COMMISSION OF THE EUROPEAN COMMUNITIES

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A COMPETITIVE EUROPEAN AERONAUTICAL INDUSTRY

(Communication from the Commission)

Explanatory memorandum and summary

1. This communication is intended to start a general open discussion on the conditions in which the European aeronautical industry can be sure of smooth development in a market which is bound to become more and more competitive.

2. In Europe and worldwide the civil aeronautical industry is undergoing profound change, characterized by two recent phenomena:

   * by developing an entire family of commercial jets and making a significant breakthrough on the world market, including the United States, Europe has become a fully-fledged civil aviation manufacturer;

   * cuts in defence budgets are gradually shifting the aeronautical industry's centre of gravity from military to civil construction, prompting companies to compensate for the fall in military orders by increased activity on the civil markets.

3. The matter has to be discussed, because the emergence of a European civil aeronautical industry is broadening the competition and thus reducing the profit margins of the major constructors by subjecting them to fierce competition over prices.

   In these conditions the European industry is handicapped by its size; Europe's good technical performance does not automatically guarantee efficient economic performance, the great potential of economies of scale remaining untapped. The question of size is fundamental in an industry where competitiveness is determined largely by ever-rising production costs and the scale of production.

   The American aeronautical industry has always been able to rely on a home market with a large capacity. This has enabled it to develop highly integrated structures, from the design stage through to production and marketing.

   In Europe, on the other hand, even though it is active on the world market, the aeronautical industry has retained a production structure strictly bound to the national territory, as a result in particular of the dual character of production plants and companies. Hitherto it has been chiefly through cooperation that European companies have in certain cases been able to solve the critical problem of size.

4. This is a good time to discuss the matter since:

   * the economy is doing well, which makes it easier to apply the measures needed to improve competitiveness;

   * the completion of the internal market should provide a legal and institutional framework better suited to the needs of the aeronautical industry.

5. Clearly, if the Commission is unable to take the place of industrial managers or the Member States it should adopt a horizontal approach to industrial policy and help solve companies' problems by creating an environment liable to improve competitiveness in the industry.

   That is why the Commission is proposing to make a detailed diagnosis, with the collaboration of the Member States and all the industries concerned, of the competitiveness of the European civil aeronautical industry, and then to create framework conditions such as will improve the situation.

   This matter is on the agenda for the Council meeting (industry) on 21 September 1990.

A COMPETITIVE EUROPEAN AERONAUTICAL INDUSTRY

The aerospace industry is a perfect example of a field with a maximum concentration of high-technology products in a wide, varied range of applications. For this reason it is rightly regarded as being of strategic importance for industrial, commercial and technological reasons despite its relatively small size in economic terms - accounting for 3% of the EEC's industrial production; 1% of industrial employment, or 500 000 direct jobs; while enjoying a trade surplus of almost ECU 6 000 million in 1987.

That this position of the European aerospace industry at the leading edge of technology has been recognized is shown by the scope of its industrial R&D, which easily outweighs its share of industrial production. This is clearly linked to the fact that economic growth in industrialized countries is closely related to the development of industries using advanced technologies because of their high added value content.

More than the other parts of the aerospace industry, that of civil aircraft manufacture covered by this analysis is open to fierce competition, which means that it must quickly achieve a high level of industrial competitiveness.

However, every country still tends to regard national ability in both aerospace and armaments as being a national asset which the country must control since it is an important plank in its defence and industrial policies. The increasing difficulty that industrial states are having in acquiring the industrial, technical and financial muscle needed to launch new aerospace products has gradually restricted national autonomy.

The long-term viability of Europe's aircraft industry will therefore depend more and more on the ability of the Member States and their aerospace companies to give precedence to a Community rather than a national approach.

Against that background, this communication must be seen as paving the way for a general, open exercise in thinking about the prerequisites for the harmonious development of the European aircraft industry in a market where normal competitive forces apply.

1. Situation and outlook

1.1 Importance of civil aircraft manufacture to the aerospace industry

Civil aircraft account for about 30% of total world aerospace activity but, although there are severe cyclic variations, they clock up substantially higher growth rates than the other branches of aerospace.

Military equipment still dominates the aerospace industry with about 55% of activity, but while military spending is closely linked with GNP in current terms, the relative size of the military aircraft sector within the aerospace industry is gradually shrinking.

Lastly, after a very fast initial build-up for the moon shots the space sector has since fallen behind in constant-value terms. It makes up about 15% of the world aerospace industry, chiefly owing to the US market for military space hardware. Commercial applications are still marginal as a fraction of total production.

1.2 World market growth

The world market of civil aircraft is growing vigorously. Demand collapsed after the 1979 oil crisis but since 1987 it has recovered on a scale exceeding all forecasts. World traffic has tripled since 1975.

The range of forecasts is in general fairly wide, but it is reasonable to expect that air traffic will double by the year 2000. Compared with a world fleet of 8 000 aircraft in 1988, the projection is for 12 000 by the year 2000 or in other words about 7 000 new aircraft, allowing for those having to be withdrawn from service.

The trend is due to largely structural factors, namely:

- the need to replace a fleet that has now grown old;
- economic and commercial growth, particularly in the Pacific rim, which is creating new markets;
- deregulation of air transport, which spurs the emergence of new carriers, and a drop in fares, particularly in regional air transport.

Overall, average aircraft size is on the increase. Airport and airspace congestion is causing the airlines partly to revamp their fleets by using aircraft with increasingly greater capacity.

It is important to bear in mind that, as in the past, the growth trend in civil aviation will still be subject to very marked cyclic variations. These are substantial in volume and value terms for an industry of this size in which the production process is particularly cumbersome and complex. In addition to the high development costs they are by far the chief obstacle to entering the sector and surviving in it and presuppose an ability to adapt that is one of the crucial factors in industrial competitiveness.

1.3 The situation in Europe

Europe's market share in the present commercial jet fleet is almost 18% by value (1988 orders) with the balance supplied by the Americans. In the remaining areas of the civil aircraft industry (regional transport aircraft, business aircraft, light aircraft and civil helicopters), which account for about 20% of total civil aircraft turnover, Europe is relatively well placed with:

- about two-thirds of the world market for commuter aircraft;
- one third of the world market for business aircraft and light aircraft; and
- almost one third of the world helicopter market.

It should be noted that, above all in the '50s, the US aircraft industry used the development of military transport aircraft in order to derive civil versions of these. It is certain that this placed the American industry in an advantageous situation.

2. Factors in competitiveness

In the military sphere technological performance takes precedence over the other aspects of competitiveness, while in the civil field other factors are just as important to full competitiveness. Penetration of the civil market, where competition is very keen, presupposes not only the availability of high-performance technology but also that firms are capable of producing at competitive prices, and then have a high level of sales and marketing capability. This applies as much to airframes as to engines and equipment which - accounting for 50, 20 and 30% respectively of an aircraft's selling price - determine overall product quality.

Although the civil aircraft industry performs well in technological and commercial terms it is still weak in certain areas of production.

2.1 High-performance technology underpins the European push

European civil aircraft, from commuter aircraft to long-haul airliners, are at least equal - and most often markedly superior - in technology to the other aircraft on sale on the world market.

This is because:

- most European aircraft, being of more recent design, incorporate the latest technologies;
- public support of research and development has been preferred to any other form of intervention;
- this margin of technological superiority is a prerequisite for gaining a foothold in the market;
- advanced technology is necessary to meet increasingly stringent environmental requirements.

It is nonetheless so that the fragmentation of public support for R&D in the various Member States, has resulted in cost overruns arising from the many cases of duplicated effort.

2.2 A European sales breakthrough held back by production capacity

In view of the position previously occupied by the United States and the airlines' reluctance to buy from suppliers who have newly entered the market the breakthrough by Europe's civil aircraft industry is a major commercial success. On the other hand it will not be complete unless reflected in sales levels similar to those of competitors and those sales are made at prices which are entirely cost-covering. In these areas, however, the European industry suffers from a twofold handicap:

- despite the change in its scale of production, the European aircraft industry lacks the flexibility enabling it to respond without delay to a sudden upsurge in demand. The result is that cyclic peaks first benefit the American industry, which has shown great flexibility with regard to delivery times in response to very sharp growth in demand;
- the length of production runs achieved by the US industry - in particular owing to the very high degree of commonality between civil and military transport aircraft programmes - confer the benefit of major economies of scale which the European industry has so far not enjoyed to the same extent (see next point).

2.3 European competitiveness in manufacturing restricted by a lack of economies of scale

Economies of scale are a decisive factor in determining manufacturers' ability to compete. There are three main sources of economies of scale:

** The **first**, deriving from mass production, enables not only the very high fixed launch costs of a new programme to be spread over more aircraft but also enables advantage to be taken of what is known as the "learning curve" i.e. know-how deriving from experience. These two basic factors sharply reduce the cost of making an aircraft in a given industrial facility.

