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The Ariane Space Launch Vehicle: Europe's Answer to the US Space Shuttle [redacted] 25X1

An Intelligence Assessment

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SW 83-10047X
July 1983

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The Ariane Space Launch Vehicle: Europe's Answer to the US Space Shuttle

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An Intelligence Assessment

The author of this paper is Office of Scientific and Weapons Research. formerly of OSWR, contributed to the preparation of the paper. Comments and queries are welcome and may be directed to the Chief, Ballistic Missile Branch, OSWR,

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This paper was coordinated with the National Intelligence Council.

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The Ariane Space Launch Vehicle: Europe's Answer to the US Space Shuttle

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Summary

Information available as of 16 June 1983 was used in this report.

Despite the success of the second operational launch on 16 June 1983, the 1982 failure of the first operational launch of the Ariane, Europe's expendable launch vehicle (ELV), together with its mediocre test performance compared with that of US space launch vehicles, leads us to believe another operational failure in the near future will threaten the Ariane's commercial success. On the other hand, if no further problems with the vehicle occur, the Ariane program probably will provide the European Space Agency (ESA) with an independent space launch capability.

The Space Shuttle, as the United States' reusable space launch vehicle, is and will continue to be the main Ariane competitor; according to the National Aeronautics and Space Administration, the Shuttle is heavily booked until about 1986. The Ariane also is booked until about 1986, with at least 31 contracts and many more under negotiation. Because production of the US ELVs Delta and Atlas-Centaur was suspended, these vehicles are expected to provide little competition in the near term; they probably will become more competitive by about 1986 if, as now planned, their programs are taken over by private industry, which we would expect to pursue competitive marketing strategies.

ESA's success in competing with US launch services can be attributed largely to skillful marketing and to the reduced availability of US ELVs. In addition to underbidding US prices on several occasions, ESA has offered favorable financing and the possibility of space-related technology transfer.

The current version of the Ariane (the Ariane 1) can deliver about 4,700 kilograms (kg) into low Earth orbit and 950 kg into geostationary orbit, using the same boost rocket for all payloads. Four additional Ariane versions are planned that will launch increasingly larger and heavier payloads, with the fifth version (the Ariane 5) capable of placing 3,300 kg into geostationary orbit. The first Ariane 5 is scheduled for launch in the 1990s.

The Space Shuttle, by comparison, can place about 30,000 kg into low Earth orbit. It can deliver a maximum of about 6,800 kg into geostationary orbit; this capability depends on the satellite payload carried. The Shuttle can place a variety of payloads into such an orbit, and each payload can use a variety of boost stages.

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Contents

	Page
Summary	iii
Background	1
The European Space Agency	1
Development of the Ariane SLV	1
Characteristics of the Ariane SLV	2
Arianespace	2
Threat to US Interests	2
US Perceptions	2
Ariane Competitive Strategy	4
Financing and Pricing	4
Availability	5
Technology Transfer	5
Other Competitive Tactics	5
Marketing Success	6
General	6
Brazil—A Case Study	6
Implications of Operational Launch Failure and Recent Launch Success	7

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The Ariane Space Launch Vehicle: Europe's Answer to the US Space Shuttle

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Background

The European Space Agency

The US monopoly of satellite launch services, which began in the early 1960s, led Europeans to seek an independent space launch vehicle (SLV) capability. Early attempts to form a viable European space agency (the European Launcher Development Organization and the European Space Research Organization) failed because of difficulty in obtaining the cooperation of the British, West Germans, and French and because of successive technical failures. Nonetheless, European countries continued to favor a heavy SLV for satellites, originally expected to become operational in 1981.

