

747-400 fleet analysis

The 747-400 fleet is sub-divided between passenger, combi and freighter aircraft; and three engines types.

Of the 656 747-400 family members delivered, all but a handful are in active service. Most of these aircraft are with the original tier-one operators and major cargo carriers. Out of the active fleet of 642, 305 aircraft are powered by the CF6-80C2, 216 by the Pratt & Whitney (PW) PW4000-94, and 121 by the Rolls-Royce RB211-524H/-524H-T engines.

The 747-400 family includes six basic production versions: the 747-400 passenger-configured model; the 747-400D designed for high-frequency domestic operations; the 747-400M 'Combi'; the 747-400F freighter; the 747-400ER extended range passenger model; and the 747-400ERF extended range freighter model.

The 747-400 programme was launched on 22 October 1985, and the first aircraft, line number 696, powered with PW4056 engines, went into service with Northwest in February 1989.

747-400 passenger version

The basic 747-400 passenger version (excluding the 'Combi' variant), accounts for 413 active aircraft, equivalent to 65% of the 747-400 family fleet in operation. Maximum take-off weights (MTOWs) vary from 800,000lbs to 875,000lbs. Within the baseline -400 passenger aircraft fleet, there is greater powerplant standardisation and less physical variation than with its predecessor, the -200. The engines powering the 747-400 are fairly standard, with only minor respective variations from the three engine manufacturers. These engines are the GE CF6-80C2B1F, PW4056, and RB211-524G/H. The PW4000 powers 154 passenger-configured 747-400s, with 156 equipped with the CF6-80C2B1F, and 103 powered by the RB11-524.

The majority, about 290, of 747-400 passenger models are owned by their operators. The remainder are on operating leases and finance leases.

The last fleet data shows an average annual utilisation of 4,135 flight hours (FH), and 562 flight cycles (FC). This gives an average FC time of 7.4FH. The fleet leaders are a Lufthansa aircraft, with a total time of 89,912FH, and an All

Nippon Airways aircraft with 19,470FC. The fleet averages are 51,529FH and 7,385FC.

As an example of aircraft age and accumulated utilisation, British Airways (BA), an original customer for RB211-powered aircraft, has a fleet of 57 747-400s with cumulative utilisation of 32,250-76,921FH and 3,663-10,588FC. These aircraft were delivered between 1989 and 1999, so BA is unlikely to start replacing its oldest 747-400s for another five to 10 years, by which time it may have ordered a successor such as the A380 or the 747-8.

There has been very little movement of 747-400s between operators, with most of the fleet still flying with their original operators and owners. The 747-400 is used for high capacity routes, and it is hard for many operators to fill. Airlines have therefore made a long-term investment in the aircraft, and amortised them over a large number of years.

Four airlines, Canadian Airlines, Malaysia, Singapore Airlines (SIA), and United, have all sold a significant proportion of their fleets for different reasons.

Canadian and United sold aircraft as part of their financial restructuring, and because of declines in passenger numbers and yields on routes to and from the North American continent following

9/11.

SIA's strategy has been to keep its fleet as young as possible, so it usually sells aircraft before they reach 10 years of age. Of the 59 aircraft delivered to SIA, 22 are now operated by other carriers. SIA has a large fleet of A380s on order, which will replace some of its 747-400s in operation.

Of the aircraft sold by SIA, at least five have since been acquired for freighter conversion, via the Boeing Converted Freighter (BCF) programme, and are in operation with Martinair Holland, Cathay Pacific, Air Atlanta Icelandic and Dragonair.

Meanwhile, Asiana, Japan Airlines and Korean Air have all taken aircraft from their own passenger fleets and then converted them for use as freighters. This suggests that many 747-400s could be converted to freighters and operated in the Asia-Pacific region.

There are 413 -400s in service. Another 11 aircraft are stored, one with GE engines and eight with PW engines (see table, this page).

747-400 combi

There are 58 747-400M Combis in operation, which are identical to the -400 variant except for a 120-inch X 134-inch maindeck cargo door on the port side of the fuselage. The two rear zones of the aircraft have a strengthened floor with a cargo handling system. In addition to the aircraft delivered, another two 747-400 passenger aircraft operated by EVA Air have been converted to Combi configuration. A total of 61 Combis were delivered, 57 of which are still in service. Three Combis have been converted by IAI-Bedek Aviation. The majority of Combis are powered by CF6-80C2s, and KLM is the largest 747-400 Combi operator with 17. Other large customers of the type include Air France, Air China,

747-400 FLEET SUMMARY

	PW4000	CF6-80C2	RB211-524	Total
747-400/-400D	154	156	103	413
747-400D	0	18	0	18
747-400ER	0	6	0	6
747-400M	10	47	0	57
747-400F	33	60	15	108
747-400ERF	8	14	0	22
747-400BCF	8	3	3	14
747-400BDSF	3	1		4
Total	216	305	121	642



Asiana, Eva Air and Lufthansa.

