

= Boeing 767 =

The Boeing 767 is a mid- to large @-@ size , long @-@ range , wide @-@ body twin @-@ engine jet airliner built by Boeing Commercial Airplanes . It was Boeing 's first wide @-@ body twinjet and its first airliner with a two @-@ crew glass cockpit . The aircraft has two turbofan engines , a conventional tail , and , for reduced aerodynamic drag , a supercritical wing design . Designed as a smaller wide @-@ body airliner than earlier aircraft such as the 747 , the 767 has seating capacity for 181 to 375 people , and a design range of 3 @,@ 850 to 6 @,@ 385 nautical miles (7 @,@ 130 to 11 @,@ 825 km) , depending on variant . Development of the 767 occurred in tandem with a narrow @-@ body twinjet , the 757 , resulting in shared design features which allow pilots to obtain a common type rating to operate both aircraft .

The 767 is produced in three fuselage lengths . The original 767 @-@ 200 entered service in 1982 , followed by the 767 @-@ 300 in 1986 and the 767 @-@ 400ER , an extended @-@ range (ER) variant , in 2000 . The extended @-@ range 767 @-@ 200ER and 767 @-@ 300ER models entered service in 1984 and 1988 , respectively , while a production freighter version , the 767 @-@ 300F , debuted in 1995 . Conversion programs have modified passenger 767 @-@ 200 and 767 @-@ 300 series aircraft for cargo use , while military derivatives include the E @-@ 767 surveillance aircraft , the KC @-@ 767 and KC @-@ 46 aerial tankers , and VIP transports . Engines featured on the 767 include the General Electric CF6 , Pratt & Whitney JT9D and PW4000 , and Rolls @-@ Royce RB211 turbofans .

United Airlines first placed the 767 in commercial service in 1982 . The aircraft was initially flown on domestic and transcontinental routes , during which it demonstrated the reliability of its twinjet design . In 1985 , the 767 became the first twin @-@ engined airliner to receive regulatory approval for extended overseas flights . The aircraft was then used to expand non @-@ stop service on medium- to long @-@ haul intercontinental routes . In 1986 , Boeing initiated studies for a higher @-@ capacity 767 , ultimately leading to the development of the 777 , a larger wide @-@ body twinjet . In the 1990s , the 767 became the most frequently used airliner for transatlantic flights between North America and Europe .

The 767 is the first twinjet wide @-@ body type to reach 1 @,@ 000 aircraft delivered . As of June 2016 , Boeing has received 1 @,@ 170 orders for the 767 from 74 customers ; 1 @,@ 088 have been delivered . A total of 765 of these aircraft were in service in July 2015 ; the most popular variant is the 767 @-@ 300ER , with 583 delivered ; Delta Air Lines is the largest operator , with 95 aircraft . Competitors have included the Airbus A300 , A310 , and A330 @-@ 200 , while a successor , the 787 Dreamliner , entered service in October 2011 . Despite this , the 767 still remains in production .

= = Development = =

= = = Background = = =

In 1970 , Boeing 's 747 became the first wide @-@ body jetliner to enter service . The 747 was the first passenger jet that was wide enough to feature a twin @-@ aisle cabin . Two years later , the manufacturer began a development study , code @-@ named 7X7 , for a new wide @-@ body aircraft intended to replace the 707 and other early generation narrow @-@ body jets . The aircraft would also provide twin @-@ aisle seating , but in a smaller fuselage than the existing 747 , McDonnell Douglas DC @-@ 10 , and Lockheed L @-@ 1011 TriStar wide @-@ bodies . To defray the high cost of development , Boeing signed risk @-@ sharing agreements with Italian corporation Aeritalia and the Civil Transport Development Corporation (CTDC) , a consortium of Japanese aerospace companies . This marked the manufacturer 's first major international joint venture , and both Aeritalia and the CTDC received supply contracts in return for their early participation . The initial 7X7 was conceived as a short take @-@ off and landing airliner intended for short @-@ distance flights , but customers were unenthusiastic about the concept , leading to its redefinition as

a mid @-@ size , transcontinental @-@ range airliner . At this stage the proposed aircraft featured two or three engines , with possible configurations including over @-@ wing engines and a T @-@ tail .

By 1976 , a twinjet layout , similar to the one which had debuted on the Airbus A300 , became the baseline configuration . The decision to use two engines reflected increased industry confidence in the reliability and economics of new @-@ generation jet powerplants . While airline requirements for new wide @-@ body aircraft remained ambiguous , the 7X7 was generally focused on mid @-@ size , high @-@ density markets . As such , it was intended to transport large numbers of passengers between major cities . Advancements in civil aerospace technology , including high @-@ bypass @-@ ratio turbofan engines , new flight deck systems , aerodynamic improvements , and lighter construction materials were to be applied to the 7X7 . Many of these features were also included in a parallel development effort for a new mid @-@ size narrow @-@ body airliner , code @-@ named 7N7 , which would become the 757 . Work on both proposals proceeded through the airline industry upturn in the late 1970s .

In January 1978 , Boeing announced a major extension of its Everett factory ? which was then dedicated to the manufacture of the 747 ? to accommodate its new wide @-@ body family . In February 1978 , the new jetliner received the 767 model designation , and three variants were planned : a 767 @-@ 100 with 190 seats , a 767 @-@ 200 with 210 seats , and a trijet 767MR / LR version with 200 seats intended for intercontinental routes . The 767MR / LR was subsequently renamed 777 for differentiation purposes . The 767 was officially launched on July 14 , 1978 , when United Airlines ordered 30 of the 767 @-@ 200 variant , followed by 50 more 767 @-@ 200 orders from American Airlines and Delta Air Lines later that year . The 767 @-@ 100 was ultimately not offered for sale , as its capacity was too close to the 757 's seating , while the 777 trijet was eventually dropped in favor of standardizing around the twinjet configuration .

