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as pre-selected altitudes are reached and automatically reports altitude to ground controllers, and an improved anti-skid braking system. The JT8D-17 is the standard DC-9-50 power-plant. Another notable feature of the Series 50 is the addi-tiqn of small strakes on the forward fuselage to assist low-speed directional stability.
The basic design of the DC-9—by far the best-selling short-range twinjet—dates back to 1962, when it was known as the Model 2086. The go-ahead was given early in 1963 and the first aircraft flew on February 25, 1965; five took part in the development programme. The initial production version, the Series 10, was originally powered by 12,5001b, 55-6kN-thrust derated JT8D-5s, and was designed, like the One-Eleven, to stay within the two-pilot crew rule of an 80,0001b, 37,400kg maximum gross-weight limit. The DC-9T0 was certificated on November 23, 1965, and services began with Delta on Decem-ber 8, 1965.
The first major development was to stretch the fuselage by 15ft, 4-5m (for up to 115 seats maximum), increase the permitted operating weights and revise the high-lift devices (triple-slotted flaps in place of double-slotted ones, and the introduction of full-span leading-edge slats) to preserve air-field performance. The first Series 30 flew on August 1, 1966. A further stretch was then embarked upon to meet an order from SAS. This resulted in the Series 40 with uprated 14,5001b, 64-5kN-thrust JT8D-9s, more fuel tankage, a further 6ft, l-8m stretch to the. body (now 21 per cent longer than the original version) for up to 125 seats, and higher permitted operating weights. The first Series 40 flew on November 28, 1967. All versions of the DC-9 are offered in all-freight (DC-9F), quick-change cargo-passenger (DC-9CF), or mixed-traffic passenger-cargo (DC-9RC) versions. The cargo and convertible models have a large side door measuring lift 4inX6ft 9in, 3-45mX 2-06m. Another permutation of the DC-9 theme is the Series 20—a "hot-rod" small capacity version for operators flying the less busy routes where good airfield performance is important. It combines the short body of the Series 10 with the large-span wing, high-lift devices and higher power of the Series 40.

The high cash-flow requirements imposed on Douglas by building up DC-9 production to meet demand were instru-mental in the formation of McDonnell Douglas.

DC-9 orders:

DC-9-10/15 Series: Aeromexico, 9; Air Canada, 6; Allegheny, 1; Avensa, 2; Bonanza, 3; W. J. Brennan, 1; Continental, 4; Delta, 14; Eastern, 15; Hawaiian, 2; KLM, 6; LAV, 1; Ozark, 6; Saudia, 3; Southern Airways, 6; Standard, 2; Swissair, 5; Tracey Investment Corp, 1; Trans Texas (now Texas Inter-national), 2; TWA, 20; West Coast, 4. Total, 113.

DC-9-10F/CF Series: Continental, 19; Trans Texas (now Texas International), 5. Total, 24.

DC-9-20 Series: SAS, 10. Total, 10.

DC-9-30 Series: Aeromexico, 7; Air Canada, 44; Air Jamaica, 3; Alitalia, 35; Allegheny, 37; ALM, 3; Ansett, 12; ATI, 14; Atlantis, 3; Austrian, 9; Avensa, 1; Aviaco, 8; Bonanza, 2; Caribair, 3; Delta, 77; Dominicana, 1; East African, 3; Eastern 72; Garuda, 12; H. Hefner (Playboy), 1; Hawaiian, 8; Hughes Airwest, 11; Iberia, 31; Inex Adria, 3; Italian Air Force, 2; JAT, 14; KLM, 9; Korean, 1; LAV, 3; Martinair, 1; North Central, 20; Ozark, 10; Pan Adria, 1; Pacific Southwest, 2; Purdue, 2; Southern Airways, 5; Sudflug, 2; Swissair, 19; TAA, 12; Trans Texas (now Texas International), 5; THY, 8; West Coast, 3. Total, 519.

DC-9-30F/CF Series: Alitalia, 3; Aviaco, 4; Balair, 1; Iberia, 4; Inex Adria, 1; KLM, 7; Martinair, 3; ONA, 7; SAS, 2; Swissair, 1; USAF, 24; US Navy, 14. Total, 71.

DC-9-40 Series: SAS, 43; TDA, 14. Total, 57.

DC-9-50 Series: Allegheny, 8; Austrian, 2; Finnair, 6; Hawaiian, 4; LAV, 3; North Central, 3; Spantax, 2; Swissair, 10. Total, 38.

Total DC-9 orders: 832.

McDonnell Douglas DC-9-60/DC-9QSF Two new versions of the DC-9 are under study: a 160-seat DC-9-60 powered by two CFM56s and a quiet short-field (QSF) aircraft powered by the refanned JT8D-209 and using the DC-9-40 or -50 fuse-lage and a high-lift wing. Another possibility is a DC-9-50 powered by the refanned JT8D-209 and stretched by one seat-row.