To this end, in 1975, the European Space Agency (ESA) was formed. Its members and their shares of ESA financing are Belgium (4.4 percent), Denmark (0.7 percent), France (59.5 percent), West Germany (19.6 percent), Ireland (0.3 percent), Italy (3.3 percent), the Netherlands (2.2 percent), Spain (2.5 percent), Sweden (2.4 percent), Switzerland (2.7 percent), and the United Kingdom (2.4 percent). The French manage and control most of the activities of ESA. Although four French companies spearhead the production of the Ariane SLV, over 60 of the subcontractors are from other member countries as well as France.

Although the Ariane is ESA's major project, two other important projects—Spacelab and a communications satellite program—are under way. Spacelab is Europe's contribution to the US Space Transportation System (of which the Space Shuttle is a part), and its major support is from West Germany, which provides 60 percent of the financing. The communications satellite program is backed primarily by the United Kingdom, which provides 65 percent of the financing.

Development of the Ariane SLV

The Ariane SLV program was inaugurated in 1975 with the Ariane 1, the first of five planned Ariane versions. ESA deliberately chose a conventional design (using proven US technology) to ensure reliability, economy, and operational availability.

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The first Ariane test launch in December 1979 was successful.[1] The second flight in May 1980 failed as a result of high-frequency vibration. The launches in June and December 1981 again were successful. In late January 1982, ESA declared the Ariane qualified, fully operational, and competitive with the US Shuttle. The announcement was made presumably because the Ariane had completed three of its four test flights successfully, but we believe it also stemmed from ESA's eagerness to make the vehicle commercially available.

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ESA's budget for the four test flights was $590 million, with an additional 20 percent of each year's budget allocated for a technical contingency fund (cost overruns). As a result of the May 1980 launch failure, an amount equal to 12 to 15 percent of the 1980/81 budget was used to correct the vibration problem.

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Because of modifications in the ESA MARCES-B satellite portion of the payload, the first operational flight [2] of the Ariane SLV (using the double-launch "SYLDA" payload system [3] for the first time) was postponed by ESA from April 1982 until September 1982. Changes were made to reduce the effects of electrostatic discharge that had caused a malfunction of the in-orbit command system of the satellite in late February 1980.

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[1] The test flights were managed by the French National Space Agency (CNES).

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[2] Operational flights up through the 11th scheduled flight will be managed by CNES and ESA. Subsequent operational flights will be promoted by ESA's commercial company, Arianespace.

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[3] SYLDA is an acronym for *system de lancement double Ariane.*

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On the first operational flight on 10 September 1982, the Ariane failed when the third stage and payload crashed into the Atlantic Ocean about 14 minutes after lift-off. From open-source data, we believe the failure was caused by a malfunctioning turbopump. The third stage was at an altitude of about 176 km and traveling at about 6 km per second when it failed. The two satellites carried (the MARCES-B and an ESA SIRIO-2) were lost on the flight.

The second and most recent operational launch (using the SYLDA system again and carrying an ECS-1 and an Amsat satellite) occurred on 16 June 1983 and was announced as successful by ESA. Several problems, however, had been encountered in preparing the Ariane for launch.

the SLV had developed a guidance-system problem, believed to have been a result of poor quality control during manufacture. These problems postponed the launch from 3 June 1983 to 16 June 1983.

Characteristics of the Ariane SLV

The Ariane is a three-stage, liquid-propellant expendable launch vehicle (ELV). (Table 1 lists its principal characteristics.) Most of its major components are produced by French and West German companies and are shipped to the launch site at Kourou, French Guiana, where they are integrated. The unsymmetrical dimethyl hydrazine used in the first and second stages is purchased from the USSR. Production of the liquid hydrogen used in the cryogenic third stage takes place in France, but may be moved to the launch site in French Guiana, where the liquid oxygen for this stage already is being produced.

The current version of the Ariane (the Ariane 1) can deliver about 4,700 kilograms (kg) into low Earth orbit and 950 kg into geostationary orbit, using the same boost rocket for all payloads (table 2). Four additional Ariane versions are planned that will launch increasingly larger and heavier payloads, with the fifth version (the Ariane 5) capable of placing 3,300 kg into geostationary orbit. The first Ariane 5 is scheduled for launch in the 1990s.