Thus where factor costs are equal the production of 1000 examples of a new type of aircraft yields an average saving of 15-20% compared with a production run of 250. A production run of 500 aircraft - never previously achieved in Europe - is now within the grasp of Airbus Industrie.

** The **second** factor arises from the ability to reduce the fixed development costs for a programme by using concepts and components from an existing programme, so extending the cost-reducing effects of the learning curve over the common components. Hence the importance of developing a family of aircraft and derivatives from an existing programme.

The "family" approach has now been introduced into Europe by Airbus, but its effect is less marked than in the United States.

** The **third** factor lies in making optimum use of production facilities. Although the number of aircraft produced is crucial to a programme's breaking-even, the amount of time over which production is spread - and thus the rate of production - is equally important.

Flexibility of production facilities is just as important as total production capacity and will therefore have a decisive role to play in Europe's ability to maintain and strengthen its position on the world market. Too slow a production build-up adversely affects orders, because the resultant longer delivery periods are unacceptable to the airlines, which operate within an ever-shortening business timescale.

Production capacity will be determined by an optimum compromise between:

** the higher cost of under-utilizing surplus production capacity;

** the lost opportunity resulting from the loss of customers to the competition when production capacity, instead, has been set at too low a level, causing delivery periods to become too long; and

** social and labour laws in Europe which, compared to the situation in the US, foster a relatively conservative approach to work force levels in order to avoid the adverse effects of overmanning in a recession. However, in view of the current rapid growth in orders, shortages of qualified staff could stifle the development of production capacity in the long term.

3. A basis for action at Community level

In view of the importance of economies of scale, the structural problem facing the European aircraft industry is chiefly its size and degree of integration. As the industry in the United States currently has a large home market, it gains a head start from its very high degree of integration in both design and production, and from its demand level.

The turnover of the biggest US aerospace manufacturer, for example, is equal to that of Europe's 12 leading aerospace companies put together; the three leading European prime contractors (British Aerospace, Aérospatiale and MBB) have on average 25% of the turnover of their US competitors (Boeing, McDonnel Douglas and Lockheed).

So far it has been chiefly through cooperation that the European industry has solved this critical problem of size. Despite some remarkable results, this is not an approach that permits integrated strategic management owing to the dispersal of decision-making centres among the government agencies responsible for launching new programmes, the manufacturers responsible for production and the sales teams.

Structural problems of this kind will become increasingly acute as competition in the civil aircraft industry grows keener owing to:

- cuts in defence budgets which, by reducing the size of military programmes, will cause the civil side of the industry to bear the full weight of certain items of R&D expenditure previously covered by the authorities as part of military spending;

- the shrinking of "protected markets" which will cause European - but, chiefly, US - manufacturers to offset the fall in government orders by stepping up their level of activity on civil commercial aircraft markets; and

- the emergence of new competitors, in particular in the equipment sector.

As the stakes are high and crucial to Europe's industrial and technological independence, cooperation between Community companies, in line with the rules of competition, could prove to be an urgent need in certain activity areas. Thus world-scale entities would be created which were then capable - if necessary - of forging transatlantic cooperative links on an equal footing. To bring this about the Community must set up the right framework enabling cooperation between Community firms to develop.

4. The arrangements for completing the internal market must make it easier for the European aerospace industry to integrate

Since the aerospace industry is in essence facing world-wide competition, the completion of the internal market will not cause any basic change in the structure of demand for large commercial transport aircraft. However, the other parts of the industry with chiefly domestic outlets, must adapt to competition on a wider front.

Indeed, the industry must try to take advantage of the spin-off from the internal market, in order to acquire efficient industrial structures on a similar level to those of its chief competitors. Apart from the consequences of active R&D and tight state-aid policies, the aircraft industry will be in a position to benefit from the action taken as part of work to complete the internal market in the following fields:

1. Company law and taxation;
2. Vetting of mergers;
3. Standardization and certification;
4. Export credit insurance.
5. Trans-European networks.

4.1 Company law and taxation

In recent years several Member States have tried to bring together complementary entities and have devised restructuring arrangements for the aircraft industry on a purely national basis. Whatever the outcome, the industry is still too small in industrial, financial and often in technological terms compared with the US industry.

Facing as it does the highly integrated structures of its competitors and the global scope of the market, the European aircraft industry lacks a Community legal framework that is appropriate to transfrontier operations. At present there is only the European Economic Interest Grouping (EEIG) which can be used as a vehicle for certain - still relatively limited - joint activities.

The proposal for a regulation on the Statute for a European Company now before the Council could provide the legal framework for matching the structure of the industry and its business management to the scale of the market. The adoption of this regulation may be a major factor in the integration of the European aerospace industry, since it will strengthen the legal feasibility of that exercise.

In terms of taxation the adoption in July 1990 by the Council of the package of three directives on mergers, parent companies and subsidiaires and on the removal of double business taxation by laying down an arbitration procedure, means the removal of barriers to cross-frontier cooperation between companies. These directives will come into force in 1992.

4.2 Vetting of mergers

The assessment criteria set out in the regulation on the vetting of mergers approved by the Council in 1989 will be applied by the Commission to Community-wide operations. In this connection the Commission will take account of the specific economic and industrial features of the aircraft industry, beauring in mind that some sectors within the industry are characterized by:

- global markets where domestic markets are proving too small to sustain companies of sufficient strength to compete internationally;
- industrial operations on such a scale that no existing European company can master all the technologies and the production facilities needed to handle a complete programme in industrial and business terms;
- financing requirements which, have risen to a level at which no single actor can cover all its needs on its own;
- the high level of integration of the European industry's chief competitors.

In this situation - with strong, world-wide competition - there may be instances in which the formation of legal entities combining the Community's supply capacity in certain areas of the aircraft industry will not lead to the creation of bolstering of a dominant position within the Community market. Where this is the case, such developments could help to boost the competitiveness of Europe's industry against its major international competitors.

4.3 Standardization and Certification

Technical barriers due to differences in regulations and standards between Member States, and the retention of specific national procedures for certification, are handicaps not suffered by the American industry.

4.3.1 Standardization

The European Association of Aerospace Manufacturers (AECMA) has signed a memorandum of understanding with the CEN, the European Committee for Standardization, recognizing the former as the associate body responsible for the technical aspects of standards relating to the aerospace industry. The memorandum of understanding entered into force on 1 January 1987 and is yielding good results.

4.3.2 Certification

The national civil aviation authorities are responsible for the certification procedure leading to the issue of certificates of air worthiness.

Harmonization of the certification requirements for aerospace products should provide the optimum level of safety while considerably reducing the cost of certification and so promoting the free movement of aerospace products within the Community.

The national civil aviation authorities have set up the JAA (Joint Aviation Authorities) with the task of developing a common approach to safety. The Commission wishes to strengthen the work of the JAA by encouraging the establishment of a European civil aviation authority with legal terms of reference. Discussions on the subject are now in progress.

4.4 European export credit insurance system

As production common to a number of Member States develops, the need for a Community mechanism to provide cover for exports becomes increasingly apparent. At present the Member States' credit insurance agencies are not able to cover such operations effectively; a single contract for exports from a number of Member States often requires separate approaches to each national credit insurance agency. As a result, the companies often only approach their usual lenders, to the detriment of their competitiveness.

4.5. Trans-European Networks

In accordance with the European Councils of Strasbourg and Dublin and with the Council Resolution of 22 January 1990 on the Trans-European Networks, the concertation between the Community and the Member States should be intensified in order to improve the adaptation of existing and future infrastructures to the forecast for the development of air transport. The two urgent problems which have been identified in this context, relate to the airspace occupation and the air traffic control as well as the airport infrastructures.

5. Research and technological development policy

5.1. Although the use of advanced technology in the design of aircraft, their propulsion and their equipment is not the sole or most important single ingredient of future commercial success, it is the case that a shortfall in the level and maturity of the technology employed will surely lead to commercial failure. In contrast to the situation in the phases of development and production, cooperation on research has been comparatively limited. While this independence of approach in research has value and was fairly easily sustainable in the past, when many government inputs were substantial, it is becoming increasingly unsatisfactory for the future. The conjunction of increasing sophistication and cost of technology with diminishing support by national governments makes it both important and urgent that concrete steps should be taken to encourage, with respect to Community competition rules, more and closer cooperation between the numerous operators who contribute to aeronautical research and technology acquisition within the Community. The benefits which may be expected to flow from such growth in cooperation are considerable:

i. maintenance of a state-of-the-art technology base;
ii. more efficient use of material and human resources;
iii. encouragement of yet closer coordination/cooperation between companies in the ensuing stages of development;
iv. provision of a mechanism for a coordinated approach to prenormative research questions;
v. provision of a common framework within which to approach research questions in areas of universal environmental and social concern.

