

Zero-G Experience

Makes Impression on Students, Professors

by Mark Smearcheck, B.S.E.E. '06

My EE495 Capstone Senior Design team and I experienced zero-gravity flight aboard the 43rd European Space Agency (ESA) Parabolic Flight Campaign in Bordeaux, France, this past spring. At the time we signed up for our projects, we didn't know we would be traveling—that was decided later on. Brian Kishpaugh, B.S.E.E. '06; Joe Trick III, B.S.E.E. '06; and our professors, Dr. Angie Bukley and Dr. Gilles Clement, also went on the trip.

The parabolic flights were used to perform experiments studying the human vestibular system, specifically the perception of optical illusions in zero-gravity. The vestibular system senses the position of the head and body in space, in relation to gravity and movement. Balance and eye movements are important human tasks correlated with this system. Investigation into the vestibular system's utilization of gravitational information helps us better understand the effects of human development and life in zero-gravity environments.

Dr. Clement, of the chemical engineering department, proposed the creation of an interactive experiment to test optical illusion strength in zero-gravity as a senior design project. A system was needed that would be capable of quantifying the illusion data obtained when, in zero gravity, test subjects adjust the size and orientation of illusions displayed on an LCD headset with use of a handheld controller. An LCD headset was chosen as the display device because of its ability to isolate the test subject's visual field from the surrounding environment. The system was also used in normal gravity to obtain control data for comparison.

Mark Smearcheck, B.S.E.E. '06, had a near out-of-body experience as a Russ College senior. He and two other students experienced weightlessness aboard an Airbus A300 as part of their senior design project—which also happened to be a European Space Agency experiment. Now a first-year master's student concentrating in avionics, Smearcheck gives his take on the trip.



Visiting Professor of Chemical Engineering Gilles Clement, Anna Lockerd of AnthroTronix, and current Russ College graduate student Mark Smearcheck, B.S.E.E. '06 (note Ohio University bear in the background at top right), give zero gravity a spin.

My team's primary objective was to develop software that would contain a database of optical illusions and enable manipulation of these illusions to a desired size or orientation along with calculating the deviation from the truth-value and the time required to complete these tasks. In addition to the creation of software, we were also required to create a handheld controller that interacted with the system to enable the illusion adjustment.

Visual Basic .NET 2003 was used to implement the optical illusion test software, and a modified, single-handed trackball mouse was used as the controller. The system was managed by a tablet laptop.

In all, we were able to run 90 experimental trials during three continuous days of flights aboard the Airbus A300 Zero-ZG plane, which is used by ESA to perform zero-gravity experimentation. During each parabola, we could experience approximately 20 seconds of zero-gravity. Weightlessness was like nothing I have ever felt before. It is amazing to be able to experience the same environment as an astronaut orbiting above the planet. I would love to be able to return to Bordeaux and continue more zero-gravity testing.

Not only did we get to experience zero gravity, but we were able to learn valuable engineering design procedures and skills, group dynamics, a new programming language, and even some neurophysiology. This project also enabled me to design something from the ground up. We began by simply generating requirements and followed the process through research, design, testing, and making use of our system. 🐻