

普通高等院校航空专业“十二五”规划教材

民航机务 专业英语

*Professional English for Aircraft
Maintenance of Civil Aviation*

李永平
编著



国防工业出版社

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·北京·

内 容 简 介

本书结合飞机维修的工作实际,编写了与飞机及其维修工程相关的技术英文内容,如飞机的一般知识、飞机电气系统、飞机健康管理、飞机客户支持等,旨在使读者掌握一定的飞机专业技术英文词汇和一定的飞机维修知识。

本书可作为大、中专院校飞机维修各相关专业“民航机务专业英语”课程的教材或教学辅助材料使用,也可供民航机务工程技术人员学习、参考。

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前 言

21 世纪是中国民航高速发展的重要时期,为了满足中国民航运输业的需要,中国民航需要大量引进欧美等国家的飞机,如波音、空中客车飞机,尽管中国也在努力研发自主知识产权的飞机,但学好飞机维修各专业的专业英语,在当前乃至未来很长一段时间都具有重要的意义。

当前,中国民航主要的飞机为波音、空中客车飞机,而这些飞机的随机技术资料均为英文,飞机维修人员(简称“机务”)必须掌握相应的专业技术词汇才能阅读并理解这些技术资料,如 AMM(Aircraft Maintenance Manual,飞机维护手册)、IPC(Illustrated Part Catalogue,图解零部件目录)等手册,这对机务人员排除飞机故障和更好地维护、修理飞机,进而保障飞机的安全具有重要的作用;同时,学好飞机维修专业英语对于有志于考取各类执照(尤其国外的飞机维修执照,如 FAA 维修人员执照)和在外国航空公司或驻中国办事处工作的机务人员,有很好的助力作用。

本书在总结中国“民航机务专业英语”这类教材的编写情况和经验的基础上,结合飞机维修的实际工作情况,编写了 12 章的内容,包括飞机的一般介绍、数量最多的机型 B737 飞机家族、最先进的机型 B787、飞机自动驾驶系统、飞机电气系统、飞机液压系统、辅助动力装置和新一代的空中交通系统,以及飞机维修工程管理类的知识,如飞机健康管理、飞机航材管理、客户支持等。期望尽可能地涵盖飞机维修的各个方面,使读者在掌握飞机专业技术英文词汇的同时,能够更多地了解飞机维修的相关知识,从而对飞机维修有更全面的了解。本书附录有 B737NG(New Generation)飞机航后维修工作单,中英文对照的编排供读者检验学习效果。另外,本书在每一课结尾有本课的词汇并在课文中按顺序加粗提示,提供若干问题供读者思考,并在书末提供全书的词汇表。

本书的编写工作得到上海工程技术大学航空运输学院/飞行学院副院长郝勇教授的大力支持,上海航空股份有限公司的马银才高级工程师提供了部分资料,上海工程技术大学施浩、郭辰贻参与部分编写工作,上海航空股份有限公司陶毅超飞行员对本书部分内容进行了仔细校对,在此一并表示衷心感谢。

本书可作为大、中专院校飞机维修各专业(如航空机电设备维修、航空机务维修、民航机务工程)“民航机务专业英语”课程的教材或教学辅助材料使用,也可供航空公司等单位的飞机工程技术人员参考使用。

由于本人水平有限,错误和不妥之处在所难免,敬请读者提出宝贵意见。

编著者
2010 年 12 月

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Lesson 1

Airplanes and Main Manufacturers Introduction

Airplanes come in many different shapes and sizes depending on the mission of the aircraft, but all modern airplanes have certain components in common. These are the **fuselage**, wing, **tail assembly** and control **surfaces**, landing gear, and **power plants**.

For any airplane to fly, it must be able to lift the weight of the airplane, its fuel, the passengers, and the cargo. The wings generate most of the **lift** to hold the plane in the air. To generate lift, the airplane must be pushed through the air. The engines, which are usually located beneath the wings, provide the **thrust** to push the airplane forward through the air.

The fuselage is the body of the airplane that holds all the pieces of the aircraft together and many of the other large components are attached to it. The fuselage is generally **streamlined** as much as possible to reduce **drag**. Designs for fuselages vary widely. The fuselage houses the **cockpit** where the **pilot** and **flight crew** sit and it provides areas for passengers and cargo. It may also carry armaments of various sorts. Some aircraft carry fuel in the fuselage; others carry the fuel in the wings. In addition, an engine may be housed in the fuselage.

