National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: March 15, 2011

In reply refer to: A-11-16

The Honorable J. Randolph Babbitt
Administrator
Federal Aviation Administration
Washington, DC 20591

The National Transportation Safety Board (NTSB) is investigating three incidents involving Cessna Aircraft Company (Cessna) 560XL airplanes that experienced loss of rudder control after ice built up inside the tailcone.[1] Preliminary findings indicate that water can collect inside the tailcone and then freeze around and restrict the movement of the rudder boost cables and pulleys. As long as the frozen ice impedes the cables and pulleys, the pilot may be unable to deflect the rudder, which is particularly dangerous when attempting to land in a crosswind or maneuver on the runway. Normally, a pilot would not use the rudder during cruise flight and would not detect that the rudder was frozen until just before or after landing. Although the investigations are ongoing, the information gathered to date has raised serious concerns about the potential loss of rudder control when ice builds up inside the tailcone. We believe this matter warrants action by the Federal Aviation Administration (FAA).

Background

On December 1, 2010, about 1336 eastern standard time, a Cessna 560XL, N607QS, experienced a jammed (unresponsive) rudder during landing at Toledo Express Airport, near Toledo, Ohio. The two pilots and one passenger were not injured, and the airplane sustained no damage. The nonscheduled, domestic passenger flight was conducted under 14 *Code of Federal Regulations* (CFR) Part 135. Visual meteorological conditions prevailed at the time of the accident, and the flight was operating on an instrument flight rules flight plan.[2]

During the approach to landing, the pilot disengaged the yaw damper[3] about 600 feet above ground level. He then experienced a jammed rudder as he tried to align the airplane's

[1] The tailcone is a metal assembly, installed at the rear of the airplane's empennage under the rudder. Cessna refers to the tailcone as a tailcone stinger.

[2] Preliminary information about this incident, CEN11IA087, can be found on the NTSB's website at <http://www.ntsb.gov>.

[3] A yaw damper is a device used on many aircraft (usually jets and turboprops) to reduce roll and yaw oscillations.

flightpath with the runway's centerline during the flare. The pilot stated in writing to the NTSB that "the rudder pedals were hard…. I actuated the autopilot disconnect button three times in rapid succession in case the [yaw damper] was still connected. No effect." The pilot further stated that, when he applied the rudder pedals, the rudder would not move. The pilot reported that he received no other indications, such as changes in handling qualities, that the rudder was not operating normally. The pilot stated that, after landing, he was able to slow and maintain directional control of the airplane only through differential braking (that is, asymmetrical application of the main landing gear brakes).

FAA inspectors examined the airplane at a fixed-base operator (FBO) and found that ice had formed at the bottom of the tailcone and around the rudder boost cables and pulleys in the tailcone (see figures 1 and 2).[4]



Figure 1. Ice found in the bottom of the tailcone.

[4] The rudder boost cables and pulleys are near the bottom of the tailcone and are attached directly to the rudder cables. The cables affected by the icing are from the rudder boost system to the rudder bell crank. The main rudder cables are not affected. However, frozen rudder boost system cables effectively prevent the movement of the main rudder cables and rudder.

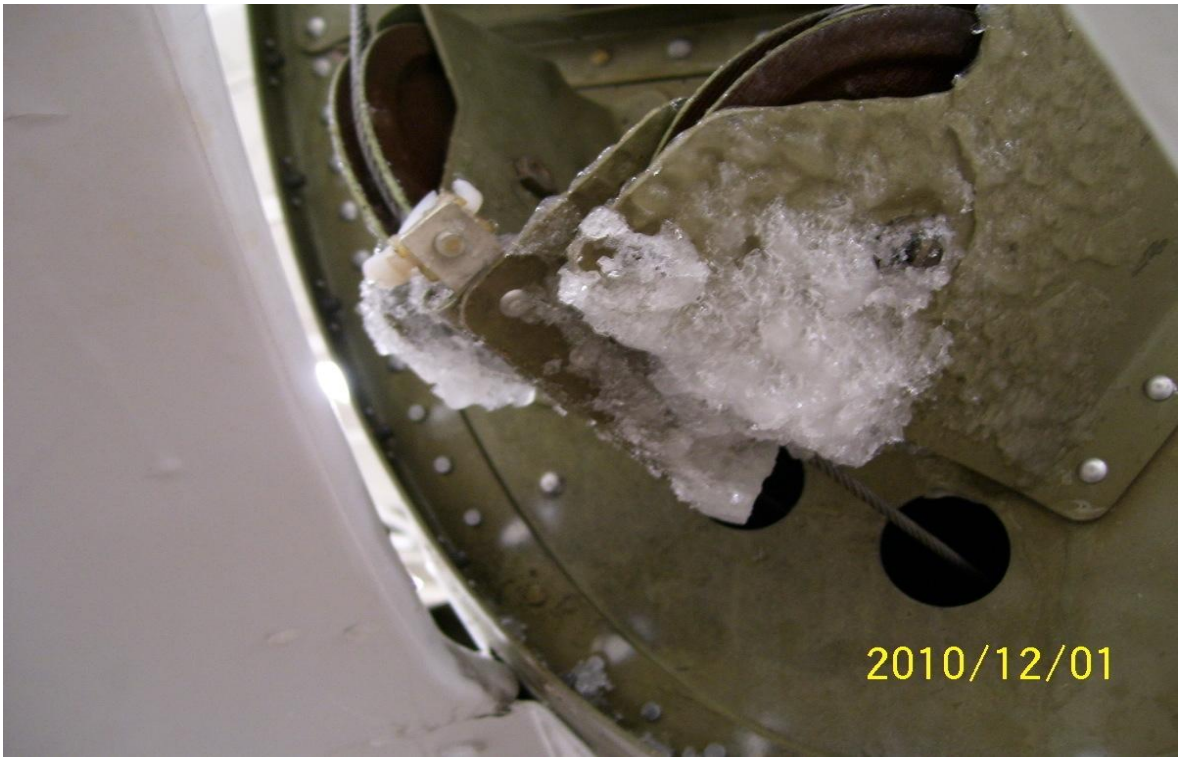

Figure 2. Ice found on the rudder boost cables and pulleys.

