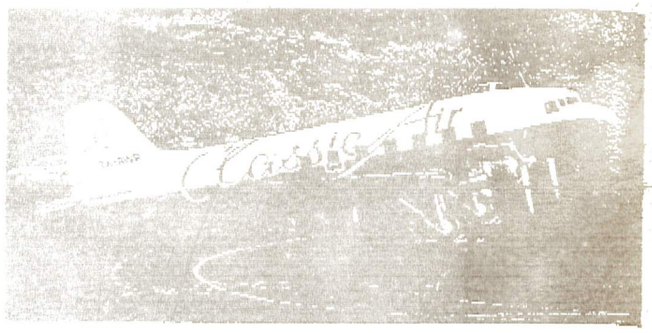
To: Ref. S. DHAWAN Fax 341

Dornier Do 28 & 128

Country of origin: G
Type: STOL utility
Powerplants: Do
flat six piston
propellers. 128
PT6A-110 turbo
Performance: Do
speed 306km/h (16
Max rate of climb
payload 1050km
cruising spe
(138kt). Initial
with max fue
(1774lb) pay
Weights: D
(3470lb),
(9590lb).
Dimensions:
(37ft 5in), he
– Same exce
Capacity:
for 10 or 12
Production:
including military
History: The Do 28
Do 28 desig
original Do 2
Dornier's
development
Skyservant
earlier Do 2
tion, was
unusual
the faired
was grante
The Do 2
variants,
introduced
changes. Most
Germany, although
A turboprop
flew in April
fitted to
Dornier
Dornier 128-6s how-
ever, were built between then
and 1988, most aircraft were for
Dornier's Munich
5:x0,y0,x1,y1, with a 895kW (1200hp) Pratt & Whitney R-1830-S1C3G
Twin Wasp 14 cylinder twin row radial piston engines driving three
blade variable pitch propellers, or two 895kW (1200hp) Wright SGR-1820
Cyclones.
Performance: Max speed 346km/h (187kt), economical cruising
speed 265km/h (143kt). Initial rate of climb 1130ft/min. Range with
max fuel 2420km (1307nm), range with max payload 563km (305nm).
Weights: Typical operating empty 8030kg (17,720lb), max takeoff
12,700kg (28,000lb).
Dimensions: Wing span 28.95m (95ft 0in), length 19.66m (64ft 6in),
height 5.09m (16ft 8in), wing area 91.7m² (987sq ft).
Capacity: Flight crew of two. Seating for between 28 and 32 passen-
gers. One buffet.
Production: A total of 10,655 built in the US including 430 for
commercial operators in the US post-WW2. 2000 or so built
in Russia under license. More than 400 remain in commercial service
in 1996.
History: No greater accolade for the DC-3 exists than the fact that
over six decades after its first flight more than 400 remain in commer-
cial service worldwide. Durability, longevity and profitability are but
three of this outstanding aircraft's virtues.
Development of the DC-3 traces back to the earlier one-off Douglas
Commercial 1 (DC-1) and then the DC-2 which made their first flights
in 1933 and 1934 respectively. In 1934 American Airlines requested
that Douglas develop a larger more capable version of the DC-2 for
transcontinental US sleeper flights. The resulting DC-3 (or DST – Doug-
las Sleeper Transport as it then was) flew for the first time on Decem-
ber 17 1935. An almost instant sales success, the DC-3 became the
mainstay of US domestic airline traffic in the years prior to World War 2.
Aside from passenger comfort and appeal, the DC-3 offered that most
important of virtues, profitability, with the result that over 400 had been
sold to airlines prior to late 1941.
The entry of the United States into WW2 in December 1941 had a
profound effect on the fortunes of the already successful DC-3. The US
Army Air Force's requirements for transport aircraft were admirably met
by the in-production DC-3, with the result that as the C-47 Skytrain it
became the standard USAAF transport during the war. More than
10,000 were built for service with US and allied air arms.
After the war many of these aircraft became surplus to requirements
and were sold off at bargain prices. The result was that demilitarised
C-47s became the standard postwar aircraft of almost all the world's
airlines and the backbone of the world airline industry. Its availability
and reliability meant it proved extremely popular. To this day hundreds
remain in service.
A postwar update of the DC-3, the Super DC-3, involving a stretched
airframe and more powerful engines, was commercially unsuccessful.
This aircraft first flew in June 1949. A small number were built for the
US Navy as the R4D-8 and a US domestic airline, and a few remain in
service.
Photo: DC-3s are often used for film and joyflights. (Mike Davidson)

