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JPRS L/10190

15 December 1981

# West Europe Report

SCIENCE AND TECHNOLOGY

(FOUO 16/81)



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WEST EUROPE REPORT  
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TRANSPORTATION

FULLY INTEGRATED MINI METRO FACTORY AT BRITISH LEYLAND

Duesseldorf VDI-Z in German No 18, 1981 pp 772-773

[Text] A fully integrated manufacturing plant for the new Mini Metro auto model has been put into operation by British Leyland at Longbridge. The largest, completely new complex in this plant is the Longbridge West works, in which the body shells for the Mini Metro are built.

In addition, Metro production also required the construction of automated storage for pressed parts, access roads and loading facilities for trucks and trains, extensive modernization of paint plants and the attendant preparation areas, storage for painted bodies, elevated conveyor belts for fitting, modernized assembly lines for engines and transmissions, new final assembly tracks, dynamometers and water test equipment, stands for emissions tests and a new final delivery check.

The pressed parts needed for the body are stored in a new, high-shelf storage area, from which they are fed to assembly. The storehouse is equipped with an electronic management system. This computer system supervises the inventory and its individual positions as well as movements in the assembly areas. Data storage starts with the suppliers, whose small computers are in constant communication with the main works computer. Each pallet with pressed parts is identified at the time of delivery to the central storehouse and reported to the computer by a controller with a "light pencil."

The computer then automatically checks weight and dimensions to ensure correct location in the storehouse. When the pallets are to be fed into the production stream, they are picked up by forklift trucks at the storage area's delivery ramp.

The body subassemblies, such as sides, front ends, subflooring, etc, are built on special lines. The prefabricated body parts are then fitted together in automatic framing jigs (Fig 1) and welded into a body shell--also automatically (Fig 2).

An important part of the preparations for large-scale production of the Mini Metro was the modernization and expansion of the facilities for corrosion protection and painting. A completely new facility was built for the preparatory treatment of body shells, a second one for cathoresis dip priming and additional facilities for priming, paint spraying, undercoating and the protection of blind box sections with a wax spray.

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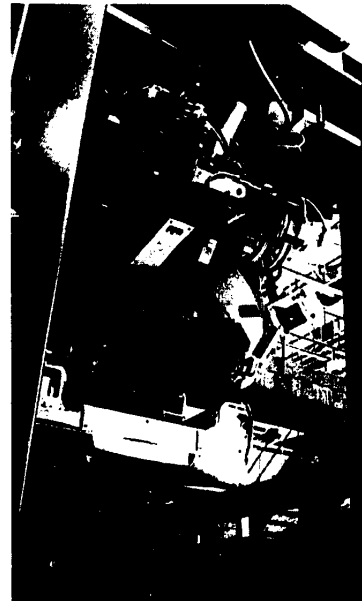
In the priming booth, the outside of the body is automatically sprayed in one operation. In the next booths, only a few finishing operations have to be carried out manually. Electrostatic processes ensure that the maximum amount of paint is applied to the metal. The new paint facility is designed to process heat-hardening acrylic paints.

Taking 2 years to complete, the huge final assembly hall at the Long bridge works was completely rebuilt, and the floor area of the building was expanded by 25,000 m<sup>2</sup>. An adjoining building contains new fitting lines. The five old assembly lines were replaced by three 335-meter-long, raised lines, each with about 60 stations (Fig 3). The bodies, complete with their interior fittings, are taken to final assembly on a ceiling conveyor.

In the final assembly area the supply of engines, chassis components, wheels and other parts is controlled completely electronically. When the finished cars roll off the line (Fig 4), they are first subjected to a test of safety-related components, such as steering and brakes. This is followed by checks of exhaust emissions, the electrical system and various other functions. An electronic diagnostic system speeds up the correction of possible faults.

