EUROPEAN AIRCRAFT MANUFACTURERS' METHODOLOGY

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Introduction

Forecasting is a method for evaluating risk. Forecasting methods must be tailored to the sort of risk you want to evaluate. They must be in line with the information required.

Simplified megatrend methods may be suitable for long-term risks, but short- and medium- term risk will need more adjustability to take into account the cyclical structure of all economic phenomena.

Cycles are the result of the combination of many positive and negative factors. Short- and medium-term models must have great ability to reflect a changing environment. They must be adaptive so as to remain realistic as conditions change. In addition, short- and medium-term models must be able to anticipate economic upturns and downturns. They must also be able to simulate these changes and to be used as a "what if" tool.

The Airbus Model

This is what I would now like to demonstrate by discussing the Airbus Industrie Macroeconomic Approach to Medium-Term Requirements for Jet Aircraft in North America.

Forecasting has either a long-term or a short-term horizon. On the long-term side, forecasting is used in most corporate planning for investment analysis and new product evaluation. In Airbus Industries, for instance, among other concerns we have built up a method to estimate the overall long-term delivery flows by main aircraft types to the year 2010. The megatrends we use for this purpose are:

- economic growth : + 3 percent
- fuel price: ≈ inflation rates
- slight decline of real fares
- traffic growth: + 5.5 percent annually
- capacity requirement: + 4 percent annually

For the shorter term -- 3 to 10 years -- we forecast to minimize risks related to day-to-day management such as market opportunity, threats to our activities due to political uncertainties, market opportunity, and positive or negative influences of the cyclical economy. These risks are well known to the aviation industry.

Airbus Industrie, as an aircraft manufacturer, seeks to limit this sort of risk and to have a method to anticipate cyclical influences on such elements as production mix (NB VV WB), production rates by aircraft type, etc.

Many methods exist for short- and medium-term forecasting, but to properly take into account the relevant cycles requires a model with several well chosen variables. These should be combined in a system dynamic approach, where the different variables are put into proper relation to the whole model.

We have started to use a model that takes into account the following external variables:

- economic inputs: GDP, fuel price, inflation, financial rates;
- industry operating characteristics: average flight length, aircraft utilization, average aircraft life;
- airline cost planning: DOC trends, operating margins, fare rates;
- air system limitations: airport and air traffic congestion, noise regulation;
- supply constraints: aircraft delivery delays;
- aircraft availability and competitiveness: effect and availability of new technologies;
- other: up to 50 external variables set at their 1987 values.

From this initial set of inputs we have worked out the basic relationships in the model to get the initial drivers which will allow further calculation of the number of new aircraft required.

These drivers are:

- demand in RPK in total and by market segments – correlated to GDP, fuel price, fares, and frequencies;

- o orders and deliveries of new aircraft -- with deliveries derived from orders, backlog, and production limits;
- o airline operating performance -- number of flights, load factors, number of passengers carried;
- o airline financial performance -- cost and revenue;
- o fleet composition -- number of aircraft by size and category for the region.

System dynamic approach is illustrated in Figure 1. Let us look at an increase in demand (which is in fact a long-term historical trend). It increases the load factor, which in turn increases airline revenues. Increase in demand reduces unit cost, which is a condition to reduce fares and further stimulate demand. Last but not least, higher demand and greater revenues stimulate aircraft orders.

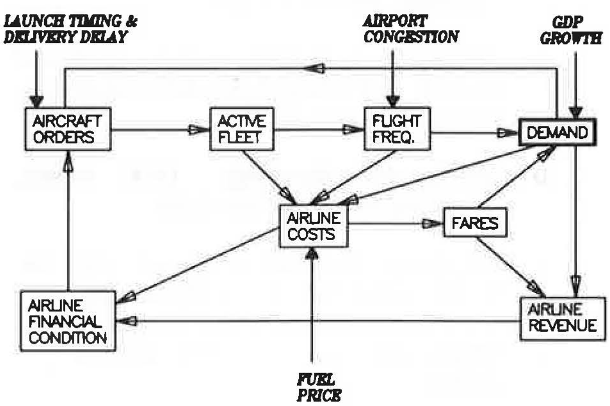

FIGURE 1. Factors Affecting the Pattern of Orders

At this point the dynamic may reverse itself because of negative external factors such as delivery delays or increase in fuel prices. These have a direct effect on cost, which results in raising fares, reducing demand and thereby reducing airline load factors and revenues. By the time the new aircraft are delivered the airline may be in a down-turn cycle which might be exacerbated by the new extra capacity. This is a simplified view of the way the system dynamics works.