= = = Design effort = = =

In the late 1970s , operating cost replaced capacity as the primary factor in airliner purchases . As a result , the 767 's design process emphasized fuel efficiency from the outset . Boeing targeted a 20 to 30 percent cost saving over earlier aircraft , mainly through new engine and wing technology . As development progressed , engineers used computer @-@ aided design for over one @-@ third of the 767 's design drawings , and performed 26 @,@ 000 hours of wind tunnel tests . Design work occurred concurrently with the 757 twinjet , leading Boeing to treat both as almost one program to reduce risk and cost . Both aircraft would ultimately receive shared design features , including avionics , flight management systems , instruments , and handling characteristics . Combined development costs were estimated at \$ 3 @.@ 5 to \$ 4 billion .

Early 767 customers were given the choice of Pratt & Whitney JT9D or General Electric CF6 turbofans , marking the first time that Boeing had offered more than one engine option at the launch of a new airliner . Both jet engine models had a maximum output of 48 @,@ 000 pounds @-@ force (210 kN) of thrust . The engines were mounted approximately one @-@ third the length of the wing from the fuselage , similar to previous wide @-@ body trijets . The larger wings were designed using an aft @-@ loaded shape which reduced aerodynamic drag and distributed lift more evenly across their surface span than any of the manufacturer 's previous aircraft . The wings provided higher @-@ altitude cruise performance , added fuel capacity , and expansion room for future stretched variants . The initial 767 @-@ 200 was designed for sufficient range to fly across North America or across the northern Atlantic , and would be capable of operating routes up to 3 @,@ 850 nautical miles (7 @,@ 130 km) .

The 767 's fuselage width was set midway between that of the 707 and the 747 at 16 @.@ 5 feet (5 @.@ 03 m) . While it was narrower than previous wide @-@ body designs , seven abreast seating with two aisles could be fitted , and the reduced width produced less aerodynamic drag . However , the fuselage was not wide enough to accommodate two standard LD3 wide @-@ body unit load devices side @-@ by @-@ side . As a result , a smaller container , the LD2 , was created specifically for the 767 . The adoption of a conventional tail design also allowed the rear fuselage to

be tapered over a shorter section , providing for parallel aisles along the full length of the passenger cabin , and eliminating irregular seat rows toward the rear of the aircraft .

The 767 was the first Boeing wide @-@ body to be designed with a two @-@ crew digital glass cockpit . Cathode ray tube (CRT) color displays and new electronics replaced the role of the flight engineer by enabling the pilot and co @-@ pilot to monitor aircraft systems directly . Despite the promise of reduced crew costs , United Airlines initially demanded a conventional three @-@ person cockpit , citing concerns about the risks associated with introducing a new aircraft . The carrier maintained this position until July 1981 , when a U.S. presidential task force determined that a crew of two was safe for operating wide @-@ body jets . A three @-@ crew cockpit remained as an option and was fitted to the first production models . Ansett Australia ordered 767s with three @-@ crew cockpits due to union demands ; it was the only airline to operate 767s so configured . The 767 's two @-@ crew cockpit was also applied to the 757 , allowing pilots to operate both aircraft after a short conversion course , and adding incentive for airlines to purchase both types .

= = = Production and testing = = =

To produce the 767 , Boeing formed a network of subcontractors which included domestic suppliers and international contributions from Italy 's Aeritalia and Japan 's CTDC . The wings and cabin floor were produced in @-@ house , while Aeritalia provided control surfaces , Boeing Vertol made the leading edge for the wings , and Boeing Wichita produced the forward fuselage . The CTDC provided multiple assemblies through its constituent companies , namely Fuji Heavy Industries (wing fairings and gear doors) , Kawasaki Heavy Industries (center fuselage) , and Mitsubishi Heavy Industries (rear fuselage , doors , and tail) . Components were integrated during final assembly at the Everett factory . For expedited production of wing spars , the main structural member of aircraft wings , the Everett factory received robotic machinery to automate the process of drilling holes and inserting fasteners . This method of wing construction expanded on techniques developed for the 747 . Final assembly of the first aircraft began in July 1979 .

The prototype aircraft , registered N767BA and equipped with JT9D turbofans , rolled out on August 4 , 1981 . By this time , the 767 program had accumulated 173 firm orders from 17 customers , including Air Canada , All Nippon Airways , Britannia Airways , Transbrasil , and Trans World Airlines (TWA) . On September 26 , 1981 , the prototype took its maiden flight under the command of company test pilots Tommy Edmonds , Lew Wallick , and John Brit . The maiden flight was largely uneventful , save for the inability to retract the landing gear because of a hydraulic fluid leak . The prototype was used for subsequent flight tests .

The 10 @-@ month 767 flight test program utilized the first six aircraft built . The first four aircraft were equipped with JT9D engines , while the fifth and sixth were fitted with CF6 engines . The test fleet was largely used to evaluate avionics , flight systems , handling , and performance , while the sixth aircraft was used for route @-@ proving flights . During testing , pilots described the 767 as generally easy to fly , with its maneuverability unencumbered by the bulkiness associated with larger wide @-@ body jets . Following the successful completion of 1 @-@ 600 hours of flight tests , the JT9D @-@ powered 767 @-@ 200 received certification from the US Federal Aviation Administration (FAA) and the UK Civil Aviation Authority (CAA) in July 1982 . The first delivery occurred on August 19 , 1982 , to United Airlines . The CF6 @-@ powered 767 @-@ 200 received certification in September 1982 , followed by the first delivery to Delta Air Lines on October 25 , 1982 .

= = = Service entry and operations = = =

The 767 entered service with United Airlines on September 8 , 1982 . The aircraft 's first commercial flight used a JT9D @-@ powered 767 @-@ 200 on the Chicago @-@ to @-@ Denver route . The CF6 @-@ powered 767 @-@ 200 commenced service three months later with Delta Air Lines . Upon delivery , early 767s were mainly deployed on domestic routes , including U.S. transcontinental services . American Airlines and TWA began flying the 767 @-@ 200 in late 1982 ,

while Air Canada , China Airlines , and El Al began operating the aircraft in 1983 . The aircraft 's introduction was relatively smooth , with few operational glitches and greater dispatch reliability than prior jetliners . In its first year , the 767 logged a 96 @. @ 1 percent rate of takeoff without delay due to technical issues , which exceeded the industry average for new aircraft . Operators reported generally favorable ratings for the twinjet 's sound levels , interior comfort , and economic performance . Resolved issues were minor and included the recalibration of a leading edge sensor to prevent false readings , the replacement of an evacuation slide latch , and the repair of a tailplane pivot to match production specifications .