The final delivery hall has a floor area of 7,500 m<sup>2</sup>. Paint damage is attended to in a special facility, which has its own paint oven and conveyor belt. The touched-up cars are then put back on the line leading to the final check. Along the way, at several stations, decorative paint stripes are applied and special equipment ordered by the customers is installed (fig 5). After the cars have their final cleaning and inspection, the conveyor belt takes them through spray booths in which they are given a protective wax coat on the outside and the underside.

Fig. 1 Automatic holding fixture for body shells.



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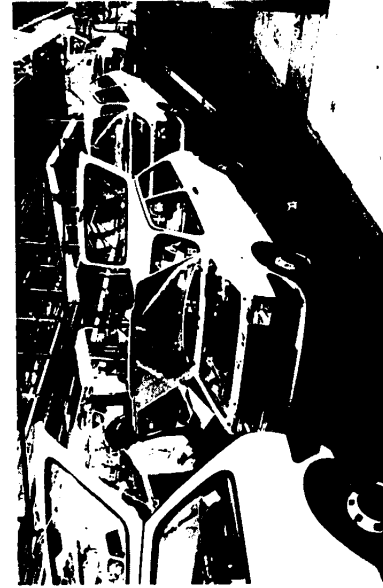
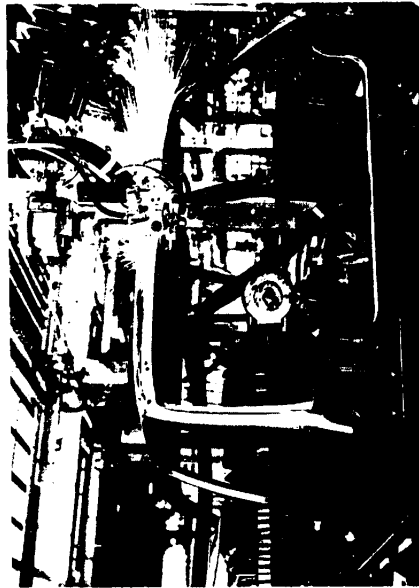
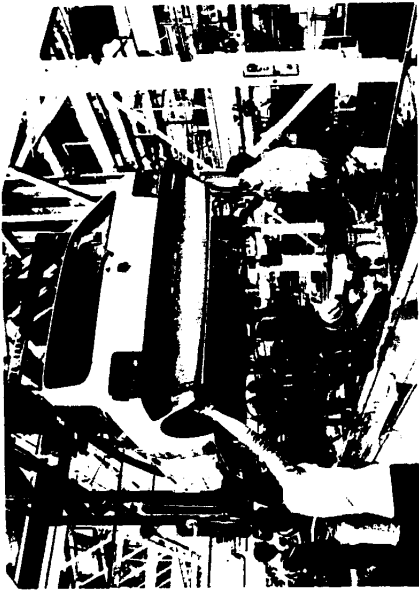


Fig. 2 Body manufacture using welding robots.  
Fig. 3 Raised conveyor belt.  
Fig. 4 Mini Matros roll off the line for final inspection.  
Fig. 5 The final stage.

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TRANSPORTATION

UPDATE ON CURRENT AIRBUS SALES, DELIVERIES

Paris AIR & COSMOS in French 19 Sep 81 pp 21, 23, 25, 27

[Article by Regis Noye: "Airbus Industrie Delivers Its 150th A-300"]

[Text] On 7 October, when Airbus Industrie delivers to Eastern Airlines the 150th A-300, there will still be 319 planes to deliver--i.e., more than double--since 469 orders have been taken so far. This means that in a little more than 7 years, since the delivery of the first A-300 to Air France, the European GIE [Economic Interest Group] has become the Western world's second-ranking supplier of commercial transport planes, behind Boeing but ahead of Lockheed and McDonnell Douglas. Airbus Industrie's market share with the A-300 and A-310 programs alone--that is, the big short-range and medium-range planes--is about 50 percent today; it only drops to 30 percent if the long-range market is added in. This indisputably represents a remarkable performance, achieved in a period of economic recession in a market long dominated almost entirely by American builders. Out of some 100 companies approached, 40 have already signed firm order contracts, and with the delivery of the first A-300 to the Australian company TAA [Trans-Australia Airlines] on 1 July, the European airplane is now in service on the five continents.