We have already seen that traffic growth (RPK) is the main driver of the model. From an airline fleet planning standpoint, this demand must be transformed into a given number of aircraft (See Figure 2).

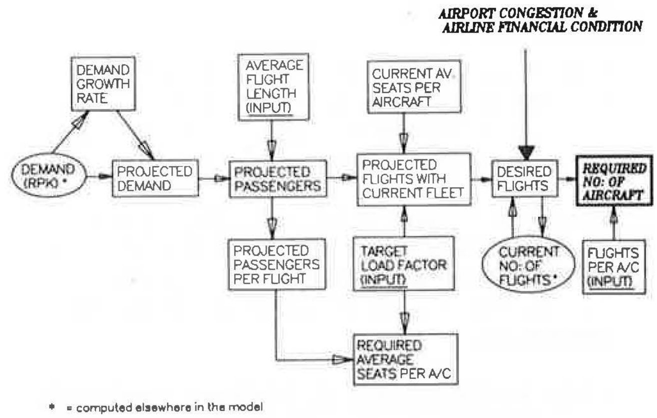

FIGURE 2. Airline Planning

Present demand is projected into the future according to a given growth rate. The projected demand is transformed into a projected number of passengers by dividing by the average flight length. The projected flights with the current fleet result from projected passengers times a target load factor and an average number of seats per aircraft.

Projected flights (trips) with the current fleet along with current flight and airport constraints (limiting slots) gives the desired number of flights, which in turn gives the required number of aircraft by applying a given number of flights per aircraft.

Obtaining the required number of aircraft to meet a given demand is a major forecasting step in determining the actual number of aircraft to be ordered. To achieve this, the following must be taken into account: (1) the fleet retirement policy (noise, age, leasing contract) and (2) additional aircraft to accommodate traffic growth. Combining these two gives the total number of aircraft required.

Having reviewed the main steps in this forecasting process, let us now look at how well the model fits reality (Figure 3).

Domestic Demand: These two curves take into account the cyclical phenomenon of air transport in 1979 (the first year of deregulation) and in 1981 (the second oil crisis).

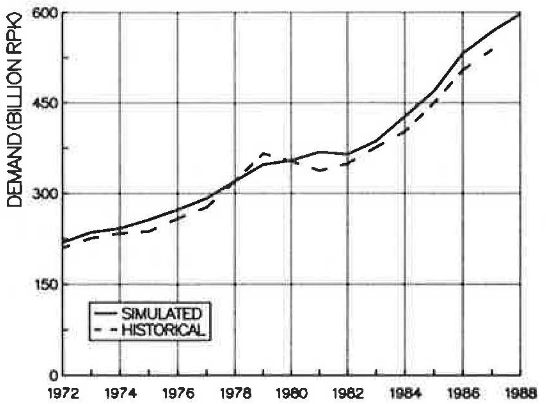

FIGURE 3. Domestic Demand - Model vs History

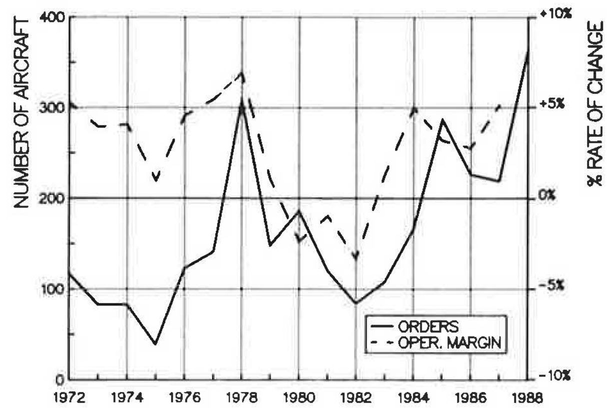

FIGURE 5. Total Orders vs Airline Operating Machines

In terms of aircraft deliveries, the same level of accuracy applies. (See Figure 4.) These two curves emphasize the close correspondence between simulated and historical data.

