citizens of the member states. The United States has a restriction on foreign investment that is more or less 25 percent, depending on how the Secretary of Transportation feels on a given day, but at least that is what the Act says. Investment rights will become an issue because U.S. carriers --particularly the strong ones, the five or six core carriers that are likely to be survivors -- are anxious to expand abroad and because it is very difficult for them to do so. Far and away, the most effective entry vehicle for U.S. carriers abroad is likely to be investment, that is, buy in and integrate those operations as time goes on into their existing U.S. operations. It will be extremely difficult for U.S. airlines to pull that off if we do not also permit foreign carriers to buy into U.S. carriers. Therefore, in the next year or o, we are going to see proposals to amend the Federal Aviation Act that would permit the United States to negotiate, probably subject to some conditions, increased foreign investment and maybe complete foreign ownership of U.S. air carriers. One of these conditions will be reciprocity for U.S. investments abroad.

By 2000 the airline industry will be more concentrated, but it will also be far more competitive, as the U.S. market has become for the five largest domestic carriers. While market share is an interesting number, it is not very informative. Considering city pairs, which is where competition actually takes place, the number of city pairs receiving competitive service from more carriers in 1989 than in 1978, is far greater than the number of city pairs where competitive service has declined. If a city pair had two-carrier service in 1978, the chances are it has three, maybe four, carriers serving it today. On a city-pair basis, fewer carriers are competing in more places. In my view, this is a trend that will develop around the world.

TURBULENCE ON THE AIRWAYS: A REGIONAL AIRCRAFT MANUFACTURER'S PERSPECTIVE

Claxton Lovin, British Aerospace

Turbulence on the airways aptly describes the ongoing structural changes within international aviation. Dictionary definitions confirm that the word turbulence appropriately describes the events which have been happening within the air transport industry recently and which will continue to be influential in the future.

The words "storm or roughness" may be severe, but I will try to show that "commotion" or "having irregular variations in the course of time" are particularly suitable in defining the factors shaping our business.

The most prominent factors creating turbulence and bringing with it an associated change to the structure of international air transport can be grouped into four main categories: congestion, political reform, legislation, and strategic posturing. (See Figure 44).

I will talk in more detail about each of these factors. In my conclusion I will attempt some predictions about the aviation scene once these influences have run their course.

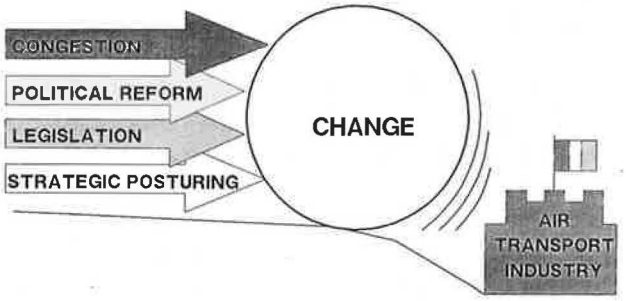


FIGURE 44 Causes of turbulence.

CONGESTION

Congestion of airports and airspace worldwide has been the subject of much debate recently and is perhaps the most important factor that could constrain the growth of air transport. It certainly will require changes in the way this industry functions. In Europe alone, estimates by the Association of European Airlines show that in 10 years over half of the 46 main airports will be heavily congested (See Figure 45). This is not unique to Europe however. Many examples worldwide spring to mind such as Sydney, Australia; Narita, Japan; Hong Kong;