We note briefly that Mr Lathiere stated during the Le Bourget Salon that as of Airbus No 360 (which is to come off the line toward the end of 1984), Airbus Industrie will have repaid to the member states the loans granted for development of the A-300. Taking into account the further expenses of manufacturing and costs relating to the A-310 program, the break-even point for the Airbus program is now at around 900 planes--a total very close to the estimated needs of the 40 companies that have already ordered A-300/310's. The slowdown presently to be observed in the rate of orders announced is explained by the fact that Airbus Industrie's commercial efforts were initially concentrated mainly on those companies that had not yet made their choice and whose needs were urgent. Moreover, there is nothing disturbing about this if one considers that the present order book represents a work load until the end of 1985, at which time the first customer companies will begin to think about replacing the first planes delivered (the average lifetime of an A-300 is 15 years).

We note also that this slowdown is entirely independent of the present problems of the American companies due to the recent air-traffic controllers' strike; because its involvement in the United States is still weak, Airbus Industrie has felt no repercussions.

The two current preoccupations of the European GIE, which demands big investments from its partners, are, on the one hand, increasing the rate of production, and on

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the other, development of the A-310, the manufacture of which has largely been started, as we shall see (see article "First Airbus A-310 to Fly in March 1982"). The present rate is 4.1 to 4.2 A-300's per month; it will reach 5 next year, and the will gradually rise to 10 in 1985-1986. At that time, the A 300-600 will already have replaced the A-300 on the line, since integration of it into the line is planned for the second quarter of 1983. Finally, let us not forget that the near future is also reserved for the A-320 program, the launching of which was officially announced at Le Bourget and which has already received 25 conditional orders plus 25 options for Air France.

## The Order Book

We present on the following pages the tables, established by Airbus Industrie as of 31 August, summarizing the orders for the A-300/310. The grand total is thus 469 airplanes (318 firm sales + 151 options) placed with 40 customers, plus one not yet announced. It breaks down as follows:

--A-300: 316 planes (239 firm sales + 77 options) placed with 32 companies;

--A-310: 153 planes (79 firm orders + 74 options) placed with 11 companies, three of which have ordered both A-300's and A-310's (Air France, Lufthansa and Kuwait Airways).

The only news since the Le Bourget Salon is the recent conversion by Indian Airlines of two of its options for A-300 B2-100's into firm orders for two A-300 B4-200's to be delivered in Summer 1982. Furthermore, Kuwait Airways has changed 3 of its 12 orders for A-310's into orders for A-300 C4-600's, thus becoming the first customer to order the convertible version of the A 300-600.

We note also that while a decision in principle has indeed been taken by Middle East Airlines for 19 A-310's (5 + 14), the signing of the contract has been postponed until the end of September, which prevents the order from appearing in the table.

The companies that are the biggest customers at present are Eastern (60 A-300's), Lufthansa (61 planes, including 11 A-300's and 50 A-310's), Air France (50 planes, including 35 A-300's and 15 A-310's), and then KLM (20 A-310's) and Swissair (likewise 20 A-310's).

As regards choice of engines, the following breakdown is noted:

--A-300 (all versions, including the A 300-600): out of 310 airplanes identified<sup>1</sup> (236 + 74), 269 (202 + 67) have General Electric engines, and 41 (34 + 7) have Pratt and Whitney engines;

--A-310: out of 133 airplanes identified<sup>1</sup> (69 + 64), 95 (46 + 49) will have General Electrics, and 38 (23 + 15) will have Pratt and Whitneys.

