



**European  
Community**

# BACKGROUND INFORMATION

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BACKGROUND INFORMATION

## UNITED IT FLIES -- THE SPINELLI PLAN FOR EUROPE'S AERONAUTICAL INDUSTRY

The recommendation of the Commission of the European Community that Europe's aeronautical industry should undergo a major rationalization process is the result of a long and detailed report by an expert committee. The main feature of the recommendations announced in July by Commissioner Altiero Spinelli was that there should be one single aircraft engine enterprise in Western Europe, and two enterprises producing airframes. These enterprises would presumably involve both government and private participation. Commissioner Spinelli, who is responsible for industrial, technical and scientific affairs in the European Community administration, also made recommendations for intra-European harmonization of airline networks and fares.

The European aircraft industry is competitive with that of the United States in ingenuity and skill, but not in cost-efficiency. In the past twenty years, the only long-haul aircraft produced in Europe have been Britain's De Havilland Comet and Vickers VC-10. Medium- and short-haul airliners have been produced in Europe in competition with each other -- for instance, France's Caravelle, Britain's BAC-111 successor, and the

British three-engine Trident. The most commercially successful short-haul European aircraft have been the Fokker F-27 Friendship, produced in the Netherlands, France's Caravelle, and Britain's Viscount.

The aim of the EC aeronautical program proposed to the policy-making Council of the Community by Mr. Spinelli is to maximize the possibilities of intra-European cooperation in the industry, particularly in the fields of financing, research and development, testing, and initial production. First "European" ventures in this direction have so far been bilateral rather than truly European, and concern aircraft like the supersonic Concorde not yet in service, and the Fokker F-28 Fellowship of which delivery commenced only recently.

Failure in spite of success

The Western European aircraft industry, which occupied a competitive place with that of the United States before World War II, now supplies only 9.5 per cent of aircraft used in the non-communist world; three-fifths of Western European airplanes are produced in Britain. Aircraft manufactured within the six-nation Community only satisfy 15 per cent of the Community market. British aircraft supply 70 per cent of the British market; but several British aircraft firms have collapsed in recent years, even when producing aircraft of acknowledged quality and apparent market success.

The preponderance of the United States in the aircraft market is partly explained by the fact that long-haul aircraft constitute 50 per cent of the global market by value: all recent long-haul aircraft produced in the non-communist world, except for the VC-10, have been American.

In spite of its market success, the United States aerospace industry has also been experiencing difficulties following cutbacks in government-financed military and space programs. Mid-1972 has seen some recovery, notably in the West Coast aircraft industry, but it is not thought likely

that the industry's dollar production value will return to the peak figures of 1968 in the near future. The EC Commission report sees this as an added reason why Europe's less favored industry should unite to survive.

Just as the American industry's principal advantage is an accident of geography -- the presence of a huge internal aircraft market -- so Britain's lead in European aircraft production dates from an accident of history -- the advances in research and development gained through Britain's role as a gigantic aircraft carrier in World War II. But although there are nationwide production norms for the U. S. industry, Europe's norms are still varied, and there is not even yet a European airworthiness code. A unifying factor, however, has been the tendency for European carriers to accept American norms and standards.

The advantage of being big

The report stresses that whereas American and other foreign aircraft of over fifteen tons all up weight (a.u.w.) can be imported into the European Common Market duty free, the United States imposes a customs tax of 5 per cent on imported aircraft. (Britain has a rarely applied tariff of 7 per cent). This and other factors have obliged European governments to subsidize aircraft production -- as the United States government proposed to do in the case of the supersonic transport (SST) project.

The report states: "The considerable and growing complexity and expense of aircraft materials require production units of ever greater dimensions . . . Even if the principal production enterprise subcontracts part of the work to smaller enterprises, the principal firm assumes the overall industrial risk: it is therefore advantageous that this sort of enterprise should be both big and highly concentrated." The report notes that the four largest American aircraft producers each have a higher gross

income than the combined aircraft industries of the Six. (The Community aircraft industry earned a revenue of \$2.293 billion in 1970.)

