# A World of Service for the Boeing 737

In the last assembly position, two engines are installed on each 737.
Somewhere in the world - at this very moment - 1,200 Boeing 737 jetliners are in the air transporting people safely to their destinations.

The Boeing 737 is the most popular commercial passenger jet of all time. Each day, the 4,000 737s that are in service worldwide carry a combined total of about 1.3 million passengers. Every 5.3 seconds, a 737 takes off from an airport somewhere on the globe.

Since the first 737 took to the sky in 1968, the 737 fleet has flown almost 49 billion nautical miles (90 billion kilometers) in about 124 million hours of service.

## Where in the world are the 737s?

When the earliest Boeing 737 model, the 737-100, was introduced in the 1960s, it brought jet travel to people in remote areas who had never even seen a jet. Since then, 737s have opened new air travel markets in areas such as northern Canada and the islands of the South Pacific - in fact, in more new locations than any other commercial airplane.

Today, operators fly 737s in 115 different countries as diverse as the Caribbean's Trinidad and Africa's Tanzania - and the routes and distances they travel vary widely. While many airlines use 737s to transport passengers to sunny destinations, Seattle-based Alaska Airlines operates 737s on a route of nearly 2,160 nautical miles (4,000 kilometers) from Chicago to Anchorage, Alaska.

The 737 is equally comfortable flying north-to-south or east-to-west transcontinental routes, or short hops. Central America's Copa Airlines holds the record for flying the 737's longest commercial route - the 2,858 nautical miles (5,300 kilometers) from Panama City at the top of the South American continent to Buenos Aires, Argentina, in the south. A number of American airlines fly 737s east and west across the North American continent several times daily.

Conversely, Japan TransOcean Air holds the record for the shortest 737 route - 7.6 nautical miles (14 kilometers) between the Japanese islands of Kita Daito and Minami Daito in the Pacific Ocean. Aloha Airlines and Cayman Airways also use 737s on short routes, island-hopping in the Hawaiian and Cayman Islands, and Air Tanzania flies a 737 on the 35-nautical mile (65-kilometer) journey from Dar es Salaam to the Indian Ocean island of Zanzibar.

## Flying higher, faster and farther

The 737 has been upgraded continually with new technologically advanced systems.

Designed entirely on computer during the early 1990s, Boeing introduced its newest line of four 737 passenger models called Next-Generation 737s. They are the 737-600, -700, -800 and -900.

The 737-700 was the first of the four Boeing designed and built. The first operator to order the model in 1993 was Southwest Airlines, a United States-based airline. The second to see the advantages of this new airplane line was Maersk Air of Denmark.

From nose to tail, the Next-Generation 737s are composed of the latest technologies that make them all-new airplanes. They have updated wings, engines, landing gear, auxiliary power units and the newest flight-deck

technologies.

The 737 wings are built at the Boeing factory in Renton, Wash. They are produced in the same building where the Boeing 707 and 727 were once made.
The four Next-Generation 737 models were designed to fly higher, faster and farther than earlier 737s. At altitudes of 39,000 feet (11,900 meters), the airplanes fly higher than competing jetliner models. Airlines benefit from that capability by being able to fly above bad weather and the congested skies of densely populated areas. Flying higher also provides passengers smoother rides.

Flying faster and getting passengers to their destinations in less time also is beneficial. The cruise speed of the newest 737s is 478 miles (770 kilometers) per hour compared with the 430 miles (690 kilometers) per hour of older 737s.

The new wing, lower fuel consumption and other design features of the newer 737s allow them to fly up to 896 nautical miles (1,660 kilometers) farther than older 737s. This increases the number of city-pairs on which airlines can use 737s, opening new markets for carriers around the world.

# Desktop airplane design

Although the overall design of the Next-Generation 737 models was completed during the 1990s, engineering work continues today.

Engineering design of the Next-Generation 737 models is performed at the Boeing manufacturing plant in Renton, Wash., a suburb of Seattle located on the shores of Lake Washington.

