



[4910-13]

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 25**

[Docket No. FAA-2015-2490]

**Bird Strike Requirements for Transport Category Airplanes**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Request for comments on bird strike requirements for transport category airplanes.

**SUMMARY:** This document solicits public comments on the need for, and the possible scope of, changes to the bird strike certification requirements for transport category airplanes. The FAA is not currently proposing a specific regulatory action. The purpose of this request is to gather comments from airplane manufacturers and other interested parties on this subject.

**DATES:** Send comments by [INSERT DATE 120 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

comments to: [Todd.Martin@faa.gov](mailto:Todd.Martin@faa.gov).

**ADDRESSES:** Send comments, identified by Docket No. FAA-2015-2490, using any of the following methods:

- Federal eRulemaking Portal: Go to <http://www.regulations.gov> and follow the online instructions for sending your comments electronically.

- Mail: Send comments to Docket Operations, M-30; U.S. Department of Transportation, 1200 New Jersey Avenue, S.E., Room W12-140, West Building Ground Floor, Washington, DC 20590-0001.
- Hand Delivery or Courier: Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, S.E., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- Fax: Fax comments to Docket Operations at 202-493-2251.

Privacy: In accordance with 5 U.S.C. 553(c), DOT solicits comments from the public to better inform its rulemaking process. DOT posts these comments, without edit, including any personal information the commenter provides, to [www.regulations.gov](http://www.regulations.gov), as described in the system of records notice (DOT/ALL-14 FDMS), which can be reviewed at [www.dot.gov/privacy](http://www.dot.gov/privacy).

Docket: Background documents or comments received may be read at <http://www.regulations.gov> at any time. Follow the online instructions for accessing the docket or go to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, S.E., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** Todd Martin, Airframe and Cabin Safety Branch, ANM-115, FAA, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, WA 98057-3356; telephone (425) 227-1178; facsimile (425) 227-1232; e-mail [Todd.Martin@faa.gov](mailto:Todd.Martin@faa.gov).

## **SUPPLEMENTARY INFORMATION:**

### **Comments Invited**

The FAA invites interested persons to comment on the need for, and the possible scope of, changes to the bird strike requirements for transport category airplanes by submitting written data, views, or arguments as they may desire. We have conducted a review of bird strike data, and we are considering whether to revise the requirements, as described in this document. We invite comments relating to the technical or economic impact that might result from any of the rule changes discussed herein, as well as any alternative suggestions. Substantive comments should be accompanied by estimates of their economic impact if possible. All comments received by the closing date for comments will be considered by the FAA.

### **Background**

Bird strike requirements for transport category airplanes are specified in Title 14, Code of Federal Regulations (14 CFR), part 25, and vary depending on the structural component being evaluated. Section 25.775 requires windshields and their supporting structure withstand, without penetration, impact with a four-pound bird at  $V_C$  (design cruising speed) at sea level. This regulation has been in place and is unchanged since part 25 was introduced in 1965.

Section 25.631 requires the empennage structure be designed to assure continued safe flight after impact with an eight-pound bird at  $V_C$  at sea level, including consideration of control system elements. This regulation was introduced at Amendment 25-23 (effective May 8, 1970) as a result of the 1962 Vickers Viscount

accident, which was caused by impact with a swan, estimated to weigh between 12 and 17 pounds, that damaged the horizontal stabilizer and elevator.

Section 25.571 considers the rest of the airframe and requires the airplane be capable of continued safe flight after impact with a four-pound bird at  $V_C$  at sea level, and  $.85 V_C$  at 8000 feet. This regulation was introduced at Amendment 25-45 (effective December 1, 1978) with some changes in the speed definition since then. A speed criterion is provided at 8000 feet to ensure adequate bird strike resistance capability up to that altitude.

