

# Boeing 747

## Outlook

- Boeing delivered the final 747 in February 2023 to Atlas Air
- Demand for the 747-8 fell sharply over the last decade; airlines prefer the operating economics of smaller aircraft
- Production averaged only six aircraft per year during 2018-22

## Orientation

**Description.** Intercontinental-range, four-engine, widebody commercial transport aircraft.

**Status.** In production.

**Total Produced.** Through December 2023, Boeing delivered 155 747-8s, including 48 passenger models and 107 747-8F freighters. Boeing delivered 1,418 747s of earlier types.

**Application.** Long-range, high-density scheduled passenger and cargo transportation. Military applications include airborne strategic communications and VIP transport.

**Price Range.** 747-8 Freighter: \$452 million, estimated list price.



Boeing 747-8I

Source: Boeing

**Boeing 747****Contractors****Prime**

<b>Boeing Commercial Airplanes</b>	<a href="http://www.boeing.com/commercial/">http://www.boeing.com/commercial/</a> , 3003 W Casino Rd, Everett, WA 98203 United States, Tel: + 1 (425) 294-2300, Fax: + 1 (425) 294-6200, Prime
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**Subcontractor**

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<b>Arconic Inc</b>	<a href="http://www.arconic.com">http://www.arconic.com</a> , 201 Isabella St, Pittsburgh, PA 15212 United States, Tel: + 1 (412) 553-4545, Fax: + 1 (412) 553-4498 (Wing Spar; Plate & Heat-Treated Sheet)
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<b>CAES, (Cobham Advanced Electronic Solutions)</b>	<a href="http://caes.com">http://caes.com</a> , 305 Richardson Rd, Lansdale, PA 19446 United States, Tel: + 1 (215) 996-2000 (UHF Satellite Terminal)
<b>CMC Electronics Inc</b>	<a href="http://www.cmcelectronics.ca">http://www.cmcelectronics.ca</a> , 600 Dr Frederik Philips Blvd, Montreal, Quebec, Canada, Tel: + 1 (514) 748-3000, Fax: + 1 (514) 748-3100 (CMA-2102 High-Gain Satcom Antenna)
<b>Collins Aerospace Systems, Interiors</b>	<a href="http://www.collinsaerospace.com">http://www.collinsaerospace.com</a> , 150 Oak Plaza Blvd, Winston-Salem, NC 27105 United States, Tel: + 1 (336) 747-5000, Fax: + 1 (336) 744-6973 (Passenger Seats)
<b>Collins Aerospace Systems</b>	<a href="http://www.collinsaerospace.com">http://www.collinsaerospace.com</a> , Four Coliseum Centre, 2730 W Tyvola Rd, Charlotte, NC 28217-4578 United States, Tel: + 1 (704) 423-7000, Fax: + 1 (704) 423-7002 (Carbon Brakes)
<b>Collins Aerospace Systems, Sensors &amp; Integrated Systems, Kidde Graviner</b>	<a href="http://www.collinsaerospace.com">http://www.collinsaerospace.com</a> , Mathisen Way, Poyle Rd, Colnbrook, Berkshire, United Kingdom, Tel: + 44 1753 766 261, Fax: + 44 1753 685 126 (Fire Detection System)
<b>Collins Aerospace Systems, Avionics &amp; Mission Systems</b>	<a href="http://www.collinsaerospace.com">http://www.collinsaerospace.com</a> , 400 Collins Rd NE, Cedar Rapids, IA 52498 United States, Tel: + 1 (319) 295-1000, Fax: + 1 (319) 295-5429 (Flightdeck Avionics and Displays)
<b>Collins Aerospace Systems, Landing Gear</b>	<a href="http://www.collinsaerospace.com">http://www.collinsaerospace.com</a> , 6225 Oak Tree Blvd, Independence, OH 44131 United States, Tel: + 1 (216) 341-1700, Fax: + 1 (216) 429-4806 (Main & Nose Landing Gear)
<b>Curtiss-Wright Corp</b>	<a href="http://www.curtisswright.com">http://www.curtisswright.com</a> , 130 Harbour Place Dr, Ste 300, Davidson, NC 28036 United States, Tel: + 1 (704) 869-4600, Fax: + 1 (704) 869-4601, Email: info@curtisswright.com (Inboard Leading Edge Flap Actuator)
<b>GE Aerospace</b>	<a href="http://www.geaerospace.com">http://www.geaerospace.com</a> , 1 Neumann Way, Cincinnati, OH 45215-6301 United States, Tel: + 1 (513) 243-2000 (GENx-2B67 Turbofan)
<b>Honeywell Aerospace, Aviation &amp; Air Transport</b>	<a href="http://aerospace.honeywell.com">http://aerospace.honeywell.com</a> , 21111 N 19th Ave, Phoenix, AZ 85027 United States, Tel: + 1 (602) 436-2311 (Autopilot; Flight Director Computer; Magnetic Compass System; Weight & Balance System; Advanced Flight Management System; HG 1050 Laser Gyroscope Inertial Navigation System (INS))
<b>Magellan Aerospace, Middletown, Inc</b>	<a href="http://www.magellan.aero">http://www.magellan.aero</a> , 2320 Wedekind Dr, Middletown, OH 45042 United States, Tel: + 1 (513) 422-2751, Fax: + 1 (513) 425-9988, Email: magellan.middletown@magellan.aero (Honeycomb Sandwich Components)
<b>Moog Aircraft Controls, Actuation and Landing Gear</b>	<a href="http://www.moog.com">http://www.moog.com</a> , Wobaston Rd, Wolverhampton, United Kingdom, Tel: + 44 1902 397700, Fax: + 44 1902 394394 (Automatic Brake Actuator)
<b>PTI Technologies Inc</b>	<a href="http://www.ptitechnologies.com">http://www.ptitechnologies.com</a> , 501 Del Norte Blvd, Oxnard, CA 93030 United States, Tel: + 1 (805) 604-3700, Fax: + 1 (805) 604-3701, Email: filters@ptitechnologies.com (Hydraulic System Filtration Components)