Arianespace

To manage the financing, production, and marketing of the Ariane program, on 26 March 1980 ESA established the commercial company Arianespace. The company is made up of 50 shareholders—36 European aerospace companies, 13 European banks, and the French National Space Agency (CNES). The firm is dominated, however, by French interests and its directors general have all been French.[4] It was established with a joint stock of 120 million French francs ($28 million) and with total funds amounting to 179 million French francs ($40 million). The European aerospace companies continue to conduct Ariane basic research and development. 25X1

The Grumman Aerospace Corporation was selected by Arianespace to represent it in the United States (so far, Grumman has obtained five contracts). Arianespace has approached C. ITOH to represent it in Japan. The French Office for Export of Aeronautical Equipment represents the marketing firm in other countries 25X1

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Threat to US Interests

US Perceptions

Despite the preponderance of US technology in the European space program, until the late 1970s or early 1980s NASA and the US space industry did not consider the Ariane a serious challenge to their supremacy in the satellite launch services field—a position afforded by the Space Shuttle, the United States' reusable SLV, and by the Delta and Atlas-Centaur ELVs. According to public statements by US officials, the main reason for this lack of concern was that ESA initially had problems obtaining cooperation among its members and readying the first Ariane for flight-testing. Even after the first successful test flight in December 1979, the Ariane program had few 25X1

[4] The director general from 1980 to 1982, Frederic D'Allest, had worked for CNES for about 15 years. In about mid-1982, D'Allest was reappointed to CNES as its director general. Seven of the 12 members of the Arianespace board of directors are French; the remaining countries are represented by the other five board members and by two assistant directors general. 25X1

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Table 1
Characteristics of Ariane 1 Space Launch Vehicle [a]

Propulsion [b]	Engines	Fuel	Tanks	Burn Time *(s)*	Average Altitude At End of Burn Time *(km)*	Velocity At End of Burn Time *(km/s)*
First stage	4 Viking-2	Nitrogen tetroxide (N_2O_4) + unsymmetrical dimethyl hydrazine (UDMH)	2 3-8-meter diameter, Vascojet-90 steel	145	57	1.8
Second stage	1 Viking-4 (3-*meter* combustion chamber)	N_2O_4 + UDMH	2 A-Z5G aluminum alloy	132	140	4.73
Third stage [c]	1 HM-7		2 A-Z5G aluminum alloy plus special cryogenic tanks		212	9.75
Length	47.4 *meters*					
Lift-off weight	207,000 *kg* (propellant—90 percent, structures—9 percent, payload—1 percent)					

Guidance and Control	Type	Mass (*kg*)
	Inertial guidance platform with digital computer	300

Payload System [d]	Type	Mass (*kg*)	Operation
	Double-launch "SYLDA"	1,000 (450-550 per satellite [e])	One satellite is carried inside SYLDA container and the other is carried atop container but within payload shroud during passage of payload through atmosphere. Shroud is jettisoned at about 110 km altitude. Upper satellite is then released, upper container half is jettisoned, and exposed second satellite is released.

[a] Four additional versions of the Ariane are planned, each capable of launching a larger and heavier payload than the previous one.
[b] In addition to improvements in the performance of each Ariane version, the Ariane 4 will be usable in six different configurations, depending on the number and type of strap-on boosters used. The Ariane 5 is planned to use a new second-stage cryogenic engine with a thrust of 90 to 100 tons. This stage will replace the second and third stages of the previous versions. The same engine also is planned to be used in a booster for European manned spacecraft.
[c] Begins operation about 5 minutes after lift-off, at an average altitude of 140 km, and ceases operation at the moment of injection into transfer (direct ascent) orbit.
[d] When launching geostationary satellites, the Ariane places its payload directly into a transfer orbit. A solid-propellant apogee boost motor attached to the payload is then ignited to move the satellite into a geostationary orbit. The same motor is used for all payloads.
[e] Mass of satellites most in demand for telecommunications.