In March 1989, the Council adopted the BRITE/EURAM Research Programme (1989-92) which includes a 2-year exploratory programme of aeronautical research activity. This activity, which is now in progress, will be carefully evaluated before any decision is made on whether to propose further Community action to prompt research cooperation.

5.2. Taking account of the consequences of the reduction in defense budgets on research in the military area and the technology transfer within dual undertakings, it could be useful for the sector as a whole, if the Community , while respecting the principle of subsidiarity, were to support increased research in those areas common to both the military and the civil.

6. Treatment of state aids

The international context in which the European aircraft industry operates requires it to boost its competitiveness from its own resources. To maintain a system of free, undistorted competition, complying with GATT rules, is one of the cornerstones of the Community. Nevertheless, it must be recognised that in the past international competition has been affected by the large-scale assistance which has benefitted everyone involved in the world aeronautics industry. In this area, as has already been seen more and more in other industrial sectors, it is essential that in future there is transparency in public financing. The aim of improving the competitiveness of the aeronautics industry implies a progressive reduction in public support in which the timing and the extent will depend on the efforts made by European industry's competitors.

7. Conclusions

The majority of the industrial or service sectors are displaying an ever-increasing cross-frontier integration of their management and decision-making centres, whereas the European aerospace industry which, however, serves a world-wide market, forms an exception to this rule. Owing to national strategy and defence policy factors the split nature of production facilities and companies restricts the development of production activities and structures to national territory. This explains why, in recent years, aircraft industry, both civil and military, has often achieved maximum integration within the confines of its national frontiers.

Thus, in that the size and integration of the production facilities and their management may help greatly in consolidating the competitive situation of the aerospace companies, Europe's industry still possesses in this area significant potential for improving its competitiveness in terms of economies of scale.

In contrast the American aircraft industry, which has been able to fall back on a vast home market, has developed production and management structures which better meet the critical size criterion.

It must be made clear that the choice and implementation of synergies lie solely with the industry's managers who, moreover, bear the risks associated with those operations. For its part the Community must provide the background conditions that favour the development of an aerospace industry that is able to ensure its own financial viability in the long term on an open, competitive market. A prerequisite for this is the setting up of a dialogue between the economic operators, Member States and the Commission in such a way that, where needed, adjustments meeting specific needs can be made at internal-market level.

This being the case the Commission intends to examine the following, in succession:

- the relative competitiveness of European civil aviation, including its sub-contractors, account being taken, in particular, of the potential for economies of scale in both development and production;

- the industrial measures needed to achieve those economies of scale and the problem arising with regard to protecting the competence of the Member States as regards defence strategy;

- the institutional and legal conditions to be provided in order to ease the industrial integration and cooperation to be defined by managers;

- the problems linked with the funding of civil aeronautical industry programmes.

ANNEX

Annex 1: STRUCTURE OF THE WORLD AEROSPACE INDUSTRY

Community aerospace production was over ECU 30 billion in 1988.

With an aerospace turnover of more than ECU 78 billion, however, the United States is still by far the world's leading producer.

The European aerospace industry enjoys practically steady growth, with no slumps or surges in turnover.

Graph 1: World Aerospace Industry

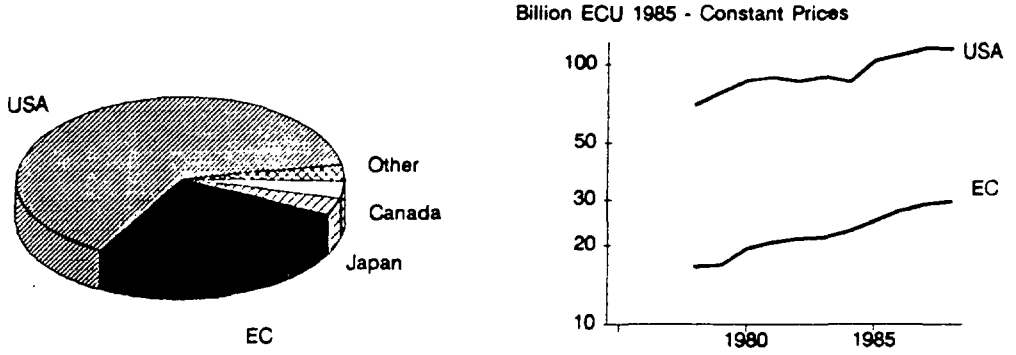


Table 1 Aerospace Turnover

	Current Prices Billion ECU		Constant Prices Billion ECU 1985		Growth Rate Prices 1985		Employment (000)	
	EC	USA	EC	USA	EC	USA	EC	USA
1978	9.2	24.5	16.5	70.1	-----	8.7%	NA	720
1979	10.6	28.0	16.8	78.3	1.9%	11.6%	424	842
1980	14.1	34.0	19.4	86.9	15.5%	11.0%	472	902
1981	16.7	49.1	20.6	89.3	5.7%	2.8%	500	900
1982	18.4	59.9	21.3	86.4	3.5%	3.1%	483	831
1983	19.3	72.0	21.4	89.9	0.8%	4.0%	482	830
1984	21.5	84.2	22.7	86.0	6.2%	4.4%	465	850
1985	24.7	103.3	24.7	103.3	8.5%	20.2%	481	939
1986	27.5	86.5	27.3	108.7	10.3%	5.2%	488	967
1987	29.3	77.7	28.8	114.8	5.7%	5.6%	492	992
1988	31.6	77.9	29.3	114.0	1.6%	0.7%	502	975
1978-88	----	----	----	----	5.9%	5.0%	----	----

EC - DG III / Source: Industrial Associations

Annex 2 LEADING WORLD AEROSPACE COMPANIES

Aerospace production on a world scale is concentrated among a small number of large manufacturers.

There is still a very big difference in size between major US and European companies. The three main European manufacturers, *British Aerospace, Aérospatiale* and *MBB* have on average one-quarter of the turnover of their US competitors *Boeing, McDonnell Douglas* and *Lockheed.*

In terms of prime contractorship (or programme leadership) the US major companies' specializations are fairly clear:

- civil and military transport aircraft: *Boeing, McDonnell Douglas, Lockheed*;
- strategic bombers: *Boeing, Rockwell, Northrop*;
- fighters and attack aircraft: *McDonnell Douglas, Northrop, General Dynamics, Grumman*;
- engines: *General Electric, United Technology.*

As in the United States, large European aerospace companies operate in both the military and civil fields.

What is more, the process of concentrating national aerospace capabilities is not yet complete. Unlike *British Aerospace* and *MBB*, which have a hand in both European collaborative combat aircraft programmes and the Airbus programme, both with

Table 2 Turnover of Major Aerospace Manufacturers

Billion ECU	1982	1983	1984	1985	1986	1987	1988	1989
M.B.B.	2.4	2.6	2.6	2.7	2.6	2.9	3.4	3.9
Aerospatiale	3.3	3.5	3.7	3.6	3.7	3.5	4.0	4.4
British Aerospace	3.7	3.9	4.2	4.5	4.7	5.8	6.1	---
Boeing	9.2	12.5	13.1	17.9	16.6	13.4	14.4	20.4
Mc Donnell Douglas	7.1	8.6	11.3	13.8	11.8	10.5	11.3	---
Lockheed	5.7	7.3	10.3	12.5	10.5	9.8	9.0	---
Dassault	2.0	2.1	2.3	2.4	2.3	2.2	2.5	3.3
Casa	.3	.3	.3	.4	.3	.4	.6	.7
Aeritalia	.6	.6	.8	.8	1.0	1.1	1.1	1.6
Dornier	.5	.4	.4	.6	.5	.5	.8	---
Fokker	.5	.6	.6	.5	.6	.5	.9	---
Shorts	---	.3	.3	.3	.3	.3	---	---
Matra	.8	.8	.8	.8	.8	.9	1.0	---
General Dynamics	---	---	---	4.0	4.4	4.6	4.5	---
Grumman	2.1	2.5	3.3	3.5	2.9	2.2	2.2	---
Northrop	2.5	3.7	4.7	6.6	5.7	5.3	4.9	---
Rockwell	2.9	4.3	5.5	7.0	5.6	4.4	3.4	---
Rolls-Royce	2.7	2.3	2.4	2.7	2.7	2.9	3.0	---
General Electric	3.0	---	---	5.9	5.1	5.0	5.0	---
Pratt & Whitney	5.3	5.1	5.4	5.3	5.5	5.7	6.3	---
Snecma	.9	1.0	1.2	1.4	1.5	1.4	1.5	1.9
M.T.U.	.4	.4	.5	.5	.5	.6	.7	---
Fiat Aero	.2	.3	.3	.4	.5	.5	.6	.7