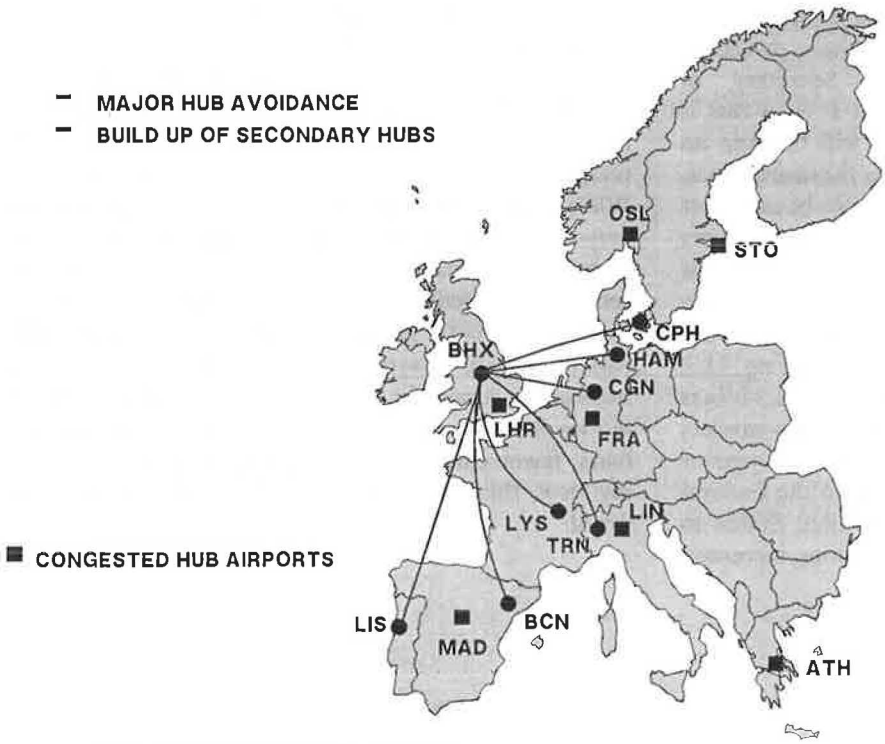


FIGURE 45 Changes to route systems.

Bangkok, Thailand; and many U.S. airports. Congestion will have various effects on the way airports are used and the scheduled services provided. Lack of suitable slot times at major airports will cause large airlines to set up secondary hubs either domestically (e.g., British Airways at Birmingham in the United Kingdom) or internationally if conditions allow (e.g., Aer Lingus at Manchester).

These secondary hubs should enable air travellers to fly on more direct point-to-point routes and thereby avoid the hassle and delay often associated with major airports. This build-up of routes which are less dependent on connections through major airports hubs will also create opportunities for regional aircraft operators who may provide feeder service from outlying areas to these secondary hubs.

Congestion at larger airports will affect aircraft manufacturers by creating a false demand among airlines for aircraft of larger capacity. As traffic grows, an airline's ability to match that growth with additional service frequencies will be reduced due to slot limitations, and increasing aircraft size will be the only option open to them. (See Figure 46). Regional aircraft, which play an important role in feeding major hubs, may be restricted in their access to these airports due to efforts by authorities to maximize the passenger-to-aircraft movement ratio. Several examples of such restriction have appeared but have always met with strong opposition. The Massport scheme of charges at Boston Logan Airport is one such example. Others are attempts by Milan airport in Italy and Dusseldorf airport in West Germany to divert regional services elsewhere.

Congestion of airspace is a problem that is also likely to be very difficult to solve. For example, within the 23 member states of European Civil Aviation Conference (ECAC), there are 22 separate Air Traffic Control (ATC) systems and 44 different ATC centers.(Figure 47)

In addition, not all ATC systems operate according to the same standards, which dictates that in some areas aircraft at the same altitude must fly 5 miles apart while in other areas coverage is so poor that a 60-mile separation is required. By contrast the continental United States controls nearly twice the airspace of Europe with a single system consisting of only 20 centers. Taking this comparison further, a flight of 780 nautical miles between Frankfurt in West Germany and Madrid in Spain requires clearances from six centers, while a flight between Chicago and Boston, a similar distance, involves only two centers.

Flight delays caused by ATC problems are a real financial burden to airlines: Lufthansa claims that delays in 1988 cost them 93 million DM ($61 million). This seemingly unavoidable cost will undoubtedly be passed on by the airline and it will be the passengers who ultimately suffer.