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Table 2
Capabilities of Ariane and US SLVs

Version	Announced Initial Operational Capability [a]	Stages	Lift-off Thrust *(kilonewtons)*	Mass [b] Placed Into Low Earth Orbit *(200- to 300-km altitude)* *(kg)*	Mass [b] Placed Into Transfer Orbit *(kg)*	Mass of Payload Placed Into Geostationary Orbit *(kg)*
Ariane 1	Mid-1983	3	2,450	4,700	1,750	950
Ariane 2	September 1983	3	2,700	4,900	2,100	1,150
Ariane 3	December 1983	3 [c]	4,100	5,800	2,400	1,400
Ariane 4	March 1986	3 [d]	5,500	7,300	3,300	2,000
Ariane 5	1990s	2, 3	5,500	10,000	4,500-5,500	3,300
Delta				2,500	900	440
Atlas-Centaur				6,500	1,850	910
Shuttle				30,000 [e]	[f]	6,800 [f] (maximum)

[a] There will be some slippage in these dates in the near term and possibly in the long term.
[b] Includes both payload and boost motors.
[c] First stage with two solid-propellant strap-on boosters.
[d] First stage with four strap-on boosters; we do not know whether solid or liquid propellants, or both, will be used.
[e] This mass is the maximum capacity of the cargo bay and includes the satellites and their payload assist modules (PAMs). PAMs are rockets used to boost the payloads from low Earth orbit into higher orbits. While the Ariane will deliver one to two satellites into geostationary orbits, the Shuttle will be able to launch three, and in some cases four, satellites into such orbits.
[f] The mass depends on the satellite payloads and boost stages used.

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prospective customers. With the advent of Arianespace in 1980, however, and with the declining availability of US ELVs, the Ariane program started to become a serious competitor.

Ariane Competitive Strategy

To promote Ariane launch services, Arianespace offers a number of advantages, notably in financing and pricing, launch-vehicle availability, and technology transfer.

Financing and Pricing. Under Arianespace financing terms, the customer actually starts receiving revenues generated from the satellite before the first scheduled principal payment. By contrast, NASA requires the full launch price to be paid over a 33-month schedule before launch.

The Ariane financing terms are complex Arianespace requires a prelaunch fee of 20 percent of the total launch price, with the remainder to be financed at 9.5-percent interest for five years through loans from ESA-approved banks.

The payment of the principal by the customer starts six months after the launch. Although the ESA-sanctioned banks begin payments to Arianespace 30 months before launch, the customers are required to pay only the interest on the loan before launch. By contrast, NASA does not assume responsibility for its customers' financial arrangements, although under certain circumstances the US Government may become involved.

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Our information on Ariane launch prices, derived from open sources, is limited. Because Arianespace can freely adjust its prices for non-ESA members, a comparison of launch prices for the Ariane and the Shuttle is difficult. The current price per launch for the Ariane 1 evidently ranges from $25-30 million. The current Shuttle price per launch is $20 million for a Delta-size payload. NASA, however, announced its

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Shuttle launch prices will increase by 85 percent in 1985. The Delta and Atlas-Centaur prices per launch are $30 million and $50-55 million (the Atlas-Centaur price depends on the number of launches per year).[5]

To promote the Ariane program outside Europe, Arianespace has decided that until mid-1986 ESA members should pay 25 percent more than nonmembers for launches of their payloads. In some cases, moreover, Arianespace adjusts its price to non-ESA members according to the competition and on several occasions it has underbid US prices. For example, in late 1978 the agency bid an average fixed price of $26 million against a $27 million price for the Space Shuttle (equivalent to the launch price for two US Delta payloads). In late 1982, Arianespace bid $56 million against $60 million for the US Atlas-Centaur. By contrast, US SLVs have fixed launch prices.

