

## SCIENCE NEWS OF THE WEEK

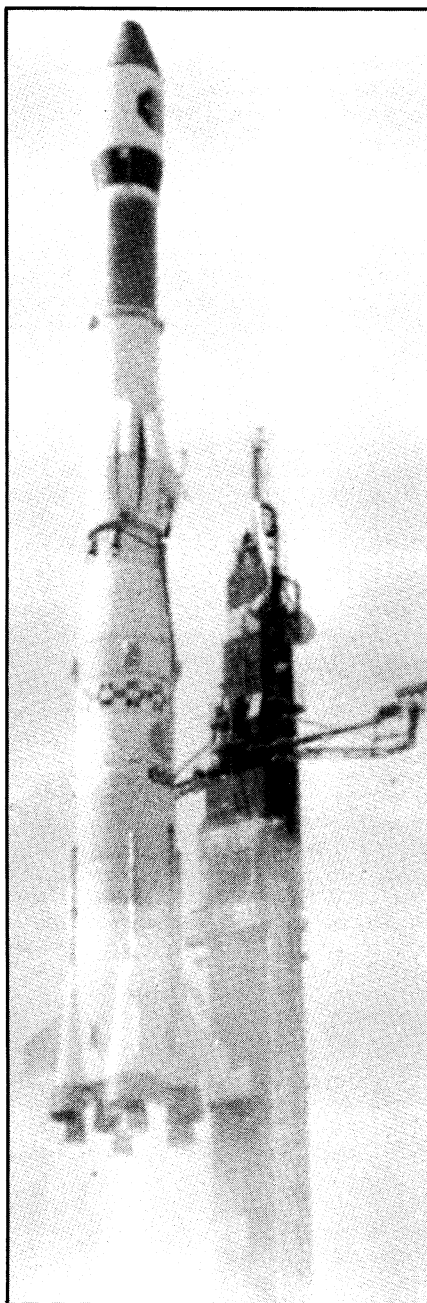
# Ariane Makes a Comeback

The European Space Agency's Ariane rocket, aimed to compete directly with the U. S. space shuttle in the growing business of launching the world's satellites, is back in the race after a stumble that was literally explosive. The first Ariane was launched on the day before Christmas of 1979 in a flawless debut that reached orbit within seconds and kilometers of its mission specifications. Number 2, however, proved anything but flawless in its May 23, 1980, liftoff, ending up less than two minutes later in a midair detonation that not only destroyed the rocket and the two satellites it was carrying, but sent an army of engineers on months of frustrating research to understand and correct the malfunction. Last week on June 19 the launch of the third Ariane proved the value of their efforts.

Last year's explosion posed a difficult problem even though telemetry from the rocket had readily revealed a high-frequency vibration in one its four first-stage engines. Half a dozen specially created working groups investigated possible vibration causes ranging from oil in the propellants to the acoustics of the Guiana launch site before finally focusing on the engine's injector. A two-month test series had apparently solved the problem, until, during subsequent tests to check out the actual injectors for the third flight, a vibration of a different frequency showed up "very suddenly and without warning." More months of testing followed before the engineers finally settled on a modification of the injectors combined with a slight watering of the fuel, which smoothed out its burning at the expense of a small but tolerable reduction in performance. Instead of the originally foreseen five months between the second and third launches, there were 13.

Like the disastrous second flight, number 3 carried a pair of satellites — ESA's second operational weather-watcher, called Meteosat 2, and a geosynchronous communication satellite for India known as Apple (lost with the second Ariane were a scientific probe named Firewheel and the Oscar 9 amateur-radio satellite, both from Germany.) The last of Ariane's four planned "developmental" flights, now targeted for October, will loft an ESA maritime communications satellite called MARECS.

Like the U. S. shuttle, Ariane has a substantial number of "firm" (committed) customers and others who have merely reserved space on particular launches, extending into the mid 1980s. From the first post-developmental flight (number 5, now scheduled for next February) through the 23rd flight in December of 1985, there are firm bookings scheduled for 14 satellites,



Ariane liftoff: June 19, 8:33 a.m. EST.

reservations for 14 more (plus one deep-space probe — the ESA mission to comet Halley) and only three scheduled Arianes whose payloads are yet fully undecided. The firm commitments are from ESA itself, France, Germany, Sweden and the International Telecommunications Satellite Consortium (INTELSAT), while the option-holders range from the United States to the Middle East to Colombia and more. In addition, negotiations for Ariane's launch services are underway between ESA and organizations as diverse as NATO and Southern Pacific. Four of ESA's own

planned payloads, in fact, have yet to stake out their own launch dates.

