



Phoenix rising:
NASTAR Center's stairway to space.

THE GREAT SPACE COASTER

CLIMB ABOARD NASTAR CENTER'S
FLIGHT SIMULATOR
FOR AN OUT-OF-THIS-WORLD EXPERIENCE.

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PHOTOGRAPHY BY KEN KOCHY

ON A DRIZZLY SUMMER
MORNING IN A LEAFY
PHILADELPHIA SUBURB, I COMMENCE MY
JOURNEY INTO SPACE. THE ADVENTURE
BEGINS AT THE NATIONAL AEROSPACE TRAINING
AND RESEARCH (NASTAR) CENTER, A 20,000-SQUARE-
FOOT COMPLEX OF PROSAIC TRAINING BAYS AND LOW-SLUNG
OFFICES IN SOUTHAMPTON, PENNSYLVANIA, WHERE ASTRONAUTS AND

fighter pilots get schooled on how to cope with the rigors of high-performance flight. At the moment, I'm inside the cockpit of a \$30 million centrifuge called Phoenix – the world's most sophisticated flight simulator – strapped into the pilot seat with a five-point safety harness, a contraption that keeps passengers anchored during maneuvers such as the one I'm about to attempt.

Greg Kennedy, NASTAR Center's director of education, sits at a panel in the mission control room. When he addresses me through speakers embedded in the backrest, it's as if his mouth is inches from my ear. "Today, Michael, we are flying out of Mojave," he announces in a soothing voice. "At 360,000 feet, you'll be able to see the California coastline." The centrifuge begins to spin with me perched at the end of its 25-foot-long rotating arm, gradually at first, and then, with a sudden jolt, it accelerates fast enough to generate more than 3.5 g's – or about three and a half times the force of Earth's gravity. This, my fellow students and I are told, is what it feels like to sit inside a spacecraft that zooms from zero to Mach 3 (roughly 2,300 miles per hour) in less than a minute.

The rollicking ride replicates the "flight profile" of Virgin Galactic's six-passenger *SpaceShipTwo*, which will launch intrepid tourists 60-plus miles high to the suborbital boundary. Here, those on board will get up to five minutes to frolic in zero gravity and relish the views before heading home – a free fall through the Earth's atmosphere followed by a gentle glide back to Spaceport America in New Mexico. Virgin founder Richard Branson has said he'll be on the inaugural flight, scheduled for later next year.

NASTAR Center, which had been primarily a training center for military and commercial aviators in addition to astronauts, is the first-ever FAA-approved facility for commercial spaceflight and space tourism training. It's open to anyone who'd like to sample the suborbital experience and is a worthwhile (and genuinely fun) thing to do whether or not you're considering a trip into space. The two-day course, which requires students to get clearance from an FAA-certified physician, includes classroom lectures and six sessions in the centrifuge.

"This is the closest simulation you can



Your brain on g's:
The centrifuge in action.

get on Earth before taking off on the Virgin flights," Brienna Henwood, NASTAR Center's director of space training and research, tells me. "By doing this training, you are going to enjoy your experience much more."

ROLLER COASTERS MAKE ME

nauseous. I'm acutely susceptible to seasickness. Even long drives can leave me queasy. Despite this, I'm not likely to feel ill on a suborbital flight. To explain why, Kennedy delves into physics and physiology. During our first classroom lecture, "Introduction to Acceleration," he points out that motion sickness (air, car, sea) is triggered when what we see isn't in sync with what we feel. The vestibular system – those tiny canals in our ears that regulate balance and spatial orientation – gets out of whack. But high-g maneuvers typically don't pitch vestibular canals to and fro erratically.

Rather, high g's are all about Newton's first law of motion, Kennedy says: "An object in motion will continue in motion un-

less an external force is acted upon it. During reentry your body wants to keep moving at 2,500 miles per hour. But then you encounter air – the atmosphere – and that will slow you down, fast." The rate at which you decelerate determines the g-forces. (For those aboard *SpaceShipTwo*, reentry will induce up to 6 g's.)

OK, enough science. "Let's see what this feels like in the centrifuge," declares Kennedy, who distributes navy blue one-piece flight suits to our class of five. Eduardo, 40, is a physicist at NASA's Johnson Space Center in Houston and a member of Astronauts for Hire, a temp agency of sorts for commercial spaceflight. MIT grad Andrzej (pronounced *An-jay*), 29, and Christy, 28, are married and work at Lockheed Martin in Denver doing mission control for robotic spacecraft, such as the Mars Reconnaissance Orbiter. Both Andrzej and Christy proclaim spaceflight as their lifelong dream and have applied to NASA's astronaut program. Then there's Andrew, a 46-year-old electrician from Calgary who



TRAINING



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TRAINING THEATER



Behind the scenes at mission control, and (middle) the class suited up for flight.