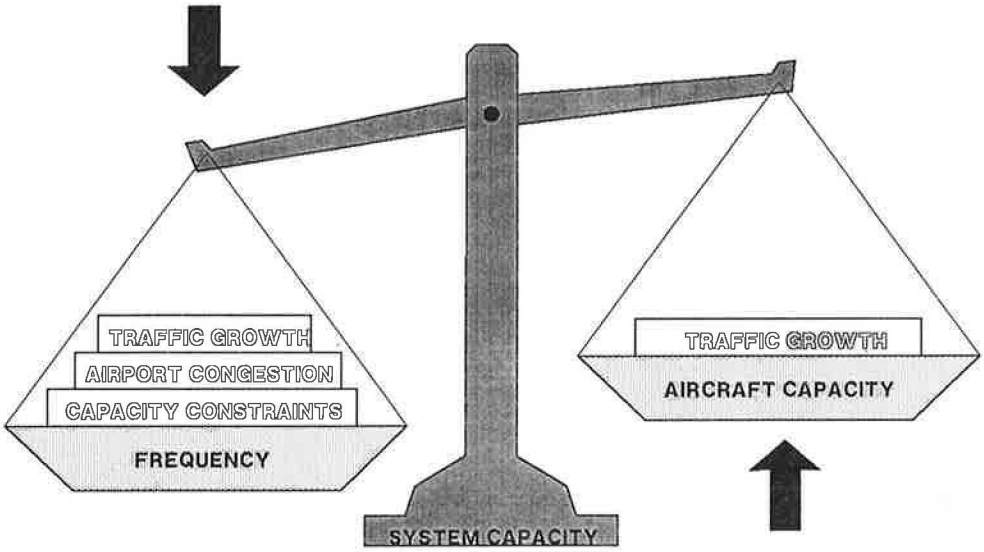
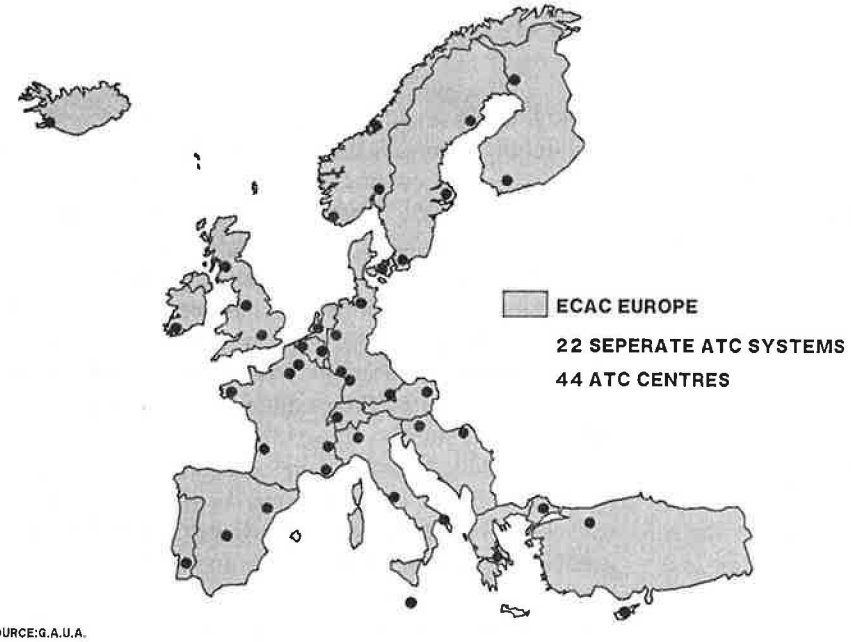


FIGURE 46 The need for larger aircraft.



SOURCE:G.A.U.A.

FIGURE 47 The need for a united European ATC system.

Various suggestions for improving Europe's ATC have been put forward. (Figure 48) The German Airspace Users Association suggests that increasing levels of improvement could be achieved according to the degree of commitment and investment. First, a harmonization of Europe's 22 ATC systems at an estimated cost of $1-2 billion could almost double current peak-period capacity, while reducing delays to an acceptable level. This interim measure could handle peak-period demand until the year 2000, when traffic levels are expected to be around twice those in 1988.

A national control facility system would leave each ECAC country with control over its own airspace but consolidate the en-route and some approach control functions into one control facility for each country. This would reduce the number of centers from 44 to 22 and should be able to carry over twice as much peak traffic as the current European ATC handles.

Finally a Regional Control Facility would consolidate en-route and terminal approach facilities and merge Europe's 44 existing ATC centers into 12, operating much more efficiently. This system would have a peak-period capacity two and one-half times greater than that of the current ATC system.

