Space shuttle takes to the air

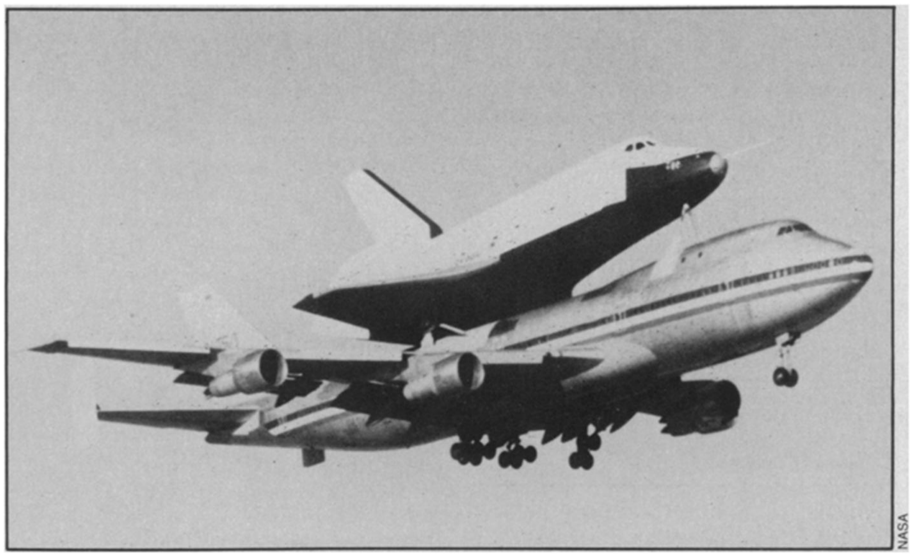
The space shuttle left the ground for the first time last week, only two days before the fifteenth anniversary of the first U.S. manned orbital spaceflight. Actually it had "left the ground" several days before, when it was mounted high atop the 747 jet that would carry it on its maiden test. And until the shuttle blasts off for orbit in 1979—going up as a rocket, coming down as a glider—the hefty 747 will be its vital link with flight.

The ungainly-looking couple got underway at 8:30 (PST) on the morning of Feb. 18. Together the two vehicles weighed in at a ponderous 584,000 pounds, 150,000 of which were contributed by the empty shuttle, carrying neither crew nor fuel. Yet this is less than a fully loaded 747 carries on an intercontinental hop. "Most of the flight," said the plane's command pilot, Fitzhugh L. Fulton of the NASA Dryden Flight Research Center in California where the test took place, "we couldn't even tell the shuttle was there." Quite a claim, considering that he was flying his superjet with what amounted to a DC-9 bolted to the roof.

The flight lasted about two and a half hours, reaching a maximum altitude of about 16,000 feet before ending in a picture-book (if not record-book) landing. A total of six such runs is scheduled (the second was this week) before the shuttle ever takes a crew aloft. They are needed to check out the stability and aerodynamics of the vehicle, as well as to verify the safety of the piggyback arrangement. The first astronauts to ride along, beginning in May, are scheduled to be Fred W. Haise Jr., as "commander" and Charles G. Fullerton as "pilot," alternating through a planned half dozen flights with Joe H. Engle and Richard H. Truly. Besides monitoring the craft's performance in person, their jobs will include refining crew operations procedures on board and helping to work out the optimum flight profile for the subsequent test series, when for the first time the shuttle will be turned loose on its own.

The shuttle gets only one chance at a safe homecoming. After leaving orbit with an initial push from its rocket engines, it will glide down on its stubby wings for a dead-stick landing. The rocket-powered ascent cannot really be tested until it happens; no suborbital flights are planned, since the craft will have to get all the way around the planet to get back to the six-mile landing strip being built for it on Cape Canaveral. Thus all of the "747-powered" tests are concerned with the final approach and touchdown.

The shuttle will make its first independent landing in July, beginning when a series of explosive bolts are fired to free the craft from its 747 carrier at an altitude of about 22,000 feet. At that point, for the first time, the shuttle will have to prove its mettle.



To test its performance in the atmosphere, the space shuttle gets a lift from a 747.

It's spectacular, it's futuristic, and it will have to take on most of the work from a wide variety of conventional "launch vehicles" for both the National Aeronautics and Space Administration and the U.S. Air Force. But for all its new and exotic ways, it will have to be routine. For in essence, the space shuttle is nothing more than a truck, designed to handle as many as 60 launches a year (using several shuttles working in rotation) without all the attendant difficulty that has made every past launch a major, one-of-a-kind endeavor.

Frank Curtis, program manager for the Boeing Co., builder of the 747, has the right idea. "There's nothing better than this," he said after last week's successful landing. "Nothing better than good old boring routine." The second flight was also an uneventful success. □

Tracing toxic environmental chemicals

Despite great concern over toxic and carcinogenic chemicals in the environment, there is surprisingly little information on which substances are actually present or potentially dangerous. Chemists are starting to use sensitive research techniques for identifying and detecting industrial organic wastes in soil and water. Biologists, meanwhile, look for reliable tests to determine which compounds present health hazards. At a symposium last week at the Massachusetts Institute of Technology, speakers reported progress in detecting nanogram amounts of organic chemicals, as well as in experiments using human cell cultures to identify potential carcinogens.

Chemists have applied biomedical research techniques to the detection of organic compounds in industrial waste water. By using gas chromatographic mass spectroscopy (GC/MS), organic compounds present in concentrations as low as 50 parts per trillion can be detected easily, according to Ronald A. Hites of MIT's chemical engineering department.

At present, most industries make only gross measurements of the total organic compound in their waste water, but do not know which specific compounds are released into the environment. While most of an industrial plant's organic wastes may be degraded before going into a river, levels of individual compounds can remain high, and these undegraded compounds may be hazardous.

GC/MS provides a powerful tool for monitoring the environment near industrial plants. For instance, Hites and coworkers studied the water and sediments near a chemical plant and near a dye plant. The dye plant wastes were quickly diluted and did not accumulate in the area, whereas sediments near the chemical plant showed a previously undetected buildup of many organic compounds. With sensitive analytical techniques available, it should now become possible to regulate the release of specific compounds by industrial plants.

A basic reason for identifying environmental chemicals is to determine which ones may become health hazards. It is particularly important to identify potential carcinogens whose effects often do not appear for many years. During the past few years, a simple bacterial test for potential carcinogens has been widely used. This test depends on the fact that most known carcinogens are also mutagens and cause changes in the DNA of the bacterial cell. These DNA changes then cause enzyme alterations.

However, bacterial cells are not human cells and many biologists feel that more meaningful results could be obtained from