

# DESIGNING SYSTEMS FOR REAL PEOPLE

BY LYDIA HINSHAW

Susan Vallance ('03) helped astronauts live and work more comfortably on the space station before she moved on to help design a new Navy destroyer.

Darren Wilson ('01) and Liz Wilson ('01) have collected data that will be used in designing future air traffic control towers, and now are working on computer displays for two Air Force planes that are used as platforms for ground surveillance and battle management.

Embry-Riddle human factors graduates like them go forth daily to find new and better ways for humans to work effectively in their environments and get along with their machines.

## Discipline's roots in World War II

Human factors psychology is a relatively new discipline, developed since World War II. Embry-Riddle's program, which began granting bachelor and master degrees in human factors and systems in 2000, has sent more than 100 graduates out to prevent man-machine misunderstandings from running expensively – or tragically – amok.

"After World War II, the military looked back and saw how systems were not made for people to use effectively," says HF department chair Fran Greene, who worked for the Air Force for a number of years before joining the university. "The military led the effort to combine engineering and psychology, and the military had the power to levy requirements on contractors: You have to build a system that's user friendly."

The result has been a continuing need

for engineers who understand how humans and machines work, and who can find ways to help them work together safely and efficiently.

As Greene points out, it's easier and less expensive to design a product or system right the first time than it is to retrofit it later or to deal with the lawsuits brought by parties injured as a result of poor designs.

## Need for expertise will grow

Edward Tenner, a consultant on technology and culture who has written two books on human factors — *Why Things Bite Back* and *Our Own Devices* — and who will speak at Embry-Riddle Jan. 24, believes the need for such expertise will only grow as technology advances.

"Human factors is a relatively young design discipline, but it has become more essential with each decade," he says. "Relatively small sums invested in prevention of accidents and injuries can save billions in health care costs. As nuclear power re-emerges as an energy option, the lesson of Three Mile Island remains that the design of controls can avert or amplify a disaster. And design that promotes ease of use can multiply productivity. Human factors is a rare discipline at the interface of the mind, the body, and the natural and constructed environment. I can't think of a technological field with greater opportunities and challenges."

Three Mile Island is every human factors engineer's inglorious example of a man-machine interface gone horribly wrong. Instruments available at the Pennsylvania nuclear power plant did not give operators the information they needed to deal properly with the 1979 accident, and the action they took, based on information they had, made things worse instead of better.

## From spacecraft to toothbrushes

A sharp human factors specialist might also have spotted the problem that cost NASA a \$125-million Mars orbiter in 1999. Ten months after launch, the orbiter got too close to Mars' atmosphere and presumably broke up and burned. Only then was it discovered that maneuvering instructions were scrambled because one engineering team had used English measurements and another had gone metric.

Human factors is often simplified to "ergonomics" by people trying to explain it. It involves everything from the design of a spacecraft to the curved-to-fit-your-hand shape of a modern toothbrush.

From the cell-phone that does so many things that you get lost in its menus to the wet mop you use in your kitchen. The latest generation of mops were, as a matter of fact, studied and tested extensively by a recent Embry-Riddle human factors class.

Human factors can be as simple as raising or lowering an office chair so a computer user will be more comfortable or as complicated as raising the floor of an airport tower so air traffic controllers can see what they need to see.

## Floor raised to fit ATCs

The Wilsons, HF masters graduates who met at Embry-Riddle and eventually married, studied towers at 25 airports when they were scientific and technical advisors for human factors for the Federal Aviation Administration.

Air traffic controllers come in all sizes, but two towers they evaluated were designed in such a way that shorter ATCs could not see over their consoles to the taxiways below, where they were supposed to help pilots avoid collisions.

"At Miami International, they wound up raising the floor 18 inches," Darren Wilson says. "At Washington National, they lowered the counters."

