UNIVERSITY OF SOUTHERN MAINE
School of Applied Science, Engineering, and Technology

Undergraduate Research: Gravity

A diverse group of Maine students, calling themselves the DIRIGO Flyers of the University of Maine System, carried their experiments into near-space aboard a plane that is often referred to as the "Vomit Comet." The nickname is typically associated with any airplane that briefly provides a weightless environment similar to what one would encounter in space flight. It is used to train astronauts and conduct research. Versions of the airplane are operated by the NASA Reduced Gravity Program at the Lyndon B. Johnson Space Center (JSC) in Houston, Texas.

A team of students headed by USM undergraduate John P. Wise, Jr., collaborated with established scientists at NASA in testing the hypothesis that normal cell function changes in microgravity and hypergravity. Such changes may make it possible for toxic chemicals to have a more damaging effect on cells and DNA under conditions of weightlessness, as encountered during space travel. As a control for the change in conditions, each experiment tested in flight will also be conducted simultaneously in one of Johnson Space Center's laboratory facilities on the ground.

Work on the project was divided between a ground crew and a flight crew to conduct the exposure and analysis segments of the project. The students were supervised by Dr. John Wise, Sr., a professor in Applied Medical Sciences and the Director of the Maine Center for Toxicology and Environmental Health, and Dr. Michael Mason, an assistant professor of Chemical and Biological Engineering at the University of Maine. The flight crew was composed of two students, John P. Wise, Jr. and Adam Courtemanche, from USM, and two students, Michael Browne and Benjamin Freedman, from the University of Maine. In addition to the faculty supervisors, the ground crew included James Wise, Sandra Wise, Nick Link, and Christy Gianios, Jr.

The results from these experiments will reveal possible differences in cellular uptake of chemicals, the amount of DNA damage induced by chemicals, and effects of exposure to microgravity and hypergravity on the ability of cells to repair damage. While providing an excellent educational opportunity for the team's students, the results will provide NASA with information necessary to assess effects of exposure to toxic chemicals while astronauts are in microgravity. The results of these experiments will contribute knowledge that can be used to protect the health of astronauts going on extended missions to the International Space Station, to the Moon, and, eventually, to Mars. In addition to documenting the extent to which exposure to hazardous materials can be tolerated in a reduced gravity environment, the project will help to establish exposure guidelines for space travelers. The results may also guide NASA engineers as they design future space equipment and stations, determining construction materials and methods, and protective steps that can be taken to protect space travelers from harmful exposures to toxic particles.

The project is funded by a grant from NASA's Microgravity University at the Johnson Space Center with matching funds committed by the Maine Space Grant Consortium.