EC - DG III / Source: Industrial Associations

Table 2 (continued) Workforce of Major Aerospace Manufacturers

('000)	1982	1983	1984	1985	1986	1987	1988	1989
M.B.B.	38.5	36.8	35.5	36.9	37.6	38.5	39.9	42.8
Aerospatiale	36.5	35.5	35.5	34.9	34.2	32.8	32.6	32.7
British Aerospace	79.0	78.0	76.0	75.6	75.5	86.8	84.9	---
Boeing	95.7	84.6	86.6	98.7	118.5	126.0	126.0	---
McDonnell Douglas	61.0	62.8	72.7	83.3	92.3	99.3	109.4	---
Lockheed	70.2	71.8	81.3	87.8	96.9	97.3	86.0	---
Dassault	15.8	15.8	16.2	16.1	15.8	14.7	13.8	13.0
Casa	9.6	9.8	10.0	10.2	10.6	10.5	10.4	10.6
Aeritalia	12.3	12.3	12.3	12.6	12.9	13.7	14.2	---
Dornier	6.9	6.7	6.8	6.9	7.5	7.4	9.2	---
Fokker	9.6	8.4	9.1	10.1	10.9	11.7	11.6	---
Shorts	---	6.3	6.2	6.6	7.2	7.2	---	---
Matra	3.7	4.4	4.8	4.8	4.9	5.0	4.7	---
Grumman	27.3	28.8	30.5	32.0	35.0	32.0	32.0	---
Northrop	35.5	37.2	41.5	46.9	46.0	46.0	---	---
Rockwell	29.0	42.3	43.3	45.7	41.1	34.4	32.6	---
Rolls-Royce	48.8	42.3	40.9	41.7	41.9	42.0	40.9	---
Pratt & Whitney	43.9	40.7	42.1	43.9	46.7	46.5	46.0	---
Snecma	12.6	13.0	13.4	13.9	13.9	13.4	13.5	13.9
M.T.U.	6.2	6.2	6.3	6.6	7.0	7.4	7.8	---
Fiat Aero	3.6	3.5	3.5	3.6	4.5	4.7	4.8	4.8

EC - DG III / Source: Industrial Associations

growing European and export sales, *Aérospatiale* and *Dassault* are both more specialized in their activities. *Aérospatiale*, unlike its partners *British Aerospace* and *MBB*, is not involved in the big European cooperative combat aircraft programmes. *Dassault*, which concentrates on national combat aircraft programmes, is also the only big European aerospace manufacturer with no stake in the high-growth market for commercial transport aircraft.

Aeritalia's and *CASA*'s activities are chiefly linked with the development of cooperative projects. The small traditional manufacturers, *Dornier* (taken over by *Daimler-Benz* in 1985), *Fokker*, *Shorts* (taken over by *Bombardier* in 1989) concentrate to a greater extent on their own projects and enjoy lower growth owing to the difficulty they experience in finding follow-on projects for their present programmes. After a period of strong growth *Matra* is keeping up a steady level of activity based on specialization in missiles.

Among aero-engine makers, the relative positions of US and European programme leaders are different from those in the aircraft field. There is no uniformity in the position of aero-engine makers in Europe. In addition, European cooperative structures are not a dominating factor in the activities of the companies concerned.

Up to the early 1980s *Rolls-Royce's* had a turnover in the same order of magnitude as the US No 2 *General Electric*. But international ranking changed radically in the 1980s, with spectacular growth by *General Electric*, which became No 1, coinciding with a sharp fall by *Pratt & Whitney*, while *Rolls-Royce* stood still. At the same time *SNECMA*, a close associate of *General Electric* in the civil field, enjoyed strong growth.

Most of the civil-engine activity of the European leader *Rolls-Royce* is taken up with in-house programmes. In the military engine field, however,

European cooperation is the dominant factor under the joint company *Turbo-Union* (supplying the engines for *Tornado* and *EFA*).

Europe's No 2 aero-engine maker, *SNECMA*, does almost all of its civil work in cooperation with *General Electric*, the US leader, and the bulk of its military work under purely national programmes.

The other two European aero-engine manufacturers *MTU* and *Fiat Aviazone*, are both divisions of strong engine companies, and have boosted their activities through participation in European cooperative military programmes and international cooperative civil programmes.

Annex 3 THE STRUCTURE OF EUROPEAN AEROSPACE PRODUCTION

The consolidated turnover of the European aerospace industry was over ECU 30 billion in 1988: about 3% of industrial production.

The number of jobs in aerospace was steady in 1988: approximately 500,000 employees or just over 1% of employment in industry.

Exports of aerospace equipment in 1988 were almost ECU 15 billion, nearly half of turnover.

Trade in military equipment has been in balance since the beginning of the 1970s, but trade in civil equipment is a different matter and did not move into surplus until the mid-1980s.

Graph 2: EC Aerospace Industry

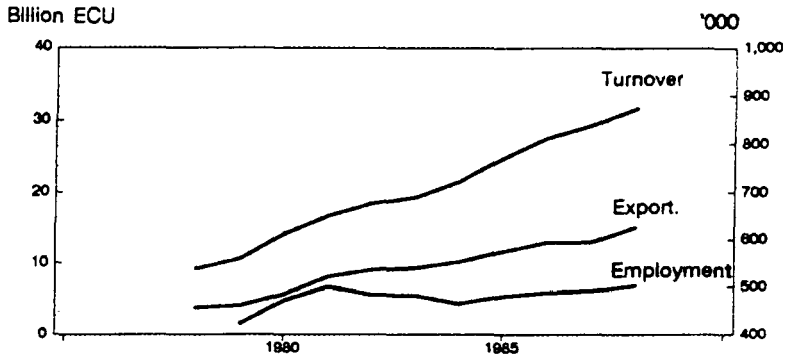


Table 3 EC Aerospace Industry

Billion ECUs	TOTAL			CIVIL			
	Turnover	Exports	Employment	Turnover	Exports	Imports	Balance
1978	9.2	3.8	NA	2.6	NA	NA	NA
1979	10.6	4.1	423.6	3.0	NA	NA	NA
1980	14.1	5.7	471.7	4.0	NA	NA	NA
1981	16.7	8.1	500.2	4.9	2.8	4.3	-1.5
1982	18.4	9.0	483.2	5.0	4.1	3.6	0.6
1983	19.3	9.3	483.1	5.9	4.5	4.0	0.5
1984	21.5	10.1	464.8	6.6	6.3	4.9	1.3
1985	24.7	11.6	481.1	7.6	6.9	6.1	0.8
1986	27.5	13.0	488.4	10.0	6.2	6.2	0.0
1987	29.3	12.9	491.6	9.9	6.0	6.0	0.0
1988	31.6	15.0	502.4	10.9	10.8	10.2	0.5

EC - DG III / Source: Industrial Associations

Breakdown by country

Aerospace production in the Community is largely accounted for by four countries: the United Kingdom, France, Germany and Italy.

The Netherlands, Belgium, and Spain (whose industry is of more recent date) each account for about 1% of EC output.

Graph 3: EC Aerospace Production (1988)

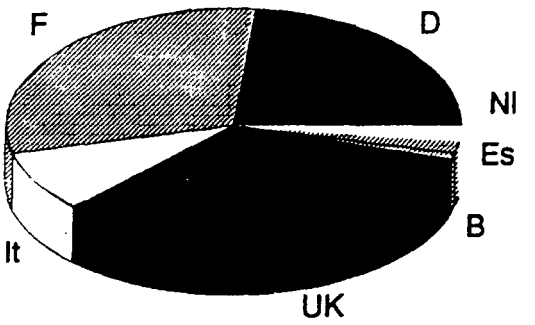


Table 4. Breakdown of EC Aerospace Turnover according to Country (EC = 100)

	BE	DE	ES	FR	IT	NL	UK	EC
1978	1	15	1	40	6	2	34	100
1979	2	20	1	38	7	2	31	100
1980	2	17	1	36	6	2	38	100
1981	2	16	1	35	7	2	38	100
1982	2	18	2	35	8	2	36	100
1983	1	18	1	36	9	2	33	100
1984	1	17	1	36	9	2	34	100
1985	1	18	1	35	9	2	34	100
1986	1	25	1	33	9	2	31	100
1987	1	24	1	31	9	1	33	100
1988	1	25	2	31	9	2	31	100

EC - DG III / Source: Industrial Associations

Breakdown by type of product

As regards technical segmentation by **type of product**, European production is still mainly accounted for by airframes. The product breakdown is changing, however, with the following trends apparent:

- a decline in the share of airframes and engines;
- a rise in the share of equipments, chiefly due to the growing importance of avionics (airborne electronics);
- the emergence of production of space hardware, chiefly related to the Ariane launch vehicle and applications satellites.