Douglas DC-3



Country of origin: United States of America
Type: Short range airliner and utility transport
Powerplants: Two 895kW (1200hp) Pratt & Whitney R-1830-S1C3G
Twin Wasp 14 cylinder twin row radial piston engines driving three
blade variable pitch propellers, or two 895kW (1200hp) Wright SGR-1820
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Photo: DC-3s are often used for film and joyflights. (Mike Davidson)

From Dr. M.S. Swamy THE HINDU
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Boeing 747-300 & -400

Boeing 747-500X & -600X

Country of origin: United States of America

Type: Long range high capacity widebody airliners

Powerplants: 747-300 – Four 245.2kN (54,750lb) Pratt & Whitney JT9D-7R4G2 turbofans, or four 246.4kN (55,000lb) Rolls-Royce RB211-524D4s, or four 233.2kN (52,500kN) General Electric CF6-80C2s. 747-400 – Four 252.39kN (56,750lb) Pratt & Whitney PW4056s, or four 257.5kN (57,900lb) General Electric CF6-80C2B5s, or four 258kN (58,0[illegible]) Rolls-Royce RB211-524Gs.

Performance: 747-300 – Max speed 982km/h (530kt), max cruising speed 939km/h (507kt), economical cruising speed 907km/h (490kt), long range cruising speed 889km/h (485kt). Range with max payload 11,040km (5960nm), range with max fuel 13,850km (7480nm). 747-400 – Max cruising speed 939km/h (507kt), long range cruising speed 907km/h (490kt). Range with 420 three class passengers 13,270km (7165nm) with PW4[illegible], 12,390km (7230nm) with CF6s, 13,150km (7100nm) with RB211s.

Weights: 747-300 – Operating empty 176,847kg (389,875lb), max takeoff 377,850kg (833,000lb). 747-400 – Operating empty 182,255kg (401,800lb) with RB211s, 180,985kg (399,000lb) with PW4056s, 181,600kg (400,100lb) with CF6s. Max takeoff options of 362,875kg (800,000lb), or 365,355kg (850,000lb), or 394,625kg (870,000lb).

Dimensions: 747-300 – Wing span 64.4m (211ft 5in), length 70.66m (231ft 10in), height 19.33m (63ft 5in). Wing area 521.9m² (5650sq ft). 747-400 – Same except for a length of 70.6m (231ft 6in).

Capacity: 747-300 – Flightdeck crew of three, two pilots and one flight engineer. 747-300 – Typical for two, typical three class arrangement for 34 first class, [illegible] and 302 economy class passengers. Maximum permissible seating for 660 at 86cm (34in) pitch, eleven abreast in the main cabin. 747-400F – Payload comprising 30 pallets or 32 containers on main deck.

Production: 81 747-300s delivered between 1983 and 1990. 79 747-300s in service in late 1996. Orders for the 747-400 as of late 1994 stood at 510, of which 382 were in service. Total 747 sales 1252.

History: The 747-300 and 747-400 share the same basic airframe with the distinctive stretched upper deck, but are otherwise quite different aircraft.

The 747-300 is essentially little changed from the 747-200, and principally differs only in the stretched upper deck. The upper deck capacity is raised to 68 passengers at six abreast. The Extended Upper Deck (EUD) has also been offered as a conversion for current 747-100s and -200s, although the only airline to take up this option was KLM. The first 747-300 was delivered in March 1983.