The U. S. shuttle, meanwhile, has an even busier schedule — though it will not be nearly as active as NASA had anticipated. As recently as December, 48 launchings (after the initial test flights) were on the manifest through the end of 1985. Now there are 34. Fully half of the reduction is in the area of science, hard hit in recent budget cuts. A spacecraft to study the poles of the sun (which was to have joined a similar ESA probe) has been canceled; an earth-orbiting Gamma-Ray Observatory and the Venus-Orbiting Imaging Radar spacecraft have been delayed until 1988; and four launchings of the ESA-built Space-lab research module have also been postponed. In addition, factors such as production problems with a weight-saving version of the shuttle's external fuel tank have prompted several potential customers to consider signing up for "old-style" launches by conventional one-shot rockets. This means either the Delta or Atlas-Centaur from NASA's arsenal (both of which might otherwise have been phased out years earlier) — or Ariane. A dozen satellites from the still-changing shuttle manifest are also listed on Ariane's, and in fact, notes a NASA official, "a number of them are triple-booked."

Heightening the competition, ESA is also considering a second launchpad to handle a more powerful version of Ariane and more frequent launches, and studies are underway of recovering and reusing Ariane's upper stages to lower launch costs. □

## Fredrickson resigns as NIH director

Donald S. Fredrickson surprised colleagues at the National Institutes of Health last week with the announcement that he plans to resign as of July 1, after directing the Institutes for six years.

"One gets less adept at any job without a sabbatical. There's no sabbatical in a job like this; you either quit or die," Fredrickson told SCIENCE NEWS in an interview on the day he announced his resignation.

He cited personal, not political, reasons for his decision. "The last six years... have been spent in the relentless company of the administrative burdens of the Director. It is time to shed them for a while, lest I forget completely how to be a scientist and a physician," he said in a speech to members of the NIH. (Fredrickson had done research on lipid metabolism and disorders and held numerous research and administrative positions at NIH.)

On June 17 Fredrickson wrote to Richard S. Schweiker, Secretary of Health and Human Services, of his decision to resign. "I take this step with great ambivalence, for NIH is in the very marrow of my bones. I very much appreciated your immediate invitation to continue in my post upon your taking office as Secretary . . ." Schweiker responded that it was "with profound regret" that he learned of Fredrickson's decision.

After leaving NIH, Fredrickson plans to spend a period as a visiting scholar at the National Academy of Sciences "to sort out options," he told SCIENCE NEWS. There he expects to get involved with issues of support for scientific research and of institutional stability.

Asked whether times were getting rougher for NIH, Fredrickson replied, "No, I see no period of chaos. All public institutions are traveling through choppy water. But I have no fears for NIH."

Fredrickson looks back "with some pride" on his period as NIH director. "It was a very exciting six years. We could find and create solutions for most of our problems," he says. "We never felt anything was insoluble."

Among the problems Fredrickson faced was "everything associated with the recombinant DNA guidelines." That issue took up approximately half his time in his first years as director. He now describes the guidelines as the first restrictive code for biological research, a balance of scientific imperatives and public interest achieved without restrictive law.

Defining the boundaries of NIH responsibility was another issue Fredrickson addressed. "They were very ragged when I came," he says. He was concerned about protecting scientists' objectivity, while at the same time having them take appropriate responsibility. To meet this goal, NIH has instituted technical consensus exercises as a discussion process in which scientists, doctors, patients and others evaluate new medical technologies.

Fredrickson sees a need, in order to "make practical success out of biology," to cope with problems at the rough interface of university, government and industry, where it is necessary to take a complex scientific area and get all the people to work together. He says that this was possible in a "bureaucratic tour de force" for the issue of biological effects of radiation. "I find that very satisfying. It was even tougher than recombinant DNA."

Finally, Fredrickson is pleased to have been able to "anticipate the austerity likely to come." For example, recent budgets stabilized the funding of biomedical research to 5,000 new and competing grants. "This," he says, "makes a big difference to the confidence of people who take up biomedical research."