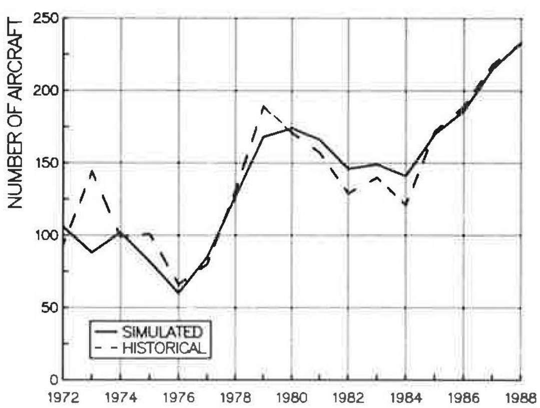

FIGURE 4. Deliveries - Model vs History

A more complex task is predicting total orders in relation to airline operating margins. Figure 5 shows the aircraft ordering pattern when the financial position of airlines is good. They anticipate the ordering of additional capacity by one year.

To go one step further, I would like to stress how useful this sort of modeling can be for the short and medium term and even the longer term forecasting by running a "what if" case.

First let us take a reference case. It is the most probable scenario, and we call it the base case. We use assumptions about the economy, airlines, and the operating environment as shown in Figure 6.

Figure 7 illustrates the growth of the main driver of the system -- the demand, for domestic (+ 5% percent per year) and for international (+ 5.6 percent per year) hauls.

Input Assumption	History (1970 - 1988)	Forecast (1988 - 2003)
Economy	Cyclical around:	Cyclical around:
Real GDP Growth	+2.6% p.a.	+3.0% p.a.
Fuel Price Growth	2 Surges in 1974 and 1980	+1.8% p.a.
Interest Rate	+9.7% p.a.	+8.0% p.a.
Inflation Rate	+6.4% p.a.	+4.8% p.a.
Airlines		
Average Flight Length	Doms +10%, Inat +40% Overall	Doms +5%, Inat +10% Overall
Average Flights per A/C	Doms -33%, Inat +1% Overall	No change
Environment		
Airways and Airport Restrictions on Flights	None	None
Number of Routes	Doms +23%, Inat +12% Overall	Doms +5%, Inat +10% Overall

FIGURE 6. Base Case: Inputs and Assumptions

This base case demand will fuel the airline revenues illustrated in Figure 8 in terms of the operating margin; and that, in turn, will stimulate fleet growth -- expressed here in terms of total orders.

The airline ordering patterns are turned into yearly deliveries of narrow-body and wide-body aircraft to the year 2003.

The model also permits us to do "what if" simulations. For instance, if we constrain flight growth to only 60 percent of the current level for domestic markets (instead of some 200 percent in the base case), the number of flights will decrease by 700,000 by 2003. (See Figure 9.)

