Europe Chases Pennies in Heaven

A new era in space competition opens next week with the first commercial flight of Europe's rocket Ariane. The competition is likely to be as much political as economic

London. On 9 September—if all goes according to plan—a new era of international competition in space opens when the European rocket Ariane launches two satellites into the equatorial skies above Kourou, French Guyana.

It will be the first of six "promotional" launches planned to initiate the commercial use of Ariane, following the completion of its first set of qualifying flights last year. With an order book almost full until the end of 1985, and rapidly filling beyond, Ariane has already proved to be one of the success stories of European scientific and technical collaboration.

The U.S. space industry, however, is watching Ariane warily. Many feel the European achievement supports their own arguments that, despite the obvious advantages of the space shuttle, a viable commercial future still exists for expendable launchers. But they also feel that, given the current lack of political support from the National Aeronautics and Space Administration (NASA), the competition with Ariane is already stacked against them.

Ariane was formally approved by the ministers responsible for space affairs of ten European countries in July 1973, with Ireland coming in 5 years later. After the disastrous experience of planning for the Europa launcher in the 1960's, in which different countries were to have been responsible for different stages of the rocket, it was agreed that the lead would be taken by France through its Centre National d'Études Spatiale (National Center for Space Studies) under contract from the European Space Agency (ESA).

The four test flights were not a complete success. The second launch failed because of unanticipated vibrations in the rocket engines, a problem that was subsequently extensively studied and eliminated by the third and fourth tests, which took place last year.

It was decided at an early stage that, unlike NASA, ESA would not be responsible for commercial Ariane flights. Thus, in March 1980, the private company Arianespace was set up; it is owned jointly by 37 of the European aerospace manufacturers involved in the launcher's development and 13 major European banks (five French, three German, and one each from Denmark, Great Britain, Holland, Italy, and Switzerland).

Arianespace's sales style has been aggressive and, so far, successful. The company's ambitious marketing plan envisages the capture of almost one-third of planned satellite launches over the next 20 years. Somewhat to the chagrin of the U.S. space industry, three contracts have been signed to launch five satellites for American companies: Western Union, GTE, and Southern Pacific Communications Corporation.

Arianespace has captured part of the American market with the help of a surprising ally: the Grumman Corporation. Grumman, which manufactures the wings of the space shuttle, is acting as Arianespace's marketing agent in the United States as part of an unusual arrangement involving the potential sale of Grumman's "Hawkeye" radar aircraft to the French government. The deal is that, if Grumman wins the Hawkeye contract, it will use its commission on Arianespace sales as a credit to lower the purchase price of the aircraft.

> Arianespace hopes to capture one-third of all launch contracts over the next 20 years. Three U.S. companies have already signed up.

Some of the sales tactics sound familiar. "Arianespace has a good pipeline, they know what our bid is and—wham!—they underbid us every time," says William F. Rector, director of space programs for General Dynamics Corporation and, as such, responsible for the rival Centaur launches.

More controversial have been complaints about Ariane's pricing policy. At present, NASA charges for launching expendable rockets on a full-cost basis, including substantial overheads.

In contrast, Ariane launches for the next 3 years will be partly subsidized by the members of ESA, who have agreed that the agency will pay 25 percent more for satellite launches than commercial customers. The result is that Ariane's prices, at between $25 million and $30 million a satellite, are significantly below those of its U.S. competitors (apart from the shuttle).

Claude A. Daoud, director of marketing for Arianespace, claims this is a legitimate strategy needed to meet NASA's monopoly on commercial launchers. "There is little doubt that we have entered a very highly protected market, in the sense that previously you either went with NASA or you did not launch," he says. "When Arianespace was created, a protocol was negotiated with ESA in which ESA agreed to pay the higher figure to assist Arianespace in penetrating the market."

Even harsher criticism has been made of the fact that Arianespace has been able to offer commercial customers highly favorable terms of payment. All NASA launches must be paid for in full in advance; in contrast, Arianespace requires merely a deposit before launch, the remainder to be paid off over a number of years.

Again Daoud defends the tactic. "There is nothing illegal or unethical from the business standpoint," he says. "We offer exactly the same terms and the same amount of money as the United States offers its export customers through the Export-Import Bank; the Americans were surprised that all of a sudden someone would offer those terms to American companies, especially at a time when interest rates were very high."

The real test, however, will come in 1986. Two events take place that year. The first is that Arianespace will become totally independent of ESA, taking sole responsibility for the marketing, financing, preparation, and launching of Ariane.

The second is that a larger version of

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the rocket is scheduled to come into use. At present, the two launchers being built for the near future are Ariane 2 and Ariane 3, both successors to the Ariane 1 used in the development phases. Ariane 2 will be able to take payloads of 5100 kilograms into low earth orbits and up to 2175 kilograms into geostationary transfer orbit—the most popular orbit for telecommunications satellites. The Atlas/Centaur, in comparison, can lift 5680 kilograms into low earth orbit and 2045 kilograms into geostationary orbit. Ariane 3, with additional boosters, can put a single payload of 2580 kilograms—or two satellites each weighing 1195 kilograms and each therefore equivalent to a single Thor/Delta payload—into geostationary orbit.