On December 13, 2010, about 0657 central standard time, a Cessna 560XL, N498AB, experienced a jammed rudder during its landing at Birmingham-Shuttlesworth International Airport, near Birmingham, Alabama.[5] The pilots and passenger were not injured, and the airplane sustained no damage. The nonscheduled, domestic passenger flight was conducted under 14 CFR Part 135. Visual meteorological conditions prevailed at the time of the accident, and the flight was operating on an instrument flight rules flight plan. A postincident examination inside the airplane's tailcone revealed ice around the rudder boost cables and pulleys.

On December 20, 2010, about 1909 mountain standard time, a Cessna 560XL, N626QS, also experienced a jammed rudder during landing at Idaho Falls, Idaho.[6] The pilots and passenger were not injured, and the airplane sustained no damage. The nonscheduled, domestic passenger flight was conducted under 14 CFR Part 135. Marginal visual meteorological conditions prevailed at the time of the accident, and the flight was operating on an instrument flight rules flight plan. The initial flight crew discrepancy report indicated that the rudder was jammed during landing and that further operations were conducted with differential braking. After about 15 minutes, the pilots verified that the rudder was again operational.

[5] Preliminary information about this incident, CEN11IA111, can be found on the NTSB's website at <http://www.ntsb.gov>.

[6] Per 49 CFR 830.5(a)(1), the operator reported this incident to the NTSB. The data was collected, but the operator's maintenance crew could not verify the presence of ice in the tailcone, and rudder operation returned to normal.

Discussion

According to Cessna, water can enter the Cessna 560XL tailcone through a large opening at the top of the tailcone where the rudder torque tube passes into it. In order to prevent water from accumulating in the tailcone, Cessna, on April 21, 2005, issued service letter (SL) 560XL-53-05, which requested that all operators drill a 0.201-inch-diameter drain hole in the bottom of the tailcone. However, while in flight, low pressure develops across the tailcone; the pressure differential across the drain hole is sufficient to draw water into the tailcone and also prevents water from draining. The water can then collect during flight and can rise to the level of the rudder boost cables and pulleys, potentially freezing around the cables and pulleys, as seen in figure 2. When the water freezes, the motion of the rudder boost cables and pulleys is restricted.

For the Cessna 560XL airplane involved in the December 1, 2010, incident, maintenance records indicate that a hole had been drilled in the tailcone. However, when the FAA personnel examined the hole postincident, it measured 0.182 inch, which was smaller than the 0.201-inch diameter required by the SL. Three other Cessna 560XL airplanes were at the Toledo FBO after the December 1, 2010, incident. FAA personnel examined these three airplanes and found that holes smaller than 0.201 inch were present in these airplanes' tailcones. Both the December 13, 2010, and December 20, 2010, incident airplanes had the correct 0.201-inch-diameter hole (as required by SL 560XL-53-05), according to FBO and operator maintenance personnel, respectively.

All three Cessna 560XL incident airplanes likely had ice in their tailcones. Because the December 13 and 20, 2010, incident airplanes had the correct 0.201-inch-diameter hole in their tailcones and still collected moisture that froze around the rudder's boost cables, it is evident that a tailcone hole that complies with SL 560XL-53-05 is not sufficient to adequately drain moisture and may allow water to enter the tailcone during flight.

The NTSB understands that Cessna has developed a modification to address the problem of water collecting in the tailcone area. SL 560XL-53-08 asks operators to, within 90 flight hours or 90 days from the date of receipt, drill a 0.75-inch-diameter hole in the bulkhead in the aft fuselage frame, slightly above the lower edge and below the holes for the rudder boost cables. This hole would drain any water from the tailcone into the fuselage before the water level could become high enough to freeze around the rudder boost cables or pulleys. SL 560XL-53-08 also proposes that operators seal the drain hole in the tailcone, if one exists.

A pilot may not detect that water has collected and frozen in the tailcone until he needs to use the rudder to align the airplane with the runway for landing or to maneuver while at high speed during the landing rollout. Thus, the risk associated with the accumulation of ice can lead to an accident because the pilot may not be able to prevent the airplane from exiting the runway at high speed. Further, in the event of an engine failure, the use of the rudder to maintain directional control is crucial at any time. Thus, it is critical that operators take specific action to ensure that ice does not form inside the tailcones of Cessna 560XL airplanes. The NTSB concludes that a drain hole between the tailcone and fuselage would provide a path for water to exit the tailcone before freezing.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

> Issue an airworthiness directive to require that all Cessna 560XL operators comply with Cessna service letter 560XL-53-08. (A-11-16)

In response to the recommendation in this letter, please refer to Safety Recommendation A-11-16. If you would like to submit your response electronically rather than in hard copy, you may send it to the following e-mail address: correspondence@ntsb.gov. If your response includes attachments that exceed 5 megabytes, please e-mail us asking for instructions on how to use our secure mailbox. To avoid confusion, please use only one method of submission (that is, do not submit both an electronic copy and a hard copy of the same response letter).

Chairman HERSMAN, Vice Chairman HART, and Members SUMWALT, ROSEKIND, and WEENER concurred with this recommendation.

[Original Signed]

By: Deborah A.P. Hersman
Chairman