The purely "space" production of the European aerospace industry still accounts for only a small fraction of total output, though growing rapidly: 5% in 1988 compared with 3% in 1980. Note that the space industry in Europe has no separate iden-

Graph 4: EC Aerospace Production

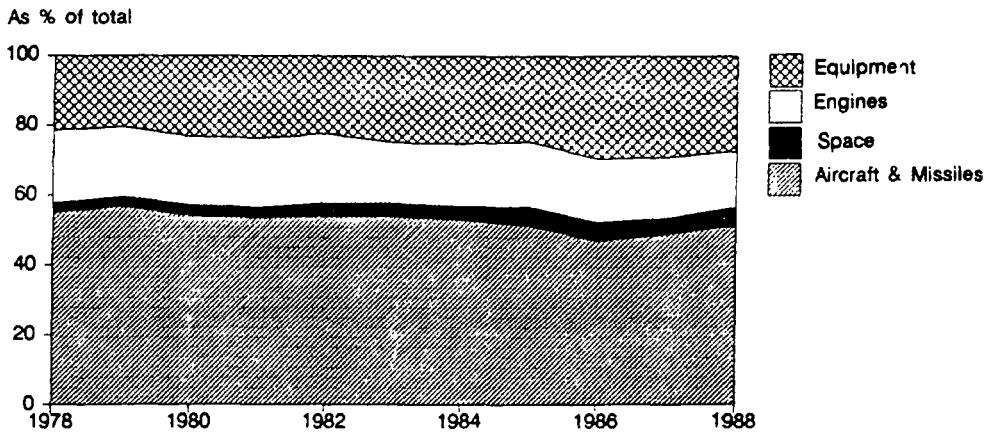
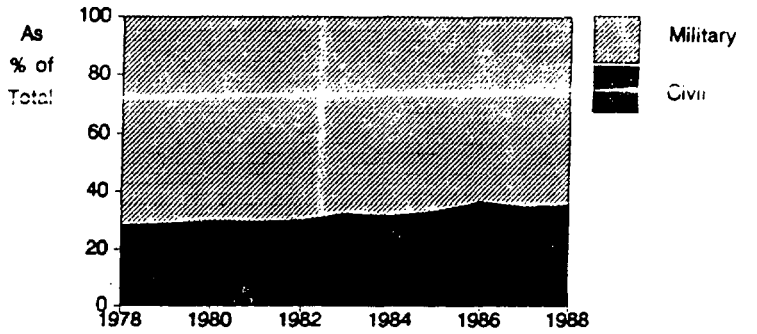


Table 5 Breakdown of EC Aerospace Turnover according to Sub-sector (as % of Total)

	Aircraft & Missiles	Space	Engines	Equipment
1978	54.9	2.8	20.9	21.5
1979	56.8	2.8	19.9	20.5
1980	54.1	3.2	19.6	23.1
1981	53.5	3.0	19.8	23.7
1982	54.1	3.7	19.9	22.3
1983	54.0	3.8	17.4	24.9
1984	52.9	4.0	17.9	25.2
1985	51.3	5.4	18.8	24.5
1986	46.8	5.5	18.0	29.7
1987	48.8	4.7	17.3	29.3
1988	51.3	5.2	16.2	27.3

EC - DG III / Source: Industrial Associations

Graph 5: EC Aerospace Production



tity, in that the bulk of the work is done by companies in the aircraft field.

Space activity is divided between the Space Agencies' markets and the commercial market. The latter relates to the manufacture of application satellites and - chiefly - of the *Ariane* launch vehicle. Work under national space agency programmes and the European Space Agency's programmes covers scientific and experimental projects, the future *Ariane 5* launch vehicle, the *Columbus* space station and the *Hermes* spaceplane.

The major part of European aerospace production is still accounted for by military equipment - chiefly combat aircraft, trainers, military helicopters and missiles of all classes.

Despite little growth in military procurement budgets, **military aircraft output** has nevertheless grown at a higher rate because the European industry has gradually won back its own military market and boosted its exports.

European **civil aircraft production** has been much less seriously affected than its American counterpart by cyclical demand fluctuations, either upward or downward.

Space production is much lower than in the United States, with 5% of total aerospace production in 1988 as compared with 20% in the US, but has enjoyed rapid and steady growth, chiefly fuelled by public spending, especially European Space Agency expenditure.

The pattern of European production is changing, with civil work accounting for an increasing fraction, having increased from 30% of total output in 1980 to almost 35% in 1988. This is due to civil output growing at a more sustained rate and should continue at least into the early 1990s for two reasons: a marked slow-down in the military sphere, in both home and export markets, and continued expansion in airliner production with rising output of the *A320*, *A330* and *A340*. European production of small commercial transport aircraft should continue to grow at the same time.

Military Output

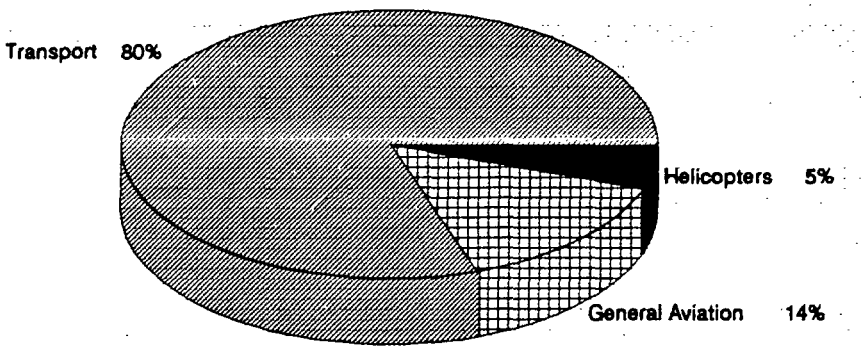
Up to 1982 military output was the driving force behind the European aerospace industry's growth. Since then a slow-down has occurred, due to East-West detente and to a decline in export markets, particularly in the Middle East, and to the transition between two generations of aircraft, i.e. from *Tornado*, *Mirage* and *Harrier* to the *EFA* and *Rafale* programmes now under development. The same is happening with missiles and helicopters, with output levelling off before the upturn which is likely to follow the introduction of a new generation of systems.

Civil production

Civil aerospace production, however, is riding high; strong market growth coincides with a time when the European industry can supply a full range of civil aircraft, from small transport aircraft with fewer than 20 seats to long-haul wide-bodied jets. However, it is handicapped by a time-lag in bringing its production facilities into line; these are expanding rapidly and in the commercial field the European industry is at present experiencing a genuine change in its scale of production. The European industry supplied just a few percent of the world market 15 years ago; it has now succeeded in capturing a quarter of it.

The rise in production of the *Airbus* range involves most large European aerospace companies, in par-

Graph 6: EC Civil Aircraft Production



ticular *Aérospatiale*, *MBB*, *Dornier*, *British Aerospace*, *CASA*, *Fokker* and *Sonaca*.

Apart from *Airbus*, output of European commercial jets also includes the *BAe146* and *Fokker 100*; the market for these is also growing strongly.

The European industry - particularly in Italy and Spain - also shares in the growth of output of American civil aircraft produced by *Boeing* and *McDonnell Douglas*.

Civil aircraft production also includes the manufacture of small turboprop transport aircraft for regional routes (known as commuter aircraft or feeder-liners).

Helicopters

The European helicopter industry is made up of *Aérospatiale*, *MBB*, *Westland* and *Agusta*.

After growing almost continually up to 1982 the helicopter market experienced a recession from which it is only now beginning to emerge; this applies to both the military and civil helicopter markets. The outlook is now better; the market, particularly for exports, is recovering.

Engines

Since 1980 the European aero-engine industry has seen steady growth, like the airframe industry but with an even more marked shift of emphasis towards the civil field.

Civil engine production is underpined by the strong growth in the civil aircraft market but is not directly linked with production of European civil aircraft, which are chiefly powered by American engines.

This is likely to change, however, as output of the *A320* builds up and with *Rolls-Royce* engines powering the new *A330*. The large orders secured for powering both American and European aircraft and the good prospects for this market will result in steady growth in future years.

Annex 4 PRODUCTIVITY IN THE EUROPEAN AEROSPACE INDUSTRY

The European aerospace industry's lower level of wage costs than the American industry's is a major advantage for the former but is not enough, to compensate for the major disadvantages of scale of production discussed earlier.