In 1993, the FAA was developing a notice of proposed rulemaking to establish a consistent eight-pound bird requirement for all structures. The FAA decided instead to task the Aviation Rulemaking Advisory Committee (ARAC) to evaluate the bird strike requirements and make recommendations. The working group completed its deliberations in 2003 without reaching agreement. All members in the working group, except the FAA, favored reducing the eight-pound bird requirement in § 25.631 to four pounds, thus establishing a consistent four-pound bird requirement for all structures. Other changes to the requirements were considered by the group, but none were adopted. The working group report is available at:

[http://www.faa.gov/regulations\\_policies/rulemaking/committees/documents/media/TAEgshT1-031593.pdf](http://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/TAEgshT1-031593.pdf).

More recently, the National Transportation Safety Board (NTSB) issued the following Safety Recommendation to the FAA as a result of a fatal Cessna 500 accident that occurred in 2008: A-09-072, “Revise the bird-strike certification requirements for Part 25 airplanes so that protection from in-flight impact with birds is consistent across

all airframe structures. Consider the most current military and civilian bird-strike database information and trends in bird populations in drafting this revision.”

To determine the adequacy of current bird strike certification requirements, the FAA reviewed a number of reports, including the 2003 ARAC report, and other reports that address bird populations. We also reviewed recent bird strike event data and compared the energy levels of bird strike events to the energy levels prescribed in the current requirements. We found numerous bird strike events in which the energy level exceeded that specified in current part 25 requirements.

### **Sample of Bird Strike Event Data**

The severity of a bird strike depends primarily on kinetic energy, which is proportional to mass times velocity squared. Bird strikes involving birds greater than four pounds occur often, but usually at speeds below the design cruising speed,  $V_C$ . Therefore, the energy level of such strikes is usually below that specified in current requirements. However, in some cases, that energy level is exceeded.

In each of the bird strike events shown below, the FAA estimates that the energy level of the strike exceeded that specified in current requirements. This is not an exhaustive list; these are just some examples of events that occurred in the US since the 2008 Cessna accident. For these events, we estimated the energy level of the event and compared it to the current four-pound bird requirement specified in §§ 25.571 and 25.775.

**RECENT EXAMPLES OF BIRD STRIKE EVENTS IN WHICH  
THE ENERGY LEVEL EXCEEDED THE CURRENT AIRPLANE-LEVEL  
STANDARD (4 POUND BIRD AT V<sub>C</sub>)**

**1. Energy level approximately 1.8 times current certification standard.**

**Date:** 4 March 2008.

**Aircraft:** Cessna Citation Model 500.

**Airport:** Wiley Post (OK).

**Phase of Flight:** Climb (3,100' MSL (mean sea level)).

**Estimated Airspeed:** 198 KTAS (knots true airspeed).

**Effect on Flight:** Crashed.

**Wildlife Species:** American white pelican (mean weight 12.5 lb.). Multiple birds.

**Damage:** Aircraft destroyed. Five fatalities. Shortly after takeoff, the airplane flew through a flock of birds. There was no evidence that any pieces of the airplane separated in flight. Bird residues were identified on the right horizontal stabilizer and the right side of the vertical stabilizer.

**2. Energy level approximately 2.3 times current certification standard.**

**Date:** 8 April 2008.

**Aircraft:** Bombardier Challenger 600.

**Airport:** Colorado Springs (CO).

**Phase of Flight:** Climb (8,000' MSL).

**Estimated Airspeed:** 260 KTAS.

**Effect on Flight:** Precautionary landing.

**Wildlife Species:** American white pelican (mean weight 12.5 lb.). Multiple birds.

**Damage:** One bird penetrated the fuselage below the cockpit windows, through the forward pressure bulkhead and into the cockpit. Both engines ingested at least 1 bird. The #1 engine had fan damage; the #2 engine lost power and had a dented inlet lip. Noise and wind in the flightdeck. The left engine had high vibration levels. The fuselage skin and forward pressure bulkhead were penetrated and contained bird matter. The left engine thrust reverser torque box assembly and pylon tracks were bent, and the engine cowl supports were broken.