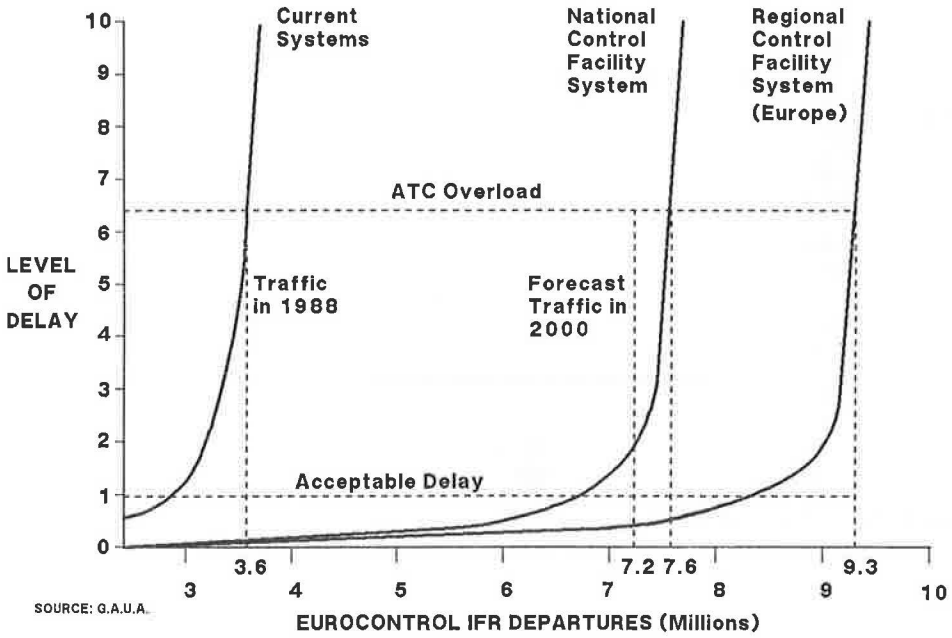


FIGURE 48 Peak period ATC performance.

POLITICAL REFORM

Next I would like to touch on the topic of political reform and how matters such as airline deregulation or changes of attitude within communist countries will affect air transport.

Deregulation of airline services has taken place recently in many countries throughout the world -- including Australia, New Zealand, Taiwan, and Canada. Europe is also currently undergoing deregulation or "liberalization". Deregulation is expected to result in more competition between airlines, better standards of service, and lower fares (See Figure 49). In light of U.S. deregulation however, one has to question these expectations. U.S. airlines have declined in numbers, competition on domestic routes, which are dominated by the use of hub airports, has been reduced; and airline fares are rising.

IN GENERAL (Based on U.S. Experience)
- Increased Competition
- Improved Service Standards
- Lower Fares
- More Routes Served

EUROPEAN LIBERALIZATION
- 5th Freedom Routes
- Cabotage
- Rules Against Anti-Competitive Behavior
- Cross Border Establishment
- Joint Route-Right Negotiation (eg. Europe-USA)

FIGURE 49 Effects of deregulation.

Within the European community, with the interests of 12 different countries at stake, liberalization is going to be a gradual process that will not resemble the overnight shock of the U.S. experience. After 1992, when the single European market should be in place, terms such as Fifth Freedom rights and cabotage should disappear for member airlines within the European community. By this time airlines will be able to serve any routes they wish. The only restrictions will be their financial and technical fitness and their commercial judgement as to suitability of routes.

One possible result of the creation of a common European airline market could be the ability to act collectively in negotiating route rights. The imbalance in gateway airports between Europe and the United States, for example, could be rectified.

The measures adopted to create the single European market will not directly affect an aircraft manufacturer such as BAe (See Figure 50). They will however affect our customers -- the airlines -- and the opportunities open to them and will create a demand for more of our products. Some of these opportunities will also create new markets to which our aircraft could be targeted such as the express freight market for which the BAe 146 in its Quite Trader configuration is suitable.

Other effects brought about by the single European market will include a harmonization of standards such as licensing or aircraft airworthiness requirements. This should make the manufacturer's job of selling aircraft in different countries easier.

The opening up of communist countries as markets for western- produced aircraft is a exciting challenge for manufacturers but not one which will be overcome easily. Lack of foreign currency makes the sale of dollar-priced aircraft difficult in such countries, and countertrade deals are likely to be involved. Soviet-produced aircraft, although now facing competition from western-produced types, will still have an advantage in that they can be sold for soft currencies. LOT of Poland announced recently that artificial currency exchange rate controls have meant that western aircraft could cost four times as much as Soviet equipment.

THE SINGLE EUROPEAN ACT DOES NOT CONTAIN SPECIFIC LEGISLATION ON MARKET OPPORTUNITIES FOR BAe BUT WILL ALTER:

- Market Opportunities For Our Customers
- The Way In Which We Sell Our Products

THE SINGLE EUROPEAN ACT WILL ALSO

- Bring About Common Standards (eg. JAR and Common Licensing)

FIGURE 50 Single European act.