Average annual utilisation of the 747-400 Combi is 4,366FH and 629FC, which gives an FC time of 6.9FH. The fleet leaders are a KLM aircraft with 87,977FH and a Korean Air aircraft with 12,487FC. The fleet averages are 61,511FH and 9,045FC.

747-400F

The next largest group comprises factory-built 747-400Fs, with 107 in operation. These are split between 60 CF6-powered aircraft, 33 PW4000-powered aircraft, and 15 RR-powered aircraft (see table, page 7). Lead customers include China Airlines (20), Cargolux (15), SIA Cargo (14), Atlas Air (11), and Korean Air (10). A further 17-400Fs are on order.

Air France was the launch customer for five aircraft. The first -400F went into service with Cargolux in November 1993.

Production ends in 2009, when the -400F will be replaced by the 747-8F. Nevertheless, the -400F will remain in service for at least another 20 years.

747-400D

The -400D is a special short-range domestic version developed for All Nippon Airways (10) and JAL (8). All the -400Ds are owned outright by their respective operators and all are powered by CF6-80C2s (see table, page 7).

As with the earlier 747-100SR version, JAL and All Nippon Airways were the only customers. The first was delivered to JAL in October 1991.

The 747-400D does not have the wingtip extensions and winglets of the -400. These features were deemed unnecessary for the short sectors the aircraft was designed to operate.

In line with its short-range operational flight profile, the variant exhibits a low average FC time of 1.45FH. Aircraft therefore generate a high number of cycles, with the fleet leader having accumulated 26,500FC. ANA's lead aircraft has accumulated 43,021FH.

747-400ER

As orders for the baseline -400 and -400F tailed off in the late 1990s, Boeing decided to introduce upgraded versions: the -400ER and -400ERF, with MTOW increased from 875,000lbs to 910,000lbs. This resulted in a wave of orders. Six -400ERs are in operation with Qantas (see table, page 7).

The 416-seat 747-400ER has a 435nm longer range of 7,435nm. The average annual utilisation is 4,964FH and 417FC, giving the aircraft an average FC time of 11.9FH. The fleet leader has accumulated 18,692FH and 1,692FC. Fleet averages are 17,478FH and 1,524FC.

The -400ER uses the stronger wing of the earlier 747-400F and has a 6,360USG higher fuel capacity provided by removable auxiliary tanks in the forward cargo hold. The aircraft is powered by engines rated at 61,000-62,000lbs thrust. The 61,100lbs thrust CF6-80-C2B5F was selected by Qantas. The PW4062 and RB211-524H-T are also available, although neither has been selected.

Almost half the 642 747-400s in operation are powered by CF6-80C2B1F engines. One-third of the fleet is equipped with PW4056s, and 121 have RB211-524 engines.

747-400ERF

The 747-400ERF was launched by International Lease Finance Corporation (ILFC) for five aircraft. A total of 40 747-400ERFs have been ordered, making it more popular than the -400ER. There is an order backlog of 18 aircraft, and 22 are in service with Air France (6), China Cargo Airlines (1), Jade Cargo (3), KLM (3), Korean Air (8), and TNT Airways (1). Eight of the 22 are powered by the PW4000 and 14 by the CF6-80C2 (see table, page 7).

Average annual utilisation is 4,074FH and 558FC, giving the aircraft an average FC time of 7.3FH. The fleet leaders are an Air France aircraft with 21,259FH, and a Korean Air aircraft with 2,823FC. The fleet averages are 10,946FH and 1,408FC.

Freighter conversions

At the time of writing, 18 747-400 passenger and Combi aircraft have been converted to freighters, 14 with Boeing's BCF programme, and another four under the Bedek Special Freighter (BDSF) programme.

There are 14 -BCFs in service with Cathay Pacific (5), Korean Air (2), Japan Airlines (3), Martinair (2) and Dragonair.

There are 33 outstanding orders for the -400BCF from Cathay Pacific (3), Korean Air (6), JAL (5), Guggenheim (4), SIA (6), Air France (3), Air Atlanta Icelandic (4) and UPS (2).

During 2006 IAI Bedek undertook its first two -400BDSF conversions, on a Combi aircraft and a passenger aircraft. There are four aircraft modified by Bedek Aviation. Two, owned by Guggenheim Aviation partners, are now flying for Air China. Another, owned by Rabobank, is flying with Air Atlanta Icelandic (for Cargolux). One more aircraft has been converted for Asiana, and will be followed by a fifth that will go to Eva Air. Other aircraft are currently being converted. IAI operates three conversion slots, and is in the process of adding two more slots in Israel, plus another two overseas.

Five 747-400Ms in Asiana's fleet are earmarked for conversion by IAI. One is a parked aircraft and the other four are active. [AC](#)

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