Seeking to capitalize on its new wide @-@ body 's potential for growth , Boeing offered an extended @-@ range model , the 767 @-@ 200ER , in its first year of service . Ethiopian Airlines placed the first order for the type in December 1982 . Featuring increased gross weight specifications and greater fuel capacity , the extended @-@ range model could carry heavier payloads at distances up to 6 @, @ 385 nautical miles (11 @, @ 825 km) , and was targeted at overseas customers . The 767 @-@ 200ER entered service with El Al on March 27 , 1984 . The type was mainly ordered by international airlines operating medium @-@ traffic , long @-@ distance flights .

In the mid @-@ 1980s , the 767 spearheaded the growth of twinjet flights across the northern Atlantic under extended @-@ range twin @-@ engine operational performance standards (ETOPS) regulations , the FAA 's safety rules governing transoceanic flights by aircraft with two engines . Before the 767 , over @-@ water flight paths of twinjets could be no more than 90 minutes away from diversion airports . In May 1985 , the FAA granted its first approval for 120 @-@ minute ETOPS flights to 767 operators , on an individual airline basis starting with TWA , provided that the operator met flight safety criteria . This allowed the aircraft to fly overseas routes at up to two hours ' distance from land . The larger safety margins were permitted because of the improved reliability demonstrated by the twinjet and its turbofan engines . The FAA lengthened the ETOPS time to 180 minutes for CF6 @-@ powered 767s in 1989 , making the type the first to be certified under the longer duration , and all available engines received approval by 1993 . Regulatory approval spurred the expansion of transoceanic 767 flights and boosted the aircraft 's sales .

= = = Stretched derivatives = = =

Forecasting airline interest in larger @-@ capacity models , Boeing announced the stretched 767 @-@ 300 in 1983 and the extended @-@ range 767 @-@ 300ER in 1984 . Both models offered a 20 percent passenger capacity increase , while the extended @-@ range version was capable of operating flights up to 5 @, @ 990 nautical miles (11 @, @ 090 km) . Japan Airlines placed the first order for the 767 @-@ 300 in September 1983 . Following its first flight on January 30 , 1986 , the type entered service with Japan Airlines on October 20 , 1986 . The 767 @-@ 300ER completed its first flight on December 9 , 1986 , but it was not until March 1987 that the first firm order , from American Airlines , was placed . The type entered service with American Airlines on March 3 , 1988 . The 767 @-@ 300 and 767 @-@ 300ER gained popularity after entering service , and came to account for approximately two @-@ thirds of all 767s sold .

After the debut of the first stretched 767s , Boeing sought to address airline requests for even more capacity by proposing larger models , including a partial double @-@ deck version informally named the " Hunchback of Mukilteo " (from a town near Boeing 's Everett factory) with a 757 body section mounted over the aft main fuselage . In 1986 , the manufacturer announced the 767 @-@ X , a revised model with extended wings and a wider cabin , but received little interest . By 1988 , the 767 @-@ X had evolved into an all @-@ new twinjet , which revived the 777 designation . Until the 777 's 1995 debut , the 767 @-@ 300 and 767 @-@ 300ER remained Boeing 's second @-@ largest wide @-@ bodies behind the 747 .

Buoyed by a recovering global economy and ETOPS approval , 767 sales accelerated in the mid @-@ to @-@ late 1980s , with 1989 being the most prolific year with 132 firm orders . By the early 1990s , the wide @-@ body twinjet had become its manufacturer 's annual best @-@ selling aircraft , despite a slight decrease due to economic recession . During this period , the 767 became the

most common airliner for transatlantic flights between North America and Europe . By the end of the decade , 767s crossed the Atlantic more frequently than all other aircraft types combined . The 767 also propelled the growth of point @-@ to @-@ point flights which bypassed major airline hubs in favor of direct routes . Taking advantage of the aircraft 's lower operating costs and smaller capacity , operators added non @-@ stop flights to secondary population centers , thereby eliminating the need for connecting flights . The increase in the number of cities receiving non @-@ stop services caused a paradigm shift in the airline industry as point @-@ to @-@ point travel gained prominence at the expense of the traditional hub @-@ and @-@ spoke model .

In February 1990 , the first 767 equipped with Rolls @-@ Royce RB211 turbofans , a 767 @-@ 300 , was delivered to British Airways . Six months later , the carrier temporarily grounded its entire 767 fleet after discovering cracks in the engine pylons of several aircraft . The cracks were related to the extra weight of the RB211 engines , which are 2 @,@ 205 pounds (1 @,@ 000 kg) heavier than other 767 engines . During the grounding , interim repairs were conducted to alleviate stress on engine pylon components , and a parts redesign in 1991 prevented further cracks . Boeing also performed a structural reassessment , resulting in production changes and modifications to the engine pylons of all 767s in service .

In January 1993 , following an order from UPS Airlines , Boeing launched a freighter variant , the 767 @-@ 300F , which entered service with UPS on October 16 , 1995 . The 767 @-@ 300F featured a main deck cargo hold , upgraded landing gear , and strengthened wing structure . In November 1993 , the Japanese government launched the first 767 military derivative when it placed orders for the E @-@ 767 , an Airborne Early Warning and Control (AWACS) variant based on the 767 @-@ 200ER . The first two E @-@ 767s , featuring extensive modifications to accommodate surveillance radar and other monitoring equipment , were delivered in 1998 to the Japan Self @-@ Defense Forces .

