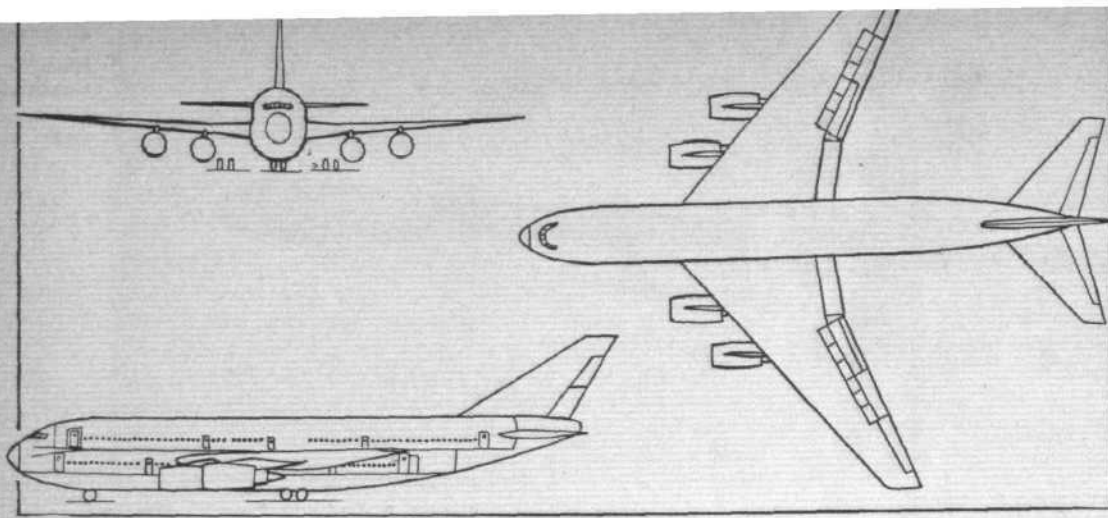


AIR TRANSPORT ...



Provisional three-view drawing of the intermediate-sized Boeing 747-3. The main undercarriage includes a centre four-wheeled bogie which retracts vertically into the centre section

BOEING 747 REVEALED

THE existence of an entirely new family of Boeing long-haul airliners was first rumoured in early October at the time when the company began the tunnel testing of possible configurations. Provisional details were contained in the November 25 *Flight* Commercial Aircraft Survey. In the December 16 issue *Sensor* predicted that Boeing would make a go-ahead decision around the beginning of this year. At the time of going to press no such announcement had been made, but *Aviation Week* had given fuller details of the projects from which the following report and drawings have been prepared.

The Boeing 747 is roughly two-thirds the size, weight and power of the company's losing entry in the recent competition for the USAF C-5A heavy logistics transport. Three versions are being proposed, powered by "C-5A technology turbofans" at engine ratings varying between 32,500lb and 40,000lb sea level static thrust. Compared with the 185-seat Boeing 707-320B, the 311-433-seat 747s are expected to show seat-mile costs between 12 and 30 per cent lower when operating over similar routes. Airline dismay at the size of the first proposals for civil derivatives of the military C-5A (variously estimated as between 700- and 1,000-seaters) will not be quite so loud in respect of the 747—but, nevertheless, there will be some call for even higher standards of operating safety and emergency escape facilities in view of the unprecedented number of passengers to be packed into one aircraft.