Because of the marketing tactics of Arianespace, even when the Shuttle can offer considerably lower prices, the Ariane may be chosen; this has been the case, for example, with Brazil. It has been reported that France has agreed to buy $58 million worth of Brazilian goods—the price Arianespace is charging Brazil to launch two of its satellites.

Availability. In initial efforts to compete with US SLVs, ESA emphasized the availability of the Ariane. At the time, availability seemed an advantage since the United States had decided to suspend production of the Delta and Atlas-Centaur because of expectations for the Shuttle.

Although the Delta occasionally still launches satellites, the Shuttle is the only real competitor with the Ariane. According to NASA, the Shuttle is heavily booked until about 1986.[6] Arianespace representatives have taken full advantage of Shuttle delays to exploit the market for launch services. For the next few years, most customers for satellite launch services are committed to either the Shuttle or the Ariane. If, as now planned, the Delta and Atlas-Centaur programs are taken over by private industry, they will offer alternatives to the Ariane after 1986, and we would expect the marketing strategies of industry to be competitive with those of Arianespace. If, however, the US ELVs are not taken over by private industry, there will be an expanded market for Arianespace to exploit. 25X1

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Technology Transfer. A major competitive tactic of Arianespace is to offer customers space-related technology transfer through courses of instruction and technical support. The French, as well as European companies with Ariane contracts, evidently have attempted to sell SLV technology abroad 25X1

The most notable example of technology transfer 25X1
used as a marketing tool is in ESA's dealings with Brazil (detailed in the next section). 25X1

Other Competitive Tactics. Until the 1982 launch 25X1
failure, as a competitive tactic Arianespace also had stressed the reliability of the Ariane. The marketing agency continues to promise to all its customers that in the event of a launch failure the launch of another satellite will take priority for a maximum of 10 months after the demand has been made by the customer. Further, to guarantee the cost of the launch and the cost and operation of the satellite during the 25X1
first two to five months in orbit, Arianespace requires the customer to take out an insurance policy, which costs about 10 percent of the launch price. It has recently been reported that Arianespace has been paying for the policy—another means of attracting customers. 25X1

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By contrast, NASA reportedly promises only a "best effort" at relaunch. The timing of this effort depends on NASA's schedule. On the other hand, NASA claims the reliability of the Shuttle is enhanced by the ability to have the payload checked out in space by its crew before it is ejected into orbit. 25X1

In addition, Arianespace claims the Ariane is specially designed to satisfy the demand for placing satellites into geostationary orbits. The agency stresses the Ariane's launch site as an advantage, pointing out that because the vehicle is launched close to the

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[5] Prices of all SLVs may vary. For example, a price variation of $3-6 million might depend on whether the cost of a perigee kick motor is included in launch or payload costs. Other differences might result from assuming operational costs, from using different vehicle models, or from other factors.

[6] We expect some Shuttle space to be available in the next few years.

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equator it benefits from the extra velocity (about 200 meters per second) imparted at this latitude by the Earth's rotation. The added velocity allows the vehicle to place heavier payloads into orbit than would be the case for boosters with comparable capabilities launched farther north and in turn permits payloads to be launched into higher orbits, thereby increasing satellite life expectancy. 25X1

An example of the marketing tactics used by Arianespace was a reported attempt in January 1982 by its director general, Frederic D'Allest, to persuade the Colombian Minister of Communications to purchase Ariane launch services. In a letter criticizing the US Shuttle program, D'Allest made the following points:

- US military launches receive priority over other launches.
- Because of the technical uncertainties of the Shuttle, customers' payloads could be delayed and additional fees charged to construct satellites.
- Shuttle prices will begin to increase in September 1985.
- The customer will have to pay for his launch even if the satellite is not ready. 25X1

Marketing Success

General

According to open sources, Arianespace has been successful in its marketing. In the first six months after its establishment, the total value of Arianespace's bookings had reached 1.4 billion French francs ($330 million). The Ariane is booked until about 1986 (see table 3), with over 31 firm orders and over 30 options and contracts under negotiation as of July 1982. Arianespace predicts that between 1985 and 1990 a worldwide market will exist for the launch of about 200 commercial, weather, and scientific satellites. According to open literature, the company originally had expected to launch only about 20 to 30 percent of this number. Assuming ESA meets its goal of launching 40 to 60 of these satellites for at least $30 million each, its receipts will total between $1 billion and $2 billion.

