
Science & Technology

Ariane V-11 flight brings European space exploration to a crossroads

by Laurent Rosenfeld in Wiesbaden

Shortly before the Space Shuttle Discovery carried out the spectacular retrieval of two satellites from orbit, another, less-publicized milestone was reached in space exploration: On Nov. 10, the European heavy launcher Ariane V-11 (an enhanced version of the Ariane 3 booster) successfully placed into orbit the Spacenet-2 American satellite and the Marecs b-2 European satellite. The two were launched into geostationary transfer orbit, and will be boosted into their final geostationary orbit on Dec. 20.

With 10 successful satellite launchings in a row and successive improvements of payload capability, the European Space Agency (ESA) is acquiring impressive capabilities. (While the Ariane 1 could launch a 1.5 metric ton payload into geostationary transfer orbit, the Ariane 3, with its larger fuel tank and solid fuel boosters, can launch up to 2.58 metric tons into a geostationary transfer orbit.)

The French press hailed the European success, describing the temporal coincidence of a European and an American flight as a "race in space"—an exaggeration, since the level of technological achievement of the two space systems can hardly be compared. The European rocket can launch payloads into orbit, but it cannot conduct repairs in space as the U.S. Space Shuttle did on a previous flight, and the Ariane cannot recover satellites from space. The Space Shuttle is truly an instrument of space industrialization, the precondition for construction of a permanent space station in the early 1990s.

Yet the success of the Ariane heavy launcher underscores the quickly improving capabilities of European space industry. In fact, although estimates vary greatly, and although both NASA and ESA accuse each other of deriving advantage from large state subsidies, economic studies show that, despite the greater performance of the Shuttle, the Ariane is cheaper per pound launched into geostationary orbit; this is simply due to the fact that in order to put a given payload into space, the Shuttle has to launch at the same time the heavier "deadweight" of the orbiter itself. For any other type of mission, such as satellite in-orbit repairing and satellite re-

trieval, as well as manned missions, which the European Space Agency is still far from being able to organize, the Space Shuttle is vastly superior.

Europe is now at the crossroad of deciding on its space activities for the next 10 years and more. Europe must basically decide before the end of the year on three interrelated projects: 1) its participation in the U.S. space station, scheduled for completion around 1992; 2) the construction of the Columbus project, a kind of autonomous space station that would become part of the U.S. space station; 3) the development of the new HM-60 heavy rocket engine, aimed at motoring the Ariane 5 launcher, a European booster that could launch into outer space the Hermes retrievable hypersonic glider, often described as a kind of "mini-shuttle."

Parallel to those decisions, there are some military developments at stake, the most important being the Franco-German military reconnaissance satellite presently stalled for budgetary reasons.

Europe and the U.S. space station

Western Europe is considering financing 15-20% of the U.S. space-station project, which NASA estimates at a total cost of \$8 billion; in other words, European countries would invest \$1.2 to 1.6 billion (in 1984 prices) over a period of seven to eight years.

Europe has suffered some disappointment in the past in its joint projects with the United States: It invested large funds in the Spacelab project (about \$1 billion), part of an agreement governing the Shuttle project, and now complains that it has not received sufficient benefit from this investment, since NASA has not allowed Europe as much use of the Shuttle as it had expected, and the Spacelab has so far flown only once. Therefore, the European space coordinators want some guarantees from the American space authorities; at the same time, Europe does not want to rely exclusively on American good will, which is sometimes subject to other considerations, such as commercial competition and military priorities, as it was in the case of Spacelab.

The European Space Agency thus adopted two projects on Aug. 1, the Columbus Space Station and the Ariane 5 rocket, and has just requested the member states to make a firm financial commitment on the two before the end of the year; this would allow Europe to have a common position vis-à-vis the United States when the preliminary studies of the Space Station project start, in April 1985. While still relying on U.S. cooperation, these two projects would give some form of autonomy to Europe, in the form of free access to the space station, not depending on the exclusive use of the Space Shuttle.