The wing provides the *principal lifting force* of an airplane. Lift is obtained from the **dynamic** action of the wing with respect to the air. The **cross-sectional** shape of the wing as viewed from the side is known as the **airfoil** section. The **planform** shape of the wing (the shape of the wing as viewed from above) and placement of the wing on the fuselage (including the **angle of incidence**), as well as the airfoil section shape, depend upon the airplane mission and the best compromise necessary in the overall airplane design.

The control surfaces include all those surfaces of an airplane used for **attitude**, lift, and **drag** control. They include the tail assembly, the structures at the rear of the airplane that serve to control and maneuver the aircraft and structures forming part of and attached to the wing. The tail usually has a fixed horizontal piece (called the **horizontal stabilizer**) and a fixed vertical piece (called the **vertical stabilizer**). The stabilizers provide stability for the aircraft—they keep it flying straight. The vertical stabilizer keeps the **nose** of the plane from swinging from side to side (called **yaw**), while the horizontal stabilizer prevents an up-and-down motion of



the nose (called **pitch**). (On the **Wright brothers'** first successful aircraft, the horizontal stabilizer was placed in front of the wings. Such a configuration is called a canard after the French word for " duck ").

The hinged part found on the **trailing edge** of the wing is called the **aileron**. It is used to roll the wings from side to side. **Flaps** are hinged or **pivoted** parts of the **leading** and/or trailing edges of the wing used to increase lift at reduced airspeeds, primarily at **landing** and **take-off**. **Spoilers** are devices used to disrupt the **airflow** over the wing so as to reduce the lift on an airplane wing quickly. By operating independently on each wing, they may provide an **alternate form** of roll control. **Slats** at the front part of the wing are used at takeoff and landing to produce additional lift.

At the rear of both the aileron surfaces and **elevators** and **rudders** are small moving sections called **trim tabs** that are attached by hinges. Their function is to (1) balance the airplane if it is too nose heavy, tail heavy, or wing heavy to fly in a stable cruise condition; (2) maintain the elevator, rudder, and ailerons at whatever setting the pilot wishes without the pilot maintaining pressure on the controls; and (3) help move the elevators, rudder, and ailerons and thus relieve the pilot of the effort necessary to move the surfaces.

The landing gear, or **undercarriage**, supports the airplane when it is resting on the ground or in water and during the takeoff and landing. The gear may be fixed or retractable. The wheels of most airplanes are attached to **shock-absorbing struts** that use oil or air to cushion the **blow** of landing. Special types of landing gear include skis for snow and floats for water. For carrier landings, **arrester hooks** are used.

Forward motion, or thrust, is generated by a thrust-producing device or power plant to sustain flight. The power plant consists of the engine (and propeller, if present) and the related **accessories**.

The main engine types are the reciprocating (or piston type) , and the reaction, or jet, engine such as the **ram jet**, **pulse jet**, **turbojet**, **turboprop**, and **rocket** engine. The propeller converts the energy of a reciprocating engine's rotating **crankshaft** into a **thrust force**. Usually the engines are located in **cowled pods** hung beneath the wings, but some aircraft, like fighter aircraft, will have the engines buried in the fuselage.

Other configurations have sometime been used. For instance, the Wright brothers' 1903 Flyer had pusher propellers (propellers at the rear of the plane) and the elevators at the front of the aircraft. Many fighter aircraft also combine the horizontal stabilizer and elevator into a single **stabilator** surface. There are many possible aircraft configurations, but any configuration must provide for the four forces needed for flight.

The Boeing Company

Boeing Commercial Airplanes, a business unit of The Boeing Company, is committed to being



the leader in commercial aviation by offering airplanes and services that deliver superior design, efficiency and value to customers around the world. There are more than 12,100 Boeing Commercial Jetliners in service, flying passengers and freight more efficiently than competing models in the market.

Boeing traces its history to aviation pioneer **William Boeing** who, in 1916, built the company's first airplane, a seaplane for two with a range of 320 **nautical miles** (515km). Since then, Boeing has defined the modern jetliner and introduced the **twin-aisle** cabin, the glass cockpit and countless other innovations.

Today, Boeing Commercial Airplanes offers a family of technologically advanced airplanes, including one that can seat more than 500 and another that boasts the longest range in the world, at more than 9,300 nautical miles (14,966km).