“Instead of getting light-headed, I feel as though somebody parked a Mini Cooper on my chest.”

has nothing to do with aerospace. “I got here by winning a season-long hockey shoot-out competition,” he tells us. “And now I’m thinking, ‘What the hell am I doing? Am I crazy?’”

That same question invades my mind soon after I volunteer to go for the first spin in Phoenix. Kennedy gets me situated in the cockpit module, which changes depending on the class (there’s an F-15 module for fighter pilots). “Things may get a little bit out of focus after you experience the g’s,” he informs me. “But don’t worry, your vision will return.”

Learning to handle intense g-forces is all about baby steps. We start out at 2.2 g’s for 20 seconds – enough that I have to perform the “anti-g straining maneuver” we covered in class. The technique, meant to stop

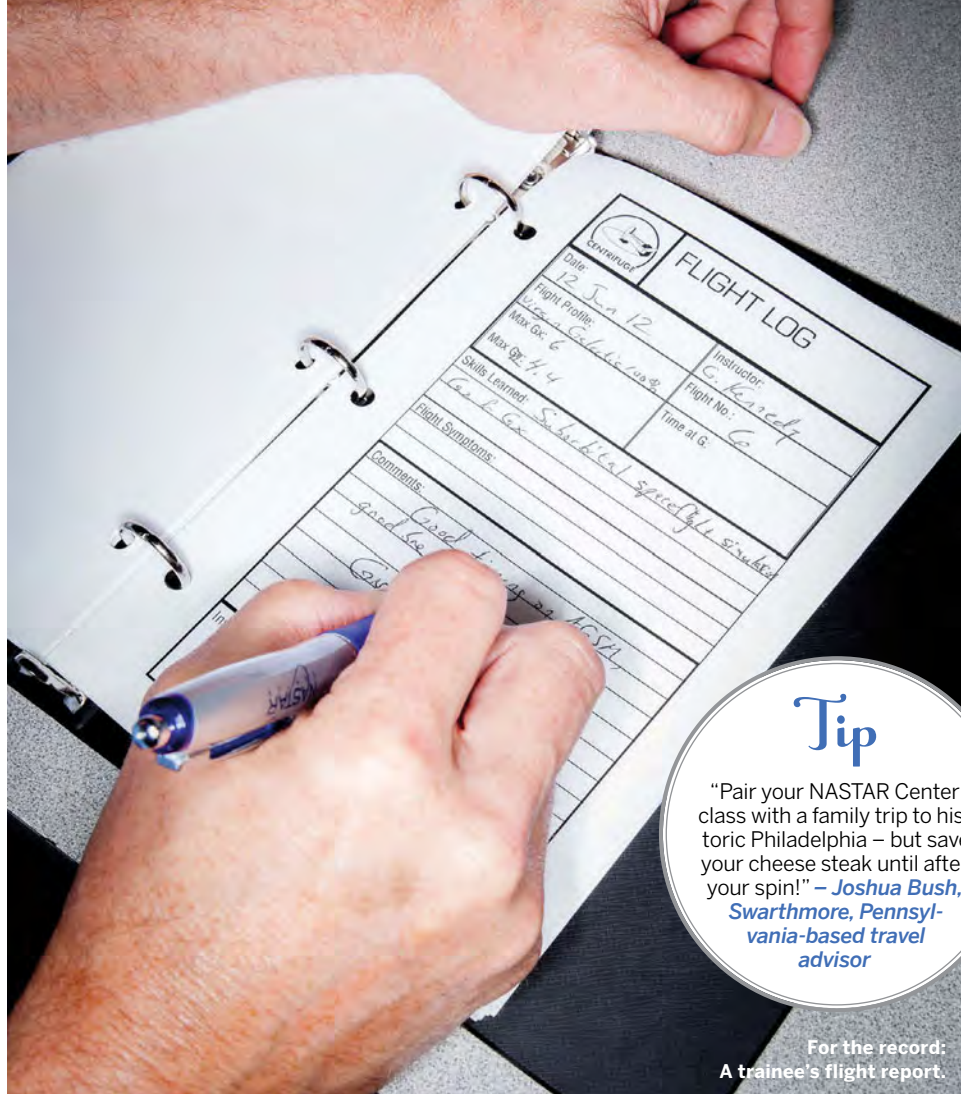
my blood from rushing south and triggering a blackout, entails clenching your butt cheeks, pushing your feet into the floor, and constraining your throat. (Apparently older trainees often handle g’s better; as we age, our arteries become less elastic, so our blood stays topside for longer.)