In November 1995 , after abandoning development of a smaller version of the 777 , Boeing announced that it was revisiting studies for a larger 767 . The proposed 767 @-@ 400X , a second stretch of the aircraft , offered an over 12 percent capacity increase versus the 767 @-@ 300 , and featured an upgraded flight deck , enhanced interior , and wider wingspan . The variant was specifically aimed at Delta Air Lines ' pending replacement of its aging Lockheed L @-@ 1011 TriStars , and faced competition from the A330 @-@ 200 , a shortened derivative of the Airbus A330 . In March 1997 , Delta Air Lines launched the 767 @-@ 400ER when it ordered the type to replace its L @-@ 1011 fleet . In October 1997 , Continental Airlines also ordered the 767 @-@ 400ER to replace its McDonnell Douglas DC @-@ 10 fleet . The type completed its first flight on October 9 , 1999 , and entered service with Continental Airlines on September 14 , 2000 .

= = = Further developments = = =

In the early 2000s , cumulative 767 deliveries approached 900 , but new sales declined during an airline industry downturn . In 2001 , Boeing dropped plans for a longer @-@ range model , the 767 @-@ 400ERX , in favor of the proposed Sonic Cruiser , a new jetliner which aimed to fly 15 percent faster while having comparable fuel costs as the 767 . The following year , the manufacturer announced the KC @-@ 767 Tanker Transport , a second military derivative of the 767 @-@ 200ER . Launched with an order in October 2002 from the Italian Air Force , the KC @-@ 767 was intended for the dual role of refueling other aircraft and carrying cargo . The Japanese government became the second customer for the type in March 2003 . In May 2003 , the United States Air Force (USAF) announced its intent to lease KC @-@ 767s to replace its aging KC @-@ 135 tankers . The plan was suspended in March 2004 amid a conflict of interest scandal , resulting in multiple U.S. government investigations and the departure of several Boeing officials , including Philip Condit , the company 's chief executive officer , and chief financial officer Michael Sears . The first KC @-@ 767s were delivered in 2008 to the Japan Self @-@ Defense Forces .

In late 2002 , after airlines expressed reservations about its emphasis on speed over cost reduction , Boeing halted development of the Sonic Cruiser . The following year , the manufacturer announced the 7E7 , a mid @-@ size 767 successor made from composite materials which promised to be 20

percent more fuel efficient . The new jetliner was the first stage of a replacement aircraft initiative called the Boeing Yellowstone Project . Customers embraced the 7E7 , later renamed 787 Dreamliner , and within two years it had become the fastest @-@ selling airliner in the company 's history . In 2005 , Boeing opted to continue 767 production despite record Dreamliner sales , citing a need to provide customers waiting for the 787 with a more readily available option . Subsequently , the 767 @-@ 300ER was offered to customers affected by 787 delays , including All Nippon Airways and Japan Airlines . Some aging 767s , exceeding 20 years in age , were also kept in service past planned retirement dates due to the delays . To extend the operational lives of older aircraft , airlines increased heavy maintenance procedures , including D @-@ check teardowns and inspections for corrosion , a recurring issue on aging 767s . The first 787s would ultimately enter service with All Nippon Airways in October 2011 , three @-@ and @-@ a @-@ half years behind schedule .

In 2007 , the 767 received a production boost when UPS and DHL Aviation placed a combined 33 orders for the 767 @-@ 300F . Renewed freighter interest led Boeing to consider enhanced versions of the 767 @-@ 200 and 767 @-@ 300F with increased gross weights , 767 @-@ 400ER wing extensions , and 777 avionics . However , net orders for the 767 declined from 24 in 2008 to just three in 2010 . During the same period , operators upgraded aircraft already in service ; in 2008 , the first 767 @-@ 300ER retrofitted with blended winglets from Aviation Partners Incorporated debuted with American Airlines . The manufacturer @-@ sanctioned winglets , at 11 feet (3 @-@ 35 m) in height , improved fuel efficiency by an estimated 6 @-@ 5 percent . Other carriers including All Nippon Airways and Delta Air Lines also ordered winglet kits .

On February 2 , 2011 , the 1,000th 767 rolled out , destined for All Nippon Airways . The aircraft was the 91st 767 @-@ 300ER ordered by the Japanese carrier , and with its completion the 767 became the second wide @-@ body airliner to reach the thousand @-@ unit milestone after the 747 . The 1,000th aircraft also marked the last model produced on the original 767 assembly line . Beginning with the 1,001st aircraft , production moved to another area in the Everett factory which occupied nearly half the space as before . The new assembly line made room for 787 production and aimed to boost manufacturing efficiency by over 20 percent .

At the inauguration of its new assembly line , the 767 's order backlog numbered approximately 50 , only enough for production to last until 2013 . Despite the reduced backlog , Boeing officials expressed optimism that additional orders were forthcoming . On February 24 , 2011 , the USAF announced its selection of the KC @-@ 767 Advanced Tanker , an upgraded variant of the KC @-@ 767 , for its KC @-@ X fleet renewal program . The selection followed two rounds of tanker competition between Boeing and Airbus parent EADS , and came eight years after the USAF 's original 2003 announcement of its plan to lease KC @-@ 767s . The tanker order encompassed 179 aircraft and was expected to sustain 767 production past 2013 .

In December 2011 , FedEx Express announced a 767 @-@ 300F order for 27 aircraft to replace its DC @-@ 10 freighters , citing the USAF tanker order and Boeing 's decision to continue production as contributing factors . FedEx Express announced an agreement to buy an additional 19 of the ? 300F variant in June 2012 . In June 2015 , FedEx said it was accelerating retirements of planes both to reflect demand and to modernize its fleet , recording charges of \$ 276 million . On July 21 , 2015 FedEx announced an order for 50 767 @-@ 300F with options on another 50 , the largest order for the type . FedEx confirmed that it has firm orders for 106 of the freighters for delivery between 2018 and 2023 .

= = Design = =

= = = Overview = = =

The 767 is a low @-@ wing cantilever monoplane with a conventional tail unit featuring a single fin and rudder . The wings are swept at 31 @-@ 5 degrees and optimized for a cruising speed of Mach 0 @-@ 8 (533 mph or 858 km / h) . Each wing features a supercritical cross @-@ section and is

equipped with six @-@ panel leading edge slats , single- and double @-@ slotted flaps , inboard and outboard ailerons , and six spoilers . The airframe further incorporates Carbon @-@ fiber @-@ reinforced polymer composite material wing surfaces , Kevlar fairings and access panels , plus improved aluminum alloys , which together reduce overall weight by 1 @, @ 900 pounds (860 kg) versus preceding aircraft .