Meanwhile, Boeing Commercial Airplanes and its global network of suppliers are hard at work building the airplane of tomorrow, a **next-generation** jet that will set the standard for fuel-efficiency and passenger comfort.

Boeing Commercial Airplanes employs about 65,400 people under the leadership of President and CEO James (Jim) F. Albaugh. The business unit brought in revenues exceeding \$ 28 billion in 2008.

With headquarters in Renton, Wash., Boeing Commercial Airplanes has operations in more than a dozen cities and countries. The business unit comprises five airplane programs, VIP-derivative airplanes, extensive fabrication and assembly facilities, and a global customer support organization.

Air transport contributes 2 percent of human-produced CO₂ emissions and this could reach 3 percent by 2050, according to updated figures from the Intergovernmental Panel on Climate Change (IPCC). The industry is now working towards carbon-neutral growth—no increase in carbon emissions in spite of traffic growth—as a first step towards a future of carbon-free energy. Boeing takes this commitment very seriously. Today, more than 75 percent of our commercial airplane research and development efforts are focused on advancing environmentally progressive innovations. See below for more information.

Aircraft entering today's fleet are 70 percent more fuel efficient than early commercial jet airplanes, consuming about 3.5 liters per passenger per 100km. Technological innovation is a fundamental part of this industry.

Boeing is actively driving the development of sustainable **biofuels** for use by the aviation industry. Technology is advancing faster than expected. Many airlines could be flying on a percentage of biofuels within the next five to ten years.

Advanced technologies for generating and harnessing energy are reducing the need to produce electricity from non-renewable resources. Boeing is developing applications within key energy harvesting technologies, including **electrodynamic, thermoelectric, piezoelectric, hydrogen** fuel cells and solar cells.

Boeing continually pursues noise-reducing innovations, making each new airplane quieter than its **predecessor**. New technologies promise even greater improvements.

Today's airspace systems are inefficient. Though safe, the current model is serving increased demand with **outmoded** technologies—the result: system congestion and delays that waste fuel and increase emissions. Boeing is helping solve this complex problem by collaborating with governments and industry partners.

Boeing is working to continually improve the environmental performance of our operations, our products and the aviation system overall. We have a plan and a set of commitments to which we hold ourselves accountable.

The Airbus Company

Airbus is one of the world's leading aircraft manufacturers, and it consistently captures approximately half or more of all orders for airliners with more than 100 seats.

Airbus' mission is to provide the aircraft best suited to the market's needs and to support these aircraft with the highest quality of service. The Airbus product line comprises 14 aircraft models, from the 100-seat single-aisle A318 jetliner to the 525-seat A380—which is the largest civil airliner in service.

Airbus made 483 deliveries in 2008, surpassing the previous year's total by 30. Its total number of aircraft provided to customers worldwide was above the 5,600 mark as of April 2009, with combined orders reaching more than 9,200 single-aisle and **widebody** Airbus jetliners.

Airbus also has expanded into the military transport aircraft sector. The A400M multi-role military **airlifter**—being produced under management of the Airbus Military company—will replace ageing fleets of C-130 Hercules and C-160 Transalls. In addition, aerial tankers for in-flight refueling and transport missions are available in aircraft variants derived from the A310 and A330.

The A318 brings all the benefits of Airbus commonality and comfort to the 100-seat market segment.

The A318 retains all of the A320 Family's advantages while providing highly efficient operations in the 100-seat airliner category.

With an overall length of 31.44 metres (103 ft. 2 in.), the A318 has the shortest fuselage of the A320 product line.

The A318 seats 107 passengers in a typical two-class cabin layout, with eight in first class and 99 in economy.

The A319 provides a new standard of service to markets where only the smallest jets have operated.

The A319 brings a new standard of comfort and performance to markets previously only



served by the smallest jet aircraft.

The A319 operational flexibility provides range possibilities of 3,700nm./6,800km. , and longer for non-stop trans-Atlantic flights.

The A319 offers a variety of seating configurations, from an all business-class layout to an optional high-density version.

The founding member of the best-selling Airbus single-aisle Family, the A320 is the only all-new aircraft in its category.

Airbus innovation means better performance and reliability with reduced fuel burn and easier maintenance.