The report admits that international cooperation in a manufacturing project has disadvantages as well as the obvious benefits of rationalization. International operations increase delays and the number of personnel employed. Where governments are directly involved, the political instability of administrations interferes with policy, including budget policy, and magnifies the demand for equal sharing and for an equal "fair return". Multinational enterprises seem to have less market penetration thrust than single-company enterprises. The report says that when the cooperation is purely at the level of industrial enterprises, success depends on the integration of the project under the accepted authority of one enterprise. This form of cooperation works best where one partner is considerably bigger than the others -- which are thus essentially subcontractors.

Growth and restraints

The report says that unless there is a serious worldwide depression, all phases of the aircraft industry will continue to grow in the years to come. The demand for new civil aircraft, following a financially debilitating, premature rash of renewals of certain types of aircraft and aircraft building materials in the mid-Sixties, is now beginning to pick up again. However, carriers and manufacturers will now face new and costly restraints: the exigencies of environmental policy, the conflict between airfield building and urban planning, and new competition from highspeed surface transport. These are principally expected to affect air transport in the 1985-2000 period.

Among other problems pinpointed by the report are the anticipated worldwide contraction of defense and space-travel spending, reducing the

amount of government money accorded to research on new aircraft and materials, and the "threat" of the Soviet and Japanese aeronautical industries. The success of the five international aircraft projects now going on in Europe -- Concorde, Airbus, Mercure, Fokker F-28, and VFW-614 -- would depend on sales outside as well as inside Europe. Market perspectives and the credible capacity for growth of the Community aircraft industry would not justify production of the full spectrum of large airplanes and powerful engines. "The Community can, without serious inconvenience, continue to satisfy a considerable part of its needs through imports," the report said. Only one type of aircraft in each category should be produced. There were already too many competing European projects for short takeoff and landing (STOL) planes, for instance.

There also was scope for collaboration between European and non-European enterprises, especially American firms. This could assist both partners to reach joint markets. Community and non-Community *governments* could be invited to cooperate, also, to "design the ground rules behind which industrialists could take shelter, cooperate, and compete in a situation of equal opportunity."

Zeroing in on 1985-2000

There should also be rationalization among purchasers, permitting more substantial orders. The report praised as a "major step" in that direction a group of five airlines -- Air France, Alitalia, Lufthansa, Sabena, and Iberia -- into the "ATLAS" unit, and the grouping of four others (KLM, SAS, Swissair, and UTA) in the KSSU unit. In each case, the airlines retain their independence, but cooperate in purchasing and maintenance.

The objective should be the establishment of a small number of large international enterprises which would take sole responsibility for major

programs. These enterprises should zero in on the needs of the industry in the period 1985-2000. They should take account of the exigencies of environmental protection, the need to reduce noise and gaseous effluents, and the problem of airport congestion.

The report devoted considerable space to the question of credit. It said Community manufacturers were handicapped in their competition with other manufacturers because there was no equivalent European institution to the Eximbanks of Japan and the United States. The American Eximbank had pursued a continuous policy of export credits for aeronautical products, on the basis of a five-year repayment period for turbo-prop aircraft and seven years for pure jets, with a down payment of 10 per cent and interest rates varying from 5 per cent to 7 per cent. Following recommendations by the National Export Development Council, easier terms had more recently been granted in some cases -- such as no down payment and reimbursement over ten years.

The report said that at present each country issued airworthiness certificates on the basis of national requirements. Disparity between these requirements sometimes hindered the sale of European aircraft in neighboring European countries, although all accepted the F.A.A. criteria used for granting a Certificate of Airworthiness (C. of A.) to aircraft manufactured in the United States. The International Association of Aerospace Material Manufacturers (AICMA) had suggested that a Joint Airworthiness Code be adopted in Europe as soon as possible. AICMA groups companies and certification authorities in Germany, Belgium, France, Britain, Italy, the Netherlands, and Sweden.

