Airliners of the World

DC-7C SEVEN SEAS

DOUGLAS AIRCRAFT COMPANY, SANTA MONICA, CALIFORNIA

THE philosophy underlying the DC-7C was to exploit, for long-range operations, the power of the Wright Turbo-Compound engine and the proven design features of the DC-7. In June 1954, when the first DC-7C studies were made, the DC-7 had been in service for about eight months. It had been well received by the travelling public and was becoming the most popular transport in domestic U.S. service. Its ability to fly non-stop coast to coast in about eight hours had changed trans-continental travel habits.

Douglas had, in 1953, begun the design of several important changes to the DC-7 to improve range. A new version, to be called the DC-7B, was scheduled for delivery in the spring of 1955. Major changes included "saddle" tanks, which increased fuel capacity by 721 gal; spinners and a new anti-drag ring for better cooling; a new wing-flap mechanism for improved take-off efficiency; larger oil tanks; general structural reinforcement; and higher operating weights.

The DC-7B was well received by the airlines but its major market was still the U.S. domestic one. Its improved range was still not great enough to revise international traffic patterns, such as had been accomplished domestically. Douglas felt that the DC-7B should be improved sufficiently to attain the frequently promised (but never delivered) non-stop all-the-year-round North Atlantic airliner. Studies were made to find the best way to bring this about. These included: (1) Wing-tip tanks. These would have reduced speed 3 to 5 m.p.h., reduced performance, limited maximum take-off weight, and increased ground loads 25 to 50 per cent. Range improvement would have been at the expense of payload. (2) Stalk tanks. These would have had basically the same effect as tip tanks, but would have had more drag. Ground loads would not have been so great but ground-clearance considerations presented problems. Other external tank proposals had similar shortcomings. (3) Extension of wing tips. This would have improved span efficiency and allowed higher take-off weight but would have substantially increased flight and ground loads, and would not permit any appreciable increase in fuel capacity. Thus external fuel would still have been necessary. (4) Extension of wing at root. This solution, which was adopted, permitted higher take-off weight due to span and area increase, room for more than 1,124 gal of additional internal fuel, and —by moving airscrews out 5ft on each side—greatly improved cabin noise and vibration levels. By moving the DC-7B wing outboard, the ground and flight loads were essentially unchanged except in the added wing section.

The latter scheme was adopted despite the fact that the wing-root extension was the most difficult from the manufacturing standpoint of the alternatives available. This modification had to be introduced into the DC-6 and DC-7 production line at a time when that line was producing more than two aircraft a week, yet the DC-7C was out ahead of schedule without delays to normal production deliveries.

Development of the DC-7C followed Douglas tradition in that much "carry-over" from existing aircraft was effected. Significantly, every major change in the DC-7B was included in the DC-7C. Had all these design features not been developed it is probable that the DC-7C could not have been undertaken owing to timing and economic considerations.

However, no compromises were made. The major new changes in the DC-7C included the previously mentioned 10ft wing-root extension, with additional fuel capacity; a 40in fuselage extension; enlargement of the ailerons and flaps; extension of the fin and rudder; a new centre-wing de-icing system; further structural reinforcement; and a series of drag-improvement modifications.

As might be expected, Douglas have been studying domestic uses for the DC-7C (which has become known as the Seven Seas). Despite its long range the aircraft is claimed to have excellent domestic characteristics, including shorter take-off and landing performance than either the DC-6B or DC-7B, improved comfort and economy, and increased flexibility of interior arrangement.

AIRFRAME. The fuselage is of all-metal semi-monocoque construction using light alloys, steel, and titanium, as sheet, extrusion, bar stock, and forgings. The fuselage shell is of conventional skin, stringer and frame construction with transverse floor stiffeners over extruded longitudinal floor supports. Production bolted joints are at the cockpit, aft pressure dome and tail cone. The whole fuselage is designed for a working differential pressure of 5.46 lb/sq in (8,000ft at 25,000ft). Triple-pane windows are fitted throughout the passenger cabin, the inner pane being of the free-floating type.

The wing is of the same basic type of three-spar construction as in the entire DC-6 and DC-7 series. Fuel bag-tanks are fitted inboard of the undercarriage; flexible cells and integral tanks are installed outboard. Ailerons and flaps are all-metal. The tail is essentially the same as that of the DC-7, except that the vertical tail is 24in higher, the horizontal surfaces have greater span and fairings have been added at the rudder hinge cut-outs.

Tubeless tyres (1700×20) on Goodyear wheels and brakes are fitted to the main undercarriage gear, which can be dropped independently of the nose unit to act as a speed brake at any i.a.s. The nosewheel has a single 1500×16 tubeless tyre on a Goodrich wheel, and is hydraulically steerable to pivot the aircraft about either main leg.

POWERPLANT. Four Wright Turbo-Compound EA-1 series engines drive 34E60-series 14ft four-bladed Hamilton Standard solid dural airscrews. Oil tanks of 47 gal each are fitted. An anti-drag ring has its inner liner inside the cowl entrance for the additional benefit of the airscrew spinner. The mounting is of flash-welded tubes bolted to forging clusters. Inboard and outboard powerplants are identical except for cabin-supercharger drives and hydraulic pumps. Powerplants are quickly removable, being attached by only four 1in-diam. special bolts.

SYSTEMS. Cabin Air. Fresh air is supplied at 5½ lb/sq in by two engine-driven superchargers located in the outboard nacelles providing 112 lb/minute. The air from the superchargers can be directed to a 300,000 B.T.U./hr heater, or through an expansion cooling turbine