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<b>Parker Hannifin Aerospace Group</b>	<a href="http://www.parker.com">http://www.parker.com</a> , 14300 Alton Pkwy, Irvine, CA 92618 United States, Tel: + 1 (949) 833-3000, Fax: + 1 (949) 851-3277 (Nose Landing Gear Steering Control)
<b>Safe Flight Instrument Corp</b>	<a href="http://www.safeflight.com">http://www.safeflight.com</a> , 20 New King St, White Plains, NY 10604-1206 United States, Tel: + 1 (914) 946-9500, Fax: + 1 (914) 946-7882, Email: <a href="mailto:mail@safeflight.com">mail@safeflight.com</a> (Wind Shear Monitor)

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 75 Glen Road, Suite 302, Sandy Hook, CT 06482, USA; [rich.pettibone@forecast1.com](mailto:rich.pettibone@forecast1.com)

**Technical Data**

(747-8I)

	<u>Metric</u>	<u>U.S.</u>
<b>Dimensions</b>		
Length overall	76.3 m	250.2 ft
Height overall	19.4 m	63.5 ft
Wingspan	68.4 m	224.4 ft
<b>Weight</b>		
Max takeoff weight	447,700 kg	987,000 lb
Max payload (passenger)	82,100 kg	181,000 lb
(747-8F)	137,700 kg	303,700 lb
<b>Performance</b>		
Max range (Intercontinental)	14,310 km	7,730 nm
(747-8F)	7,630 km	4,120 nm
Typical cruise speed (passenger)	Mach 0.86	Mach 0.86
<b>Propulsion</b>		
747-8	(4)	GE GENx-2B67 turbofans rated at 296 kN (66,500 lbst) each.
<b>Seating/Accommodation</b>		
747-8I		410 passengers in typical three-class configuration.

**Variants/Upgrades**

**747-100B.** First production model, delivered in 1969 with Pratt & Whitney JT9D-3 turbofans. 167 built, plus nine -100B models.

