



Fact Sheet

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A History of Boeing Aviation Safety Improvements

Boeing works tirelessly to constantly improve the safety of its products and lead the entire industry to higher levels of safety through global collaboration. Given the excellent safety record of modern commercial airplanes, many of today's improvements are incremental. Nevertheless, Boeing's ongoing commitment and efforts to advance safety are substantial. The company's long history of safety improvements began in the 1950s with the introduction of the 707, whose design philosophy lifted the entire industry to a higher safety plateau. This philosophy precludes single-failure modes (i.e., the failure of no single structural component or system can ever be allowed to jeopardize the airplane) and the use of limited-life parts in areas that airlines cannot inspect. What follows are examples of specific safety improvements introduced by Boeing Commercial Airplanes.

Timeline	Safety Improvements
1982	A "glass cockpit," the term used for the integrated display screens backed by flight-management computers, entered commercial airline service aboard the 767. This computer-based technology significantly lessens pilot workload, alerts pilots to aircraft system abnormalities and helps them determine the actions they need to take to mitigate problems.
1993	Boeing introduces Accident Prevention Strategies (APS) analysis, a paradigm shift that changes the focus from what caused the accident to what might have prevented it. By shedding a light on the entire chain of linked events that might combine to allow an accident to happen, APS has undoubtedly allowed the industry to prevent many future accidents

	by identifying and addressing systemic weaknesses.
1995	Boeing delivered its first 777 with seats that are capable of withstanding 16 times the force of gravity (the previous standard was nine times the force of gravity). The seats provide better protection from head impact injuries. All new-production airplanes designed and built after 1998 have the new 16g seats.
1995	Boeing released the Maintenance Error Decision Aid (MEDA), which helps operators identify what causes maintenance errors and how to prevent similar errors in the future.
1996	Boeing introduced the Electronic Checklist (ECL) on the 777 flight deck. The ECL digital system replaces paper checklists and includes all normal and non-normal checklists required for safe operation of an aircraft. All steps in the ECL system are displayed in sequence and must be completed before the system indicates "Checklist Complete," thereby reducing the potential for errors.
1996	Boeing introduced hinged over-wing exit doors on the Next-Generation 737. The doors make egress easier in an emergency.
1997	Boeing released a CFIT Education and Training Aid, which greatly reduced the incidence of "controlled flight into terrain" accidents. This Boeing-produced training package was developed over a three-year period by an industrywide team representing airframe manufacturers, avionics suppliers, airlines, pilot groups, and governmental and regulatory agencies.
1998	Boeing released a Turbulence Education and Training Aid, which helped reduce turbulence-related injuries and minimize aircraft damage by giving pilots and other aviation professionals a stronger knowledge of weather conditions that cause turbulence and tips on how to avoid turbulent conditions.
1998	Boeing delivered its first Next-Generation 737 with a Head-up Display (HUD) system, which increases a pilot's flying precision and situational awareness. HUD shows critical flight information on a transparent glass display positioned between the pilot's eye and the flight deck window. It

	provides an extra margin of safety by allowing a pilot to keep his or her eye "in the sky," rather than looking down at the instrument panels.
1999	Boeing begins delivering new aircraft with a predictive system designed to help pilots avoid windshear, a sudden change in the wind's speed or direction that involves strong side-by-side updrafts and downdrafts. Improving on the earlier reactive windshear alerting system, predictive windshear equipment and improved windshear-training programs for pilots have together virtually eliminated this type of accident.
1999	Boeing released the Procedural Event Analysis Tool (PEAT), which is used to analyze situations in which crew procedural deviations led to a safety hazard or incident. Boeing developed and validated PEAT with the participation of a multi-cultural team comprising representatives of eight airlines in Asia, Europe and North America, as well as the International Federation of Airline Pilots Association.
2003	The Boeing-developed Vertical Situation Display (VSD) delivered on the Next-Generation 737. VSD builds on terrain awareness warning systems by presenting a clear picture of an airplane's vertical position relative to the predicted flight path and terrain. This capability allows pilots to see at a glance potential terrain conflicts and runway overshoots at a much earlier point in time than traditional warning systems.
2003	The Jeppesen Airport Moving Map application entered service on Class 3 Electronic Flight Bags (EFB). The Jeppesen Airport Moving Map uses a detailed database to dynamically render maps of an airport's runways, taxiways and airport structures. Through the use of GPS technology, the application shows pilots their position on the airport surface, reducing the risk of incursions. This important tool is available on both Class 2 and 3 EFBs.
2009	The U.S. Federal Aviation Administration certified the Runway Awareness and Advisory System (RAAS) for the 777. The Boeing configuration of the Honeywell RAAS provides improved situational awareness to the flight crew to help break the chain of events that can

	<p>lead to a runway incursion. The system helps pilots avoid taxiing onto an active runway unintentionally and ensures pilots are taking off or landing on the correct runway. It also provides a visual and audible alert if an airplane inadvertently accelerates for takeoff while still on a taxiway or lines up on a short runway on the ground or on approach</p>
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December 2009
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