The report recommended that although a large part of advanced aeronautical research must continue to depend on defense requirements, the Community should encourage and finance a "judicious program of

applied research related to overall civil aviation needs."

Implementation texts

The Commission sent four implementation texts to the Council.

The first recommended a coordinated development policy and a structural integration of present aeronautical enterprises. The second dealt with the financing of research and development, and with investment and marketing. The third recommended a common policy of credit, credit guarantees, exchange guarantees and guarantees against increases in production costs where Community programs were aimed at markets outside the Community. The fourth text related to the tariffs on aeronautical products.

The Commission recommended that the governments of the Six should achieve a concerted production program of new civil transport aircraft and power plants. It called for structural integration of aeronautical enterprises within the Community, and for a full sharing of technical information. There should be close consultation with manufacturers, carriers, users, and those public services involved in aircraft construction and air transport. Construction enterprises should keep the Community informed of all international projects of interest to the whole Community.

On the question of subsidies, the report said that the enormous amounts of capital immobilized by aeronautical research and development, and the extreme length of the aeronautical production cycle made government aid imperative. Development could cost from thirty to seventy times the value of the final assembly-line product. Any commercial aeronautical program for a single new aircraft would now cost hundreds of millions of dollars. Research development subsidies should therefore

cover the total cost of this pre-production phase, with those subsidies being repaid from sales. To help aircraft manufacturers procure investment for production, governments should guarantee loans contracted by manufacturers from their investors.

To assist marketing, aid should take the form of long-term credits, and insurance against commercial risk. There should also be guarantees against exchange fluctuations, and against abnormal and unpredictable production cost increases occurring between contract and delivery.

World fleets - Europe's share

In 1970 the non-communist world fleet of long-haul aircraft totalled 1,478 units valued at \$13,501 billion. Medium- and short-haul airplanes numbered 1,995, valued at \$10,937 billion. These figures do not include aircraft in the business and private categories. Europe's share of these fleets totaled 21 per cent, of which 10.3 per cent were owned by airlines inside the Community, with 4.4 per cent in British ownership and 6.3 per cent in other non-communist European countries. American lines own 63.9 per cent of the total and the rest of the non-communist world, 15.1 per cent.

European Community airlines bought 83.4 per cent of their aircraft from the United States, 15.2 per cent from Community manufacturers, and 1.4 per cent from Britain. Britain bought 71.9 per cent of its aircraft from local manufacturers, 28.1 per cent from American companies and none from Community countries. Other non-communist European countries bought 76.9 per cent of their aircraft from American builders, 18 per cent from Community manufacturers and 5.1 per cent from Britain. United States aircraft industries supplied 97.9 per cent of the needs of American lines, with British industry furnishing most of the remaining fraction.

The most successful European Community aircraft produced so far has



been the F-27. This sold fourteen units in Holland itself, fifty in other countries of the Community, and 516 elsewhere, including 200 produced under license by Fairchild Industries in the US. France's Caravelle sold sixty-three units internally, thirty-seven to other Community markets and 179 elsewhere. By the end of 1971, the new Dutch F-28 had sold two units in Holland, eighteen in other Community countries, and twenty-seven elsewhere, the report noted.

Air traffic grows

In 1969, the 119 member states of the International Civil Aviation Organization (ICAO) recorded air traffic of 43,128,000,000 ton-kilometers (nearly 17 billion ton-miles), an increase of 249 per cent over 1960, or 14.9 per cent per year. United States aircraft accounted for 57.2 per cent of total traffic and 27.1 per cent of international traffic. Community airlines accounted for 11.2 per cent of total traffic and 22.4 per cent of international traffic. British aircraft accounted for 5 per cent of total traffic and 10.3 per cent of international traffic. Other airlines accounted for 26.6 per cent of total traffic and 40.2 per cent of international traffic.