LEGISLATION

Introducing legislation within the air transport industry covering matters such as aircraft noise emissions or the harmonization of operating regulations will affect manufacturers, airlines, passengers, and even the economies of individual countries.

Various proposals by regulatory or representative bodies cover the issue of noise regulations and suggest the non-addition or the non-operation of Chapter 2 aircraft. In addition, a more stringent standard for super quiet aircraft is being considered to determine which types may be operated at night or at particularly noise-sensitive airports. (Figure 51) The effects of these proposals could be harmful to some less wealthy airlines, reducing the value of their fleet of noisy aircraft and forcing them to acquire replacements. Manufacturers or suppliers of hush kits may benefit significantly.

Of the 8,000 or so aircraft in the world's commercial fleet in 1988, some 5,400 aircraft or 67 percent of the total fail to meet the most stringent ICAO Chapter 3 noise regulations, which are similar to the FAA's Part 36 Stage 3.(Figure 52) Non-operation of Chapter 2 aircraft is likely to be introduced, at the earliest, by 1995 and not uniformly throughout all the countries of the world. By 1995 many of the noncompliant aircraft will have been retired due to age, and others will be subject of hush-kitting. Even taking this into account, there will be a large demand for replacement aircraft, which manufacturers will be unlikely to satisfy and airlines will be unlikely to finance. Less developed or less wealthy countries which do not introduce such noise legislation domestically may well end up being the dumping ground for noisy aircraft.

Harmonization of air transport regulations by the European Economic Community en route to a single European market will cover three distinct areas: personnel licensing, airworthiness, and airport slot availability. (Figure 53) These measures will have considerable impact on aviation. Pilots and engineers would be able to seek employment in other countries within the EEC. Aircraft should not need recertification when being sold from one country to another, and manufacturers of new aircraft will have less complicated production lines. A new allocation system for airport slots is really necessary to ensure that the furtherance of competition among airlines is achieved and that congested airports are not used as a barrier against market entry. This will be a very contentious issue that will require revamping of the grandfather-rights system.

AIRCRAFT NOISE REGULATIONS

PROPONENTS

ICAO, FAA, EEC, ECAC

REGULATIONS

- No Addition of Chapter 2 Aircraft to Fleet
- No Operation of Chapter 2 Aircraft
- Chapter 11 Standard for Super-Quiet Aircraft

EFFECTS

- Reduction in Value of 2nd Hand Aircraft
- Large Replacement Market for Noisier Aircraft
- Hush-kitting Market Growth
- Night-sensitive Airport Access to Super-quiet Aircraft
- Hardship for Less Wealthy Airlines

FIGURE 51 Aircraft noise regulations.

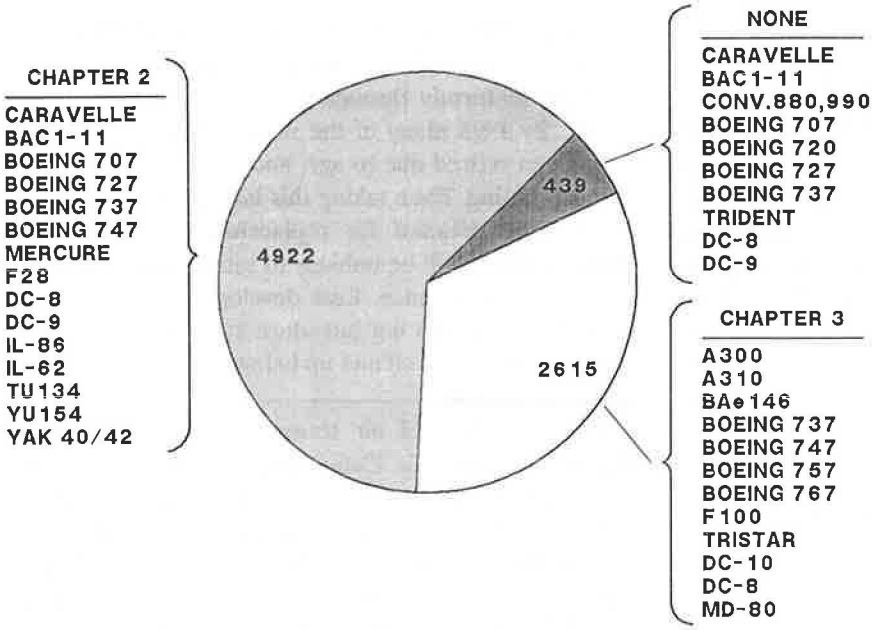


FIGURE 52 Noise classifications (ICAO).