To distribute the aircraft 's weight on the ground , the 767 has a retractable tricycle landing gear with four wheels on each main gear and two for the nose gear . The original wing and gear design accommodated the stretched 767 @-@ 300 without major changes . The 767 @-@ 400ER features a larger , more widely spaced main gear with 777 wheels , tires , and brakes . To prevent damage if the tail section contacts the runway surface during takeoff , 767 @-@ 300 and 767 @-@ 400ER models are fitted with a retractable tailskid . The 767 has exit doors near the front and rear of the aircraft on the left side .

In addition to shared avionics and computer technology , the 767 uses the same auxiliary power unit , electric power systems , and hydraulic parts as the 757 . A raised cockpit floor and the same forward cockpit windows result in similar pilot viewing angles . Related design and functionality allows 767 pilots to obtain a common type rating to operate the 757 and share the same seniority roster with pilots of either aircraft .

= = = Flight systems = = =

The original 767 flight deck uses six Rockwell Collins CRT screens to display Electronic flight instrument system (EFIS) and engine indication and crew alerting system (EICAS) information , allowing pilots to handle monitoring tasks previously performed by the flight engineer . The CRTs replace conventional electromechanical instruments found on earlier aircraft . An enhanced flight management system , improved over versions used on early 747s , automates navigation and other functions , while an automatic landing system facilitates CAT IIIb instrument landings in low visibility situations . The 767 became the first aircraft to receive CAT IIIb certification from the FAA for landings with 980 feet (300 m) minimum visibility in 1984 . On the 767 @-@ 400ER , the cockpit layout is simplified further with six Rockwell Collins liquid crystal display (LCD) screens , and adapted for similarities with the 777 and the Next Generation 737 . To retain operational commonality , the LCD screens can be programmed to display information in the same manner as earlier 767s . In 2012 , Boeing and Rockwell Collins launched a further 787 @-@ based cockpit upgrade for the 767 , featuring three landscape @-@ format LCD screens that can display two windows each .

The 767 is equipped with three redundant hydraulic systems for operation of control surfaces , landing gear , and other equipment . Each engine powers a separate hydraulic system , and the third system uses electric pumps . A ram air turbine is fitted to provide power for basic controls in the event of an emergency . An early form of fly @-@ by @-@ wire is employed for spoiler operation , utilizing electric signaling instead of traditional control cables . The fly @-@ by @-@ wire system reduces weight and provides for the independent operation of individual spoilers .

= = = Interior = = =

The 767 features a twin @-@ aisle cabin with a typical configuration of six abreast in business class and seven across in economy . The standard seven abreast , 2 ? 3 ? 2 economy class layout places approximately 87 percent of all seats at a window or aisle . As a result , the aircraft can be largely occupied before center seats need to be filled , and each passenger is no more than one seat from the aisle . It is possible to configure the aircraft with extra seats for up to an eight abreast configuration , but this results in a cramped cabin and is therefore uncommon .

The 767 interior introduced larger overhead bins and more lavatories per passenger than previous aircraft . The bins are wider to accommodate garment bags without folding , and strengthened for heavier carry @-@ on items . A single , large galley is installed near the aft doors , allowing for more efficient meal service and simpler resupply while at airports . Passenger and service doors are an

overhead plug type , which retract upwards , and commonly used doors can be equipped with an electric @-@ assist system .

In 2000 , a 777 @-@ style interior , known as the Boeing Signature Interior , debuted on the 767 @-@ 400ER . Subsequently adopted for all new @-@ build 767s , the Signature Interior features even larger overhead bins , indirect lighting , and sculpted , curved panels . The 767 @-@ 400ER also received larger windows derived from the 777 . Older 767s can be retrofitted with the Signature Interior . Some operators have adopted a simpler modification known as the Enhanced Interior , featuring curved ceiling panels and indirect lighting with minimal modification of cabin architecture , as well as aftermarket modifications such as the NuLook 767 package by Heath Tecna .

= = Variants = =

The 767 has been produced in three fuselage lengths . These debuted in progressively larger form as the 767 @-@ 200 , 767 @-@ 300 , and 767 @-@ 400ER , respectively . Longer @-@ range variants include the 767 @-@ 200ER and 767 @-@ 300ER , while cargo models include the 767 @-@ 300F , a production freighter , and conversions of passenger 767 @-@ 200 and 767 @-@ 300 models .

When referring to different variants , Boeing and airlines often collapse the model number (767) and the variant designator (e.g. ? 200 or ? 300) into a truncated form (e.g. " 762 " or " 763 ") . Subsequent to the capacity number , designations may or may not append the range identifier . The International Civil Aviation Organization (ICAO) aircraft type designator system uses a similar numbering scheme , but adds a preceding manufacturer letter ; all variants based on the 767 @-@ 200 and 767 @-@ 300 are classified under the codes " B762 " and " B763 " , respectively , while the 767 @-@ 400ER receives the designation of " B764 . "

= = = 767 @-@ 200 = = =

The 767 @-@ 200 was the original model and entered service with United Airlines in 1982 . The type has been used primarily by mainline U.S. carriers for domestic routes between major hub centers such as Los Angeles to Washington . The 767 @-@ 200 was the first aircraft to be used on transatlantic ETOPS flights , beginning with TWA on February 1 , 1985 under 90 @-@ minute diversion rules . Deliveries for the variant totaled 128 aircraft . There were 49 passenger and freighter conversions of the model in commercial service as of July 2015 . The type 's competitors included the Airbus A300 and A310 .

The 767 @-@ 200 ceased production in the late 1980s due to being superseded by the extended @-@ range 767 @-@ 200ER . Some early 767 @-@ 200s were subsequently upgraded to extended @-@ range specification . In 1998 , Boeing began offering 767 @-@ 200 conversions to 767 @-@ 200SF (Special Freightier) specification for cargo use , and Israel Aerospace Industries has been licensed to perform cargo conversions since 2005 . The conversion process entails the installation of a side cargo door , strengthened main deck floor , and added freight monitoring and safety equipment . The 767 @-@ 200SF was positioned as a replacement for Douglas DC @-@ 8 freighters .