Labour productivity in the European aerospace is much lower than in the American industry owing to the fact that production is still on a small scale and production runs much shorter, which reduces the learning curve effect. This means more work for the same output.

Ultimately, the process of concentrating European aircraft production into a smaller number of programmes, with longer production runs, should enable the European industry to exploit its wage-cost advantage, which so far, has not been enough to compensate for its lower apparent productivity of labour.

With production runs for some types of equipment, such as helicopters, certain tactical missiles, commuter aircraft and satellite launch vehicles, already similar to those achieved by the American aerospace industry, labour productivity is even now higher than in the United States.

Table 6 Productivity of Major Aerospace Manufacturers

in '000 ECUs	1983	1984	1985	1986	1987
Value Added by Worker					
M.B.B.	33	36	34	34	36
Aerospatiale	--	--	51	36	37
British Aerospace	20	23	25	24	23
Boeing	49	58	62	50	40
McDonnell Douglas	43	51	56	45	39
Lockheed	47	55	59	48	43
Employment Costs by Worker					
M.B.B.	26	28	29	32	34
Aerospatiale	--	--	32	34	36
British Aerospace	17	19	20	19	19
Boeing	38	44	46	38	32
McDonnell Douglas	33	38	41	34	30
Lockheed	37	43	45	37	32
Productivity Margin (Value Added/Employment Costs)					
M.B.B.	1.26	1.28	1.18	1.08	1.05
Aerospatiale	--	--	1.56	1.05	1.02
British Aerospace	1.15	1.20	1.20	1.24	1.23
Boeing	1.30	1.31	1.36	1.34	1.23
McDonnell Douglas	1.31	1.34	1.35	1.30	1.28
Lockheed	1.27	1.29	1.31	1.30	1.32

EC - DG III / Source: EUROSTAF

Table 7 Value Added by Worker in the Aerospace Industry

in '000 ECUs	1983	1984	1985	1986	987
FRG	30	34	33	35	--
France	36	45	46	44	--
Italy	27	29	31	34	33
UK	24	24	25	29	--
USA (*)	46	55	59	47	40

EC - DG III / Source: EUROSTAF - (*) average for Boeing, McDonnell Douglas and Lockheed

Effect of exchange rates on wage costs

Owing to their magnitude variations in rates of exchange are quite clearly a basic factor affecting movements in the relative levels of labour productivity in Europe and the United States.

This is a considerable drawback for the European industry, because commercial aircraft have for a long time been priced in dollars. Both its income and its costs, in relative terms, fluctuate to an extent that is often beyond conventional means of obtaining forward cover owing to the amounts involved and the uncertainties due to market fluctuation.

Annex 5 GROWTH OF EUROPEAN INDUSTRIAL COOPERATION

The European aerospace industry has been integrating its civil and military programmes for about twenty years.

On the military side, chiefly bilateral cooperative programmes are progressively being extended to take in multilateral arrangements.

Overall, the trend towards European production integration is growing steadily, though with important specific national features, in particular:

- the continued existence in Europe of programmes which compete head on;
- multilateral cooperative structures in which one major partner does not participate;
- transatlantic cooperative arrangements which are in a dominant position in relation to European programmes - especially in the engine field.

Graph 7: Intra-EC Aerospace Co-operation

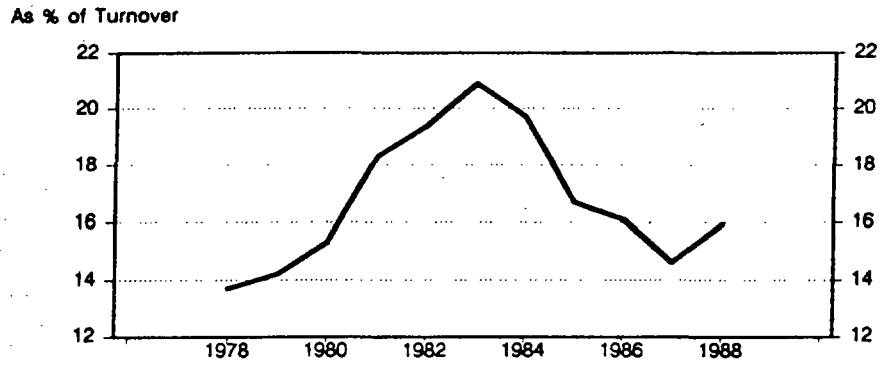


Table 8 Indicator of the level of intra-european co-operation in aerospace sector

Sales to other EC aerospace manufacturers (as % of turnover)

	BE	DE	ES	FR	IT	NL	UK	EC
1978	34	25	18	7	13	12	16	14
1979	26	20	25	8	9	11	18	14
1980	17	30	26	8	22	12	15	15
1981	18	36	28	8	13	15	21	18
1982	17	38	20	7	11	16	24	19
1983	20	39	29	9	20	13	25	21
1984	28	39	18	8	21	10	23	20
1985	28	34	17	4	25	5	19	17
1986	32	24	15	5	26	5	19	16
1987	33	22	13	6	26	3	14	15
1988	24	25	16	6	26	4	16	16

EC - DG III / Source: Industrial Associations

Annex 6: RESEARCH AND DEVELOPMENT

Technological development is very important in the aerospace industry: R&D accounts for over 15% of turnover. Consequently, the aerospace industry's importance in terms of R&D activity far outweighs its share of production. The European aerospace industry comes third, after electrical engineering and electronics and the chemical industry, with 13.8% of total industrial R&D expenditure.

Because output is smaller, aerospace R&D has a greater apparent magnitude in Europe than in the United States. This is due to the large number of military and civil programmes with production on a smaller scale than in the United States. In view of the high costs of development in the industry, the relative share of industrial R&D in Europe appears disproportionately large in relation to production. This is even more pronounced in terms of public R&D investment.

Aerospace is the only industry where the State provides more than 50% of R&D expenditure. The trend now, however, is towards a fall in the proportion of public support for aerospace R&D in Europe at the same time as production is rising; the share of public finance fell from 75 to 58% between 1975 and 1985.

Military aerospace is the biggest consumer of R&D. Military R&D is partly concerned with fields specific to military applications, but most basic research is dual-purpose, i.e. military and civil. This explains the importance of military hardware production as a form of support for innovation in the civil field.

Many technologies originate in aerospace and diffuse into other industries. That the aerospace industry's role as a technology driver is recognized is shown by the increasing number of technical cooperation agreements between aerospace companies and businesses in other industries, the engine industry in particular. Conversely, production technologies are transferred, particularly from the engine industry, to aerospace.

Graph 8: Public Support to the Aerospace Industry

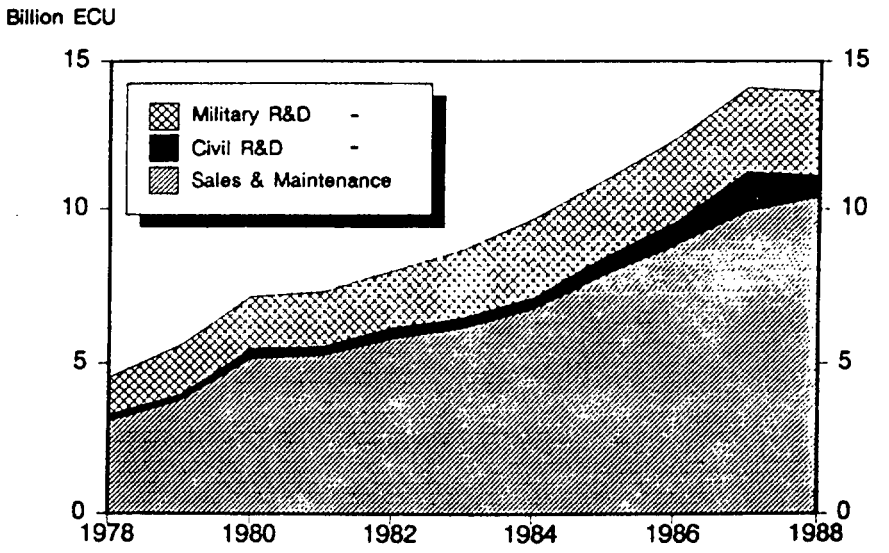


Table 9 Breakdown of Public Support to the Aerospace Industry according to contract type