This makes a total of 364 (248 + 116) airplanes equipped with General Electric engines and 79 (57 + 22) equipped with Pratt and Whitneys; or as percentages, 82 percent for General Electric and 18 percent for Pratt and Whitney. There are nine companies that have chosen Pratt and Whitney so far: Austrian Airlines, China Airlines,

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1. That is, the airplanes for which the engines have been chosen.



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Airbus A-300/A-310 Orders as of 1 September 1981

| 1<br>Sigles | 2<br>Compagnies                 | 3<br>Versions      | Motoristes<br>choisis | 4<br>Commandes<br>fermes | Options | Total |
|-------------|---------------------------------|--------------------|-----------------------|--------------------------|---------|-------|
| RK          | Air Afrique                     | A300B4-200         | G.E.                  | 3                        | —       | 3     |
| AF          | Air France                      | A300B2-100         |                       |                          |         |       |
|             |                                 | B4-100/200         | G.E.                  | 23                       | 12      | 35    |
|             |                                 | A310               | G.E.                  | 5                        | 10      | 15    |
| IT          | Air Inter                       | A300B2-100         | G.E.                  | 8                        | —       | 8     |
| AZ          | Alitalia                        | A300B4-200         | G.E.                  | 8                        | —       | 8     |
| OS          | Austrian Airlines               | A310               | G.E.                  | 2                        | 3       | 11    |
| ER          | British Caledonian Airways      | A310               | P. and W.             | 2                        | 3       | 4     |
| CI          | China Airlines                  | A300B4-200         | G.E.                  | 4                        | —       | 4     |
| SC          | Cruzeiro Do Sul                 | A300B4-200         | P. and W.             | 2                        | —       | 2     |
| EA          | Eastern Airlines                | A300B2-200         | G.E.                  | 2                        | —       | 2     |
|             |                                 | A300B4-100/600     | G.E.                  | 34                       | 26      | 60    |
| MS          | Egyptair                        | A300B4-200         | G.E.                  | 5                        | —       | 5     |
| GA          | Garuda Indonesian Airways       | A300B4-200         | P. and W.             | 9                        | 3       | 12    |
| HF          | Hapag Lloyd Flug                | A300B4-100/C4-200  | G.E.                  | 7                        | —       | 7     |
| IB          | Iberia                          | A300B4-100         | P. and W.             | 6                        | —       | 6     |
| IC          | Indian Airlines                 | A300B2-100         | G.E.                  | 8                        | 1       | 9     |
|             |                                 | A300B4-200         |                       | 2                        | —       | 2     |
| IR          | Iran Air                        | A300B2-200         | G.E.                  | 6                        | 3       | 9     |
| KL          | KLM                             | A310               | G.E.                  | 10                       | 10      | 20    |
| KE          | Korean Airlines                 | A300B4-100         | G.E.                  | 8                        | —       | 8     |
| KU          | Kuwait Airways                  | A310               | P. and W.             | 8                        | —       | 8     |