FLIGHT International, 23 October 1975

McDonnell Douglas DC-10 By the end of September 207 DC-lOs had been delivered to 32 airlines. The uprated version of the DC-10-40, powered by three 53,0001b-thrust JT9D-59As, made its maiden flight on July 25. The -59A gives 5,0001b more thrust than the earlier version of the engine and will allow Japan Air Lines, the first customer, to operate with higher maximum weights and over longer stage lengths. Earlier this year McDonnell Douglas offered British Airways an RB.211-powered version of the DC-10-30 designated DC-10R. McDonnell Douglas is offering three new DC-10 variants: two stretched aircraft and a specialist freighter. The largest will have a 40ft fuselage extension and will be capable of carrying 385 passengers in a mixed-class layout or 430 pas-sengers in an all-economy layout. Maximum take-off weight is 580,0001b and maximum landing weight is 446,0001b. Power will be supplied by either CF6-50Js, each of 54,0001b thrust, or CF6-50Cs, each of 51,0001b thrust. The second development with 30ft stretch, would have the same take-off and landing weights but longer range. In common with the 40ft-stretched variant it is on offer with both types of CF6. The freighter DC-10 is not dimensionally stretched but has higher weights than the DC-10-30. Maximum take-off weight is 580,0001b, as opposed to 555,0001b, and the powerplants specified are CF6-50Js. Two sizes of cargo loading doors are offered, both on the left-hand side of the forward fuselage. The standard door is 120inX140in, but one 120inX260in is also being proposed. All cabin windows are deleted and only the forward left-hand passenger door is retained.

The domestic version of the DC-10, the Series 10, was the first to enter service. The DC-10-10 first flew on August 29, 1970, was certificated by the FAA on July 29, 1971, and began scheduled commercial operations on August 5, 1971.
The first long-range version, the Series 40 powered by JT9D-20s, made its initial flight on February 28, 1972, and was followed by the CF6-50-powered Series 30 which made its maiden flight on June 21, 1972. Northwest and Japan Air Lines are the only customers so far for the JT9D-powered Series 40. There is no trijet competitor for the long-range DC-10 as it has a greater payload-range capability than any TriStar. It clashes head-on, however, with the 747SP.

The DC-10 originated in American Airlines' April 1966 requirement for a large-capacity aircraft capable of flying the Chicago-Los Angeles route with a full payload and of departing from the short runway at La Guardia, New York, in ISA + 17°C conditions with a full-capacity payload for Chicago. To fulfil this specification American Airlines en-visaged a twin-engined aircraft, but the transcontinental TriStar and DC-10-10 were the result (see TriStar entry). The first of the trijet orders (for 25) came from American on February 19, 1968, when it chose the McDonnell Douglas aircraft. The airline took options on another 25 but did not at that time specify an engine. A go-ahead was not warranted by this total and things thus looked a little bleak for the DC-10 by the end of the next month because on the last day of March 1968 Lockheed went ahead with the TriStar— its first commercial transport since the Electra. When the decision to go-ahead was taken there were 144 orders and options from Eastern, TWA and Air Holdings.
But on April 25 United Airlines ordered 30 DC-10-10s with
an option on a similar number, and McDonnell Douglas gave the go-ahead. Soon afterwards both American and United chose the General Electric CF6-6 of about 40,0001b, 178kN thrust to power the aircraft.
Paradoxically, the first order for a long-range variant (from Northwest) specified Pratt & Whitney JT9D engines, basically the same engine as fitted to the 747.
The second big breakthrough, following the American and United decisions, was the KSSU order for the long-range -30 aircraft in June 1969, which came after Lockheed and McDonnell Douglas had fought a pitched battle for the European foothold which KLM, SAS, Swissair and UTA rep-resented. Fourteen DC-lOs were ordered and 21 taken on option, with deliveries to begin in 1972.
Manufacture of the DC-10 is spread around North America, Japan and Europe, as has happened with the DC-9. Aeritalia, for example builds the fin and rudder in Naples.
The -30 aircraft bought by KSSU was a true intercontinental aircraft with a much increased take-off weight necessitating the addition of a third main undercarriage leg. Other major revisions, apart from a greater wing span and new power-plants, were made to the internal layout. Galleys were moved from under the floor to the main cabin, giving a larger cargo volume.

DC-10 orders:

DC-10-10 Series: American, 25; Continental, 8; Laker, 3; National, 14; THY, 3; United, 37; Western, 6. Total, 96.

DC-10-10CF Series: Continental, 8. Total, 8.