Billion ECU	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
EC										
R&D	1.9	2.0	2.1	2.2	2.5	2.9	3.1	3.5	4.1	3.6
- civil	.2	.3	.3	.3	.3	.4	.5	.7	1.3	0.7
- military	1.7	1.7	1.8	1.8	2.2	2.5	2.5	2.8	2.8	2.9
Sales & Maintenance	3.8	5.2	5.3	5.8	6.2	6.8	7.9	8.8	9.9	10.4
Total	5.6	7.2	7.3	8.0	8.7	9.7	11.0	12.4	14.1	14.0
As % of Turnover	44%	42%	34%	33%	34%	35%	36%	37%	40%	36%
USA										
R&D	4.3	4.8	7.6	10.3	12.5	17.1	20.5	14.5	15.4	16.2
Sales & Maintenance	12.4	15.2	21.9	31.1	38.8	45.9	55.8	49.4	42.7	40.2
Total	16.6	20.0	29.6	41.4	51.3	62.9	76.3	63.9	58.1	56.5
As % of Turnover	59%	59%	60%	69%	71%	75%	74%	74%	75%	73%

EC - DG III / Source: Industrial Associations

Table 10 Public Financing of R&D

As % of Turnover	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
EC	12	10	8	8	8	9	9	9	10	8
USA	15	14	16	17	17	20	20	17	20	21
As % of Total Public Support										
EC	33	28	28	27	29	30	28	29	29	26
- civil	3	5	4	4	4	4	5	6	9	5
- military	30	24	24	23	25	26	23	23	20	20
USA	26	24	26	25	24	27	27	23	27	29

EC - DG III / Source: Industrial Associations

Annex 7: DEVELOPMENT OF THE COMMERCIAL AIR TRANSPORT MARKET

An analysis of the development of this market over the last 20 years shows up both how large this industry has become and how irregular its growth has been.

Developments in the commercial transport aircraft market are chiefly determined by the growth in air traffic, which has been practically continuous in the last 30 years. In the last 15 years world growth has averaged over 7%. Forecasts of growth in the next 15 years vary from 3.5% to 5.5%.

There are, nevertheless, very marked cyclical variations in sales of commercial aircraft. These variations, in volume and value terms, are substantial for an industry of this size, in which the production process is particularly cumbersome and complex. They form by far the chief problem in entering and staying in this line of activity.

This cyclical phenomenon is not confined to the aerospace industry but typical of mature capital goods industries.

Graph 9: World Scheduled Air Traffic

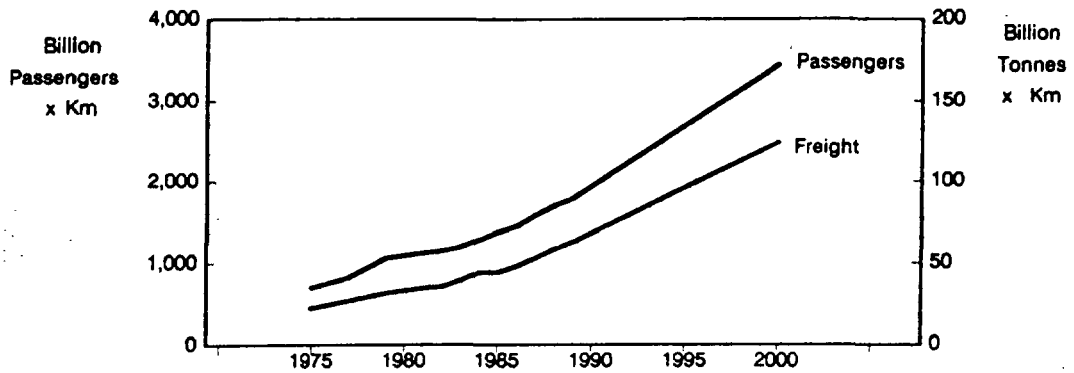


Table 11 World Scheduled Air Traffic

	PASSENGERS			FREIGHT	
	Passengers (Billions)	Passengers/Km (Billion)	Load Factor	Tonnes (Mio)	T/Km (Billion)
1975	0.5	697	59%	8.7	12.3
1980	0.7	1,089	63%	11.1	13.1
1981	0.8	1,119	64%	10.9	14.7
1982	0.8	1,142	64%	11.6	15.4
1983	0.8	1,190	64%	12.3	19.1
1984	0.8	1,278	65%	13.4	23.9
1985	0.9	1,367	66%	13.7	24.2
1986	1.0	1,452	65%	14.7	27.7
1987	1.0	1,589	67%	16.1	32.9
1988	1.1	1.704	67%	17.3	38.4
1989	1.1	1.797	68%	18.1	41.9

EC - DG III / Source: ICAO

Most of the factors apart from growth in air traffic which affect developments on the commercial jet transport market combine to keep it highly cyclical. They arise from:

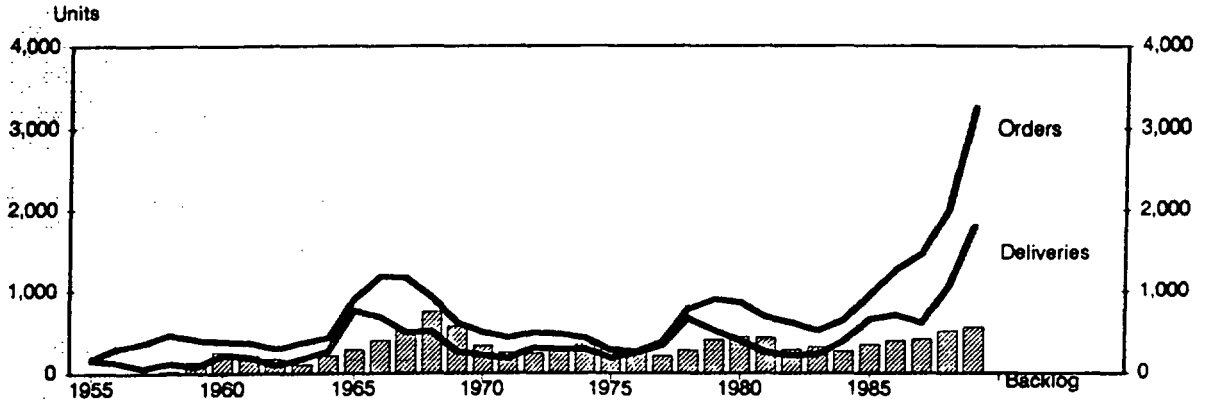
- the airlines' attempts to anticipate events, and the effects of airline competition;
- aircraft replacement due to aging, or obsolescence on economic and regulatory grounds; and
- financial constraints due to the airlines' financial health.

The cyclical nature of the market should be alleviated by the rising importance of such "new" markets as those in Asia, where there is still plenty of room for growth and requirements are expanding on a more linear trend.

The most probable market outlook for the next ten years sees strong growth over the next three years, with deliveries rising to almost (82) $20 billion per year, followed by a decline to less than (82) $20 billion and with a recovery at the end of the period. The 1989 level of net firm orders was an all-time high. Beyond that some decline is likely, most of the big airlines will by then have entered into long-term commitments.

Underlying the cyclical variations, however, is a strong growth trend (in volume and in value terms), reflecting the expansion of air transport.

Graph 10: World Civil Aircraft Market

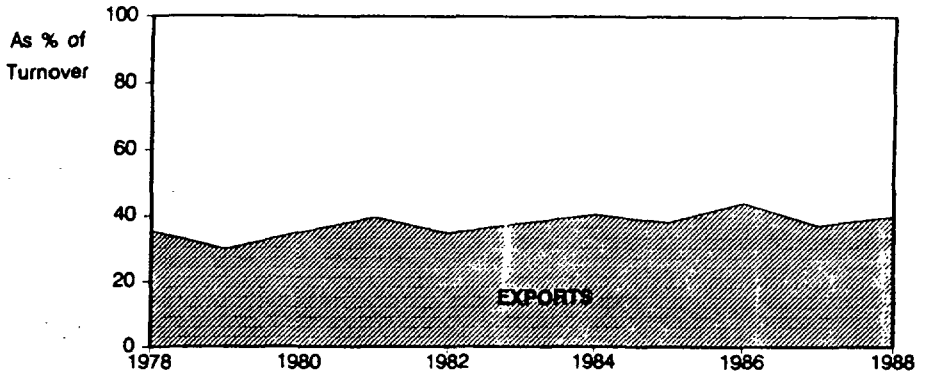


Growing importance of export markets

External trade in civil aircraft has shown continued growth, with export s accounting for an increasing share of the output of the major countries active in this field. At European level, the share of civil output exported rose from 26% in 1976 to 44% in 1985. This trend should continue as part of a growing commercial breakthrough by the European aircraft industry into extra-Community markets, especially in America.

