SCIENCE NEWS of the week

Ariane 6: A Needed Success

Wide World

Astronaut Sally K. Ride deploys Canada's Anik C-2 satellite from the space shuttle.

June 16: The space shuttle Challenger sat on its Florida launchpad, two days away from taking off on a complex mission scheduled to include two communications satellite launchings, the first deployment and retrieval of a satellite, seven experiment-packed "getaway special" cannisters, numerous other scientific and engineering tests, the flight of the first five-member crew (including the first U.S. spacewoman) ever launched in a single spacecraft, and more.

Meanwhile, as the shuttle ticked through its Cape Canaveral countdown, a rocket lifted off from a spot near the little town of Kourou (pop. 7,000), along the Atlantic coastline of French Guiana in northeastern South America. It was a conventional, "old-style" rocket, not a state-of-the-art, reusable vehicle like the shuttle. It carried no astronauts, no arrays of scientific experiments. And riding atop its pillar of flame were nothing more than a pair of satellites — and Europe's hopes for regular, independent access to space.

It was the sixth flight of an Ariane, the rocket developed by the 11-nation European Space Agency to serve the growing number of countries, consortia and companies who want their own satellites in orbit. The first four flights were considered test missions (even though all but the first carried actual satellite payloads), and #5 was designated as "operational," meaning that Ariane was now officially on the job, representing, among other things, direct competition with the shuttle for launch business. Flight #6, therefore, might not seem to have been heir to a uniquely heavy burden of hopes for the future. But following the glowing success of the maiden flight, the second one suffered a malfunction that left its two-satellite payload on the bottom of the Atlantic, necessitating months of investigation and redesign to put the program back on track. Flights #3 and #4 were successful, and Ariane was awarded "operational" status — but last September, another malfunction occurred, leaving that initial on-the-job rocket also on the ocean floor (SN: 9/18/82, p. 180).

This was not a test series anymore. It was business. Potential customers for launchings have to choose their method of transportation months or years in advance, and each choice can be worth $10 million or more to the purveyor of the service. In addition, many of those potential customers are counting on their satellites' being available by known dates, so that they will be able to market their commodities (communications channels, for example) in advance. And Ariane's record — only three successes in five tries — was not the sort to inspire confidence. One cutting quip dubbed Ariane "Europe's first rocket-powered submarine," and an official associated with one of the payloads on last week's launching went even further: "If this flight doesn't make it," he said a few days before the liftoff, "it may sink the whole program." Even officials of ESA itself privately acknowledged similarly grim concerns, mindful that a third failure would present possible customers with a rocket that missed as often as it succeeded.

But the flight was a success, producing a sigh of relief that ought to have been audible from Kourou to ESA headquarters in Paris, to say nothing of the offices of Arianespace, Ariane's private marketing company, which includes the 36 principal European aerospace firms, 11 European banks and the French space agency (the enterprise's principal partner).

The rocket's two passengers were the European Communications Satellite ECS-1 (designed for use by the member countries of the EUTELSAT consortium and the European Broadcasting Union), and AMSAT Phase III-B, built by sophisticated amateur radio operators (many of whom are professional engineers) for use by hams worldwide. Both were released as planned (using a device known as SYLDA, a French acronym for the Ariane double launch system). Preliminary data indicated that both were in good condition, although the AMSAT initially emerged with its solar panels pointed about 70° away from the sun, thus reducing its available electricity and altering its thermal characteristics. The problem did not appear critical, said an AMSAT official, since natural forces such as atmospheric drag were correcting the misalignment. The anomaly is being investigated, but the launch itself has Ariane officials smiling.

Meanwhile, the space shuttle took off from Cape Canaveral on June 18, and its crew (including pioneering spacewoman Sally K. Ride) successfully launched communications satellites for Canada and Indonesia and set about a host of other activities. *—J. Eberhart*

Titan air resembles that of prebiotic earth

"We're not talking about life originating on Titan but we *are* talking about the first chemical steps toward life." So reveals Tobias Owen, astronomer at the State University of New York in Stony Brook, commenting on the detection of carbon monoxide (CO) in the atmosphere of Saturn's largest satellite.

Although only small amounts of CO were found in Titan's atmosphere, the discovery lends credence to a report by a Voyager-Infrared Astronomy Satellite team of carbon dioxide (CO_2) on Titan and confirms the presence of oxygen-containing molecules there. It is known that particle collisions and solar ultraviolet light have aided in the formation of hydrocarbon smog layers in Titan's 82-percent-nitrogen (N_2) atmosphere. This, together with the oxygen confirmation, opens up the possibility of amino acids, the building blocks of life, forming there as well. The intense cold of Titan prevents water from existing in liquid form and blocks the continuation of the chemical evolution that took place on earth. Nonetheless, Titan now looks even more similar to primitive earth, says Owen, and "may represent a sort of natural laboratory to test our ideas about pre-biological, chemical evolution — the kinds of things that must have happened on the early earth."

The CO discovery was made by Owen and co-workers using a spectrometer and the 4-meter Mayall telescope at Kitt Peak National Observatory in Tuscon, Ariz. Their data, reported in the June 24 SCIENCE, showed two dips in the spectrum of light from Titan that correspond to two wavelengths of light absorbed by CO molecules making the transition from one rotational or vibrational mode to another. The correspondence was so clear that Owen and his colleagues, Catherine de Bergh at the Observatoire de Meudon in France and Barry L. Lutz at Lowell Observatory in Flagstaff, Ariz., began looking for other CO absorption lines. They found them, but only after first correcting for the overlapping methane (CH_4) absorption lines in the same region of the spectrum. Methane-rich Uranus, which has no measured CO in its atmosphere, was used as a guide to subtract out the CH_4 contamination in Titan's spectrum.

Owen's group estimates that the abundance of CO ranges from 6 to 40 CO molecules per 100,000 N_2 molecules, depending on the particular atmospheric model used. Constructing an accurate model of the complicated structure of atmospheres that will properly account for the rescattering of light is difficult, but present work by de Bergh may produce a better, more sophisticated model.

—P. D. Sackett