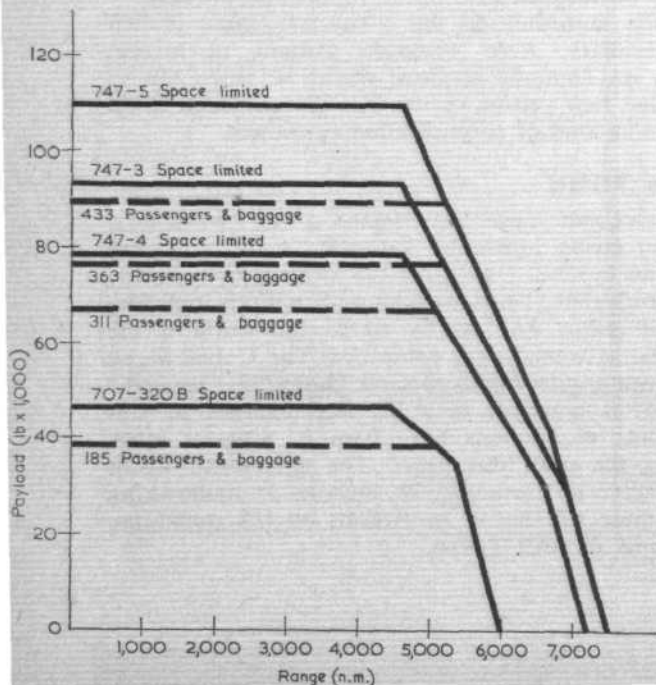
As can be seen from the accompanying diagrams the 747 adheres to the well-tried configuration principles of the 707. However, the two lobes of the bulky double-bubble fuselage

cross-section are not only considerably larger but are now of almost equal radius. The wing is effectively mid-mounted for adequate ground clearance of the engine nacelles which, at up to 101in, are nearly twice the diameter of the JT3D-3B in the 707-320C. An unusual feature of the layout is the four-point undercarriage. In addition to the conventional nose and wing units there is to be a central four-wheeled bogie which would retract vertically into the fuselage centre-section.

From an aerodynamic point of view perhaps the most unexpected feature of the bulky 747 design is the choice of a maximum cruising speed of Mach 0.9 (595 m.p.h.) at 40,000ft. To this end the wing leading edge is swept back 42° and similarly proportioned to those of the 707 series but the fin is more sharply raked. The engine nacelles are supported on short under-wing pylons located some 22ft and 36ft from the fuselage centreline. The nacelle envelopes for the three categories of advanced turbofan engine being considered (32,500lb, 35,000lb and 40,000lb) are 91in, 95in and 101in, respectively.

Whereas the 707-320B was the ultimate development of the 707 family in the matter of range, the 747 is planned from the outset for profitable operation on such ultra-long-haul routes as Los Angeles-London/Rome. The estimated direct operating costs per aircraft mile over 3,000-mile stages are \$2.5 (747-4), \$2.6 (747-3) and \$2.75 (747-5); these costs are, respectively, 50 per cent, 56 per cent, and 64 per cent greater than that of the 707-320B. On a seat-mile basis the costs work out at 0.8 cents (12 per cent less), 0.71 cents (20 per cent less) and 0.63 cents (30 per cent less), respectively. The break-even load

Left, payload-range of the 747 variants compared with the 707-320B. The payloads shown represent those limited by space available in the all-passenger version. The 747-5C can carry up to 198,000lb of freight. The fuel reserves accounted for comprise: 2,000lb (-320B), 28,000lb (-3), 26,000lb (-4), and 29,000lb (-5). Right, basic weights and dimensions for the 747s compared with the 707-320B



	320B	747-3	747-4	747-5
Powerplant thrust (lb)	18,000	35,000	32,500	40,000
Payload				
Passengers at 34-in pitch	185	363	311	433
Passengers and baggage (lb)*	38,665	75,867	64,999	90,497
Space limit (lb)†	48,225	91,895	78,565	109,195
Structural limit (lb)	53,400	95,800	82,300	112,600
Maximum weights (lb)				
Taxi	336,000	532,000	484,500	599,400
Take-off	333,600	530,000	482,500	597,400
Zero-flaps	331,600	528,000	480,500	595,400
Landing	215,000	375,000	338,000	423,500
Zero fuel	195,000	347,000	312,000	394,500
Operating empty weight (lb)	141,600	251,200	229,700	282,300
Fuel tankage (US gal)	23,855	38,000	33,000	41,500
Underfloor cargo volume (ft³)	1,770	3,200	2,725	3,775
Dimensions				
Length (ft)	145.5	173	161.5	187
Span (ft)	145.8	155	150	160
Wing area (ft²)	2,892	4,400	4,000	4,800

* Passengers at 165lb and baggage at 44lb † Baggage and/or cargo at 10lb/ft³ usable space