On the basis of an assessment of future market demand, ESA last year approved a new family of Ariane 4's, each using a different combination of solid and liquid propellants. These rockets, which are now under development, are intended to be Europe's principal launchers into the 1990's. The biggest, Ariane 44L, will be able to launch 4200 kilograms into geostationary orbit, a capability designed with one eye firmly on potential contracts for launching the next set of international telecommunications satellites, INTELSAT VI.

According to ESA publicity, Ariane 4 "will provide a launch means combining all the advantages of the operational flexibility of a conventional launch vehicle with the economic attractions of the space shuttle."

NASA—not surprisingly—remains convinced that the shuttle is the better deal. "I believe that the shuttle will be significantly more flexible and a significantly better commercial vehicle than any expendable launch vehicle," says NASA administrator James Beggs.

Aware of the size of the competition Ariane faces, its promoters have been playing something of a David and Goliath game, moving quickly to exploit any perceived limitations and weaknesses in the commercial appeal of the shuttle.

ESA officials readily admit that, while part of the current success being enjoyed by Ariane is the result of a predicted surge in demand for telecommunications satellites, their efforts have been boosted by problems with the shuttle, including the recently announced price increases. "Naturally in the competition for the market we have been helped by the fact that the shuttle has been delayed and that the costs seem to be higher than initially anticipated," says ESA director-general Erik Quistgaard.

Arianespace is also playing up to potential customers the fact that claims on the shuttle by the U.S. military have tended to squeeze commercial flights down the priority list and create uncertainty over future scheduling.

"We do not have to say that the space shuttle will be squeezed by military needs; there have been enough statements in the United States by the Administration and by the Air Force that their priority would go to projects involving national security," says Arianespace's Daoud.

In addition to potential scheduling problems, Daoud also points to the technical uncertainties that remain in the U.S. program over the type of upper stage that will be built to take heavy payloads from the space shuttle up into a geostationary orbit, a hotly debated topic within NASA, the Congress, and among U.S. space contractors (see page 1012).

"The question that we see facing commercial decision-makers is whether they involve themselves with the development of kick motors which have not yet been proven, or whether they remain with conventional boosters, such as Ariane, able to inject satellites directly into transfer orbit," says Daoud.

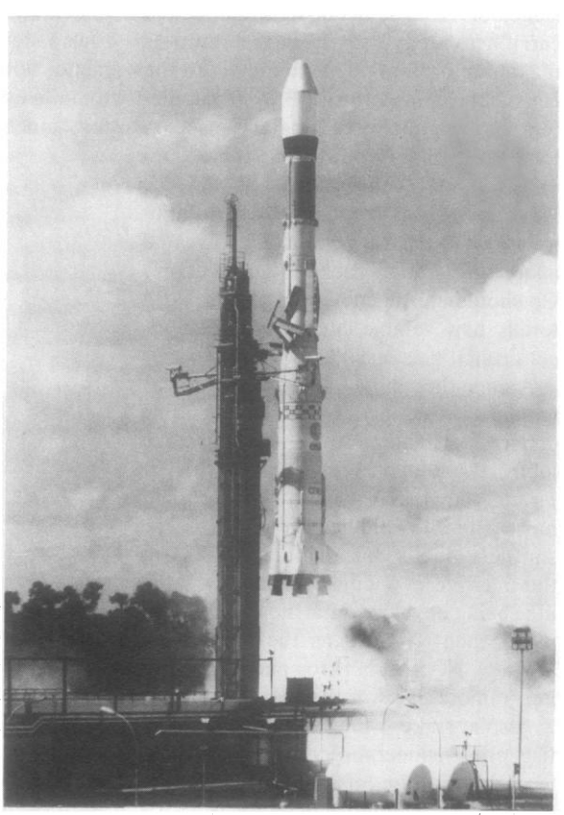
Not that the Ariane schedule has been immune from technical problems. In addition to the failure of the second test flight, a potential short-circuiting problem on MARECS-B, the maritime communications satellite due to form half of the 9 September payload, has already delayed the original timetable. This has led one customer, INTELSAT, to take up an option on a Centaur launch, rather than wait for the next available Ariane slot (although it has further Ariane launches booked later next year).

Furthermore, U.S. manufacturers of expendable launchers are using the same arguments about the uncertainty over shuttle schedules and costs and the technical hurdles still facing Ariane to suggest that NASA should recover some of its initial enthusiasm for expendables.

"We would like to see NASA take a policy of combining Delta and reusable launch systems, so that it could guarantee a launch on the one or the other," says a sales representative from McDonnell Douglas, manufacturer of the Delta, which is due to be phased out soon. "That way we could sell something the French could not match."