The A320's 3.96-metre-wide (13 ft.) fuselage provides wider seats and more room for carry-on baggage in the cabin, and the ability to load containerized cargo in the **lower hold**.

The A320 set a new generation of comfort standards, accommodating 12 first class and 138 economy passengers in the widest cabin available for single-aisle jetliners.

With lower operating costs and more profitability available than with any other aircraft in its class, the A310 also offers wide body passenger comfort and exceptional cargo capacity.

The A310 offers maximum comfort, versatility and efficiency—making it the world's most profitable jetliner in the 200-seat size category.

The A310 uses the Airbus 222-inch widebody fuselage cross-section, providing the optimum balance between aerodynamic efficiency, passenger comfort and underfloor cargo capacity.

The A310 accommodates 220 passengers in a typical two-class layout with 20 first-class and 200 economy-class seats.

The shortest fuselage member of the A330 series provides airlines with excellent range and cargo capacity.

The A330-200 offers superior payload/range capability and greater cargo volume on medium-capacity routes to extended-range operations.

The shortest-fuselage version of Airbus' A330 series, the A330-200 has an overall length of 59 metres (193 ft. 7 in.), with a range of up to 6,750nm./12,500km.

The A330-200 typically carries 253 passengers in a first /business/ economy class layout, while the aircraft's two-class configuration seats 293 passengers.

The A340-200 enabled airlines to open long-range non-stop routes between cities that previously needed **intermediate stops**.

The A340-200 is the shortest-fuselage version of the A340 series, with an overall length of 59.3 metres (194 ft. 10 in.).

The typical seating configuration for the A340-200 includes 216 passengers in a three-class cabin arrangement.

The A380 Navigator has enjoyed huge popularity and allowed many thousands of visitors worldwide to follow the design and industrial development of Airbus' 21st century **flagship** and share the excitement of the programme as it progressed.



Now that the A380 is in regular commercial service, the role of the A380 Navigator has come to an end. The dedicated site, which was created to follow the progress of the A380, is no longer being updated. We thank you for the enthusiastic interest you have shown for the A380 and encourage you to browse back through the milestones of this exceptional aircraft programme, review its development and continue to enjoy its many photos and videos.

The successful entry into service of the A380 is a tribute to the giant leap forward in technology and innovation embodied in the A380, which makes it the new industry's technology benchmark. This is highlighted by the more than 380 patent applications filed for A380 technologies.

Since its first flight in April 2005, the A380 has flown at air shows and carried out several worldwide tours, demonstrating its airport compatibility, its magnificent handling qualities and **eco-friendly** operation, and meeting with an enthusiastic welcome in every one of the 71 airports it visited.

The "Gentle Giant" as the media dubbed it, now belongs to the airlines and passengers who fly it. As more and more A380s are delivered and enter into service, its majestic and quiet flight will become a normal sight at airports all around the world.

The Bombardier Company

Bombardier is a global transportation company, present in more than 60 countries on five continents. It operates two industry-leading businesses:

- Aerospace
- Rail transportation

Our 66,900 employees design, manufacture, sell and support the widest range of world-class products in these two sectors. This includes commercial and business jets, as well as rail transportation equipment, systems and services.

With more than 32,500 employees and well-positioned in global markets, Bombardier Aerospace ranks as the world's third largest civil aircraft manufacturer. Our high-performance aircraft and services set the standard of excellence in several markets, including:

- Business aircraft
- Commercial aircraft
- **Amphibious** aircraft
- Jet travel solutions
- Specialized aircraft solutions
- Aircraft services and training

The Embraer Company

Embraer was Brazil's largest exporter from 1999 to 2001 and the second largest in 2002,



2003 and 2004. It currently employs more than 16,853 people, 94.7% based in Brazil.

Embraer has become one of the largest aircraft manufacturers in the world by focusing on specific market segments with high growth potential in commercial, defense, and **executive aviation**. We develop and adapt successful aircraft platforms and judiciously introduce new technology whenever it creates value by lowering **acquisition price**, reducing direct operating costs, or delivering higher reliability, comfort, and safety.

As a result, our aircraft provide excellent performance with day-in and day-out reliability, while being economical to acquire and cost-effective to operate and maintain. Equally important, we provide a superior product package, with comprehensive aircraft and after-sales support for parts, services, and technical assistance.