French aircraft exports have risen steadily in the past decade from sales of \$202 million in 1961 to \$453 million in 1970; of this last figure, 57.4 per cent was represented by aircraft and airframe sales, 23 per cent by sales of motors and engines, 10.7 per cent by helicopter sales, 5.5 per cent by sales of avionics and 3.4 per cent by the sale of other aircraft equipment. According to official figures, British aircraft sales have increased from \$425 million in 1961 to \$625 million in 1970, with a peak of \$784 million in 1969. Nearly half of the British sales are accounted for by the sales of new or reconditioned aircraft engines and parts of engines.

In the case of military aviation sales, the proportion of engines is even greater. In 1970, Britain sold 34.8 per cent of its military aviation exports to the Community, 24.2 per cent to North America, 19.9 per cent in the sterling zone, 3.2 per cent to EFTA countries, 1.1 per cent to Eastern Europe, 5.5 per cent to Latin America, and 11.3 per cent in other countries.

The U. S. aircraft industry

American aircraft exports have more than doubled in the past four years from \$1,672,600,000 in 1966 to \$3,400,000,000 in 1970. The military aviation fraction has fallen from 38.1 per cent in 1966 to 25.2 per cent in 1970. In this area, missile sales have dropped from 8 per cent of total aerospace exports to 3.2 per cent. Most civil aviation exports were of complete aircraft, with only a relatively small proportion of separate power plant sales. Eximbank credits for sales of jet airplanes have risen from \$94,400,000 in 1966 to a level of nearly \$600,000,000 today. Eximbank credits for the export sales of piston aircraft rose from \$4.9 million in 1966 to \$38 million in 1970. Eximbank guarantees against cost overruns also showed a marked increase: they totaled over \$180 million for the first six months of 1971.

In 1970, American aircraft industry revenue constituted 82.9 per cent of the non-communist world aviation trade.

The current sales position (August 8) on the three largest American civil aircraft currently in production are:

DC-10: 168 firm orders, 62 options, 42 delivered.

Lockheed 1011: 110 firm orders and 54 options.

Boeing 747: 209 firm orders and 189 delivered.

The report noted that there had already been a considerable unplanned compression of the European aircraft industry. In Germany, the number of airframe firms had fallen from twelve to three between 1963 and 1970. In France, the number had dropped from five to two between 1952 and 1970. In Italy, there were still five airframe companies, but only one of any size. In Britain, the number of aircraft manufacturing companies fell from sixteen to four in the two years between 1959 and 1961. In the realm of power plants, there are only two sizeable firms in France, one in Germany, and three in Italy -- working partly under license from foreign firms. In Britain, in 1966, virtually all the aviation power plant industry was concentrated in the hands of Rolls-Royce.

U.S.-European company sizes compared

In gross turnover, according to 1970 figures, Rolls-Royce leads the Western European aircraft industry in turnover with a total of \$645 million, followed by \$600 million for l'Aérospatiale and \$496 million for Hawker-Siddeley Aviation. The average size of the six largest European airframe firms was about one-sixth the size of their American equivalents. Europe's two largest aero engine manufacturers were also about one-sixth the size of their American competitors. The report recommended the formation of a single Community power plant enterprise -- which it suggested would still be only about half the size of General Electric.

In the airframe sector, the report said that only three companies -- France's SNIAS and Britain's Hawker-Siddeley and BAC -- were larger than American *subcontracting* companies. It recommended the consolidation of the European airframe industry into two enterprises.