|             |                                 | A300C4-600         |                       | 3                        | —       | 3     |
| GK          | Laker Airways                   | A300B4-200         | G.E.                  | 10                       | —       | 10    |
| LH          | Lufthansa                       | A300B2-100/B4-200  | G.E.                  | 11                       | —       | 11    |
|             |                                 | A310               | G.E.                  | 25                       | 25      | 50    |
| MH          | Malaysian Airline System        | A300B4-200         | G.E.                  | 4                        | —       | 4     |
| MP          | Martinair                       | A310               | G.E.                  | 3                        | 1       | 4     |
| WT          | Nigeria Airways                 | A310               | G.E.                  | 4                        | —       | 4     |
| OA          | Olympic Airways                 | A300B4-100         | G.E.                  | 8                        | 2       | 10    |
| PK          | Pakistan International Airlines | A300B4-200         | G.E.                  | 4                        | 6       | 10    |
| PR          | Philippine Airlines             | A300B4-200         | G.E.                  | 5                        | —       | 5     |
| SN          | Sabena                          | A310               | P. and W.             | 3                        | 3       | 6     |
| SV          | Saudi Arabian Airlines          | A300B4-600         | P. and W.             | 11                       | —       | 11    |
| SK          | Scandinavian Airlines System    | A300B2-300         | P. and W.             | 4                        | 4       | 8     |
| SO          | Singapore Airlines              | A300B4-200         | G.E.                  | 6                        | 6       | 12    |
| SA          | South African Airways           | A300               |                       |                          |         |       |
|             |                                 | B2-200/B4-200/C4   | G.E.                  | 7                        | 1       | 8     |
| SR          | Swissair                        | A310               | P. and W.             | 10                       | 10      | 20    |
| TG          | Thai International              | A300B4-100/200/600 | G.E.                  | 12                       | 2       | 14    |
| ID          | Toa Domestic Airlines           | A300B2-200         | G.E.                  | 9                        | —       | 9     |
| TN          | Trans Australia Airlines        | A300B4-200         | G.E.                  | 5                        | 2       | 7     |
| HE          | Trans European Airways          | A300B1             | G.E.                  | 1                        | —       | 1     |
| TU          | Tunis Air                       | A300B4-200         | G.E.                  | 1                        | —       | 1     |
| RG          | Varig Airlines                  | A300B4-200         | G.E.                  | 2                        | —       | 2     |
| VP          | VASP                            | A300B2-200         | G.E.                  | 3                        | —       | 3     |
| WD          | Wardair International Ltd       | A310               | G.E.                  | 6                        | 6       | 12    |
|             | Non annoncée                    | A300               |                       | —                        | 3       | 3     |
|             | Total                           |                    |                       | 318                      | 151     | 469   |