**3. Energy level approximately 1.5 times current certification standard.**

**Date:** 3 February 2009.

**Aircraft:** Boeing 757-200.

**Airport:** Denver International (CO).

**Phase of Flight:** Climb (7,500' MSL).

**Estimated Airspeed:** 270 KTAS (Airspeed not recorded. Airspeed estimate assumes airplane was flying 10 knots below 250 KIAS speed restriction. At 7500' MSL, 250 KIAS is approximately equal to 280 KTAS).

**Effect on Flight:** Emergency landing.

**Wildlife Species:** Bald eagle (mean weight 10.4 lb.). Single bird.

**Damage:** Bird hit right side of engine cowling making a large dent before entering the engine where it damaged all fan blades.

**4. Energy level approximately 4.2 times current certification standard.**

**Date:** 10 August 2010.

**Aircraft:** Embraer 145.

**Airport:** Salt Lake City International (UT).

**Phase of Flight:** Approach (11,000' MSL).

**Estimated Airspeed:** 290 KTAS.

**Effect on Flight:** Landed using back up radio.

**Wildlife Species:** American white pelican (mean weight 12.5 lb.). Multiple birds.

**Damage:** Birds punctured the nose of the aircraft between the nose cone and windshield.

The birds damaged the skin, stringers, structural mounts and various avionics equipment.

One bird penetrated the airplane's skin and entered the forward avionics bay. The captain lost a number of his primary instruments.

**5. Energy level approximately 2.3 times current certification standard.**

**Date:** 08 November 2010.

**Aircraft:** Bombardier DHC-8.

**Airport:** Los Angeles International (CA).

**Phase of Flight:** Approach (6,600' MSL).

**Estimated Airspeed:** 243 KTAS.

**Effect on Flight:** Emergency landing.

**Wildlife Species:** Common loon (mean weight 9.1 lb.). Single bird.

**Damage:** Bird impact resulted in a 12-inch hole in the right wing leading edge, and internal structural damage to the right wing and fuel tank.

**6. Energy level approximately 1.2 times current certification standard.**

**Date:** 15 November 2010.

**Aircraft:** Embraer 170.

**Airport:** Minneapolis-St. Paul International (MN).

**Phase of Flight:** Climb (5000' MSL).



**Estimated Airspeed:** 270 KTAS.

**Effect on Flight:** Precautionary landing.

**Wildlife Species:** Snow goose (mean weight 5.8 lb.). Multiple birds.

**Damage:** Radome, engine, fuselage. Autothrottle system disengaged. First officer's primary flight display had alert flags for the indicated airspeed and altitude parameters.

Substantial damage to the radome and its underlying structural components. The forward pressure bulkhead web contained a dent and puncture. The left engine compressor section was damaged.

**7. Energy level approximately 1.4 times current certification standard.**

**Date:** 01 November 2011.

**Aircraft:** Airbus 320.

**Airport:** Minneapolis-St Paul International (MN).

**Phase of Flight:** Climb (3300' MSL).

**Estimated Airspeed:** 220 KTAS.

**Effect on Flight:** Precautionary landing, emergency declared.

**Wildlife Species:** Tundra swan (mean weight 14.8 lb.). Single bird.

**Damage:** Bird hit right side of nose. Substantial damage to the radome, nose, #2 engine and forward pressure bulkhead.

**8. Energy level approximately 1.8 times current certification standard.**

**Date:** 25 October 2012.

**Aircraft:** Boeing 757-200.

**Airport:** Boise Air Terminal (ID).

**Phase of Flight:** Climb (14,000' MSL).

<b>Estimated Airspeed:</b> 390 KTAS.
<b>Effect on Flight:</b> Precautionary landing.
<b>Wildlife Species:</b> Snow goose (mean weight 5.8 lb.). Multiple birds.
<b>Damage:</b> The radome was penetrated and the bulkhead was punctured. There was extensive damage to the #2 engine.
<b>9. Energy level approximately 2.2 times current certification standard.</b>
<b>Date:</b> 12 October 2013.
<b>Aircraft:</b> Cessna 525.
<b>Airport:</b> Lincoln (NE).
<b>Phase of Flight:</b> Climb (6400' MSL).
<b>Estimated Airspeed:</b> 220 KTAS.
<b>Effect on Flight:</b> Precautionary landing.
<b>Wildlife Species:</b> American white pelican (mean weight 12.5 lb.). Single bird.
<b>Damage:</b> Substantial damage to the outer right wing spar.