The agreement has already been reached as far as the Columbus project is concerned: According to the French weekly space magazine *Air et Cosmos*, Germany would finance about 50% of the project, Italy 25%, France 20%, and the United Kingdom 6%. Germany is considering spending \$1.5 billion on the large European space projects until 1996, of which \$966 million would be on Columbus and \$533 on the French-led Ariane 5 and possibly Hermes projects. The main architect of the Columbus project would be a consortium led by the Munich-based Messerschmidt-Boelkow-Blohm (MBB) firm, and including ERNO and Aeritalia. The original project consisted of six elements, of which two are being realized: a large manned space laboratory module, which would be attached to the Space Station, and a semi-autonomous platform; the four other elements originally planned (a solar electric generator, a maintenance module, a machine-tool module, and a polar-orbit autonomous platform), which would be necessary to give Europe a fully autonomous space station, are likely to be postponed or even canceled, although the ESA would prefer not to cancel them.

In short, with this Columbus project, Europe has essentially committed itself to participation in the U.S. space project, although a lot of financial bargaining is still ahead. NASA is still unable to assess the operating cost of the Space Station, estimated to be anywhere between \$1 and 2 billion. Europe cannot make a full commitment before more detailed specifications for the Space Station are available, because it does not want to invest such large sums in projects that will define the next 10 to 15 years' activity without a more precise American commitment on the returns Europe would enjoy. Furthermore, the concerned European ministers must decide early next year on the global long-term objectives of Europe's space program, and these would depend to a large extent on the American response.

HM-60, Ariane, and Hermes

The other large projects being considered and reportedly nearly decided are the development of the HM-60 cryogenic rocket engine and the Ariane 5 heavy launcher. Ariane 5 would be a largely modified version of the earlier Ariane 1 to 4 models. The main improvement in Ariane 5 would be the second stage, equipped with a new HM-60 cryogenic rocket engine. The HM-60 engine, using liquid oxygen and hydro-

gen, would deliver a thrust of 900 kilonewtons (to be compared with the Shuttle's SSME engine, whose thrust is 2090 kN). This engine and other improvements would allow Ariane 5 to lift a payload of 15 metric tons (33,000 pounds) on a low orbit (i.e., about half of the Shuttle capability), or 7 to 8 metric tons in a geostationary orbit. Other improvements would include: 1) the Ariane 5 would be partly recoverable, thus reducing the launching cost; 2) it would be made safer and more reliable, in order to allow manned flight on the Hermes spaceship.

The 15-ton low-orbit payload would permit launching the Hermes manned hypersonic glider, often described as a mini-shuttle. Hermes could carry up to five astronauts, or two astronauts and up to 1.5 metric ton of cargo. With its inferior capabilities, but also lower costs, compared to the American Space Shuttle, Hermes would offer some improved flexibility in servicing the Space Station. Among other things, it is believed to be an adequate "rescue vessel" for the Space Station (to service crews staying in the Space Station for long

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periods). The Hermes is being designed to be able to land on any regular jet aircraft runway (although it would normally be operated from the Kourou space center in French Guyana); this is believed to increase dramatically the flexibility and versatility of this machine.

So far, the Ariane 5 project has been essentially accepted by the member states. The total cost of the Ariane 5 project (including the development of the HM-60 engine) is estimated at \$1.3 billion. The financing would be assured at about 50% by France, 25% by Germany, and the rest by Italy and the United Kingdom.

Although it is an essential part of the Ariane 5 project, the Hermes is more subject to budgetary disputes and far from being decided. The French Centre National d'Etudes Spatiales (CNES) is pushing for it and wants to start development around 1988, in order to have it ready soon enough for use with the Space Station, while the ESA leadership views the project positively, but would have it started three to four years later. Developing Hermes would cost about \$700 to 900 million, and some European countries are reluc-

tant to engage such a project on top of the Columbus and Ariane 5 projects.

