

# COMMERCIAL AIRCRAFT OF THE WORLD

The A310-200 was certificated in March 1983 and was the first major derivative of the A300. This model, optimised as a short-haul type, was quickly followed by the extended-range A310-300, launched in March 1983 with an order from Swissair, and flown for the first time in July 1985.

The A310 has a new wing of reduced size, a shorter fuselage, a two-crew cockpit, and more advanced digital systems, but retains the basic eight-abreast, twin-aisle fuselage cross-section of the A300. It contrasts in many ways with its principal competitor, the Boeing 767, which was initially designed for longer ranges and has a larger wing and a rather smaller-diameter fuselage offering a seven-abreast layout in normal economy.

Because of an extensive weight-saving programme, the A310-300 has an empty weight close to that of the A310-200 despite having a significantly higher maximum take-off weight.

**Programme status:** total orders, 161; delivered, 132. Production rate for A300-600/A310 will reach four a month by the end of 1988.

**A320.** A small number of large orders from major airlines and leasing companies have pushed orders, options, and commitments for the A320 over the 700 mark—well past the most recently stated breakeven point of 660 sales. These have included Iberia (15 plus 7 options), GATX CL Air (10), ILFC (18 plus 11 options), Air Canada (34 plus 20 options), and Canadian Airlines International (17 plus 34 options). Although Iberia has yet to announce a decision, all the recent major customers have opted for the CFM56-5 rather than the IAE V.2500. Flight-testing of this option is now under way and IAE says that it is confident it will recover from the loss of Lufthansa and Alia from its order list in February.

Since the last Survey, the weights of the latest A320-200 have grown and both engine manufacturers are working to reduce specific fuel consumptions, which have come out rather higher than expected.

The loss of an Air France A320 during an air display flypast on June 26 provoked much ill-informed speculation in the popular press, but resulted in the A320's advanced systems being fully vindicated.

Several recent orders, most noticeably that of Air Canada, have included notes about the freedom of the airline to convert options into deliveries of stretched A320-300s; it now seems only a matter of time—and possibly as soon as the New Year—before the project goes ahead. The fact that the airlines are ready for an aircraft larger than the A320 is illustrated by the recent upsurge in sales of the Boeing 757. Airbus believes that the demise of the 717 will ensure that it will now win a greater share of the standard-bodied twinjet market.

Initial models of the 150-seat A320, designated the -100, have a maximum weight of 145,500lb (66 tonnes) and a range of around 1,900 n.m. (3,500km). From aircraft 22, to be delivered later this year, the updated -200 will become the standard model, with first deliveries of CFM56-5-powered examples scheduled for Ansett. At a maximum weight of 162,000lb (73-5 tonnes), the -200 will have a range with 150 passengers and baggage of 3,000 n.m. (5,560 km). This extended-range version will have additional fuel in the wing centre-section and will make use of the Airbus-developed wingtip fences pioneered on the A310-300 but being applied to all the company's latest models.

The A320 was formally launched in March 1984, although it had been "internally launched" a year earlier. Agreement was reached after Britain, the last of the sponsoring governments, was satisfied it would see a commercial return on its launch finance. In total, development costs were estimated at \$1-7 million.

The A320 has a number of features setting it apart from the previous generation of standard-bodied twins. These include full-authority, computer-driven fly-by-wire controls, gust-load

alleviation, fully integrated large-screen displays in the cockpit—and sidestick controllers in place of the conventional column. It makes extensive use of carbon composites, including a composite tailplane and fin, and has a fuselage cross-section some 19cm (7-6in) greater than current six-abreast types. This will allow wider seats and the use of underfloor containers with the same base as the industry-standard LD-3.

The latest proposals for a stretched A320, sometimes dubbed the -300, are for an aircraft some 22-6ft (6-93m) longer, carrying 200 passengers at 32in pitch, compared with 164 for the current model. It would be powered either by the CFM56 or the V.2500 rated at 27,500lb. Weights would be: MTOW, 178,525lb; MLW, 160,890lb; and MZFW 152,075lb. The wing would remain the same, but the flaps would be modified. With the fuel tankage of the -100/200, the stretched aircraft would have a range with full passenger payload some 460 n.m. shorter.

Workshares are 36 per cent for Aerospatiale, 32 per cent for Deutsche Airbus, 26 per cent for BAE, around 6 per cent for Casa, and 2 per cent for Belairbus.

**Programme status:** orders, 319 (including all 100 of the aircraft ordered by Northwest and 25 of the 50 ordered by GPA); options, 164 plus 127 other commitments; delivered, 13. Production rate has been set at six and a half a month by the end of 1989, and eight a month by the second quarter of 1990.