= = = 767 @-@ 2C = = =

A commercial freighter version of the Boeing 767 @-@ 200 with series 300 wings and an updated flightdeck was first flown on 29 December 2014 . A military tanker variant of the Boeing 767 @-@ 2C is being developed for the U.S. Air Force as the KC @-@ 46 . Boeing is building two aircraft as commercial freighters which will be used to obtain Federal Aviation Administration certification , a further two Boeing 767 @-@ 2Cs will be modified as military tankers . As of 2014 , Boeing does not have customers for the freighter .

= = = 767 @-@ 200ER = = =

The 767 @-@ 200ER was the first extended @-@ range model and entered service with EI Al in 1984 . The type 's increased range is due to an additional center fuel tank and a higher maximum takeoff weight (MTOW) of up to 395 @,@ 000 lb (179 @,@ 000 kg) . The type was originally offered with the same engines as the 767 @-@ 200 , while more powerful Pratt & Whitney PW4000 and General Electric CF6 engines later became available . The 767 @-@ 200ER was the first 767 to complete a non @-@ stop transatlantic journey , and broke the flying distance record for a twinjet airliner on April 17 , 1988 with an Air Mauritius flight from Halifax , Nova Scotia to Port Louis , Mauritius , covering a distance of 8 @,@ 727 nmi (10 @,@ 000 mi ; 16 @,@ 200 km) . The 767 @-@ 200ER has been acquired by international operators seeking smaller wide @-@ body aircraft for long @-@ haul routes such as New York to Beijing . Deliveries of the type totaled 121 with no unfilled orders . As of July 2015 , 35 examples of passenger and freighter conversion versions were in airline service . The type 's main competitors of the time included the Airbus A300 @-@ 600R and the A310 @-@ 300 .

=== 767 @-@ 300 ===

The 767 @-@ 300 , the first stretched version of the aircraft , entered service with Japan Airlines in 1986 . The type features a 21 @.@ 1 @-@ foot (6 @.@ 43 m) fuselage extension over the 767 @-@ 200 , achieved by additional sections inserted before and after the wings , for an overall length of 180 @.@ 25 ft (54 @.@ 9 m) . Reflecting the growth potential built into the original 767 design , the wings , engines , and most systems were largely unchanged on the 767 @-@ 300 . An optional mid @-@ cabin exit door is positioned ahead of the wings on the left , while more powerful Pratt & Whitney PW4000 and Rolls @-@ Royce RB211 engines later became available . The 767 @-@ 300 's increased capacity has been used on high @-@ density routes within Asia and Europe . Deliveries for the type totaled 104 aircraft with no unfilled orders remaining . As of July 2015 , 67 of the variant were in airline service . The type 's main competitor was the Airbus A300 .

=== 767 @-@ 300ER ===

The 767 @-@ 300ER , the extended @-@ range version of the 767 @-@ 300 , entered service with American Airlines in 1988 . The type 's increased range was made possible by greater fuel tankage and a higher MTOW of 407 @,@ 000 lb (185 @,@ 000 kg) . Design improvements allowed the available MTOW to increase to 412 @,@ 000 lb (187 @,@ 000 kg) by 1993 . Power is provided by Pratt & Whitney PW4000 , General Electric CF6 , or Rolls @-@ Royce RB211 engines . Typical routes for the type include Los Angeles to Frankfurt . The combination of increased capacity and range offered by the 767 @-@ 300ER has been particularly attractive to both new and existing 767 operators . It is the most successful version of the aircraft , with more orders placed than all other variants combined . As of June 2016 , 767 @-@ 300ER deliveries stand at 583 with no unfilled orders . There were 467 examples in service as of July 2015 . The type 's main competitor is the Airbus A330 @-@ 200 .

=== 767 @-@ 300F ===

The 767 @-@ 300F , the production freighter version of the 767 @-@ 300ER , entered service with UPS Airlines in 1995 . The 767 @-@ 300F can hold up to 24 standard 88 @-@ by @-@ 125 @-@ inch (220 by 320 cm) pallets on its main deck and up to 30 LD2 unit load devices on the lower deck , with a total cargo volume of 15 @,@ 469 cubic feet (438 m3) . The freighter has a main deck cargo door and crew exit , while the lower deck features two port @-@ side cargo doors and one starboard cargo door . A general market version with onboard freight @-@ handling systems , refrigeration capability , and crew facilities was delivered to Asiana Airlines on August 23 , 1996 . As of June 2016 , 767 @-@ 300F deliveries stand at 114 with 78 unfilled orders . Airlines operated 115 examples of the freighter variant and freighter conversions in July 2015 .

In June 2008 , All Nippon Airways took delivery of the first 767 @-@ 300BCF (Boeing Converted Freighter) , a modified passenger @-@ to @-@ freighter model . The conversion work was performed in Singapore by ST Aerospace Services , the first supplier to offer a 767 @-@ 300BCF program , and involved the addition of a main deck cargo door , strengthened main deck floor , and additional freight monitoring and safety equipment . Since then , Boeing , Israel Aerospace Industries , and Wagner Aeronautical have also offered passenger @-@ to @-@ freighter conversion programs for 767 @-@ 300 series aircraft .

== = 767 @-@ 400ER == =

The 767 @-@ 400ER , the first Boeing wide @-@ body jet resulting from two fuselage stretches , entered service with Continental Airlines in 2000 . The type features a 21 @. @ 1 @-@ foot (6 @. @ 43 @-@ metre) stretch over the 767 @-@ 300 , for a total length of 201 @. @ 25 feet (61 @. @ 3 m) . The wingspan is also increased by 14 @. @ 3 feet (4 @. @ 36 m) through the addition of raked wingtips . Other differences include an updated cockpit , redesigned landing gear , and 777 @-@ style Signature Interior . Power is provided by uprated Pratt & Whitney PW4000 or General Electric CF6 engines .