The 747-400 goes much further in being a comprehensive update of the 747 based on the -300. Its features include drag reducing wingtip winglets, an advanced two crew EFIS glass flightdeck, new engine options, an 11 tonne empty weight saving and a 13,150km (7100nm) plus design range. It, like other 747 derivatives, is offered in Short

Country of origin: United States of America

Type: Long range high capacity widebody airliners

Powerplants: 747-500X – Four 305 to 315kN (68 to 70,000lb) thrust class General Electric/Pratt & Whitney GP7000 or Rolls-Royce Trent 976 turbofans. 747-600X – Four 340 to 350kN (76 to 78,000lb) thrust class General Electric/Pratt & Whitney GP7000 or Rolls-Royce Trent 976 turbofans.

Performance: 747-500X – Cruising speed Mach 0.85 or 955km/h (521kt) plus. Cruising altitude 41,000ft. Design range 16,100km (8700nm). 747-600X – Cruising speed Mach 0.85 or 965km/h (521kt) plus. Cruising altitude 41,000ft. Design range 14,350km (7750nm).

Weights: 747-500X – Max takeoff 528,900kg (1,166,000lb). 747-600X – Max takeoff 538,000kg (1,186,000lb).

Dimensions: 747-500X – Wing span 77.7m (255ft), length 76m (249ft), height 21m (70ft). Interior cross section [illegible] (20ft). 747-600X – Same except for a length of 84.5m (277ft).

Capacity: Flightcrew of two. 747-500X – Typical three class seating arrangement for 462, in combi configuration could carry 321 passengers and seven freight pallets on the main deck. 747-600X – Typical three class seating arrangement for 548.

Production: Boeing has forecast a market for approximately 400 aircraft in this size class. First deliveries would be in 2001.

History: In late 1996 Boeing looked set to go-ahead with these two stretched developments of the 747 as its answer to world airline demand for a Very Large Aircraft 500 plus seat airliner. The result will be the world's largest airliner growing even larger.

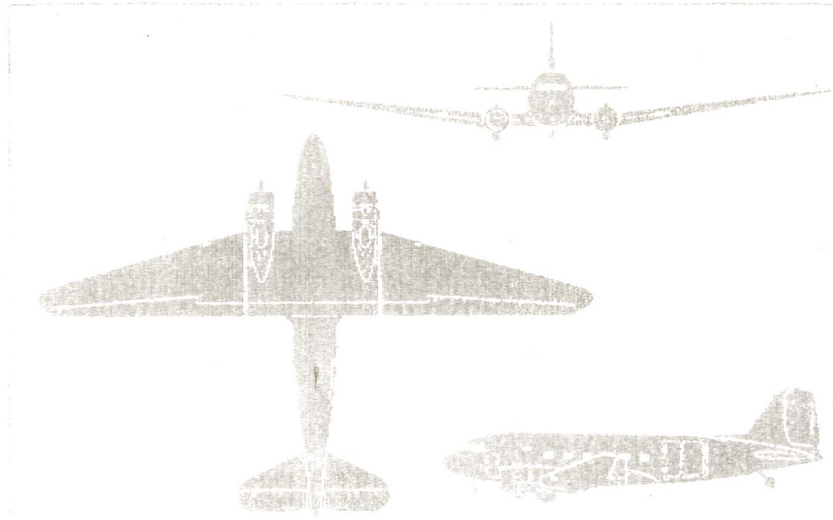
Boeing had first studied a VLA in the early 1990s under the VLCT (Very Large Commercial Transport) design study, which also involved Airbus Industrie's individual partners – BAe, DASA, Aerospatiale and CASA – and Japanese companies Fuji and Mitsubishi. The VLCT partners studied an all new design which would have featured twin decks. However the VLCT was shelved in mid 1995, allowing Boeing to concentrate instead on stretching the 747, which was always going to be a cheaper VLA solution.