**A330/A340.** Airbus considers the A330 and A340 to be two versions of the same basic design, and this was emphasised by the recent decision to increase the length of the A330 (now dubbed the A330-300) to match that of the A340-300. The A340 also remains available with a shorter fuselage as the -200 series (see data table).

The A330 and A340 enjoy extensive commonality despite their different roles. They share an identical wing, basic fuselage, cockpit, and empennage. The main difference between the two is the number of engines and engine-related systems.

Airbus has signed a memorandum of understanding with General Electric, Pratt & Whitney, and Rolls-Royce covering the CF6-80C2E1A1, PW4168, and RB.211-524L respectively for the A330. Each should be capable of growing to 70,000lb of thrust. Since the last Survey, the basic engine for the A340 has become the 31,200lb-thrust (139kN) CFM56-5C-2, and the aircraft has grown some 10,000lb (4-5 tonnes) in maximum gross weight.

Following the debacle of the IAE Superfan, the A340 is offered only with the CFM56-5C-2. The demise of the Superfan forced Airbus to revise and increase the area of the wing slightly to retain the promised payload-range performance. The variable-camber system proposed originally has been dropped. The common wing has winglets rather than the smaller wingtip "fences" used on the A300-600R.

The A340 is offered in two versions: the A340-300, carrying 295 passengers in a three-class layout over 6,650 n.m. (12,300km), and the A340-200, carrying 262 three-class passengers over 7,450 n.m. (13,800km). The A340-300 is also available as a combi, with a large door in the left rear fuselage and a flat floor (the rear part of the floor of the standard aircraft will slope upwards very slightly).

Total launch costs of the A330/A340 will be about \$2-5 billion, with the principal partner companies receiving government launch aid of \$1-66bn (Germany), \$0-82bn (France), and \$0-75bn (UK). Worksharing percentages will be similar to those held by the main four partners on the A310/A300-600, but significant percentages are being offered as commercial risk-sharing packages to other aerospace companies.

The A330/A340 programme was launched in June 1987, on the basis of reasonably firm commit-

ments from ten airlines for 130 aircraft (89 A340s and 41 A330s). Since then commitments have increased to 149 from 12 customers (108 A340s and 41 A330s). The order list (see table) looks particularly impressive given that the A340 is not due to enter service until May 1992, and the A330 just over a year later towards the end of 1993.

**Programme status:** total orders for A330, 12 plus 29 options; A340, 71 plus 37 options; delivered 0.

Operator	A330		A340	
	firm	options	firm	options
Air France	—	—	7	4
Air Inter	5	15	—	—
Air Portugal	—	—	2	—
Iberia	—	—	K	4
ILFC	3	—	2	2
Lufthansa	—	—	15	15
Northwest	—	10	20	—
Royal Jordanian	—	—	5	3
Sabena	—	—	5	3
Thai International	4	4	—	—
UTA	—	—	6	6
Unannounced	—	—	1	—
<b>Totals:</b>	<b>12</b>	<b>29</b>	<b>71</b>	<b>37</b>
	<b>41</b>		<b>108</b>	

**A330/A340 total:** 149

**Airbus Industrie/McDonnell Douglas co-operation.** These two companies continue to work together in an attempt to identify areas where co-operation might be profitable. The most likely project is the A330/MD-11 hybrid, dubbed the AM300, which would be the proposed MD-11 Superstretch with the A330 wing.

## Boeing

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The production rates shown in the individual aircraft entries listed below indicate that Boeing builds about 25 aircraft a month. Record demand is likely to push the rate for the best-selling 737 series from 14 to 17, while 757 production may go from around five to seven, taking the total to about 30 a month, or more than one per working day. These volumes underline the sheer size of the organisation—which has, of course, interests other than commercial transports—and the buying power the company commands when it comes to dealing with subcontractors and suppliers.

Since the last survey, the 737 series has outsold the A320 and MD-80, and the 767 has outsold the A300/A310. The 757 surged ahead, while the 747-400 continued to gain sales at a rate never enjoyed by the 747-300. By the beginning of August, Boeing had sold more aircraft than it had in the whole of 1987.

These results vindicate Boeing's decision to abandon the 717 and concentrate on the 737 and 757. But, having decided its strategy for 100-200 seaters and all but certificated the modernised 747, the company must begin to consider updating the 767 to compete with the A330, in particular, and, to a lesser extent, the A340 and MD-11. This is the reason behind plans for a 767 with a new wing and for a further fuselage stretch.

**717.** Once proposed for 1992 certification, the 717 is now simply one possible design being studied by Boeing's advanced products group as an aircraft for the 1990s. Much of the research into advanced systems, aerodynamics, and structures for this unducted fan-powered 150-seater can, nevertheless, be applied to more conventional designs. The project acts as a reminder that the airliner market is now market-driven and not technology-driven—a point Boeing recognised earlier than most.

The baseline 717 was powered by the GE-36