**747-100SR.** Specially configured for short-haul, high-capacity, single-class passenger transport. Initial versions based on 747-100B with strengthened fuselage and undercarriage. Total of 29 delivered to JAL and All Nippon.

**747SP.** Derived from the 747-100, the 747SP was designed for ultra-long-range travel. It featured a shortened fuselage and a larger tailplane. The first aircraft entered service with Pan Am in 1976. Production totaled 45 aircraft.

**747-200B.** Flew in 1970. Longer range passenger version with increased fuel capacity, more power

options, and increased max TOW to 377,847 kilograms (833,000 lb), extending range with 442 passengers to 11,378 kilometers (6,140 nm). Original engine was the JT9D; later, GE and Rolls-Royce engines were added as options. Boeing delivered 225 aircraft.

**747-200C Convertible.** Can be converted from all-passenger to all-cargo, or five combinations of both. Has powered freight-handling system, reinforced deck, and hinged nose. Power options, gross weights, and performance basically the same as for 747-200B. Only 13 built.

**747-200F Freighter.** All-cargo version carries from 112,400 kilograms (247,800 lb) up to 8,300 kilometers (4,480 nm), or lesser loads over greater distances. 73 delivered.

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**747-200M Combi.** Features 3.12 x 3.40 meter (10.25 x 11.66 ft) cargo door in port side of fuselage. Entered service in 1975. Boeing delivered 78.

**747-300/M/SR.** Upper forward fuselage extended aft by 7.11 meters (23.333 ft) to increase upper deck seating to 96. Max TOW originally 371,950 kilograms (820,000 lb), increased to 377,846 kilograms (833,000 lb). First delivery in 1983. Boeing delivered a total of 81 -300 models.

**747-400.** Same fuselage dimensions as -300, but increased range, a 9 percent reduction in fuel burn compared with the -300, more interior configuration flexibility, reduced operating costs, and 6-foot wingtip extensions with 6-foot-high winglets. First flight in 1988. Deliveries ran from 1989-2009. Boeing delivered 442 aircraft.

**747-400F.** Uses standard hinged-nose section; has capacity of 131,543+ kilograms (290,000 lb). Boeing delivered 126.

**747-400D (Domestic).** Short-range version for JAL, All Nippon, and Japan Air System. Seats 625+ in a single economy class. Boeing built 19.

**747-400M.** Combi variant. 61 delivered.

**747-400ER/ERF.** Formerly 747-400X, with strengthened wing of -400F freighter and stronger landing gear and fuselage structure. Max TOW increased to 910,000 pounds (35,000 lb more than the -400); additional fuel tank in forward cargo hold. The -400ERF is a freighter that can use the higher maximum takeoff weight to either extend the range of the aircraft or carry more cargo. 46 built.

**E-4A/B.** Militarized airborne command post version of the 747-200. Three E-4As and one E-4B built for the U.S. Air Force.

**VC-25.** Designation for two 747-200s in service with the U.S. Air Force. Known as Air Force One and Air Force Two.

**747 Advanced.** Announced in 2003, with projected in-service date of 2009-2010. Passenger version would have been powered by the same engines as the 787 and been stretched 140 inches. Superseded by 747-8.

**747-8I/F.** Stretch of the 747-400. Includes both the Intercontinental passenger model and 747-8 Freighter model. Both versions feature GENx engines, meet Stage 4 and QC2 noise requirements, have reduced emissions, offer lower trip costs, and have an upgraded flight deck and improved wing.

## Program Review

**Background.** In November 2005, Boeing officially launched the new Boeing 747-8 program, which includes the 747-8 Intercontinental passenger airplane and the 747-8 Freighter model (see **Variants/Upgrades** for details).

The original plans called for the Intercontinental to be about 7 feet shorter than the freighter and have a passenger capacity of 450 in a three-class configuration. However, Boeing decided in 2006 to sacrifice some of the expected range of the prior design to build the Intercontinental at the same length as the freighter after consulting with potential customers of the passenger variant. Both variants were stretched 5.6 meters (18.3 ft) in comparison to the 747-400 model then in production.