The FAA granted approval for the 767 @-@ 400ER to operate 180 @-@ minute ETOPS flights before it entered service . Because its fuel capacity was not increased over preceding models , the 767 @-@ 400ER has a range of 5 @, @ 625 nautical miles (10 @, @ 418 km) , less than previous extended @-@ range 767s. This is roughly the distance from Shenzhen to Seattle . No 767 @-@ 400 version was developed , while a longer @-@ range version , the 767 @-@ 400ERX , was offered for sale in 2000 before it was cancelled a year later , leaving the 767 @-@ 400ER as the sole version of the largest 767 . Boeing dropped the 767 @-@ 400ER and the -200ER from its pricing list in 2014 . A total of 37 aircraft were delivered to the variant 's two airline customers , Continental Airlines (now merged with United Airlines) and Delta Air Lines , with no unfilled orders . All 37 examples of the -400ER were in service in July 2015 . One additional example was produced as a military testbed , and later sold as a VIP transport . The type 's closest competitor is the Airbus A330 @-@ 200 .

== = Military and government == =

Versions of the 767 serve in a number of military and government applications , with responsibilities ranging from airborne surveillance and refueling to cargo and VIP transport . Several military 767s have been derived from the 767 @-@ 200ER , the longest @-@ range version of the aircraft .

Airborne Surveillance Testbed ? the Airborne Optical Adjunct (AOA) was modified from the prototype 767 @-@ 200 for a United States Army program , under a contract signed with the Strategic Air Command in July 1984 . Intended to evaluate the feasibility of using airborne optical sensors to detect and track hostile intercontinental ballistic missiles , the modified aircraft first flew on August 21 , 1987 . Alterations included a large " cupola " or hump which ran along the top of the aircraft from above the cockpit to just behind the trailing edge of the wings , and a pair of ventral fins below the rear fuselage . Inside the cupola was a suite of infrared seekers used for tracking theater ballistic missile launches . The aircraft was later renamed as the Airborne Surveillance Testbed (AST) . Following the end of the AST program in 2002 , the aircraft was retired for scrapping .

E @-@ 767 ? the Airborne Early Warning and Control (AWACS) platform for the Japan Self @-@ Defense Forces ; it is essentially the Boeing E @-@ 3 Sentry mission package on a 767 @-@ 200ER platform . E @-@ 767 modifications , completed on 767 @-@ 200ERs flown from the Everett factory to Boeing Integrated Defense Systems in Wichita , Kansas , include structural strengthening to accommodate a dorsal surveillance radar system , engine nacelle alterations , as well as electrical and interior changes . Japan is the operator of four E @-@ 767s . The first E @-@ 767s were delivered in March 1998 .

KC @-@ 767 Advanced Tanker ? the 767 @-@ 200ER @-@ based aerial tanker developed for the USAF KC @-@ X tanker competition . It is an updated version of the KC @-@ 767 , originally

selected as the USAF 's new tanker aircraft in 2003 , designated KC @-@ 767A , and then dropped amid conflict of interest allegations . The KC @-@ 767 Advanced Tanker is derived from studies for a longer @-@ range cargo version of the 767 @-@ 200ER , and features a fly @-@ by @-@ wire refueling boom , a remote vision refueling system , and a 767 @-@ 400ER @-@ based flight deck with LCD screens and head @-@ up displays . Boeing was awarded the KC @-@ X contract to build a 767 @-@ based tanker , to be designated KC @-@ 46A , in February 2011 .

KC @-@ 767 Tanker Transport ? the 767 @-@ 200ER @-@ based aerial refueling platform operated by the Italian Air Force (Aeronautica Militare) , and the Japan Self @-@ Defense Forces . Modifications conducted by Boeing Integrated Defense Systems include the addition of a fly @-@ by @-@ wire refueling boom , strengthened flaps , and optional auxiliary fuel tanks , as well as structural reinforcement and modified avionics . All four KC @-@ 767Js ordered by Japan have been delivered . The Aeronautica Militare received the first of its four KC @-@ 767As in January 2011 .

Tanker conversions ? the 767 MMTT or Multi @-@ Mission Tanker Transport is a 767 @-@ 200ER @-@ based aircraft operated by the Colombian Air Force (Fuerza Aérea Colombiana) and modified by Israel Aerospace Industries . In 2013 , the Brazilian Air Force ordered two 767 @-@ 300ER tanker conversions from IAI for its KC @-@ X2 program .

= = = Undeveloped variants = = =

= = = = 767 @-@ 400ERX = = = =

Boeing offered the 767 @-@ 400ERX , a longer @-@ range version of the largest 767 model , for sale in 2000 . Introduced along with the 747X , the type was to be powered by the 747X 's engines , namely the Engine Alliance GP7000 and the Rolls @-@ Royce Trent 600 . An increased range of 6 @-@ 492 nautical miles (12 @-@ 023 km) was specified . Kenya Airways provisionally ordered three 767 @-@ 400ERXs to supplement its 767 fleet , but after Boeing cancelled the type 's development in 2001 , switched the order to the 777 @-@ 200ER .

= = = = E @-@ 10 MC2A = = = =

The Northrop Grumman E @-@ 10 MC2A was to be a 767 @-@ 400ER @-@ based replacement for the USAF 's 707 @-@ based E @-@ 3 Sentry AWACS , Northrop Grumman E @-@ 8 Joint STARS , and RC @-@ 135 SIGINT aircraft . The E @-@ 10 MC2A would have included an all @-@ new AWACS system , with a powerful active electronically scanned array (AESA) that was also capable of jamming enemy aircraft or missiles . One 767 @-@ 400ER aircraft was produced as a testbed for systems integration , but the program was terminated in January 2009 and the prototype sold to Bahrain as a VIP transport .

= = Operators = =

The customers that have ordered the most 767s are FedEx , Delta Air Lines , All Nippon Airways and United Airlines . Delta Air Lines is the largest customer , having received 117 aircraft . The Atlanta @-@ based carrier is also the only customer to have ordered all passenger versions of the 767 . Its 100th example , a 767 @-@ 400ER , was delivered in October 2000 . FedEx confirmed that it had placed firm orders for 50 of the freighters for delivery between 2018 and 2023 . United Airlines was the only carrier operating all versions of the 767 ER series (762ER , 763ER , and 764ER) as of November 2012 . The largest cargo customer is UPS Airlines , having received 59 aircraft as of June 2016 .