These event data, including estimated airplane altitude and airspeed, are derived from the following reports:

1. The FAA Wildlife Strike Database, available at:  
[http://www.faa.gov/airports/airport\\_safety/wildlife](http://www.faa.gov/airports/airport_safety/wildlife).
2. The FAA Aviation Safety Information Analysis and Sharing (ASIAS) System, available at: <http://www.asias.faa.gov>. This includes the FAA Accident/Incident Data System, and the NTSB Aviation Accident and Incident Data System.

3. National Transportation Safety Board. 2009. *Aircraft Accident Report: Crash of Cessna 500, N113SH, Following an In-Flight Collision with Large Birds, Oklahoma City, Oklahoma, March 4, 2008*. Aircraft Accident Report NTSB/AAR-09/05. Washington, DC.

In addition to the events listed above, there are hundreds of examples of bird strike events in which the energy level did not exceed current requirements, but substantial damage to the airframe occurred. In addition to structural damage, major damage to electrical, flight control and fuel systems has occurred, and there have been dozens of incidents in which the flight deck was penetrated.

### **Bird Population Trends**

The bird strike threat has increased, especially the threat due to larger birds. In a report commissioned by the FAA, *Assessment of Wildlife Strike Risk to Airframes*; Herricks, Mankin, and Shaeffer; December 2002; the authors wrote, “The findings of this report, supported by other literature, indicate that future operational environments for aircraft can be expected to contain larger numbers of birds, and larger numbers of birds with weights greater than four pounds.”

According to *Wildlife Strikes to Civil Aircraft in the United States, 1990–2013*, US Depts. of Transportation and Agriculture, July 2014: “Many populations of large bird and mammal species commonly involved in strikes have increased markedly in the last few decades and adapted to living in urban environments, including airports. For example, the resident (non-migratory) Canada goose population in the USA and Canada increased from about 0.5 million to 3.8 million from 1980 to 2013 (Dolbeer et al. 2014, U.S. Fish and Wildlife Service. 2013). During the same time period, the North American

snow goose population increased from about 2.1 million to 6.6 million birds (U.S. Fish and Wildlife Service. 2013). Other large-bird species that have shown significant population increases from 1980 to 2012 include bald eagles (6.4 percent annual rate of increase), wild turkeys (9.5 percent), turkey vultures (2.7 percent), American white pelicans (7.9 percent), double-crested cormorants (6.1 percent), sandhill cranes (5.9 percent), great blue herons (1.2 percent), and ospreys (3.0 percent, Sauer et al. 2014). Dolbeer and Begier (2013) examined the estimated population trends and numbers for the 21 species of birds in North America with mean body masses greater than 4 pounds and at least 10 strikes with civil aircraft from 1990-2012. Of these 21 species, 17 had shown population increases from 1990-2012 with a net gain of 17 million birds. Previous research had documented that 13 of the 14 bird species in North America with mean body masses greater than 8 pounds showed significant population increases from 1970 to the early 1990s (Dolbeer and Eschenfelder 2003).”

### **Airspeed Information**

In the U.S., § 91.117 prescribes a speed restriction of 250 knots indicated airspeed below 10,000 feet mean sea level. The 250 knot speed restriction is also in place in Mexico and Canada, and in many areas around the world, but not everywhere. Where this speed restriction is in place, it provides a significant safety benefit with respect to bird strikes.

