COMMERCIA L AIRCRAF T OF THE WORL D •

had delivered 59 MD-80s in 1990 out of a total 1,549 ordeVs and commitments. Japan Air System took delivery of its 20th MD-80, which is also the 750th aircraft of the type in service with 50 operators.
The MD-80 is offered in five versions, giving customers a wide range of five-abreast seating capacities, range capabilities and engine take-off thrusts.
Honeywell's windshear-alert and guid-ance system has been certificated by the FAA on the MD-80-series airliners. Able to be coupled to the autopilot, it allows the pilot the option to choose an autopilot-controlled escape manoeuvre. The system will become standard equipment on the range in late 1990.
American Airlines' 190-strong MD-80-series fleet is the world's largest for any single aircraft type.
The MD-88 features digital systems, elec-tronic flight instrumentation and a flight management system. Its windshear protec-tion system is being certificated and is available for retrofit to other MD-80s or, in a modified form, to DC-9s.
The Chinese Government has approved co-production of a further 20 McDonnell Douglas MD-80s by Shanghai Aviation In-dustrial Corporation in Shanghai, China. The development of the MD-80 family provides a case study of the way new technology can be applied retrospectively to an existing design. The basic DC-9 made its maiden flight in February 1965. The DC-9-80 (renamed the MD-80) entered service in 1980. All members of the MD-80 family use the same wing and are available with any of the P&W JT8D-200 series of engines. Programme status: orders, 435; options, 643; delivered, 745; total, 1,823, including MD-90s. DC-9-series sales (excludingMD-80s), 976, all delivered, including 43 mili-tary C-9s.

MD-87 Because it is 5.3m shorter than the other MD-80s, the MD-87 can be consid-ered a distinct model. The aircraft has a MTOW of 63,500kg with an optional in-creased MTOW of 67,800kg. It employs a high degree of commonality with its larger brothers, however, and has a common type-rating for cockpit crew. The pro-gramme was launched in early 1985. The model's first flight followed in December 1986 and deliveries of certificated aircraft began in October 1987.
Austrian Airlines and Finnair were the first to take delivery of MD-87s, Midway Airlines was the first US operator of the type, taking delivery of the first of eight aircraft in April 1989.
Powered either by the P&W JT8D-217C or -219, the MD-87 can carry 139 passen-gers. Some examples have an auxiliary fuel tank to boost range to 5,300km.
Programme status: orders, 95; delivered, 26; production rate, all MD-80 models, eight a month.

McDonnell Douglas DC-9 re-engining The existence of a large DC-9 fleet in airline service and the success of the re-engining of the DC-8, has focused attention on the possibility of re-engining this US twinjet. The progress of the Valsan 727 conversion and discussions about a possible engine modification programme for the 737-200, have also made re-engining respectable. Among the options which have been studied are the use of the JT8D-200 series, the remanufactured JT8D-400, and the Rolls-Royce Tay 670 at around 75.6kN of thrust.

MD-90 Delta Air Lines launched the next generation of McDonnell Douglas twinjets with a firm order for 50 MD-90-30s and options on 110 more in November 1989. Three versions are being offered, a mixed-class 114-seat MD-90-10, the MD-90-30 as ordered by Delta, with a 150-seat mixed-class capacity and the larger MD-90-40 with 180 seats. All three models are powered by International Aero Engines V2500 powerplant, which is already certifi-cated and will be the quietest in its class, according to McDonnell Douglas, meeting Stage III noise level requirements and mak-ing it suitable for noise-sensitive airports. Engine thrusts for the three models will be: MD-90-40, 126kN; MD-90-30, 112kN and the MD-90-10, 99kN (22,0001b). MD-88 cockpit technology will be incor-porated in the MD-90 models, including digital displays, EFIS, flight management system and a windshear detection system. A new inertial reference system will be fitted and changes are to be made to improve pilots' outside visibility. TheMD-90 will also have control-surface position indicators on the instrument panel. Cockpit commonality with the MD-88 will assist crew training and cross-crew qualification.
The same single-aisle, five-abreast fuse-lage cross-section and high-lift wing section of the MD-80 are to be retained in the new models. The MD-90-40 will have two fuse-lage plugs, one 4.8m in front of the wing and a 2.4m section aft of the wing. A 1.4m extension in front of the wing, will be fitted on the MD-9-30.

Ranges for the MD-90-10 and -30 are identical at 4,450km (2,400nm). Gross take-off weights are to be 63,050kg and 70,760kg respectively.
The new models are expected to offer 13% reduction in fuel burn/seat on the MD-90-10 and 17% for the MD-90-30, compared with the earlier MD-80s. McDonnell Douglas foresees a market for more than 800 MD-90s, from first deliveries in 1994, extending to the year 2000 and beyond.
Interchangeable standardised fuselage modules will be introduced, both MD-80s and MD-90s being built on the same pro-duction line, which will reduce costs and lead-times. Production time has been re-

duced from 160 days to 110 days an aircraft and is planned to reduce even further. McDonnell Douglas will start a prototype development programme using Ship 909, a Douglas-owned flight-test aircraft. The first MD-80 built, this aircraft will be converted into an MD-90-30, complete with the 1.4m Series 30 fuselage extension and the new V2500 engines.
Full-scale assembly of production aircraft will only begin after the first two flight-test aircraft built on the production line have joined the prototype in the flight-test pro-gramme.
McDonnell Douglas is also discussing with European carriers longer-range MD-90 versions. Changes would include: increased maximum take-off weight, increased wing area and strengthening of the wing, use of MD-11 avionics, one-man loading of the baggage hold and an improved cabin inte-rior. Range improvements would add a 1,130km for the MD-90-10EC, 740km to the -30EC and 330km on the -40EC.

The customer order and (option) list includes: Alaska Airlines 20 (20), Delta Airlines 50 (110), Japan Air System 10 and International Lease Finance 15 (15). Programme status: orders, 95; options, 155.

DC-10 The last DC-10 built, a DC-10-30, was delivered to Nigeria Airways early in 1989, replacing one lost in a 1987 crash, clearing the DC-10/KC-10A production line for the follow-on MD-11.- This not only marks the end of the DC-10 series, but also the DC "Douglas Commercial" designation which was first used on the DC-1 of 1933.

The definitive DC-10-30ER of 1988, pow-ered by the GE CF6-50C2 and with a maximum take-off weight of 264,000kg, is a significant development of the CF6-6D-powered initial "domestic" model DC-10-10 which first flew in August 1970 and grossed 200,000kg.
The DC-10 programme was launched by large orders from American Airlines and United in 1968 for the DC-10-10. Orders for the higher-gross-weight intercontinental version followed, first from Northwest. Only the DC-10-40, however, with its JT9D engines (initially dubbed the -20) ordered by Northwest and JAL, was not powered by a version of the CF6. The DC-10-40 made its maiden flight in February 1972 and the DC-10-30 the following June. The DC-10-15 was a hot-and-high version of the -10 with uprated engines, first delivered in 1981. The production list includes 120 DC-10-lOs, 9 DC-10-lOCFs, 7 DC-10-15s, 174 DC-10-30s and -30ERs, 23 DC-I0-30CFs, 12 DC-10-30 Freighters and 41 DC-10-40s.

Programme status: DC-10, all civil models: orders, 386; delivered, 386. KC-10A Exten-der: authorised, 60; delivered, 60, for the US Air Force. Production is complete. MD-11 Four MD-lls are flying and a fifth

FLIGHT INTERNATIONAL 3 - 9 October, 1990