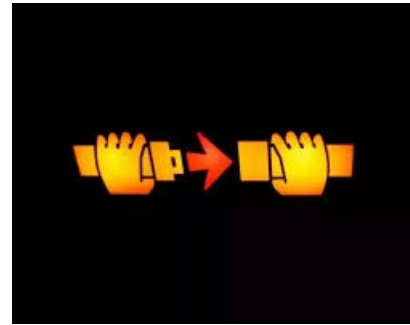


Buckle Up: The History of Aviation Safety Belt Policy

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Everyone who has flown on a commercial flight knows the phrase: “Ladies and gentlemen, the Captain has turned on the Fasten Seat Belt sign. Please be seated and check to see that your seat belt is fastened securely.”¹ However, many travelers do not know that disobeying illuminated safety signs violates federal law. According to 14 C.F.R 121.317(f), a refusal to fasten a seat belt during landing may cost a passenger a fine of \$10,000. But one may wonder when and how seat belts became a fundamental aspect of aviation.

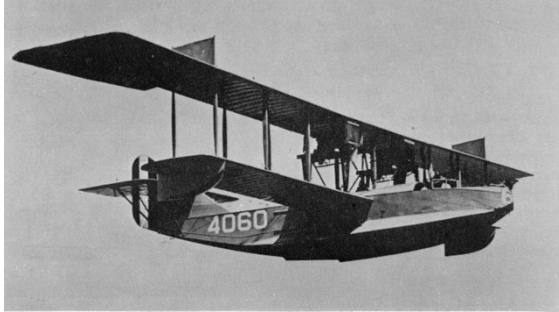


Major General Benjamin D. Foulois
Source: US Air Force

Aviators credit Major General Benjamin D. Foulois for inventing the first aircraft safety belt in 1911. A US Signal Corps officer, Foulois was one of the first military pilots and the fifth Army officer to be given the rating of military aviator. During his training at Fort Sam Houston, Foulois invented multiple inventions for the Wright Military Flyer, such as aviation goggles and wheels to aid in landing. His addition of the safety belt was to prevent himself from being thrown out of the aircraft.² Foulois’s seat belt did an efficient job of keeping pilots inside a plane but did nothing to protect them during a crash. Yet his idea for a seat belt began to spread throughout the aviation community. By the time World War I began in Europe in 1914, the US military began installing seat belts or harnesses in aircraft. After the war, seat belts started to appear in civil aircraft.³

In 1926, the US issued the Air Commerce Act of 1926, the first federal aviation regulations.⁴ The act included the country’s first seat belt regulation, which required “safety belts or equivalent apparatus for pilots and passengers in open-cockpit airplanes carrying passengers for hire or reward.”⁵ Later revisions included the first seat-anchoring regulation, the first occupant restraining strength condition, and requirements for safety belt buckle operation and minimum strength for seat belts, seats, and seat belt anchors.⁶ By 1928, seatbelts were mandatory in all types of aircraft, but passengers were not required to wear them.⁷

Safety belts in the 1920s did little to protect passengers or pilots during crashes. The purpose of safety belts was to prevent passengers from being tossed around or thrown out of the cockpit during turbulence or other maneuvers. Keeping pilots strapped in was especially important for smaller planes because small amounts of turbulence could throw pilots against controls, resulting



A US Navy Curtiss H-16

in deadly crashes. The fatal April 29, 1927, crash of a US Navy H-16 seaplane that killed four highlighted the importance of safety belts. None of the pilots wore safety belts when they hit turbulence, resulting in them being tossed around and one of them hitting a control, causing the plane to crash. The proper wearing of the safety belts could have prevented the pilots from being jostled around and allowed them to remain in control of their plane.⁸

Throughout the 1930s, the federal government continued to update new safety belt regulations for aircraft. The 1931 *Aeronautics Bulletin*, for example, stated that all aircraft required “safety belts or equivalent for pilot and passengers... Seats or chairs in cabin aircraft shall be firmly secured in place. Safety belts and their attachments shall be capable of withstanding a load of 1,000 pounds applied in the same manner as a passenger's weight would be applied in a crash.”⁹ Another *Aeronautics Bulletin*, effective March 1, 1933, required airplanes to have safety belts “capable of withstanding a load of 1,000 pounds applied in the same manner as a person’s weight would be applied in a crash. [Safety belts should] also be easily adjustable and equipped with a quick-release mechanism capable of being operated by hand under a load of 400 pounds.”¹⁰ The following year, the Civil Aeronautics Board issued Aeronautics Bulletin Amendment 7a, effective October 1, 1934, increasing the requirements for safety belts. Belts “and their attachments” should be able to hold 1,000 pounds applied “upwardly and forwardly at an angle of approximately 45° with the floor line.” Seats should also be firmly secured in place.¹¹

During the 1940s, the research behind seat belts shifted from restraints to crashworthiness - from restraining passengers to preventing injury and accidents.¹² In 1945, the US Armed Forces and the Federal Aviation Agency began to examine aircraft crashworthiness separately. In 1947, the Air Force conducted its own studies and found that if secured with a safety belt, the human body can withstand at most 4870 pounds of force without injury.¹³ From these results, seat belt manufacturers focused on creating durable belts and belt buckles that allowed easy removal but would not fly open on impact. Additionally, engineers had to figure out how to securely attach a seatbelt to a seat or plane.