Comparing funds allocated to research and development, the report quoted the following figures for 1968:

(mil \$)	<u>E.E.C.</u>	<u>United Kingdom</u>	<u>United States</u>
Military programs	559	456	3,857
Space programs	247	45	5,348
Civil programs	<u>210</u>	<u>225</u>	<u>1,253</u>
Total	1,016	726	10,458
Percentage of govern- ment subsidy	93.0	92.1	89.0

The report did note, however, that French subsidies for civil aviation research had increased from \$83 million in 1966 to \$254 million in 1972 and for cooperative Community projects from \$75 million in 1966 to a similar figure of \$254 million in 1972. Of this last figure, \$148,200,000 was for Concorde, \$64,500,000 for the European Airbus project, and \$33,100,000 for Mercure.

The development and production cycle

British subsidies to civil aircraft construction have increased from \$92 million in 1966 to approximately \$200 million in 1970. In Germany, the figure has remained constant at about \$60,000,000 a year, most of which is for the Airbus project.

The complete cycle of aerospace activities -- basic research, development research, production, and marketing -- stretches to between ten and twenty years, exceptionally longer than for other industries. The period from research to first delivery is considerably shorter in the US than in Europe, in spite of the fact that American industry tools up for a much higher production figure than equivalent European industries. The increasing complexity of the aeronautical industry means that between 25 per cent and 30 per cent of personnel are employed on research and development.

It takes between four and five years to produce a new military

aircraft, at considerably greater cost than for civil aircraft. The average new pursuit plane, including power plant and avionics, costs \$200 million, but can reach \$400 million for high performance machines. The costliest civil aircraft development in aviation history has been the Concorde, the development costs of which are about eighty times the cost of the first production model. By 1975, from research to production will have taken twelve and a half years. Even for a less ambitious project like the Airbus, R and D costs are about forty times the price of production models: development is taking five years -- or about the same as for the Douglas DC-10.

The development figure for power plants varies from five to eight years, including long and expensive bench and wind-tunnel testing. Research costs are several hundred times the value of a single production model of the engine. However, a successful jet engine usually spawns a whole family of different models for varying aircraft types, and there is a much higher sale of new and reconditioned models than is the case with airframes.

The report contrasts the launching and production costs of aircraft, according to the number of units produced, in the following table of proportions:

<u>Units produced</u>	<u>Cost of production</u> <sup>1/</sup>	<u>Cost of launching</u> <sup>2/</sup>	<u>Total costs</u>
1	9.63	200.00	209.63
30	8.35	6.66	15.01
100	8.00	2.00	10
200	7.85	1.00	8.85

1/ Direct work, raw materials, parts and components, general production costs (variable and fixed), general expenses.

2/ R&D jiggling and tooling, selling and promotional expenses, "learning costs".

The Mercure Project

The report examines the current transnational projects in Europe in two groups -- under the headings of "international industrial cooperation" and "intergovernmental cooperation".

The longest established shared-risk international project in the Community is the Mercure, a 150-passenger short-haul jet now undergoing flight testing. The project originated in 1966 with the French company Marcel Dassault collaborating with two Italian companies, Aeritalia and SECA, later joined by SABCA (Belgium), CASA (Spain), Federal Emmen (Switzerland) and Canadair (Canada). All the companies are participating in production and all except the Swiss enterprise are contributing risk capital. Dassault has full responsibility for production and marketing and for 70 per cent of the total cost, of which 56 per centiles are covered by the French government. The Italian firms are responsible for 16.8 per cent of production and approximately 10 per cent of financing. The other participants have smaller shares.

Development costs for the Mercure, including two prototypes and two fuselages for static and fatigue testing, are put at approximately \$200 million. The first prototype made its maiden flight May 28, 1971 and the second test model began flight tests this summer. Tooling-up for the assembly line has started; initial production will be three aircraft per month, hopefully rising to six. Certification tests are scheduled for the period March to September 1973 and Air-Inter should take delivery of the first production model in October 1973. Air-Inter has ordered ten units for a total cost of \$78 million (1972 dollars), and contract completion is promised by the end of 1975.