PERSONNEL LICENSING: (A recognition of qualifications)
· Will Enable Pilots & Engineers to Work Abroad with Minimum of Complications

AIRWORTHINESS: (Common standards, e.g. JAR)
· Will Enhance Second Hand Aircraft Sales Among EEC Member States

AIRPORT SLOT AVAILABILITY: (New allocation system?)
· Will Promote Competition Among Airlines by Freeing Slots at Congested EEC Airports

FIGURE 53 EEC proposals to harmonize air transport regulations.

Strategic Posturing

Finally I would like to address the strategic posturing by airlines and manufactures. There are opportunities for both users and producers of aircraft. It is interesting to watch the strategies being adopted to benefit from these opportunities. (Figure 54) From the airlines' point of view there are significant benefits to be gained from entering into some form of relationship with another airline or airlines. These relationships can vary in rigidity from outright ownership to a simple interlining agreement. The benefits to be gained are many and varied but, in general, enable an airline to achieve a market position it probably could not have obtained otherwise in order to achieve cost reductions through economy of scale. There are many examples of relationships between airlines, and not all have been achieved with a blessing from the regulatory bodies concerned. British Airways was forced to drop certain routes when it acquired British Caledonia. American Eagle's purchase of 138 slots at Chicago from Britt Airways received much attention from the U.S. Department of Justice. Currently Air France, in particular, is being scrutinized by the European Commission for anticompetitive practices due to its dealings with Air Inter.

AIRLINE RELATIONSHIPS
·OWNERSHIP
·EQUITY POSITION
·CODE-SHARING
·INTERLINING

RATIONALE BEHIND RELATIONSHIPS
·MARKET ENTRY
·PASSENGER FEED
·SLOT/GATE ACCESS
·FLEET PLANNING
·SPARES/MAINTENANCE AGREEMENTS
·PROTECTION FROM UNFRIENDLY TAKE-OVERS

FIGURE 54 Elements of airlines' strategic posturing.

SAS of Scandinavia for example, is particularly active in its worldwide positioning strategy. Figure 55 shows the companies, both domestic and international, in which SAS has some form of equity position. In the agreement with LAN-Chile, SAS is giving LAN management advice in all areas and hopes to take advantage of LAN's extensive traffic rights across the Atlantic. LAN will effectively join the global traffic system operated by SAS

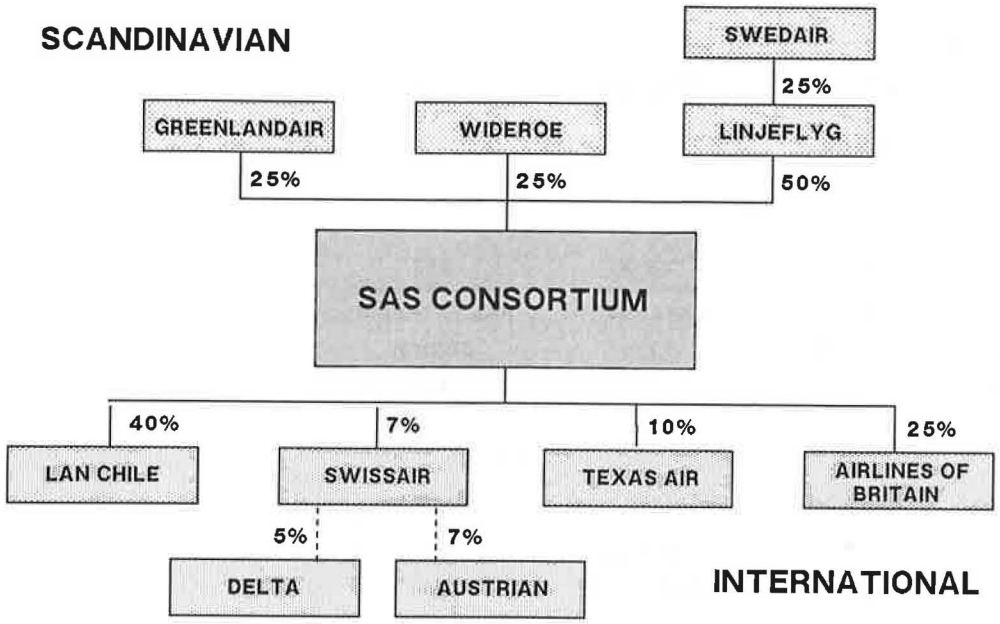


FIGURE 55 SAS relationships with other airlines.

and its other partners and will be able to offer connections through New York to both SAS and Continental Airlines flights. In addition to these equity agreements, SAS also has links with Finnair, Thai International, and All Nippon.