New Words & Phrases

fuselage 机身

tail assembly 尾翼组件

surface 舵面

power plant 动力装置(一般简称发动机或引擎)

lift 升力

thrust 推力

streamline 使……成流线型

drag 阻力

cockpit 驾驶舱

pilot 飞行员

flight crew 飞行机组人员(一般包括飞行员和空中乘务员)

dynamic 空气动力的

cross-sectional 代表性的

airfoil 机翼

planform 俯视图

angle of incidence 入射角

attitude 姿态

drag 阻力

horizontal stabilizer 水平安定面

vertical stabilizer 垂直安定面

nose 机头

yaw 偏航

pitch 俯仰

Wright brother 莱特兄弟

trailing edge 后缘

aileron 副翼

- flap 襟翼
pivoted 转动的,回转的,装在枢轴上的
leading 前面的,前端的
landing 着陆
takeoff 起飞
spoiler 扰流板
airflow 气流
alternate form 备用方式
slat 缝翼
elevator 升降舵
rudder 方向舵
trim tab 调整片
undercarriage (飞机的)起落架,车盘,着陆装置
shock-absorbing strut 减振支柱
blow 撞击
arrestor hook 制动钩
accessory 附件
ram jet 冲压喷气
pulse jet 脉冲喷气
turbojet 涡轮喷气
turboprop 涡轮螺旋桨
rocket 火箭
crankshaft 曲轴
thrust force 推力
cowled pod 整流罩罩体
stabilator 平尾
William Boeing 威廉·波音(波音公司创始人)
nautical mile 海里
twin-aisle 双通道
next-generation 下一代
biofuel 生物燃料(指曾经为活质的燃料,如煤)
electrodynamic 电力学的
thermoelectric 热电的
piezoelectric 压电的
hydrogen 氢
predecessor 前辈,前任,(被取代的)原有事物
outmoded 过时的
widebody 宽体的



airlifter 运输机

nm. = nautical mile 海里

lower hold 腹舱(即一般客机的货舱)

intermediate stop 中转站

flagship 旗舰

eco-friendly 对生态环境友好的,不妨害生态环境的

amphibious 两栖的

executive aviation 公务航空

acquisition price 购买价格

Questions

1. Which components in common do all modern airplanes have?
2. How does the airplane produce lift?
3. What's the function of fuselage?
4. What do the shape and the placement of the wing depend upon?
5. Which control surfaces does an airplane have? Please explain their function respectively.
6. Which types of engine are there currently?
7. Please simply retell the history of Boeing Company.
8. Which effort will the Boeing Company make in the aspect of carbon emission?
9. Please simply introduce the Airbus Company.
10. What's the feature of the A380 aircraft?
11. Please simply introduce the Bombardier Company.
12. Please simply introduce the Embraer Company.

Lesson 2

About the 737 Family

The newest members of the Boeing 737 family—the 737- 600/-700/- 800/-900 models—continue the 737’s pre-eminence as the world’s most popular and reliable commercial jet transport. The 737 family has won orders for more than 6,000 airplanes, which is more airplanes than The Boeing Company’s biggest competitor has won for its entire product line since it began business.

The **737—a short-to-medium-range airplane**—is based on a key Boeing philosophy of delivering added value to airlines with reliability, simplicity and reduced operating and maintenance costs.

The Next-Generation 737 models build on the strengths that made the 737 the world’s most successful commercial airliner, while incorporating improvements and value-added technology designed for the 21st century.

Advanced technology **winglets** (see Fig. 2 - 1) allow airlines to save on fuel, extend its range ,carry more **payload** and reduce engine maintenance costs(Fig. 1). Blended winglets are wing tip extensions which provide several benefits to airplane operators. The winglet option in-

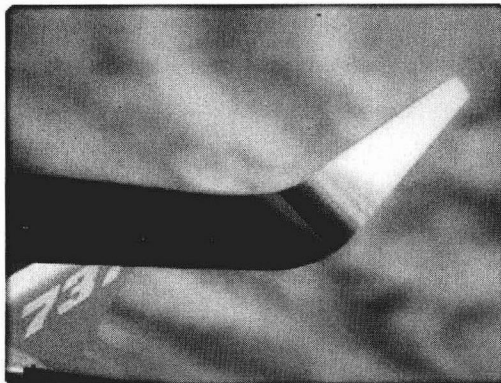


Fig. 2 - 1 Winglet



creates the Next-Generation 737's lead as the newest and most technologically advanced airplane in its class. These new technology winglets are now available on 737-700s, 737-800s and 737-900ER as well as on the Boeing Business Jet (737-700 and 737-800).