A 180-seat stretched Mercure may be produced from 1978. The present aircraft has Pratt and Whitney engines, but the stretched version will

have a larger power plant with 22,000 pounds of thrust, to be developed by SNECMA and General Electric, with the possible participation of Rolls-Royce, Volvo Flygmotor and MTU.

Total world market for this category is estimated at 1,500 units. The Mercure is expected to replace the Caravelle in fleet renewals, especially in French and Spanish airlines. The potential French market for the airplane is estimated at eighty units. The global target market for the aircraft is put at 300 units. French government export credits vary from 80 per cent to 84 per cent for seven to eight years, at 7 per cent interest.

The Fokker Fellowship

Another well-advanced project is the Fokker F-28 Fellowship, a short-haul twin-jet 60-passenger liner, now in assembly-line production by Fokker-VFW of Amsterdam. The F-28 has a range of 2,000 kilometers (1,200 statute miles); a 75-passenger version will have a range of 1,360 kilometers (850 statute miles).

The F-28 program has been executed by VFW-Fokker of Bremen and the British firm Short Brothers and Harland. The power plants were purchased from Rolls-Royce.

The Dutch share of financing was 67 per cent of development costs -- \$40,500,000. The Dutch government covered 50 per cent of this figure, and this advance will be repaid by Fokker from the sales of the twenty-sixth to the 215th unit. For the other half of the Dutch financial share, Fokker-VFW borrowed from the capital market, the loan being guaranteed by the State, which will receive the interests on the capital loan from the sales of the 127th unit onward.

Break-even point is estimated at 175 sales. Fokker say their most conservative market estimate assures them of at least 250 sales over the

next ten years. Early this year, Fokker reported fifty orders, with thirty-five already delivered.

The VFW-614

A smaller project is the VFW-614, a 40-seat feeder-line twin jet now being flight-tested. VFW-Fokker is the principal manufacturer, in association with MBB, SABCA, and Fairey; the power plants are being produced by Rolls-Royce and SNECMA.

Airframe costs are put at 54.5 per cent of the total, with the proportional cost-sharing being: Germany, 70; Netherlands, 16; Belgium, 8; Britain, 6. Power plant costs are put at 16.9 per cent of the total, with Britain covering 72 per cent of the financing and France, 28 per cent. Market and after-sales service constitute 6 per cent of total costs, entirely borne by the German interest. Government cover of these investments varies from 60 per cent to 80 per cent for the various countries.

Development costs and the production of three prototypes are estimated at \$165 million -- \$80 million for the airframe and avionics and \$85 million for the reactor. The German government is subsidizing 80 per cent of airframe costs and 50 per cent of power plant costs. The German government has also accorded a supplementary credit of \$36.6 million and a guarantee of \$41.4 million to cover a cost overrun; and if the finance committee of the Bundestag agrees, the German government will also provide \$68 million to finance sales.

Initial problems with the Rolls-Royce/SNECMA M-45 H engine increased production costs by \$33 million to \$109 million: the German government agreed to cover this overrun on condition that the manufacturers give guarantees on performance and retail price and that VFW-Fokker guaranteed the purchase of a minimum number of units.



Germany will produce 64 per cent of the assembly-line aircraft, the Netherlands, 22 per cent, Belgium, 10 per cent, and Britain, 4 per cent. The global market for aircraft in this category is estimated at between 1,200 and 1,400 units; VFW-Fokker hope to capture a third of this market. Break-even point is said to be 175 units.

The prototype VFW-614 flew July 14, 1971, but was later lost in a flight test accident on February 1, 1972.

The Concorde saga

Under the heading of "intergovernmental cooperation", the report deals with two projects -- Concorde and Airbus. In both cases, the governments involved have defined and financed the programs and chosen and supervised the manufacturers.