Boeing originally scheduled the rollout of the first 747-8 for November 2008. This deadline was later pushed back three months after Boeing decided to wrap up production of all remaining orders for the existing -400F before transitioning the production lines to the new, longer variant. The delay was also partly caused by the need to divert engineering teams from the 747 program to the 787 program and the 777 Freighter program. A months-long strike by the machinists union at Boeing's

commercial aircraft division in 2008 further aggravated the situation. Boeing announced more delays in the fall of 2009 and in 2010.

The freighter flight test fleet included five aircraft that were later delivered to customers (RC521 and RC522 to Nippon Cargo Airlines, and RC501, RC502, and RC503 to Cargolux).

The -8 Intercontinental test fleet included three aircraft: RC001, RC003, and RC021.

The 747-8F Freighter achieved U.S. Federal Aviation Administration (FAA) and European Union Aviation Safety Agency (EASA) certification on August 19, 2011. Launch customer Cargolux received its first aircraft on October 11, 2011.

Certification of the -8 Intercontinental followed in mid-December. Certification was granted after Boeing locked out the 3,300-gallon (12,500-liter) fuel tank in the aircraft's horizontal stabilizer after the flight test program revealed that a flutter condition could occur if the aircraft wing-to-strut joint fitting failed. The measure reduced the Intercontinental's range, but the freighter version was not affected by the issue.

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The delivery of the first Cargolux aircraft was marred by a last-minute dispute over compensation for a fuel burn performance shortfall of 2.7 percent that was discovered during flight testing.

The GENx-2B Performance Improvement Package (PIP) has since improved fuel burn by 2 percent. Upgrades to the flight management computer (FMC) software allowed the reactivation of the aircraft's fuel tank in the horizontal stabilizer, adding range and allowing changes to the trim of the aircraft for reduced drag while cruising. Boeing said in July 2014 that these and other changes made since the aircraft entered service in 2011 increased fuel efficiency by 3.5 percent.

***747-8 Selected for Air Force One Recapitalization***

The U.S. Air Force announced in January 2015 that it had selected the 747-8 for its Presidential Airlift Recapitalization program. The program ordered two new aircraft to serve as Air Force One aircraft in a sole-source acquisition deal announced in September 2017. Boeing delivered the two aircraft – white tails the manufacturer had already built for Russia's bankrupt Transaero airline – in late 2017. They would undergo a substantial conversion process by the PAR program prior to entry into service.

**Funding**

The cost of developing the 747-8 model is estimated at \$3-\$4 billion in 2006 dollars.

**Selected Acquisition Reports (SARs)**

The Department of Defense (DoD) periodically releases Selected Acquisition Reports (SARs) that summarize the latest estimates of cost, schedule, and performance status for Major Defense Acquisition Programs (MDAP). These reports are prepared annually in conjunction with submission of the president's budget. (Subsequent quarterly exception reports are required only for those programs experiencing unit cost increases of at least 15 percent or schedule delays of at least six months.)

The total program cost estimates provided in the SARs include research and development, procurement, military construction, and acquisition-related operations and maintenance. Total program costs reflect actual costs to date as well as future anticipated costs.

See below for instructions on how to view the annual SAR related to this particular report.

Online and DVD Clients – Click link below.

Hard-Copy Clients – Insert the CD located in the sleeve at the front of the binder. (Electronic version updated quarterly.)

**Contracts/Orders & Options/Inventories**

For a list of 747 orders and options and details on inventories, see Appendix VI, "Major Civil Transport Orders & Options," and Appendix VII, "Major Civil Transport Inventories."

**Forecast Rationale**

Boeing rolled out the final 747-8 from its Everett, Washington, facility in December 2022, marking the end of production of this historic aircraft. The manufacturer delivered this last aircraft to Atlas Air in February 2023.

Boeing announced in July 2020 that it planned to shut down production of the 747 once its then-current backlog was exhausted, given the lack of demand for new jumbo airliners.

Triumph Group supplied only enough components to allow Boeing to complete aircraft in the existing backlog, and filling any new orders would require finding a new supplier for those components. Facing low demand for the 747-8F, Boeing's management decided the prudent course was to end production entirely.