Key:

- 1. ID letters
- 2. Companies
- 3. Engines chosen
- 4. Firm orders
- 5. Not announced

Garuda, Iberia, Kuwait Airways, Sabena, Saudi Arabian Airlines, SAS and Swissair. The planes for which the choice does not seem to have been made yet are: the three a-300 C4-600's of Kuwait Airways (though it can be supposed that it will be for Pratt and Whitney), the eight A-310's of Nigeria Airways, the 12 A-310's of Wardair, and the A-300's of the unannounced company--i.e., a total of 26 planes (13 + 13), including 20 A-310's.

State of Deliveries

In 2 years, the number of planes in service and the number of users have more than doubled, going from 67 to 148 planes and from 13 to 28 companies.

Since the Le Bourge Salon, when 140 A-300 B2's and B4's were in service with 26 carriers, 8 planes have been delivered, including the first A-300 B4-200's to Varig on

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Airbus A-300 Deliveries as of 1 September 1981

| 1<br>Sigles | 2<br>Compagnies                 | 3<br>Moteurs | Versions |               | Total |
|-------------|---------------------------------|--------------|----------|---------------|-------|
| RK          | Air Afrique                     | G.E.         | —        | 1 B4-200      | 1     |
| • AH        | Air Algerie                     | G.E.         | —        | 2 B4-100      | 2     |
| AF          | Air France                      | G.E.         | 9 B2-100 | 11 B4-100/200 | 20    |
| IT          | Air Inter                       | G.E.         | 7 B2-100 | 1 B4-100      | 8     |
| AZ          | Alitalia                        | G.E.         | —        | 7 B4-200      | 7     |
| SC          | Cruzeiro Do Sul                 | G.E.         | —        | 2 B4-200      | 2     |
| EA          | Eastern Airlines                | G.E.         | 2 B4-200 | 17 B4-100     | 19    |
| • MS        | Egyptair                        | G.E.         | —        | 5 B4-100/200  | 5     |
| HF          | Hapag Lloyd Flug                | G.E.         | —        | 4 B4-100      | 4     |
|             |                                 |              |          | 1 C4-200      | 5     |
|             |                                 |              |          | 4 B4-100      | 4     |
| IB          | Iberia                          | P. and W     | —        | —             | 8     |
| IC          | Indian Airlines                 | G.E.         | 8 B2-100 | —             | 2     |
| IR          | Iran Air                        | G.E.         | 2 B2-200 | —             | 6     |
| KE          | Korean Airlines                 | G.E.         | —        | 6 B4-100      | 6     |
| GK          | Laker Airways                   | G.E.         | —        | 3 B4-200      | 3     |
| LH          | Lufthansa                       | G.E.         | —        | 3 B4-100      | 9     |
| MH          | Malaysian Airline System        | G.E.         | 6 B2-100 | 4 B4-200      | 4     |
| OA          | Olympic Airways                 | G.E.         | —        | 6 B4-100      | 6     |
| PK          | Pakistan International Airlines | G.E.         | —        | 4 B4-200      | 4     |
| PR          | Philippine Airlines             | G.E.         | —        | 4 B4-200      | 4     |
| • SV        | Saudi Arabian Airlines          | G.E.         | —        | 3 B4-100      | 3     |
| SK          | Scandinavian Airlines System    | P. and W.    | 4 B2-300 | —             | 4     |
| SO          | Singapore Airlines              | G.E.         | —        | 3 B4-200      | 3     |
| SA          | South African Airways           | G.E.         | —        | 1 B4-200      | 5     |
| TG          | Thai International              | G.E.         | 4 B2-200 | 9 B4-200      | 9     |
| JD          | Toa Domestic Airlines           | G.E.         | —        | —             | 3     |
| TN          | Trans Australia Airlines        | G.E.         | 3 B2-200 | —             | 2     |
| HE          | Trans European Airways          | G.E.         | 1 B1     | 2 B4-200      | 1     |
| RC          | Varing                          | G.E.         | —        | 1 B4-200      | 1     |
|             | Total                           |              | 46       | 102           | 148   |

\* Air Algerie: the two A-300 B4-100's are planes leased from Lufthansa. Egyptair: two of the four A-300's are leased from Hapag Lloyd. Saudi Arabian Airlines: the two A-300 B4-100's are leased from Korean Airlines.

Key:

1. ID letters
2. Companies
3. Engines

15 June and the first A-300 B4-200 to TAA, thus increasing the number of users to 28. As of 15 August, the 147 Airbus in service had flown more than 800,000 hours and had made 550,000 takeoffs, which represents an average of 1 hour 45 minutes of flight per takeoff. Twenty planes had flown more than 10,000 hours, and the maximum recorded for a plane was 14,000 hours. The rate of technical regularity of the A-300's in service was 98.3 percent for the fleet as a whole, and 99.7 percent for the top three companies. Of the 148 deliveries as of 31 August (see table above), 46 were A-300 B2's (including 4 with Pratt and Whitney engines delivered to SAS), and 102 were A-300 B4's (also 4 with Pratt and Whitneys, delivered to Iberia). Three companies are actually using planes leased from Lufthansa (by Air Algeria), from Hapag Lloyd (by Egyptair), and from Korean Airlines (by Saudi Arabian Airlines).

The 149th plane will be delivered to Thai International on 29 September, and the 150th, to Eastern Airlines on 7 October. As of 31 December, 38 A-300's will have been delivered since the beginning of the year; some 50 will be delivered in 1982, which enables us to predict the delivery of the 200th in September 1982.

The principal users at present are Air France (20 planes), Lufthansa (9 planes), and Thai International (also 9).