Concorde is a supersonic long-haul aircraft for 128 to 144 passengers. The project was first agreed to by the French and British governments in November 1962. For the airframe, SNIAS (l'Aérospatiale) is responsible for 60 per cent of the development and production work and BAC, for 40 per cent. Rolls-Royce is responsible for 67 per cent of engine production and SNECMA, for 33 per cent. Both countries are sharing the task of developing and producing the avionics and other systems. R and D costs on Concorde, up to 1975, were estimated in May, 1972 at \$2.5 billion.

The two prototypes 001 and 002 have been flying since 1969; a pre-production model is being flight-tested, a second is about to be, and ten production models are at different stages of the assembly line in Britain and France. The present schedule calls for delivery of eighteen production units by 1975, thirty-eight by the end of 1976, seventy-three by the end of 1977, and 150 by the end of 1979. The production rhythm should reach three units a month in 1976, and the target market is 250 units over ten years.

A sophisticated and complicated system covers orders and options. Deposits are required to secure delivery positions. This gives an option which must be made firm or surrendered in periods varying from six to nine months. BAC say that some US carriers took out options on Concorde in the hope of acquiring extended trans-Pacific routes which were later denied them. Early deposits are not being forfeited as, although the Concorde project was able to meet the payload requirements of the contract, it was not able to meet the original price estimate.

The Concorde order book currently reads (July 28, 1972) as follows:

BOAC: 5 orders, 3 on option.

Air France: 4 orders, 4 on option.

Chinese government: 2 initial purchase agreements.

Iran Air: negotiating to purchase 3.

Pan Am: 8 options.

American Airlines: 6 options.

TWA: 6 options.

United Airlines: 6 options.

Eastern Airlines: 6 options.

Continental Airlines: 3 options.

Braniff Airlines: 3 options

Qantas: 4 options

Japan Air Lines: 3 options

Lufthansa: 3 options

Sabena: 2 options

Middle East Airlines: 2 options

Air India: 2 options

Pan American Airways have stated that, contrary to press reports, they are not dropping their eight options, but the line is not expected

to take them all up. Air Canada has cancelled its four late-1977 options. Eastern Airlines have taken options on Concorde with a view to future Pacific routes. The United Airlines options are for the Hawaii run.

The airlines that have taken options on Concorde fly over 70 per cent of the non-communist world's scheduled passengers, a BAC spokesman says.

The Airbus venture

The most recent intergovernmental cooperation project is the Airbus A-300B, a short- and medium-haul 250-300 seat twin-jet airliner. The project was initially defined by an agreement signed by the French and German governments on May 29, 1969; other agreements have since been signed with the Netherlands and Spain. Deutsche Airbus, the manufacturing enterprise, is owned 60 per cent by MBB and 40 per cent by VFW-Fokker; it estimates development costs at \$479,210,000, with 40.5 per cent of the financing coming from Germany and the same proportion from France. The Dutch partner and Hawker-Siddeley of Britain are each providing 6.2 per cent of the financing, and the remaining 6.8 per cent should come from the sale of the prototypes. There will be a small Spanish contribution to financing, and CASA will be responsible for 4.2 per cent of manufacture.

The Airbus will have two General Electric CF 6-50 power plants, developing between twenty-two and twenty-three tons of thrust. SNECMA will be responsible for 30 per cent of the manufacture of the engines and MTU (Germany), 10 per cent. The engines will be assembled in France.

The Airbus project employs over 10,500 people and by the end of 1971 \$300 million of development costs had already been spent. Taxi trials of the first prototype began at Toulouse this month, and the first flight is scheduled for later this year. Delivery of this first production model is planned for 1974. The first ten deliveries should be completed that year, with forty by the end of 1975 and seventh-three by the end of 1976.

Production rhythm should reach between six and ten units a month. The first prototype will carry 259 passengers for a range of 2,200 kilometers (approximately 1,300 statute miles). A second version, ordered by Air France (six firm orders and ten options) will carry 270-290 passengers over the same distance. Another 270-290 passenger version with a maximum range of 4,000 kilometers (approximately 2,500 miles) is to be produced for Iberia (two firm orders and eight options). The extended autonomy will be achieved by placing an additional fuel tank between the wing roots. The larger versions of the Airbus have an estimated price of \$40,300,000 each (1972 dollars), including spares and simulator.

