A flight on the Weightless Wonder!

It all started about a year ago when I was contacted by a former student of mine who asked if my science class would be interested in helping her with a project. She was a student at Carnegie Mellon University and has worked with NASA at Johnson Space Center (JSC), as part of her college work. Her name is Kate Williams and she graduated from the Reading-Fleming Middle School in Flemington in 1992.

She had flown on a Zero-G experiment flight aboard the NASA KC-135 airplane (also known as the Vomit Comet and by its correct name the Weightless Wonder). The zero gravity is accomplished by having the plane fly "parabolas." Each flight consists of about 30 of these "curves" with the Zero-G time for each "curve" lasting about 25 to 30 seconds.

She asked my class to create an activity or an experiment that could be performed on her next flight.

Kate visited my class in January and showed the students various websites and discussed their ideas for an experiment. The class had come up with a few ideas and they discussed and tested their experiments in class. One experiment was chosen and was formally written-up using the "scientific method."

The problem to be solved: What effect does zero gravity have on a propeller driven aircraft? To find the answer, we will use a single propeller, model aircraft.

Testing my students' predictions in Zero-G

To my good fortune I was asked to fly on the Zero-G flight along with my students' experiment. I would join Kate and the rest of the Carnegie Mellon flight crew (Lydia Choy, Adrian Perez, Daniel Maynes-Aminzade) aboard the KC-135.

I assumed the role of guest "journalist" for the *Hunterdon Democrat*, a local paper, as my part of the flight crew. Besides the Carnegie Mellon team's experiments to be flown, we were to fly my students' activity as part of the NASA Outreach Program.

We would be testing to see if the students' predictions about how their experiment will behave differently in Zero-G compared with the behavior here on Earth in 1-G are correct.

Regardless of whether their predictions are correct or not, I knew this would prove to be a valuable real-life learning experience that will be remembered by all the students for years to come.

As luck would have it, we (the Carnegie Mellon team) were extremely fortunate to be at JSC for the welcome home conference for the Expedition 1 crew returning from Alpha 1, the International Space Station, as well as the STS #102 crew which brought the Expedition 1 crew back to Earth. Here we were just a few feet away from the crew that took humankind on its next step toward continuous human occupation of space. This new space adventure will hopefully allow humankind to gain the knowledge and technology needed to extend ourselves to human exploration of Mars.

Pre-flight training

Our pre-flight physiological training was preceded by five hours of classroom lectures and lots of note-taking. The purpose of this training was to familiarize personnel who are exposed to a lowered barometric pressure with the physiological stresses encountered and how to successfully overcome these stresses. Then we entered the Hyperbolic Chamber. This is where the participants are suited-up with oxygen masks and put into a chamber where the pressure can be lowered to approximate the atmospheric pressure and oxygen content of the atmosphere at an altitude of 25,000 feet. After breathing pure oxygen for 30 minutes, they begin to depressurize the chamber to simulate being 25,000 feet high; fortunately they don't also simulate the temperature at that altitude, which would be –55°F. Next we are instructed to remove our masks and perform a series of simple tasks. This is when Hypoxia sets in (a state of oxygen deficiency in the blood, tissues, and cells sufficient to cause an impairment of mental and body functions). In a matter of three to five minutes even the simplest tasks became frustratingly difficult, if not impossible. After bringing the chamber pressure back to that of sea level, it was all too clear the danger we would face if the cabin of our KC-135 became depressurized. After debriefing, and a written test you must pass to receive certification to fly, lightheaded and a little euphoric, we were done for the day.

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After teaching for two years in Hazlet, Richard Tormey became the eighth grade science teacher at the Reading-Fleming Middle School in Flemington in 1976. Throughout his teaching career, Tormey's interest in space has been evidenced in both his classroom and his life.

In 1985, Tormey applied to NASA as a candidate for the Teacher in Space Program. In 1990, he participated in Space Camp in Huntsville, Alabama and attended a manned launch in the former Soviet Union at the invitation of the Aerospace Education Association (AEA). He returned the next year with six students as part of the first AEA aerospace student exchange delegation. Tormey has since served as a host for Kazakstan students and educators who visited the United States.

Because of his level of experience, Tormey has presented at the N.J. Science Teachers Convention, an NJEA professional development conference, as well as in numerous other programs. He was chosen by the United States Space Foundation to be the host and facilitator of a NASA-funded in-service program entitled "Getting comfortable with teaching space."

Tormey has served on the National Aerospace Teachers Association Formation Committee and has met with the National Commission on Math and Science Testing at the invitation of Congressman Rush Holt.

But for Tormey, the highlight was participating on a NASA Zero-G experiment flight last year. "It was an incredible experience," said Tormey. "It exceeded all of my expectations."

For eighth-grade science teacher Richard Tormey, a ride on the Weightless Wonder was the highlight of his impressive list of space credentials. Thanks to a former student, he experienced what it would be like to move around in space, on the Moon, and on Mars.

Next came the TRR (Test Readiness Review). This is where each team of university members must present their experiments to be flown. Each experiment is carefully checked and scrutinized by a team of NASA staff members. If the experiments aren't deemed scientifically acceptable and completely safe, they do not pass muster and the university team is grounded and will not fly.

While all this was going on, the Carnegie Mellon team I was working with was hard at work making last minute adjustments to their activities to be flown. At the same time they were also busy testing preselected candidates with their VR (Virtual Reality) simulator that was designed to allow flight teams to practice simulated flights on the KC-135 as a tool to help future passengers to avoid the motion sickness often associated with this flight.

Get ready for lift-off!

After three days of preparation, my Zero-G flight day had arrived. After a preflight briefing with a NASA doctor who distributed motion sickness medication, we boarded the KC-135, buckled in, and we took off. Now the ride of a lifetime begins, and all the hours of preparation and anticipation will soon pay off. After a few minutes we were out over the waters of the Gulf of Mexico. We unbuckled from our seats at the rear of the plane and assumed positions throughout the mostly vacant cabin. After a warning from the ever-vigilant NASA crew on board, it began.

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My body began to drift upward off the flow of the plane in an almost surreal setting. This state of physical escape from gravity lasted an all too short 25 seconds and then the warning, coming out, feet down. This means you have about three seconds to get your feet pointing toward the floor because you are leaving the state of Zero-G and headed for 2-G's (imagine the feeling of weighing twice your weight) while the plane climbs toward another parabola, and after about 30 seconds, Zero-G again. This exciting and exhilarating experience was repeated 30 times. Each time I found myself becoming a little braver, and I began attempting some upside down maneuvers, Superman poses, and various spins and turns, all while defying Earth's gravity. I launched our toy airplane, and it flipped over, barrel-rolled, and floundered. The spinning propeller proved to be a destabilizing force in Zero-G.

This experience of a lifetime lasted an all too brief hour and a half and before we realized it we had completed 30 Zero-G's. But wait, one more surprise was yet to come. The pilot flew a "Lunar and a Martian." This is where they adjust the parabolic curve to simulate the feel of gravity on the Moon, one-sixth of that here on Earth (divide your body weight by six). Then, a Martian, about one third of that here on Earth (divide your body weight by three). How cool is that—not only did I get to experience what it's like to float around in Zero-G, but I also get to experience what it would be like to move around on both the Moon and on Mars. Way cool!

Richard Tormey