The next session brings 20 seconds at 3.5 g’s, equivalent to a Space Shuttle launch and what those on board *SpaceShipTwo* will experience after disengagement from the mother ship and ignition of its rocket motor. It’s significantly more challenging; I forget to maintain my straining maneuver for a split second and immediately get tunnel vision.

Eventually, we ramp up to 6 g’s, only this time the cockpit adjusts to a slightly different angle to mirror the rapid deceleration of reentering the atmosphere. Instead of

getting light-headed, I feel as though somebody parked a Mini Cooper on my chest. Surprisingly, none of the sessions inside Phoenix make me dizzy because there’s virtually no spinning sensation. It’s more akin to being shot out of a cannon. When space specialist Andrzej emerges from the centrifuge, he tells the group, “I imagined it would feel like when you put your foot down on the accelerator in your car. Oh, but no. It’s *waaaaaaay* beyond that.”

ON DAY TWO, WE PERFORM two longer centrifuge sessions that mimic suborbital flight profiles. Phoenix is probably the closest our class will ever get to *SpaceShipTwo*. But for those with seats already booked, the NASTAR Center course provides a realistic dress rehearsal, teaching



Tip

“Pair your NASTAR Center class with a family trip to historic Philadelphia – but save your cheese steak until after your spin!” – **Joshua Bush, Swarthmore, Pennsylvania-based travel advisor**

For the record:
A trainee's flight report.

its students that space travel is serious business. “This isn’t a commercial airliner; this is a rocket,” Henwood tells our class. “There is no flight attendant – it falls on you to be more fully trained. We want you to be able to recognize the noises, the vibrations, the sensations, and the forces. We want them to feel familiar, so you’ll be calm and comfortable and able to maximize your experience in space.”

I have to agree. A few trial runs inside Phoenix would make the *SpaceShipTwo* voyage infinitely more enjoyable. You might even consider taking the class *before* committing to a Virgin Galactic flight, because, well, 6 g’s isn’t for everyone. As Henwood, who urges training for anyone interested in spaceflight, explains, “We can give you this phenomenal, once-in-a-lifetime experience without ever leaving the ground.”

THE FINAL CENTRIFUGE FLIGHT re-creates an entire suborbital flight experience. The cockpit shakes. The rocket

roars through a high-fidelity sound system. A rear-mounted digital projector reproduces the view from the flight deck. Through simulated windows, I watch Earth shrink and the stars loom. At the apogee, the part where passengers will float in space, everything abruptly stops – no movement, no sound. After a couple of minutes, a prerecorded female voice comes over the intercom: “Reentry in five, four, three, two ...” *Whuuuuump!* Phoenix catapults from stasis to 6 g’s in a blink. The pressure compresses my rib cage. I gulp shallow, half breaths. And then it’s over. I’ve passed safely through the atmosphere and commenced the silent glide home.

Kennedy unlatches the cockpit door. “So, how do you feel?” he asks.

My heart is pounding, but exhilaratingly so. I desperately want to go again, but my classmates are eager for their turn. In the meantime, I can only hope Mr. Branson reads this: Sir, should you need a fearless reporter to document your suborbital sojourn, I’ll happily take the seat.

The Right Stuff

Your countdown to a star-studded adventure.

3. Bring a touch of history to your futuristic experience: **The Ritz-Carlton, Philadelphia** features 300 rooms in the heart of the city and a great place to celebrate your virtual astronaut wings. Eric Ripert’s 10 Arts Bistro and swank cocktail lounge. *Doubles from \$269, including breakfast daily and a \$100 dining credit.*

2. **NASTAR Center** offers civilian programs on everything from basic suborbital flights to advanced spaceflight to training for spacecraft payload specialists. If you’ve reserved a seat on Virgin Galactic’s *SpaceShipTwo* or are interested in space tourism, start here. *Two-day suborbital flight training from \$3,000.*

1. Virtuoso’s accredited space agents are the exclusive travel advisors for **Virgin Galactic** in North America. Ticketed passengers receive perks such as invites to Spaceport America and Virgin Group parties and events. *Virgin Galactic flights from \$200,000. VI.*