Before the September 1982 launch failure, ESA prospects looked even more promising as a result of a decision announced by NASA in June 1982 to reduce its satellite launch schedule during the next 12 years by over 200 launches and to increase its price per launch by 85 percent.[7] 25X1

Table 3
ESA-Announced Launch Schedule for Ariane SLVs [a]

Flight	Launch Date	Payload
L7	August 1983	Intelsat V-6
L8	November 1983	Intelsat V-7
L9	November 1983	Intelsat V-7
L10	March 1984	ECS-2
L11	May 1984	Telecom 1A
L12	July 1984	Telecom 1B and Westar 6
L13	September 1984	Spacenet 1 and Arabsat 1
L14	November 1984	G Star 1 and ECS-3
L15	January 1985	SPOT 1 and Viking
L16	March 1985	G Star 2 and Spacenet 2
L17	May 1985	TV-Sat or Satcol 1
L18	July 1985	Satcol 1 and SBTS 2 or TV-Sat
L19	September 1984	TDF-1 or SBTS 2
L20	November 1985	GIOTTO and STC 1
L21	January 1986	Aussat 1 and SBTS 2
L22	March 1986	Aussat 2 and Anik D

[a] Some payloads have not yet been scheduled. 25X1

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Brazil—A Case Study

An example of an aggressive and tenacious marketing effort by Arianespace that has been largely successful is its negotiations with Brazil. 25X1

France decided as early as 1978 to attempt to sell Brazil a comprehensive package of satellites and SLV services/technology.[8] 25X1

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[7] Although the Shuttle is heavily booked, we expect some space to be available in the next few years. 25X1

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[8] Because of the close association of CNES with ESA, CNES has participated in the marketing of the Ariane 25X1

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by French specialists at the Brazilian Aerospace Institutes, beginning in April 1980. An agreement was reached on a series of courses in the areas of vector analysis, metallurgy, aeronautical alloys and methods, micromolecular materials and fiberglass, compound materials, and quality control. The courses may have been offered to entice the Brazilians to accept the comprehensive SLV package the French had offered Brazil in 1978. After numerous French proposals and Brazilian counterproposals, the French realized in about 1980 that the SLV package was encountering serious problems. There is no evidence that the courses ever were given. In mid-to-late 1980, the Brazilians canceled the SLV agreement because the French would not transfer sensitive technology.

the French believed Brazil was so important in penetrating the markets of other Latin American countries that they continued their efforts. In 1980-81, they began promoting the Ariane SLV. At about the same time the Brazilians realized their own SLV would not be ready in time for its planned initial satellite missions and began expressing interest in foreign SLVs. In about mid-1980, the French offered to train 100 Brazilians for three years in their aerospace industry free of charge. As part of the package, French professors would teach courses on the technology of composites (probably materials) and on the launch and use of satellites. We do not know whether these courses were part of the series agreed on earlier, but it appears that in similar fashion they were offered to entice the Brazilians to purchase both launch and satellite services from the French.[9]

It was also in about mid-1980 that the French started marketing Ariane launch services through ESA. By this time, however, the Canadians were offering the Brazilians a better financial package than the French to build a satellite. In addition, NASA offered Brazil a 1985 launch date at $35 million for two satellites (a lower price and earlier launch date than it previously had offered). This was 60 percent less than Arianespace's $58 million offer. ESA evidently believed it was about to lose the satellite contract and possible launch services and began pressuring the Brazilians.