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The 150th A-300 Delivered Bears Series Number 152

The 150th Airbus A-300, to be delivered to Eastern on 7 October, actually bears series number 152, because of the fact that two of the planes built at Toulouse have not been delivered (one prototype and No 3, owned by Airbus Industrie, and presently being used for flight-testing). It is an A-300 B4-203 (the first of this type delivered to Eastern), equipped with General Electric CF6-50C2 engines. This plane has in fact, at the request of the American company, undergone structural modifications so that its takeoff mass can reach 165 t, as against 157.5 t for a standard B4-200. Its layout is with 245 passenger seats--24 first-class and 221 tourist-class. Eastern is in fact one of the companies requesting the biggest seat pitch in tourist class.

The plane started on the assembly line on 5 March 1981. After going through the normal circuit in the Aerospatiale factory of St-Martin (11 work doors on the line, 1 day of pressurization tests, painting, mounting of engines, runway building), it made its first flight on 22 June before leaving for Hamburg (interior fittings), from which it returned on 2 September.

It will leave Toulouse on 5 October in the hands of two Airbus Industrie pilots; it will fly to New York (with or without a stop at Gander), then on to Atlanta, where it will be officially delivered to Eastern on 7 October. It is only at that moment that it will become the property of the company. It will then go to Miami--this time with two American pilots in command--where it will be placed in service on that same day.

It is the 20th A-300 to be used by Eastern, but only the 18th delivered by Airbus Industrie, since two other planes already in service come from Iran Air. The Eastern Airlines contract comprises a total of 60 A-300's (B2-200's and B4-100/600's), including 34 firm orders and 26 options. Six more planes will be delivered between now and the end of the year.

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TRANSPORTATION

FIRST AIRBUS A-310 TO FLY IN MARCH 1982

Paris AIR & COSMOS in French 19 Sep 81 p 29

[Article: "The A-310 Will Fly in March 82, the A 300-600 in Mid-83"]

[Text] While the 150th A-300 will soon be delivered, the A-300 (220 passengers) and A 300-600 (improved version of the A-300 B2/B4) programs are proceeding along. and as we have already had occasion to note at various times (cf AIR ET COSMOS, Nos 870 and 872), the A-310 is taking shape very rapidly at Toulouse. We mention first of all that the manufacture of these planes will be characterized by a phenomenon unique in the world: the assembly of two big transports on a single line, not just one plane as usually, even though these two planes have a lot of fuselage in common. Moreover, it should be stressed that the integration of the A-310 into the A-300 B2/B4 line, and then the A 300-600, will be done simultaneously with a steady but rapid rise in the rate of fabrication.

A-310

The final assembly of the first A-310 is presently taking place in the "Concorde" room of the Saint-Martin factory of the SNIAS [National Industrial Aerospace Co]. Following the horizontal tail unit, the two half-wings, which arrived at Toulouse on 30 and 31 August, are now fixed to the fuselage, assembly of which was completed in the first days of July. After receiving its landing gear, in mid-October the airplane will go to the new room (M90) that Aerospatiale has just built for the purpose, in the medium term, of extending the present A-300 assembly line by transferring two work stations to it and in which airplane No 3 is presently under construction. The mounting of the fin, then of the engines, and finally, "turning on the current," will be carried out successively in the M90 room. After checkout of the systems, A-310 No 1 will leave the shop at the end of January; its first flight is still planned for March or April 1982.

After its departure from the "Concorde" room it will later be replaced by airplane No 2, whose wing spar boxes, already delivered to Breme by British Aerospace, are being equipped, and delivery of which to Toulouse is planned for the beginning of November. Likewise, the first four or five A-310's will be assembled separately so as to break in the various operations perfectly and not impede the production-rate increase on the A-300 line. The integration will be done in Autumn 1982, starting with No 5 or 6. It should be noted in passing that a convertible version of the A-310 is now being planned.

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The A 300-600

The first A 300-600 will also be assembled separately, but its integration into the assembly line for the B<sup>7</sup>/B<sup>4</sup>'s, which it will gradually replace, will be done directly with No 2, during the second quarter of 1983. Its first flight is planned for mid-1983, while the first deliveries are scheduled for Spring 1984.

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