Boeing had been studying stretched developments of the 747, dubbed the 747X, concurrently alongside the VLCT. Early studies focused on stretching the fuselage and joining an all new wing, based on that developed for the 777. Power would have been supplied by existing engines such as the CF6, PW[illegible]0 and Trent.

Design development in close co-operation with potential customers continued through to September 1996, when Boeing announced it had firmed up its designs, and hoped for a launch in 1997.

The 747-500X would feature a 5.6m (18.4ft) stretch over the 747-400 (giving a length of 76m/250ft) and seating for 462. The larger 747-600X would be further stretched to 85m (279ft) and seat 548. Both will feature a new 777 style flightdeck, fly-by-wire controls, a new wing and new engines, in the form of the Trent 900 or the all new GP7000 being developed by General Electric and Pratt & Whitney.

DOUGLAS C-47



A military transport version of the commercial DC-3 airliner which first flew on December 22, 1935, the C-47 entered service with the U.S.A.A.F. in 1941, and remains today the world's most widely-used general-purpose military transport, 10,926 C-47's and its variants having been built in the U.S.A. when production terminated, licence manufacture also having been undertaken in Japan and the U.S.S.R. Russian-built models were designated Li-2 (Cab) and still serve with the Sov.A.F. The C-47 is operated by all U.S.A.F. commands as the C-47A, HC-47A, RC-47A, VC-47A, VC-47B, C-47D, EC-47D, HC-47D, TC-47D, VC-47D and C-47E, and by the U.S. Navy and Marine Corps as the C-47H, EC-47H, LC-47H, SC-47H, TC-47H, C-47J, EC-47J, LC-47J, SC-47J, TC-47J, VC-47J and TC-47K. The C-47 is currently operated by more than sixty air forces and naval services. A 7,500-lb. cargo load or twenty-eight troops may be accommodated.

Power Plants: Two 1,200 h.p. Pratt and Whitney R-1830-90C air-cooled radial engines. Performances: Max. speed, 229 m.p.h. at 7,500 ft.; cruising, 185 m.p.h. at 7,500 ft.; initial climb, 1,130 ft./min.; service ceiling, 24,000 ft.; range, 1,500 mls. Weights: Empty, 18,050 lb.; max. loaded, 26,000 lb. Dimensions: Span, 95 ft. 0 in.; length, 64 ft. 5½ in.; height, 16 ft. 11 in.; wing area, 987 sq. ft.

 4-5

"Aircraft Maintenance Management" by C.H. Friend 1992

Cost comparisons

3.4 Cost comparison, vs B767

	6787,500	
	288.5	
	168	
	225	
	2.9	
	299	
	582	
	853	
	1.5	
Airframe	1.5	1.9
Engine	1.1	0.9
Total direct maintenance	2.6	2.8
Maintenance burden	2.5	2.3
Total maintenance cost	5.1	5.1
Cash operating expenses	2,112	1,800
Depreciation and rentals	402	1,248
Total A/C operating expenses	$2,514	$3,048
Cost/revenue-mile, US ¢	6.1	7.1
Cost/seat-km, US ¢	1.91	1.90

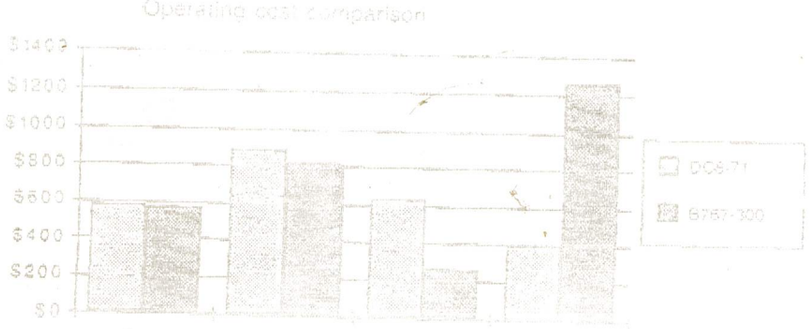


Fig. 3.5 Cost c DC9 vs MD-80