The passenger cabin on the Boeing Next-Generation 737s has a new look, providing passengers with comfortable, aesthetically pleasing surroundings. The Boeing 737-900ER is the newest member of the Next-Generation 737 airplane family. The higher capacity, longer-range derivative of the 737-900 was launched on July 18, 2005 with an order for 30 airplanes from Indonesia's Lion Air.

737 Chronology

Did you know about 50 gallons of paint are used to paint an average 737? Once the paint is dry, it will weigh approximately 250 pounds.

You can learn more about the technologically advanced and economical 737 and the secret of its low-fare success. You can also learn how it provides a world of service, never sleeps, and provides more value than its competitor.

Also browse the 737 **chronology** (see Tab. 2 - 1), take a quick look at the 737 Program important dates and find out who has the newest single-aisle jetliners (Tab. 1).

Tab 2 - 1 737 chronology

Model	First Order	Rollout	First Flight	Certification	First Delivery	In Service	First Airline in Service	Last Delivery
737-100	02/15/65	01/17/67	04/09/67	12/15/67	12/28/67	02/10/68	Lufthansa	7/26/73 NASA
737-200	04/05/65	06/29/67	08/08/67	12/21/67	12/29/67	04/28/68	United	08/08/88 Xiamen Airlines
737-300	03/05/81 (go ahead 03/26/81)	01/17/84	02/24/84	11/14/84	11/28/84	12/07/84	Southwest (USA)	12/17/99 Air New Zealand
737-400	06/04/86	01/26/88	02/19/88	09/02/88	09/15/88	10/01/88	Piedmont	02/25/00 CSA Czech Air
737-500	05/20/87	06/03/89	06/30/89	02/12/90	02/28/90	03/02/90	Southwest (USA)	07/26/99 Air Nippon
737-600	03/15/95	12/08/97	01/22/98	07/98	09/19/98	10/25/98	SAS	
737-700	11/17/93 (go ahead 11/17/93)	12/08/96	02/09/97	FAA- 11/7/97 JAA- 2/19/98	12/17/97	01/18/98	Southwest (USA)	



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Model	First Order	Rollout	First Flight	Certification	First Delivery	In Service	First Airline in Service	Last Delivery
737- 800	09/05/94	06/30/97	07/31/97	FAA- 3/13/98 JAA- 4/9/98	04/22/98	04/24/98	Hapag-Lloyd (Germany)	
737-900	11/10/97	07/23/00	08/03/00	03/2001	05/16/01	5/27/01	Alaska (USA)	
737- 900ER	07/18/05	08/08/06					Lion Air	

The Next-Generation 737 family is offered in four sizes, ranging from 110 to 220 seats in mixed-class configuration.

The 737-600 can carry 110 to 132 passengers.

- Scandinavian Airlines (SAS) became the launch customer for the 737-600 on March 15, 1995, when the airline ordered 35 airplanes.

- The 737-600 earned type certification from the U. S. Federal Aviation Administration (FAA) on Aug. 14, 1998, followed by **Europe's Joint Aviation Authorities (JAA)** validation on September 4, 1998.

- First delivery of the 737-600 went to SAS in the third quarter of 1998.

The 737-700 is capable of carrying 126 to 149 passengers.

- The 737-700 was launched in November 1993 with Southwest Airlines' order for 63 airplanes.

- First delivery occurred in December 1997.

- On Nov. 7, 1997, the 737-700 was awarded type certification by the FAA, clearing the airplane for passenger service within the United States.

- On Feb. 19, 1998, JAA—which comprises the aviation regulatory authorities of 27 countries—recommended type validation of the 737-700.

- On Jan. 31, 2006, the 737-700ER (Extended Range) was launched with an order conversion from ANA (All Nippon Airways) for two airplanes.

The 737- 800 can seat 162 to 189 passengers.

- On Sept. 5, 1994, the 737- 800 was launched with commitments from customers for more than 40 of the airplanes.

- On March 13, 1998, the 737- 800 earned type certification from the FAA; JAA type validation followed April 9, 1998.

- The first delivery was to German carrier Hapag-Lloyd in spring 1998.

The 737-900ER can seat 180 to 220 passengers.