SCIENCE NEWS of the week

Challenger: The 2nd Shuttle's 1st Flight

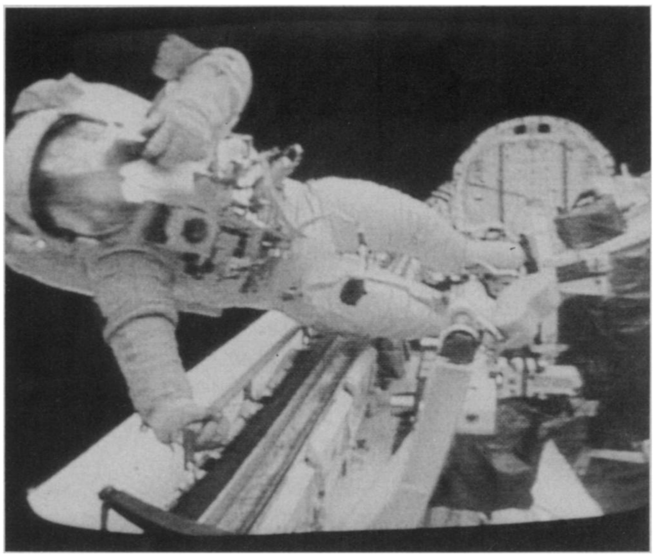
It was never the idea to have just one. Although even the first reusable space shuttle, Columbia, immediately introduced a radical change from the hundreds of throwaway rockets that had characterized the past years of the Space Age, the huge and costly effort has always been directed toward a family of shuttles, working in rotation. And last week, the successful maiden flight of Columbia's sibling, Challenger, just as dramatically changed the essence of the National Aeronautics and Space Administration's "space transportation system" from "shuttle" to "shuttle *fleet*."

Challenger's launching had been delayed two and a half months by the discovery of leaks in the plumbing of its main engines, a problem that required round-the-clock, triple-shift labors by engineers and technicians to keep the fleet's tight future schedule in at least a semblance of order. But once the new craft was set on its new timeline, it went right by the numbers, taking off only 0.08 seconds late on April 4 and landing just over five days later at California's Edwards Air Force Base.

Gen. James Abrahamson, NASA's associate administrator for space flight, called Challenger's initial outing "superb"—and with examples. The original shuttle, Columbia, experienced 82 "anomalies," or technical problems during its own maiden voyage in 1981, according to Abrahamson, whereas Challenger, he says, underwent only 22. For the first time in the six shuttle flights to date, in fact, he says, "we did not have to do any significant replanning of the mission [once the craft was on its way]. It was flown exactly according to plan." In short, "all the indications are [that Challenger] is indeed a better spacecraft."

It is also a more powerful one. Its engines, which one NASA official characterized as "probably the tightest engines in the world" after their leakage problems had been fixed, were operated at up to 104 percent of their rated thrust. In addition, Challenger's huge external fuel tank and the motor casings of its solid-propellant booster rockets had been lightened by about nine tons from previous versions, and other changes saved yet more weight. Compared with Columbia's fifth flight last November, Challenger's first carried over 40 percent more payload in its huge cargo bay.

But the goals of the mission depended on more than the operation of the shuttlecraft itself. A principal objective was to deploy the first of NASA's Tracking and Data-Relay Satellites, intended to replace the ground stations that have always been the agency's link with its earth-orbiting satellites. Stretching 57 feet from tip to tip of its solar panels, the 5,000-pound, $100 million TDRS (the first of three, including an orbiting spare) has been described as the largest, most complex communications satellite ever launched. Designed to look down from a fixed equatorial longitude at a "geosynchronous" altitude of 22,235 miles, it is planned to be capable of keeping in touch with as many as 26 lower-orbiting satellites at a time. One of its first and most important jobs will be to relay the vast streams of scientific data expected from the European Space Agency's manned Spacelab research module, to be carried on the ninth shuttle flight, scheduled for late September. If, that is, the TDRS is on station at the time.



Wide World

Astronaut Donald H. Peterson holds onto a handrail in the cargo bay of the space shuttle Challenger, during the first U.S. spacewalk since the final Skylab mission in 1974. Together, he and astronaut F. Story Musgrave inspected their craft, practiced rigging a winch cable and tried other tasks under weightless conditions.

Challenger's astronauts deployed the satellite as planned, manipulating controls to stand it upright in the payload bay and releasing a spring to set it free. About 55 minutes later, the first stage of a two-stage Air Force booster called the Inertial Upper Stage ignited automatically to start the TDRS on its way to its geosynchronous altitude. All seemed to be going well, even when a radioed ground command, as planned, ignited the IUS second stage for an expected 105-second "burn." About 80 seconds into that burn, however, all the telemetry signals from the TDRS/IUS "stack" suddenly ceased. Controllers on the ground first concluded that the satellite was tumbling out of control, then that its batteries were about to fail, then that it might be permanently stuck to the dead weight of the now-spent IUS. Order was restored, but the TDRS turned out to be in a low, elliptical orbit rather than the planned circular path. This week, officials were refining a plan to use timed burns from its steering jets in an effort to get the device on station.

No such anomaly marred the flight's other major milestone: the first U.S. spacewalk in nine years. Astronauts F. Story Musgrave and Donald H. Peterson spent nearly four hours maneuvering about the open cargo bay, a task that had been canceled on the previous flight due to spacesuit problems. For the shuttle's busy future, such mobility will be a necessity. —*J. Eberhart*

Virus now indicted in toxic shock

At first the toxic shock syndrome—characterized by vomiting, diarrhea, fever and rash—seemed to be due to the bacterium *Staphylococcus aureus*, which was already known to be capable of causing a spate of diseases, from boils and wound infections to meningitis and pneumonia. But now the villain appears to be not *S. aureus* per se, but rather a virus that has insinuated its genetic material into that of *S. aureus* and that is commanding it to churn out disease-causing toxins.

This finding, by Steven E. Schutzer, Vincent A. Fischetti and John B. Zabriskie of Rockefeller University in New York City, is reported in the April 15 SCIENCE.

Several factors led Schutzer and his co-workers to postulate that *S. aureus* is serving as a henchman to a resident virus. One was the discovery during the 1960s and 1970s that scarlet fever and diphtheria are due to toxins made by bacteria at the instruction of viruses. Another was the marked similarity in symptoms between scarlet fever and toxic shock. The third was the 1981 finding that *S. aureus* isolated from toxic shock victims makes two kinds of toxins.

To test their hypothesis, Schutzer and his colleagues first collected 12 strains of