To design jetliners, Boeing engineers use a computer software program called CATIA that allows the use of two- and three-dimensional graphics to create engineering drawings that show every part and its relationship to other parts. Computers guarantee the utmost precision, ensuring that each part fits exactly into the next.

Every commercial operator chooses a slightly different configuration - or layout - for its new 737s. Because of the large range of options available, engineers must fine-tune the design of each operator's airplanes, such as creating drawings for the installation of a new type of in-flight entertainment system or a special food-preparation galley.

Design also is ongoing, because Boeing continually makes improvements to the flight-deck technology that pilots use to fly the airplane and to other systems that improve airplane safety or efficiency.

# Assembling 367,000 parts

Boeing Commercial Airplanes performs major assembly of all 737s at its factories in the United States; however, parts for the airplanes come from suppliers all over the world.

Assembling a 737 is a complex job. Factory employees must take 367,000 parts; an equal number of bolts, rivets and other fasteners; and 36 miles (58 kilometers) of electrical wire; and put them all together to form an airplane.

The fuselage, or body of the airplane, is produced at a Boeing plant in Wichita, Kan., in the American Midwest. At that facility, employees attach the nose section of the airplane's fuselage to the center and tail sections. When the fuselage is complete, it is strapped aboard a railroad car for a 2,175-mile (3,500-kilometer) train ride across the United States.

When the train arrives at the Renton factory, the fuselage is transferred to a large cart and wheeled to the

final assembly building, where it spends about 13 days.

During the first stage of final assembly, factory workers focus on the interior. In the same way carpenters might finish the inside of a house, they install insulation material along the inside walls of the fuselage, then add wiring and plumbing.

When the fuselage is ready to move to the next stage of production, an overhead crane located 89 feet (27 meters) above the floor lifts it high into the air and gently places it down into its next position. Here, precision tools are used to install the landing gear and the two wings, making the structure look like a real airplane. At this point, the 737 can roll along the factory floor and take its position in the moving production line.

# A Henry Ford line for airplanes

Once the wings and landing gear are installed, the 737 is pulled to the Moving Line. As each 737 moves along the assembly line, the tail fin and horizontal stabilizer are added and all parts are installed in the flight deck and passenger cabin.
Henry Ford introduced the moving assembly line to automobile manufacturing a century ago. Boeing became the first commercial airframe manufacturer to use the concept to build jetliners when first the 717, and then the 737, production lines were transformed into a moving line. The moving line helps reduce the time to assemble the airplane and also cuts inventory and production costs.

The 737s on the line move continuously at a rate of 2 inches (5 centimeters) per minute; the line stops only for employee breaks, critical production issues or between shifts. Timelines painted on the floor help workers gauge the progress of manufacturing.

Near the beginning of the moving line, an overhead crane lifts the 23-foot-high (7-meter) tailfin into place so it can be attached. Next, floor panels and serving galleys are installed and functional testing begins.

# A tricky little test

In a test called the "high blow," mechanics pressurize the plane to trick it into thinking it is flying 92,847 feet (28,300 meters) in the air (more than twice as high as it will fly in service). Then, inspectors make sure there are no air leaks. In another test, large yellow jacks lift the 154,983-pound (70,300-kilogram) airplane into the air so employees can try out the landing gear retraction system.

As the airplane moves closer to the end of the line, the rest of the interior is completed - lavatories, luggage bins, ceiling panels, carpets, seats and other essentials are installed. Right before the 737 exits the final assembly factory, mechanics attach the jet engines.

Once assembled, the airplane is towed to a hangar for painting. About 50 gallons (189 liters) of paint are used on an average 737; the paint weighs approximately 300 pounds (136 kilograms).

When painting is complete, the airplane is ready for a Boeing test flight - one last step to make sure the 737 is ready to fly passengers. After Boeing test pilots fly the airplane, the customer's airline pilots take it for a test run.

When the customer test flight is complete, the 737 is ready for delivery to its new owner. And one more plane is added to the roster of 737s flying the skies worldwide.

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