A total of 765 aircraft (all 767 variants) were in airline service in July 2015 , with airline operators Delta Air Lines (95) , UPS Airlines (59) , American Airlines (56) , All Nippon Airways (52) , United Airlines (51) , Japan Airlines (44) , Air Canada (31) , and others with fewer aircraft of the

type .

= = = Orders and deliveries = = =

Data through June 30 , 2016

= = = Model summary = = =

Data through end of June 2016 .

= = Accidents and notable incidents = =

As of October 2015 , the Boeing 767 has been in 45 aviation occurrences , including 15 hull @-@ loss accidents . Six fatal crashes , including three hijackings , have resulted in a total of 851 occupant fatalities . The airliner 's first fatal crash , Lauda Air Flight 004 , occurred near Bangkok on May 26 , 1991 , following the in @-@ flight deployment of the left engine thrust reverser on a 767 @-@ 300ER ; none of the 223 aboard survived ; as a result of this accident all 767 thrust reversers were deactivated until a redesign was implemented . Investigators determined that an electronically controlled valve , common to late @-@ model Boeing aircraft , was to blame . A new locking device was installed on all affected jetliners , including 767s . On October 31 , 1999 , EgyptAir Flight 990 , a 767 @-@ 300ER , crashed off Nantucket Island , Massachusetts , in international waters killing all 217 people on board . The U.S. National Transportation Safety Board (NTSB) determined the probable cause to be due to a deliberate action by the first officer ; Egypt disputed this conclusion . On April 15 , 2002 , Air China Flight 129 , a 767 @-@ 200ER , crashed into a hill amid inclement weather while trying to land at Gimhae International Airport in Busan , South Korea . The crash resulted in the death of 129 of the 166 people on board , and the cause was attributed to pilot error .

An early 767 incident was survived by all on board . On July 23 , 1983 , Air Canada Flight 143 , a 767 @-@ 200 , ran out of fuel in @-@ flight and had to glide with both engines out for almost 43 nautical miles (80 km) to an emergency landing at Gimli , Manitoba . The pilots used the aircraft 's ram air turbine to power the hydraulic systems for aerodynamic control . There were no fatalities and only minor injuries . This aircraft was nicknamed " Gimli Glider " after the airport at which it landed . The aircraft , registered C @-@ GAUN , continued flying for Air Canada until its retirement in January 2008 . The aircraft was subsequently scrapped in 2008 .

The 767 has been involved in six hijackings , three resulting in loss of life , for a combined total of 282 occupant fatalities . On November 23 , 1996 , Ethiopian Airlines Flight 961 , a 767 @-@ 200ER , was hijacked and crash @-@ landed in the Indian Ocean near the Comoros Islands after running out of fuel , killing 125 out of the 175 persons on board ; survivors have been rare among instances of land @-@ based aircraft ditching on water . Two 767s were involved in the September 11 attacks on the World Trade Center in 2001 , resulting in the collapse of its two main towers . American Airlines Flight 11 , a 767 @-@ 200ER , crashed into the north tower , killing all 92 people on board , and United Airlines Flight 175 , a 767 @-@ 200 , crashed into the south tower , with the death of all 65 on board . In addition , more than 2 @,@ 600 people were killed in the towers or on the ground . A foiled 2001 shoe bomb plot involving an American Airlines 767 @-@ 300ER resulted in passengers being required to remove their shoes for scanning at U.S. security checkpoints .

On November 1 , 2011 , LOT Polish Airlines Flight 16 , a 767 @-@ 300ER , safely landed at Warsaw Frederic Chopin Airport in Warsaw , Poland after a mechanical failure of the landing gear forced an emergency landing with the landing gear up . There were no injuries , but the aircraft involved was damaged and subsequently written off . At the time of the incident , aviation analysts speculated that it may have been the first instance of a complete landing gear failure in the 767 's service history . Subsequent investigation however determined that while a damaged hose had disabled the aircraft 's primary landing gear extension system , an otherwise functional backup system was inoperative due to an accidentally deactivated circuit breaker .

In January 2014 , the U.S. Federal Aviation Administration issued a directive that ordered inspections of the elevators on more than 400 767s beginning in March 2014 ; the focus is on fasteners and other parts that can fail and cause the elevators to jam . The issue was first identified in 2000 and has been the subject of several Boeing service bulletins . The inspections and repairs are required to be completed within six years .

The aircraft has suffered from multiple occurrences of " uncommanded escape slide inflation ? during maintenance or operations . A number of these incidents involved the slide inflating during flight . In late 2015 , the FAA issued a preliminary directive to address the issue .

= = Retirement and display = =

As new 767s roll off the assembly line , older models have been retired and scrapped . One complete aircraft is known to have been retained for exhibition , specifically N102DA , the first 767 @-@ 200 to operate for Delta Air Lines and the twelfth example built . The exhibition aircraft , named " The Spirit of Delta " by the employees who helped purchase it in 1982 , underwent restoration at the Delta Air Lines Air Transport Heritage Museum in Atlanta , Georgia . The restoration was completed in 2010 . Featuring the original delivered interior as well as historical displays , the aircraft is viewable by visitors (self @-@ guided) daily , during the museum 's operating hours . Hangar renovations , begun in June 2013 , are now complete , and the museum is accessible on a daily basis .

In 2005 , four retired American Airlines 767 @-@ 200s were dismantled for parts in Roswell , New Mexico , and their nose sections removed intact for collector or film use . Of these four aircraft , the cockpit of N301AA , the eighth 767 built and the first of its type delivered to American Airlines , was transported to Victorville , California , to be restored for museum display . As of 2013 , the cockpit section of N301AA is housed at the interim museum location of the American Museum of Aviation , a nonprofit organization in Las Vegas , Nevada , along with a display of American Airlines photographs .

= = Specifications = =

Sources : Boeing 767 general specifications , and other sources .