In 1941, the Civil Aeronautics Administration mandated that airplanes must have “a suitable means for warning passengers to fasten seat belts.”¹⁴ The following year, the CAA required “certificated safety belts for all passengers and members of the crew” on board the aircraft.¹⁵ Newly revised civil air regulations in 1945 reiterated the requirement, emphasizing that aircraft operating at day and/or night must have “certificated safety belts for all passengers and members of the crew.”¹⁶ In addition to seat belts, air safety also became a priority, with requirements for “emergency exits or doors, life preservers... and other devices to preserve the safety of passengers and crew.”¹⁷

However, disinformation about the dangers of seat belts deterred the public from wearing them. One common misbelief was that seat belts prevented crash victims from escaping, resulting in them being trapped in their seats and potentially burning to death. News articles of crash victims

trapped in their seats scared the public. For example, a 1922 article about a crash near Tucson reported that “bodies were found in the accustomed places with the safety belts still tightly strapped... no apparent effort had been made by either victim to free himself.”¹⁸ Such stories persisted - for example - in a 1952 article, a survivor described how he had to cut passengers loose from their safety belts.¹⁹ Articles like these fueled the fear of seat belts trapping flyers from escaping a crash site. Another misbelief was that seat belts were killing passengers during a crash. On October 31, 1950, 28 of 30 travelers died aboard a Vickers VC-1 aircraft. Dr. Donald Teare conducted the autopsies and reported in the *British Medical Journal* that “the immediate cause of death in more than half of the victims was acute flexion of the body over the safety belt.”²⁰ The article went viral, scaring people from wearing their safety belts. Dr. Eugene DuBois, the former chair of the Committee on Aviation, refuted the claim in his article in the *British Medical Journal*, concluding that the cause of death was that the crash threw the passengers against hard objects.²¹ Yet, even with the proven mis-conclusion, the damage was done. The skepticism about automobile seat belts also contributed to the decrease in aircraft belt wearing.



A Vickers Viking Aircraft

The Federal Aviation Act of 1958 established the Federal Aviation Agency and emphasized the need for improved aviation safety requirements.²² In 1971, amendments to the Federal Aviation Regulations required that “each occupant of an aircraft fasten his safety belt during the takeoff and landing of that aircraft.” Amendment 91 required that “each person on board occupy a set or berth with a safety belt properly secured about him,” and that it is the “responsibility of the pilot in command to ensure that all persons on board the aircraft have been notified to fasten their safety belt.”²³ Amendment 121 stated that during takeoff and landing... each person... shall occupy an approved seat... with a separate safety belt properly secured about him” except for children under the age of two.²⁴ These laws differed from previous regulations as passengers were now required to wear safety belts. Congress codified requirements for basic safety features and safety belts in 1972.

Over the years, some aviation safety proponents have questioned why airline manufacturers and operators have not adopted shoulder belts like those installed in automobiles. The origin of the shoulder seat belt can be traced to 1939 when the Air Corps designed it for military aircraft. An issue of the *Air Corps News Letter* described the invention as “In appearance, it resembles a pair of suspenders passing over the user’s shoulders. The front ends are latched to the standard lap type safety belt; the back ends are anchored to the airplane seat.”²⁵

Over the years, the shoulder belt began to be implemented in automobiles and smaller aircraft. However, to this day, larger planes still use the lap belt due to its design and aerodynamics. Shoulder belts require a strong secure anchor spot, which would need the airline seats to be heavier, making the plane less aerodynamic. Another option would be



to connect the belts to the wall or ceiling of the aircraft; however, that would increase pressure on the exterior walls.²⁶ Additionally, research has shown that lap belts are sufficient in protecting passengers during turbulence.

Safety belts in aircraft have been around since the beginning of heavier-than-air aviation. Foulois's invention of a strap for pilots led to a new area of research, development, and requirements for aviation safety. The purpose behind seat belts has changed from simple restraints to injury prevention. Legislation for safety belts dates to 1926, and the safety belt used on airliners has gone through many designs and iterations. Even though pilots and passengers have used safety belts since the 1920s, public opinion toward them has wavered. Misconceptions of the dangers of seat belts decreased their usage during the 1950s. However, amendments during the 1970s to the Federal Aviation Regulations mandated that all passengers must wear their safety belts. Hence, it is illegal to not wear a safety belt during takeoff and landing.

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- ¹³ Larry Ronan, “Seat Belts: 1949-1956: Final Report,” DOT-HS-803-911; DOT-TSC-NHTSA-79-01 Seat belts: 1949-1956: Final Report § (1979), 2.
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