The manufacturers of U.S. renewable launchers argue that, if they are to compete with Ariane, they need more federal support. General Dynamics, for example, is currently trying to convince NASA to provide extra funds to stretch out the Centaur and give it more thrust, so that it can compete directly with Ariane for the heavier payloads.

Politically, however, it will be difficult for NASA to go to Congress, even with the Europeans breathing down its neck, to ask for more money for expendables when it has spent the past 10 years



Ariane 1

Boosting arguments to continue using expendable launchers in the United States

arguing that the future of space commercialization lies in the shuttle. "We would not have entered the shuttle program if we had thought that the expendable was the way to go," says Beggs.

Further down the road, Europe has plans for competing here as well. Already on the drawing board are ideas for a much larger Ariane 5. So far, ESA has made no commitment to the new version, whose future depends on the outcome of a current study of the size and shape of future markets.

CNES, however, is continuing development of the cryogenic engines, two of which might be used on Ariane 5 in contrast to the single cryogenic engine in the current series.

One possible use for the larger rocket would be to launch a small two-person space vehicle—the current version is known as Hermes—which would subsequently glide back to the earth like the shuttle. "There could be all sorts of scope for intermediate vehicles, such as retrieving satellites from orbit, perhaps from orbits that the shuttle cannot get to economically very often," says Christopher Nicholas of Britain's Department of Industry.

Defining the boundary line between useful competition and unnecessary duplication of effort is a task that now faces space policy-makers on both sides of the Atlantic. Each seems to have taken up the gauntlet that has been thrown down by Ariane; "monopoly is usually damaging, one way or another," says Nicholas.

ESA's Quistgaard, however, warns that too much competition between commercial operators in space could become counterproductive and suggests a possible international division of labor. "We should make sure that we do not end up in the same situation as, for example, shipbuilding, where everyone tried to get into the market and it proved to be disastrous," he says. "Some form of constraint on the countries that work with this should be maintained, because there is no point in every country trying to do everything. I personally feel that it makes sense to use our worldwide technical capability in the most intelligent way and not to saturate each other with things that are already there."

—DAVID DICKSON

Centaur Wars

A straightforward technical decision on space shuttle upper stages has dissolved into a political free-for-all

Even as the Europeans are moving aggressively forward with their Ariane rocket (p. 1010), Washington has once again bogged down in bickering over the one tool that would do the most to keep the space shuttle competitive.

That tool is the high energy upper stage, or HEUS, a booster that would carry heavy payloads from the shuttle's maximum orbit of 1000 kilometers to the geosynchronous orbit at 35,900 kilometers, or even into interplanetary space. A long-simmering controversy has reemerged in recent weeks: Should the National Aeronautics and Space Administration (NASA) go ahead now and adapt an existing rocket, the Centaur? Or should the agency wait and build a totally new vehicle later, when the budget crunch has eased?

Arcane though it sounds, the issue has ignited a free-for-all between feuding congressional committees, the aerospace lobby, the Reagan White House, the Air Force, and NASA, with the latter caught mostly in the middle. At stake is the shuttle's viability as a launch vehicle for the massive new communications satellites being developed for the latter half of the decade—as well as the viability of any new NASA plans to send spacecraft into remote parts of the solar system.

Also at stake is the sanity of the scientists and engineers in charge of the Galileo orbiter/probe mission to Jupiter: the $850-million Galileo, currently NASA's only approved planetary mission, is once again being whipsawed from one launch configuration to another, and its scientific productivity is once again under a cloud.

The problem goes back to the original plan for upper stages, formulated in the mid-1970's. The idea was to use solid-fueled devices because of their convenience and safety. The Air Force agreed to build a two-stage, solid-fueled booster for launching moderate-sized payloads.

Representative Ronnie G. Flippo

This booster came to be known as the Inertial Upper Stage, or IUS. NASA agreed to develop a third solid-fueled stage to be added on for occasional high-energy missions such as Galileo or the International Solar Polar Mission.

Unfortunately, developing that third stage turned out to be more difficult than anyone had imagined. By 1980 it was becoming clear that the IUS contractor, Boeing, would not be able to deliver a vehicle powerful enough to launch Galileo to Jupiter. So the mission was reconfigured: instead of a single launch in 1982 there would be a dual launch in 1984, with the orbiter and probe traveling separately.

Even so, when Boeing still had not resolved the third stage problems by the beginning of 1981, NASA terminated the third stage and announced that henceforth the agency's HEUS needs would be met with the Centaur.

It was a popular move: the liquid oxygen/liquid hydrogen burning Centaur had been a reliable NASA workhorse for more than a decade. It was far more powerful than the IUS, and at the same time more gentle. Its slowly building thrust would be kinder to spacecraft than the instant jolt of a solid rocket. Best of all, as a liquid fueled rocket the Centaur could be turned on and off as needed; once ignited, the IUS, like all solid boosters, would have to burn out like a skyrocket.

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