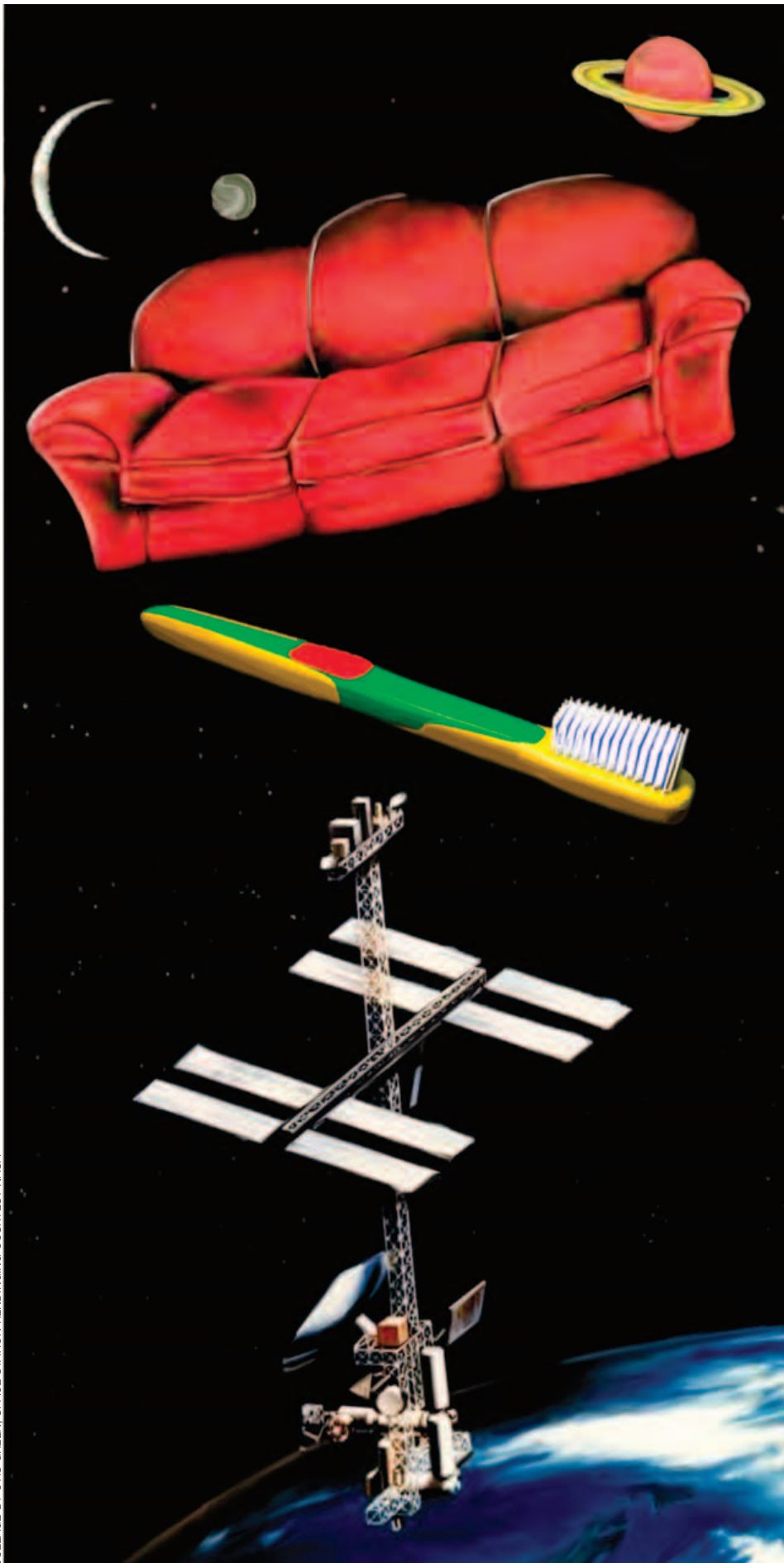
During their three years with the FAA, they also compiled data that will be used in the design of future computer displays for control towers.

Tired of their Washington, D.C., commutes, the Wilsons left the FAA last December and now work for Northrop-Grumman in Melbourne, Fla.

They soon will be joined by Vallance, another master-degree graduate whose first job was with NASA in Houston as part of the operational habitability team for the space station.

## Improving space station livability

"We were involved in crew debriefs, and we would take their direct comments and try to improve living conditions on the space station," Vallance says. "Anything that sounded like it would improve habitability we tried to help out with it."



COLLAGE BY OTIS GREEN; SPACE STATION RENDERING COURTESY NASA

After that, she went to work for Northrop Grumman in Washington, where she's been lead designer on the interface for damage control on the Navy's newest class of destroyers.

Her recent transfer to Northrop Grumman's Melbourne operation will complete a trifecta for her resume: spacecraft, ships and planes.

Embry-Riddle students in human factors have unique opportunities offered by no other university in the country. They rub elbows daily with pilots, engineers, students in other aviation disciplines, and well-connected professors.

A professor helped Vallance get her first internship with NASA, which she parlayed into a second internship and finally a full-time job.

The Wilsons, who came to Embry-Riddle to become professional pilots, grew interested in human factors after internships with the Army (Liz) and the National Transportation Safety Board (Darren).

#### **Students are sought by employers**

"Our students are recruited by the FAA, the NTSB, all government agencies, the military, and major aerospace contractors," Greene says. "They are very well prepared, and have had great success."

"Embry-Riddle gave us the opportunity to work on projects with software engineers, hardware engineers, and other people who could give you an idea what you're going to be dealing with when you get out there," says Liz Wilson. "I thought that was really invaluable. You have to know how to speak other people's languages, and when they say one thing to know that it might not necessarily have the same definition that you have in your field."

Darren Wilson adds that the combination of human factors and systems is that graduates can do both, which makes them more marketable.

"In today's economy you want to be educated to be employed," he says. "You come out of Embry-Riddle thinking you can have an impact wherever you go. They give you a toolbox of knowledge, skills and abilities, and you go to wherever you need to go, and you're able to be effective from day one. That's what employers are looking for." ✈