Strategic posturing by aircraft manufacturers is a trend in the industry that has grown recently due to the prohibitive cost of launching new products and the desire to be able to offer airline customers an attractive range of products. (Figure 56) Collaboration between manufacturers can vary from the manufacture of someone else's product under license to producing parts of the aircraft on a subcontract basis.

COLLABORATION

- LICENCE PRODUCTION
- JOINT VENTURE
- SUB-CONTRACT

RATIONALE BEHIND COLLABORATION

- SHARED DEVELOPMENT COSTS
- INDIGENOUS MARKETS
- LOW LABOUR RATES
- EXISTING EXPERTISE
- COMPETITOR ELIMINATION
- DEVELOPMENT OF EXISTING AIRCRAFT

FIGURE 56 Elements of aircraft manufacturers' strategic posturing.

The benefits of collaboration can be classed as cost and risk reduction or improvements in the marketability of the aircraft. The market for regional aircraft under 100 seats is dominated by non-U.S. manufacturers, and the number of collaborative ventures is surprising. Fluctuations in dollar exchange rates, which can be critical to an aircraft's success, can perhaps be offset by production in more than one country.

Another major advantage in collaborating with a particular manufacturer is that the home market of this firm may become open to your product. Any manufacturer with eyes on Russia as a market is sure to have this in mind.

Examples of collaboration among manufacturers are many and varied. (Figure 57) Under the heading of license-build relationships the production of BAC 1-11s in Romania is noteworthy because it exemplifies the possibility of using noise-compliant Rolls Royce Tay engines, and it is an early example of an Eastern European country building a western aircraft. The possibility of a multinational supersonic aircraft produced by the United States, Russia, and the United Kingdom in a joint venture is both intriguing and something that would have been unthinkable prior to Gorbachev's political turnaround. The Jetstream 41, launched by BAe, involves American, Swiss, and UK subcontractors on a risk-share basis. The use of Gulfstream as wing suppliers and Garrett for engines ensures that the dollar content of the aircraft is high and that exchange rate fluctuations are not particularly harmful.

LICENCE BUILD	HAL	NURTANIO	FAIRCHILD	ROMBAC
	BAe748	CASA 212	FOKKER F27	BAC 1-11
JOINT VENTURE	AIRBUS	CBA123	YS-X	SST
	BAe	EMBRAER	JAPANESE	GULFSTREAM
	MBB	FAMA	????	SUKHOI
	AEROSPATIALE			ROLLS ROYCE
	CASA			LYULKA
SUB-CONTRACT	BOEING 767	SAAB 2000	DORNIER 328	JETSTREAM 41
	JAPANESE	CASA	DAEWOO	GULFSTREAM
	AERITALIA	WESTLAND	AERMACCHI	PILATUS
	CANADAIR	VALMET		FIELDS
	GRUMMAN	ALLISON		

FIGURE 57 Collaboration among aircraft manufacturers.

CONCLUSION

Having talked about the driving forces in the air transport industry and the effects they will have, I would now like to try a few predictions of how I think industry structure will appear in the future.

Traffic will continue to show a healthy growth, and today's levels will probably be doubled by early in the next century. The major traffic flows will change, as a reflection of the Pacific Rim's importance as a major trade centre and the opening up of previously restricted countries as tourist attractions.

This growth which seems hard to believe, considering today's congested atmosphere will be accommodated in a variety of ways. First, a limited number of all-new airports will be built, but many of today's airports will be developed to permit a larger traffic capacity. Secondary hub airports will be major growth areas, and regional airports will also experience increased utilization.

There will be a decreasing number of airlines due to mergers between dominant carriers in developed countries and a pooling of resources by airlines of less developed countries. There will be a continuing role for niche carriers.

There will be fewer manufacturers producing individual aircraft. The number of manufacturers will decrease because of mergers and acquisitions but also because some manufacturers will take on the role of subcontractors rather than producing their own products. Aircraft capacities will increase, and designs will call for more environmentally friendly characteristics.

Air traffic control will be improved and rationalized in areas of heavy usage. A global positioning system will be set up, and it will enable a more efficient and precise tracking system.