While deviations to this speed restriction are allowed, and the requirement is not global, it does indicate that limiting airspeed below 10,000 feet is operationally feasible for transport category airplanes. Indeed, to meet current bird strike criteria, some manufacturers specify relatively low  $V_{MO}$  and  $V_C$  airspeeds up to 8000 feet, that increase

above that altitude. These speed “cutbacks” at lower altitudes are beneficial for three reasons: 1) they increase safety by reducing the energy of any bird strike that occurs below 8000 feet, 2) they apply to all airspace, not just those areas covered by US operating regulations, or those of other countries, and 3) they reduce the bird strike speeds to which the airplane must be designed.

To encourage these speed cutbacks, we believe establishing the bird strike speed criteria based on  $V_{MO}$  rather than  $V_C$  may be warranted. While most structures rules are based on  $V_C$ , allowing these very speed-dependent criteria to be based on  $V_{MO}$  may make the establishment of speed cutbacks easier to achieve.

### **Summary of FAA Findings**

Our review of bird strike event data and bird population data indicates the following:

1. Bird strikes have occurred and will continue to occur at energy levels that exceed the level provided by current requirements.
2. Numerous bird strikes have resulted in penetration into the flight deck, mostly below the windshield, even at energy levels below current requirements. Penetration of the cockpit obviously introduces a number of significant risks to the airplane. Currently, there is no requirement that specifically prohibits penetration of the flight deck through structure other than the windshield.
3. The bird strike threat has increased, especially the threat due to larger birds. Therefore, current fleet history may not be indicative of what to expect in the future.
4. Bird strike events often involve more than one bird. Such multiple bird strikes may result in structural damage in several areas, pilot disorientation, engine failure and

systems failures. Any one of these effects can significantly reduce the controllability of the airplane. Sections 25.571 and 25.631 assume a single bird strike, rather than multiple bird strikes. The FAA believes that this single bird strike approach is an adequate approach for airframe structure as long as the single bird strike criteria are robust. By showing the structure capable of withstanding a significant bird strike in any one area, a bird strike to that area should not compound the hazard from strikes in other areas.

5. Limiting airspeed below 10,000 feet is operationally feasible for transport category airplanes. Bird strike data indicate numerous damaging bird strikes have occurred above 8000 feet, but above 10,000 feet, bird strikes are rare. Therefore, expanding the envelope above 8000 feet, but limiting it at 10,000 feet, may be warranted.

6. Establishing reduced  $V_{MO}$  and  $V_C$  airspeeds at lower altitudes provides a significant safety benefit with respect to bird strikes.

### **Request for Comments**

The FAA invites interested persons to comment on the need for, and the possible scope of, changes to the bird strike requirements for transport category airplanes by submitting written data, views, or arguments as they may desire. We invite comments relating to the technical or economic impact that might result from any considerations discussed herein, as well as any alternative suggestions. In particular, we invite information, comments, and opinion on the following questions:

1. Should the bird weight requirement be applied consistently across the airplane?

2. Should the bird weight requirement be increased, to eight pounds or some other value?

3. Should a “no-penetration” requirement be applied to the entire fuselage, not just the windshields?
4. Should the bird strike criteria be expanded to 10,000 feet?
5. Should the 0.85 speed reduction factor at 8000 feet, currently specified in § 25.571, be removed?
6. Should the speed criterion for bird strikes be based on  $V_{MO}$  rather than  $V_C$ ?

### **Conclusion**

This document solicits public comments on the need for, and the possible scope of, changes to the bird strike certification requirements for transport category airplanes.

### **List of Subjects in 14 CFR Part 25**

Aircraft, Aircraft safety.

Issued in Renton, Washington, on June 25, 2015

Jeffrey E. Duven  
Manager, Transport Airplane Directorate  
Aircraft Certification Service  
[FR Doc. 2015-17404 Filed: 7/17/2015 08:45 am; Publication Date: 7/20/2015]