The budget of the CNES was increased in 1984, in spite of budgetary austerity, in order to plan the development of Hermes, and Hubert Curien, one of the staunchest advocates of Hermes, the former head of the CNES, was appointed French research minister in August 1984. Thus, it seems that France, at least, is willing to go ahead with this project, and has made it known that it was ready to finance a large share (up to 50%) of the project.

Military reconnaissance

During a Franco-German summit meeting between French President François Mitterrand and West German Chancellor Helmut Kohl on May 28-29, 1984, President Mitterrand had proposed the construction of a military reconnaissance satellite, and Chancellor Kohl had warmly accepted the idea. Neither country has an independent capability in this area, and neither country has access to data collected by U.S. observation satellites. The necessity for these two countries to have such a reconnaissance satellite was underscored recently in Chad, where the U.S. government delivered to Chad and to the press space photographs showing that the Libyans had not withdrawn their troops from northern Chad as claimed.

However, at the latest Franco-German summit in Bad-Kreuznach on Oct. 29 and 30, Chancellor Kohl had a much cooler view on the project. Not that he personally was against the project, but the Security Council of the Federal Republic, which includes the defense, foreign, finance, and economic ministers, stated that it was opposed to the project, essentially for financial reasons. The project is estimated by the French to cost \$640 million, to be shared equally between the two countries, for building three satellites. But West German experts criticized these French estimates, claiming that it would cost two to five times more. The council further stressed that no defense funds have been allocated to such a project or to military satellite development until at least 1996! West German Research Minister Heinz Riesenhuber also opposed the project, for fear that it would take too much from the space budget.

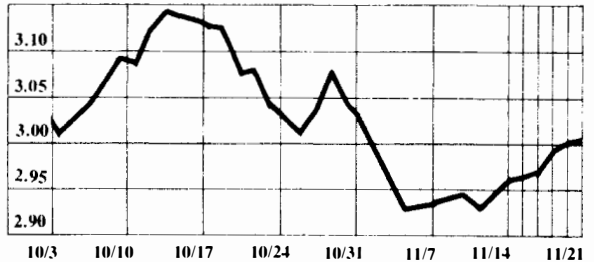
The Security Council also argued that the French project was not really the best possible solution. The French project consisted of a scouting satellite, which can only be used in the daytime and in clear weather; the German Security Council argued that a synthetic aperture radar satellite would be much more appropriate, because despite its lower resolution power, it allows pictures to be made in all weather conditions, night and day. Although the argument has some merit, it would be a poor reason to cancel the project altogether.

This does not mean that the project is canceled, and discussions are continuing; but the instability of the coalition in Bonn, with the Free Democratic Party being very reluctant to accept any increase of military spending and programs, makes a positive solution look quite distant.

Currency Rates

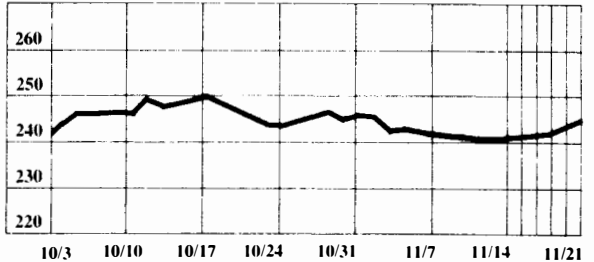
The dollar in deutschemarks

New York late afternoon fixing



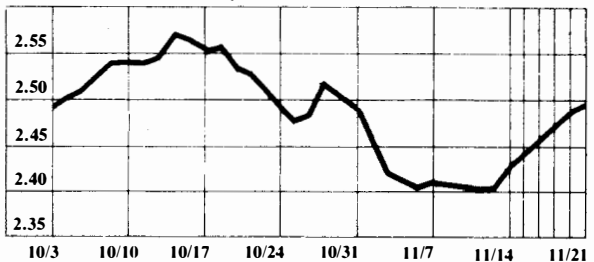
The dollar in yen

New York late afternoon fixing



The dollar in Swiss francs

New York late afternoon fixing



The British pound in dollars

New York late afternoon fixing