Global market for the Airbus category is put at 850 to 1,050 units; the European Airbus hopes to sell 400 units in the initial years and eventually about 600 units, including 70-80 units to the ATLAS group.

The European Investment Bank and the President of l'Aérospatiale signed an agreement in Luxembourg on December 21, 1971 for a twelve-year loan of 14.4 million Units of Account (pre-devaluation dollars). The following day, the German government agreed to a finance guarantee for the assembly-line production of eight units and the development work on the larger derivative models. The German guarantee amounts to \$620,000 per unit.

The report notes that Aeritalia and Boeing are considering a cooperation project on a short take-off, 100-150 seat airliner for which delivery would start in 1975.

#### Power plant programs

In addition to two single-country power plant programs in Europe -- the British RB 211 and the SNECMA CFM-56 [carried out in cooperation with General Electric] -- there are two European cooperation projects: the Olympus 593, for Concorde, and the M-45 H, for the VFW-614. Both are

Rolls-Royce/SNECMA projects. Rolls-Royce is responsible for two-thirds of the study and development of the Olympus, and SNECMA is building the rear part of the reactor. R and D costs were estimated at the end of September 1970 at \$440 million for Rolls-Royce and \$240 million for SNECMA.

Twenty-eight units have already been used in flight and sixteen more test units are being built. Another seventeen test engines are being used for special tests at sea level, at high altitude, and also using the British Vulcan bomber as a test bed.

Forty production model engines are being built, twenty for the certification of the two pre-production aircraft and the first three production units. From the forty-first production Concorde onward, the Olympus Mk. 621, with 39,940 pounds of thrust will be available: this will permit non-stop flight from New York to Frankfurt with economic payloads.

Certification is expected in 1973 after 32,000 hours of testing in flight and on the work bench. Rolls-Royce and SNECMA have set up a joint subsidiary, Concorde Engine Support Organization, Ltd., to negotiate and manage supply contracts, including replacement engines and spare parts.

The other project, the M-45 H, is a derivative of a military engine and has three and a half tons of thrust. It is especially suited to short-haul transport craft, and will be used in the VFW-614. Its low noise level satisfies FAA and ICAO specifications.

Rolls-Royce is responsible for the technical development, and SNECMA for producing the low-pressure unit. Development costs, estimated at \$50 million in 1967, have now run past \$82 million. Development and manufacture is being handled 55 per cent by Rolls-Royce and 45 per cent by SNECMA; the financing is 25 per cent Rolls-Royce, 25 per cent SNECMA and 50 per cent German government.

Twenty-one units are being produced, six for work bench trials and fifteen for flight testing.

Government aid

An annex report dealing with government aid policy notes that in Britain manufacturers themselves submit projects that require a government share in risk-capitalization: the Government then investigates the technical features involved, the commercial prospects and the total costs -- normally providing about half the total launching costs, including design, development, prototypes, tooling, and personnel training. But the British government does not usually support cost overruns. The terms of repayment from sales are negotiated in advance, stipulating reimbursement from a certain production number onward: this means that if the number of aircraft sold is less than expected, the government only recovers part of its investment, but if a larger number is sold, the government makes a profit. Policy is that government support is a risk investment, not a subsidy.

German governmental financial support can go as high as 60 per cent of development costs. German government loans are also repaid proportionally to sales. Some French governmental finance occasionally covers 100 per cent of production costs of new aeronautical materials.

In the Netherlands, the Dutch Institute for Aeronautical Development administers a revolving fund which may also on occasion provide 100 per cent of development costs. Repayment is proportional to sales.

The report makes no reference to military transnational projects or to general aviation.