Astronauts Can't Stomach Zero Gravity

Space sickness afflicts half the astronauts for half their time on the shuttle. No one can say who will suffer or why

The space shuttle astronauts do not like to talk about it. They find the whole subject embarrassing. They want it to go away. But the unpleasant reality is that a lot of them are getting sick up there in zero gravity—becoming so debilitated with nausea and vomiting that the syndrome threatens to compromise shuttle operations.

Space sickness was most recently in the news during the shuttle's first operational flight in November, when mission specialist William B. Lenoir became ill and a planned test of the National Aeronautics and Space Administration's (NASA's) new space suits had to be postponed. (The test was later canceled because of mechanical problems with the suits.)

But the problem has actually been around a long time. American astronauts had to cope with it on Apollo and Skylab. Soviet cosmonauts report it consistently aboard the Salyut space stations. It has hit half the crew members on the shuttle so far.

Unfortunately, there is no predicting whom it will hit. The symptoms begin within a few hours after launch and last for 2 days or so. They can be mild or severe, and may or may not respond to drugs. Then they clear up by themselves.

This is plainly not a life-threatening situation, and in fact on extended space missions such as Skylab or Soyuz, space sickness has been no more than a minor annoyance. People recover and have plenty of time to go on with their jobs.

But the shuttle is a truck, designed for short, busy missions of no more than 7 days. If nothing else, having half the people debilitated for half the time promises to play havoc with schedules. So NASA is giving high priority to finding a solution. Research into prediction and countermeasures is centered at the Johnson Space Center in Houston, while the Ames Research Center in Mountain View, California, is taking a more basic look at the causes.

The astronauts' syndrome is essentially identical to the condition known on Earth as seasickness, airsickness, car sickness, or more generally, motion sickness. However, it is not at all clear that motion sickness is what the astronauts have. "The symptoms are just the body's response to something it doesn't like," says Gerald A. Soffen, head of NASA's life sciences division. "But it's like getting sweaty palms when you're nervous. The same response can be triggered by many causes."

In particular, the syndrome has striken astronauts who seem immune to motion sickness on the ground—and vice versa. There appears to be no correlation, and thus no way to solve the problem by selecting a sickness-resistant crew. On the other hand, some of the doctors who work with the astronauts say they can guess who will get sick in space, although they cannot say why. Since their hunches prove true more often than not, says Soffen, they must be picking up some subtle, subconscious hints. NASA hopes to find out what those clues are.

Another obvious approach to the problem is through drugs. At the moment, most spacesick astronauts use a combination drug known as ScopeDex: scopolamine to clear up the nausea, and Dexedrine to counteract the scopolamine, which leaves a patient groggy and lethargic. Unfortunately, this combination helps only some astronauts. "It's a difficult thing," says Soffen. "The dosages are specific to each person." His office is hoping to start an effort to find new and better drugs.

Which way is up?

Shuttle astronaut Robert L. Crippen does some acrobatics in zero gravity.

Yet another promising technique is biofeedback, says Soffen. Biofeedback is a way of gaining some conscious control over the autonomic, or involuntary, nervous system. The training has allowed some hypertensive patients to control their blood pressure, for example. At Ames Research Center, researcher Patricia Cowings has developed a program for controlling motion sickness that appears effective in a wide variety of subjects, from students to housewives. At Brooks Air Force Base in San Antonio, Texas, young pilot candidates are using a similar program to overcome motion sickness that could otherwise force them out of flight training. And at the Johnson Space Center in Houston, the flight surgeons for the manned spaceflight program are considering the development of a test of biofeedback on the shuttle.

Meanwhile, says Soffen, NASA is trying to learn more about what is really happening. On the most recent flight, for example, Lenoir and his fellow mission specialist Joseph P. Allen performed experiments on the effects of target tracking, head movements, and eye response. "The astronauts tend to be very sensitive about this," says Soffen. Aside from the fear of being grounded if they turn out to be too susceptible, he says, they did not become astronauts to be medical subjects. But they have been cooperative. "We've got to start getting more than anecdotal information," says Soffen.

There are, however, theories. Dr. Sam L. Pool, medical sciences chief at the Johnson Space Center, explains that one possibility is sensory conflict: in zero gravity the cues coming from the eyes, the inner ear, and the "proprioceptive," or "posture," receptors are all different. The brain thus rebels, with drastic effects on the stomach.

Another possibility is that removing the gravitational forces on the balance organs of the inner ear causes some change in sensitivity. Finally, there may be disorientation due to the shift in fluids from the lower body to the upper body. The shift is roughly equivalent to being in a 6-degree head-down position on Earth, says Poole.

"Of course, there could be some element of all these simultaneously," he says.—**M. Mitchell Waldrop**

0036-8075/82/1210-1106$01.00/0