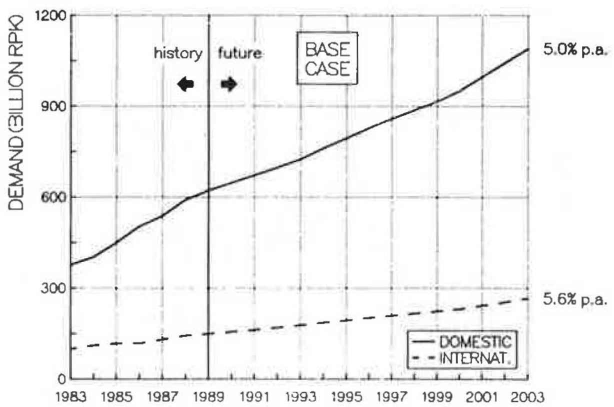

FIGURE 7. Domestic and International Demand

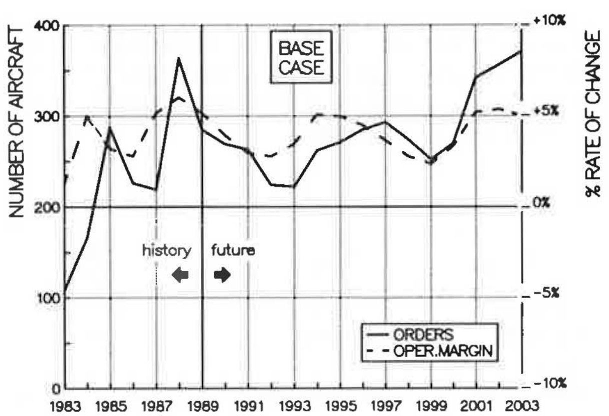

FIGURE 8. Total Orders vs Airline Operating Margin

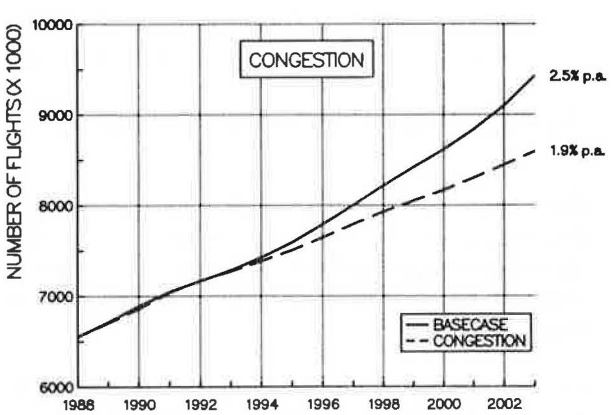

FIGURE 9. Domestic Flights

The delivery of narrow-body aircraft is most affected by this limitation, particularly from 1995 onward (25 percent less delivery over the period). (See Figure 10.) As growth in flights becomes increasingly restricted, more and more capacity is required to meet a growing demand. The average domestic aircraft size grows from 140 to 200 seats and the wide body come to the rescue (+ 13 percent over the base case). (See Figure 11.)

To sum up the effect of the higher constraint on flights, total deliveries for the U. S. domestic market are reduced by 12 percent or 500 aircraft. The effect of air congestion will be noticeable only from the second third of the period onward

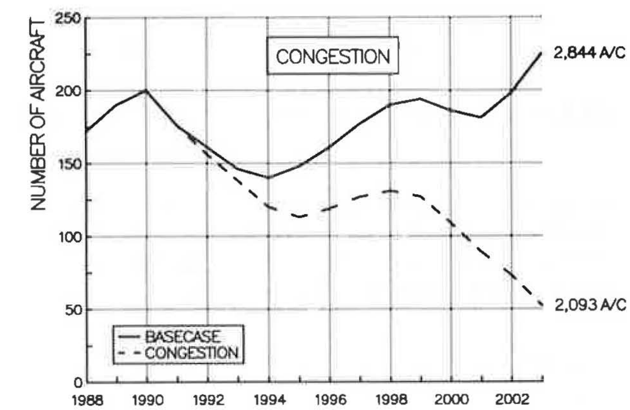

FIGURE 10. Deliveries for Narrow Bodies

North American market

	Forecast period	1989 to 1993	1994 to 1998	1999 to 2003
Base Case	Narrow bodies	873	816	984
	Wide bodies	582	478	451
	Total deliveries	1,455	1,294	1,435
Congestion Scenario	Narrow bodies	860	610	450
	Wide bodies	570	513	660
	Total deliveries	1,430	1,123	1,110

FIGURE 11. Delivery Summary (1989 - 2003)

since the orders for the early 1990s are already fixed. It will be most severe near the end of the forecast period, when the tension to get extra slots will rise it to its maximum.

To conclude, we have a tool that helps to build possible scenarios, and to simulate "what if" cases for the short- and medium-term future. However, you will notice how a medium term decision on aircraft ordering can affect the longer-term outlook.