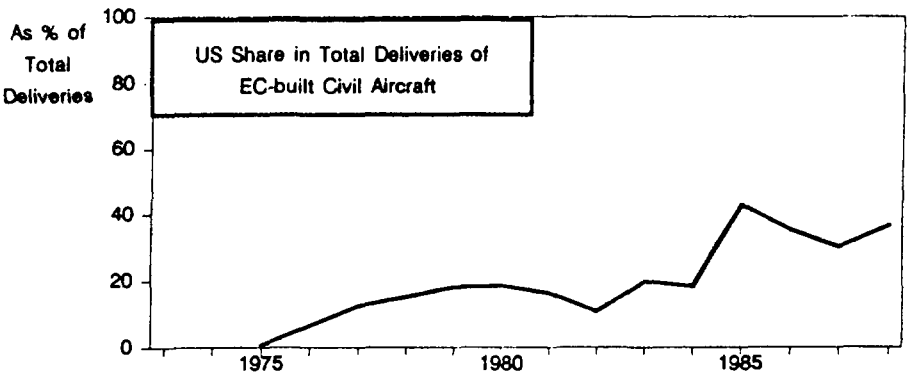
The past 15 years have seen a big increase in the penetration of the American market for civil aircraft by the European industry. European penetration of the American general aviation and civil helicopter markets is already over 50%. Penetration of the American market for large commercial aircraft has also grown substantially: in value terms, from less than 1% up to 1975 to over 10% since 1983, with a peak of 25% in 1985. Penetration of this sub-market should continue in view of the increasing sale success of European aircraft, and Airbus in particular, on the American market. With "bare" engines (i.e. not sold as part of a complete aircraft), the traditional American surplus has also melted away owing to imports of European equipment.

Graph 11: EC Civil Aerospace Exports



The interpenetration of the American and European markets is a phenomenon of increasing importance in all product segments. This applies to complete aircraft; here national preferences are becoming less and less marked. With engines, internationalization and interpenetration have already reached a very high level.

Graph 12: US Share in EC Civil Aircraft Sales



Changes in the international breakdown of markets

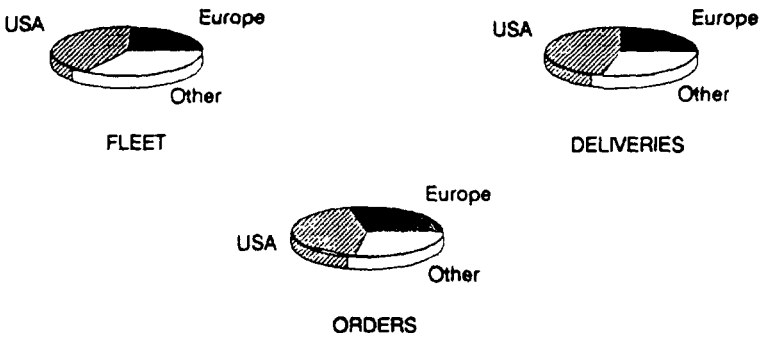
The world's civil aircraft markets are still very much concentrated on the large developed countries: the United States and Europe currently account for almost 60% of the world fleet.

The last 30 years have shown an underlying **trend for the relative significance of the North American market to decline**, though this was halted by US deregulation in the early 1980s: the United States then recovered from 20% of the world market in 1975 to 44% in 1988 (i.e. by value of deliveries).

Europe's share of world deliveries fell from 28% in 1975 to 24% in 1988.

In terms of the value of deliveries, countries other than the United States and Europe fell from 44% of the world market in 1975 to 31% in 1988.

Graph 13: World Civil Aircraft Market (1988)



Graph 14: Origin of Civil Transport Aircraft

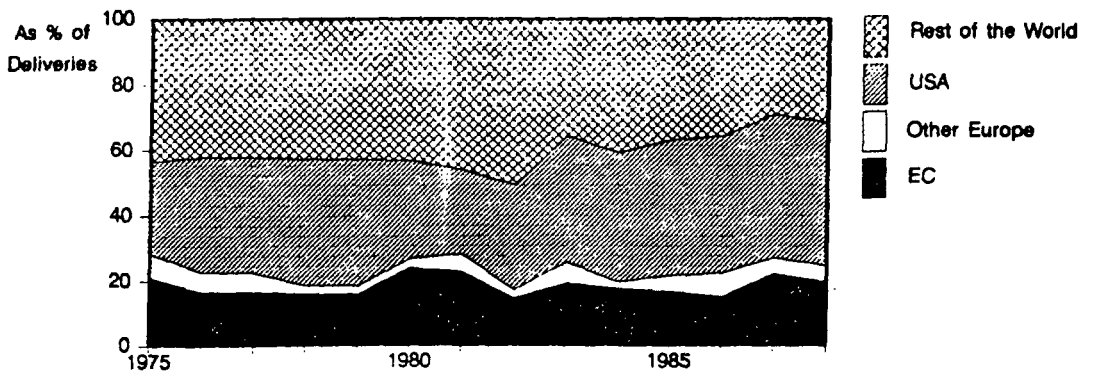


Table 12. Breakdown of Civil Aircraft World Deliveries (1988 - in Billion ECUs)

	Design Origin			
Markets	EC	USA	Rest of the World	Total
EC	1.0	2.7	0.1	3.8
Rest of Europe	0.4	0.5	0.0	0.9
USA	1.5	6.8	0.2	8.5
Rest of the World	1.2	4.6	0.2	6.0
Total	4.1	14.6	0.5	19.2

EC - DG III / Source : AEROSPATIALE

Importance and limits of the role of home markets

This international redistribution has major consequences for national industries' potential basic markets and for the average production runs which those markets reflect.

Their huge home market was always regarded as a decisive advantage for American manufacturers, enabling them to develop mass production for home needs and to export aircraft which enjoyed an advantage in terms of economies of scale of production. This advantage is maintained with the recovery in the American market's share of the world market.

The relative size of the European market increased when supply was combined under the permanent structure of *Airbus Industrie*: the home market went from 4-5% of the world market for the British and French industries to a theoretical 25% for *Airbus*.

The size of production runs needed for programmes to break even means that European market requirements cannot be taken as the only criterion in defining a new aircraft: this must take the entire world market into account.

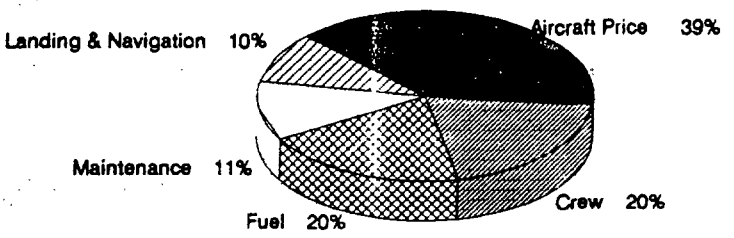
The European market is still smaller than the American market; most importantly, it is less homogeneous in terms of fleet make-up and replacement dates. In the future, integration of the European market and more liberalization of air transport will tend to produce greater homogeneity, but with the corollary of less airline stability.

Annex 8: DIRECT OPERATING COSTS

There is no single criterion determining the competitiveness of an aircraft, but it is generally acknowledged that the decisive factor in the competitiveness of a civil aircraft is its **direct operating costs (DOC).**

The main elements in the DOC of a civil aircraft of *A320* type are as follows: purchase price (two-fifths), fuel (one-fifth), crewing costs (one-fifth), maintenance (one-tenth) and miscellaneous fees and charges (one-tenth).

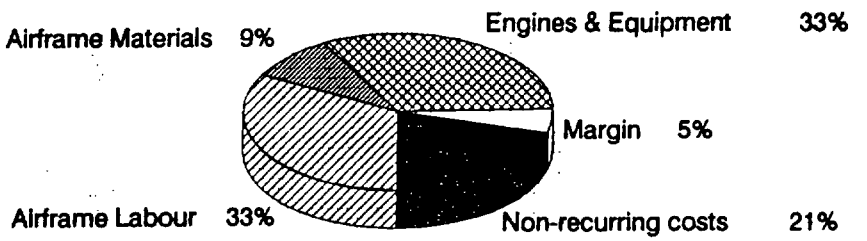
Graph 15: Civil Transport Aircraft DOC



Of the main components of DOC, aircraft price is the one through which the manufacturer can substantially reduce DOC:

- now that two-pilot crews have become the norm, savings on "crewing costs" are outside the manufacturer's control;
- owing to past progress and the present oil price, fuel consumption, often stressed as a way of warranting new technology developments, is now equivalent to barely half the level of costs directly due to aircraft price; and
- aircraft price, therefore, is by far the main element in DOC (about 40%), about half is directly due to production processes (amortization of non-recurring costs and labour costs).

Graph 16: Breakdown of Civil Aircraft Costs



FINANCIAL IMPACT

By its very nature, this communication has no financial impact. Where necessary, such impact will be given in detail when the Commission makes specific proposals for the implementation of the proposed action.

IMPACT ON SMALL BUSINESS

The action described in this communication will have a positive impact on all sectors relating to aviation, and especially the SME which are already making sizeable contributions to this industry's hi-tech achievements.