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The French won the launch contract but lost the satellite bid. the number of students and hours of training were cut in half when Brazil chose the US-Canadian consortium SPAR/Hughes to build the satellites. The actual Ariane launch contract terms were disclosed recently by the Arianespace director general.

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According to the launch contract made public by ESA, the French financing will be from Credit Lyonnais and Banque de Eides Pays-Bas, which together offered $34.44 million to be repaid in 10 years with a four-year grace period and an 8.5-percent interest rate. Another $18.5 million will be repaid within eight years, with a four-year grace period and an annual interest rate 2 percent higher than that of the London Interbank Offered Rate. The complimentary credit totals $27.44 million, with an eight-year period. The French banks also will offer, under advantageous terms, additional credits to be used by the Brazilian Government for other purposes.

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Implications of Operational Launch Failure and Recent Launch Success

We do not yet know the full effect on the Ariane program of the September 1982 operational launch failure and the June 1983 launch success. We believe, however, that ESA engineers must move quickly for

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[9] The conditions set by the Brazilian Government to obtain the satellite contract largely eliminated US bids. (The company had to be sponsored by its government, had to provide low-interest loans, and had to be able to provide offset trade benefits to Brazil.)

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the program to be a commercial success. The 1982 failure may have caused the termination of one contract, and Arianespace has obtained no new contracts since the failure.

The contract that was terminated was for the launch of the Dutch EXOSAT satellite. Because the Ariane is booked until about 1986, it would have been difficult for ESA to launch the EXOSAT before then without canceling another contract. A major factor in the cancellation, however, may have been ESA uncertainty about reliability of the Ariane launcher.

We do not know how the failure affected an ESA plan conceived before September 1982 to add a fourth stage for the second operational flight and to recover the first stage for possible reuse. For the recovery operation, a parachute package was to have been deployed off the coast of French Guiana after first-stage burnout. ESA estimates recovery of the first stage would save about 15 to 20 percent of the cost of the launch.

The 1982 launch failure set back the launch schedule by about nine months. As a result of the failure, ESA revised its launch schedule for later versions of the Ariane, according to an open source. The first Ariane 2 and Ariane 3 SLVs were scheduled for launch in 1983, the first Ariane 4 for 1986, and the first Ariane 5 for the 1990s. There will be some slippage in the schedule in the near term and possibly in the long term. (For announced dates of initial operational capability, see table 2.)

We do not know how the 1982 failure and the June 1983 success will affect other scheduling plans of ESA. Before the 1982 failure, ESA announced it had revised its scheduling procedure for flights 10 to 13 to make up for the April-to-September 1982 postponement and to meet other commitments. On these flights the first available satellite would be given launch priority. ESA also had considered using the Ariane 3 for the first time on the 11th flight. 25X1 25X1

One result of the 1982 failure, according to open sources, probably will be an increase in the insurance premiums for launch services and satellites. We cannot estimate the amount of the increase, but most likely it will result in higher premiums than for US systems because they have proved to be more reliable. We expect the increase would be more than the 10 percent of the launch price that customers for the Ariane and US SLVs normally pay. 25X1 25X1

We believe another operational failure of the Ariane in the near future could substantially reduce credibility regarding launcher reliability, especially among foreign customers—essential to the economic success of the program. Despite the June 1983 launch success, the 1982 failure, together with the Ariane's mediocre test performance compared with that of US SLVs, leads us to believe another such failure will threaten the Ariane's long-term commercial success. (The reliability of the Ariane launcher has been 66 percent in terms of number of successful flight tests, while that of US space launchers has been over 90 percent.) Additional Ariane failures also could cause the Europeans to reassess their commitment to the program. 25X1 25X1 25X1

Several more successful flights will be needed to prove the Ariane SLV is reliable. Barring further problems with the vehicle, the Ariane program will provide ESA with an independent space launch capability. The Shuttle is and will continue to be the main Ariane competitor. 25X1 25X1

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