So far there is no word on whom Fredrickson's successor may be. Fredrickson says, "I just hope it's a good person, it's a very nice big job, and important." □

## Gene-splice vaccine for foot-and-mouth

It's the first vaccine to be produced with recombinant-DNA technology, and it could lead to "annual savings of billions of dollars and an increase in the world's supply of meat," says Department of Agriculture Secretary John R. Block. The vaccine, which is being produced in genetically engineered bacteria, consists of a single protein of the coat of the virus that causes foot-and-mouth disease. Tests conducted during the past eight weeks have shown it to be effective against that disease.

Foot-and-mouth is a severe, highly contagious disease that affects more than 30 species of animals, including cattle, sheep and pigs. It causes blisters on the mouth, nose and feet — weakening animals and reducing their agricultural value. Foot-and-mouth disease is an especially serious problem in Asia, Africa, Latin America and southern Europe. Strict importation screening and quarantine procedures have prevented outbreaks of the disease in the United States since 1929.

Seven types of the virus, and 65 subtypes, are implicated in the disease; animals immune to one type are still susceptible to the others. And although there are no treatments for foot-and-mouth, there have been vaccines that protect against it. The vaccine currently in use contains killed or attenuated virus matched to the existing disease in an area. An estimated 500 million doses are used annually, making it the most widely used antiviral vaccine. This vaccine, however, is difficult to use in developing countries because it must be refrigerated. In addition, incomplete attenuation of virus has resulted in outbreaks of foot-and-mouth disease among vaccinated animals.

In contrast, explains Block, "The vaccine produced by the new recombinant DNA technology is safe and effective. It cannot produce the disease in vaccinated animals because only a segment of the virus is used, not the whole virus. Also, the vaccine produced with the new technology can be stored for long periods of time without refrigeration. It is economical to

produce, and greater quantities can be produced at a time than was possible under previous methods of production."

The new vaccine is a result of collaboration between scientists of Genentech, Inc., a South San Francisco genetic engineering company, and the U.S. Department of Agriculture. The team was led by Howard L. Bachrach, who had previously demonstrated that a single protein, called VP<sub>3</sub>, of the four on the foot-and-mouth disease virus surface, produces immunity in animals without causing infections (SN: 2/19/77, p. 120). The work was carried out on Plum Island, off the tip of Long Island in New York, because federal law prohibits the keeping of intact foot-and-mouth disease virus on the U.S. mainland.

The USDA announcement follows a recent report that German scientists have spliced genes into bacteria to produce a surface protein of the foot-and-mouth disease virus (SN: 3/7/81, p. 150). The German and U.S. teams produced different viral surface proteins (VP<sub>1</sub> and VP<sub>3</sub>, respectively), and the USDA-Genentech group reported a higher yield — more than a million molecules of viral protein per bacterial cell compared with only 1,000 molecules per cell reported by the German group. The new vaccine protects against only one common type of the virus, but work toward a more general vaccine is underway.

The business agreement between Genentech and the USDA involved no money. Genentech holds patent rights and the right to license the manufacture of the vaccine, but the USDA retains the right to use the vaccine without paying royalties any time it is needed in this country. Genentech plans to manufacture and sell the vaccine, which it estimates to have a \$200 million annual market, under an agreement with the fertilizer manufacturer, International Minerals of Northbrook, Ill. Commercial production is expected to begin in the mid 1980s. □

Howard Bachrach

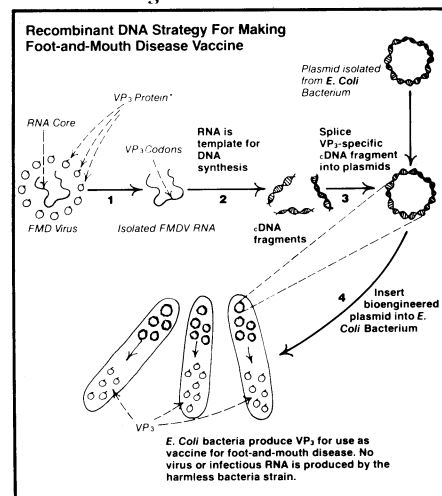


Illustration and Photo: SEA/USDA

