do the right thing. Would *Ingenuity* hover majestically over the Martian surface? Or would it be overpowered by the Martian winds, lose track of where it was, or prematurely think it had landed?

When data finally arrived on my computer, showing that *Ingenuity* had confidently executed the exact maneuvers we had sent off just hours earlier, it was a feeling unlike any other—the feeling of a thousand nagging worries and imagined disaster scenarios instantly evaporating. And on behalf of the team, that morning I got to complete another task familiar to every pilot: creating the first logbook entry for an extraterrestrial helicopter flight.