# breaking the ICE jam

**Directive targets frozen controls in Citations.**

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Reacting to recurring incidents involving Cessna 560XL rudder jamming, the U.S. Federal Aviation Administration (FAA) has issued an airworthiness directive (AD) requiring modifications to reduce the amount of water that can accumulate in the aft fuselage and freeze on the rudder control cables and pulleys.

Effective April 25, the AD, 2012-06-01, applies to about 475 Cessna 560XLs — the Citation Excel, XLS and XLS+ — registered in the United States. It requires, in part, the installation of water drain holes and air seals in the "tailcone stingers" — the aftmost portion of the fuselage, beneath the empennage — within 12 months or 800 flight hours, whichever comes first.

The directive is the latest in a series of actions dating back to April 2005, when Cessna began drilling drain holes in the bottom of the tailcone stingers on production airplanes and issued a service letter, SL560XL-53-05, recommending that owners of existing 560XLs do the same.

One of the first indications that the fix was not successful came about five years later. On Dec. 1, 2010, a pilot was unable to move the rudder pedals when he attempted to initiate a crosswind correction while landing at Toledo, Ohio. No damage or injuries occurred, but differential thrust and wheel braking had to be used to taxi the airplane to the ramp. During an external inspection of the airplane, the pilot tried to move the rudder by hand, but it would not budge. Maintenance personnel found ice in the tailcone stinger, and further examination by an FAA inspector revealed that although a drain hole had been incorporated per the service letter, it was smaller than specified. The inspector examined other 560XLs in a maintenance hangar at Toledo and found three that also had drain holes smaller than specified by SL560XL-53-05.

Twelve days later, on Dec. 13, 2010, a flight crew found that rudder control was "unusually stiff" after disengaging the autopilot and yaw damper on final approach to Birmingham, Alabama. As in the Toledo incident, the airplane was

landed without further event, and the crew had to use the brakes to steer the business jet to the ramp. Investigators for the U.S. National Transportation Safety Board (NTSB) found another similarity: Both airplanes had been parked outside in the rain before the incident flights and had encountered freezing temperatures en route. Unlike the Toledo incident, however, the Birmingham airplane had a drain hole that met the dimension specified by the service letter.

During the investigation, NTSB also found that a similar incident had occurred at Idaho Falls, Idaho, on Dec. 20, 2010.

The incidents prompted Cessna to issue an alert service letter, ASL560XL-53-08, on Jan. 21, 2011, advising owners to seal the hole prescribed by the initial service letter and to drill two new drain holes — in the forward stinger bulkhead and in the tailcone frame forward of the stinger.

NTSB recommended that an AD be issued to mandate compliance with the alert service letter, but the FAA cited evidence that the specified modifications had not solved the problem. Foremost, there had been another incident, this time involving a 560XL that had been modified according to the ASL. The airplane was en route from Baltimore to the Bahamas on March 10, 2011 — after having been on a ramp in moderate rain for 1.5 hours — and was climbing through 29,000 ft when the pilot flying noticed that the yaw damper was not functioning normally. After disengaging the yaw damper and the autopilot, he exercised the flight controls and found that the rudder was jammed. The crew decided to divert to Myrtle Beach, South Carolina. "Descending through 13,000 ft, normal rudder operation returned, and the subsequent approach and landing [at Myrtle Beach] were uneventful," the NTSB report said. After parking the airplane, the pilots saw water dripping from the airplane; further inspection revealed ice in the bottom of the tailcone stinger.

Modifications include seals to reduce the amount of water and air entering the tailcone, and holes to improve drainage.

In its response to NTSB, the FAA also noted that it had participated with Cessna in test-flying an ASL-compliant airplane equipped with video cameras in the tailcone stinger. The tests showed in part that air could enter through seams in the bottom of the stinger and through one of the drain holes with enough velocity to splatter water onto the rudder pulleys and cables. Only after building up in a large quantity would water overcome the air flowing into the drain hole and exit the stinger. The FAA told NTSB that the investigation was continuing and that several design changes were being considered.

NTSB classified the FAA's response as "acceptable" and stated that the recommendation would remain open until further action was taken. That action came on Oct. 4, 2011, when Cessna issued a service bulletin, SB560XL-53-16, introducing "additional modifications to reduce the amount of moisture that can enter the tailcone stinger and improve drainage."

The FAA followed up in December with a proposal to mandate compliance with Cessna's service bulletin, as well as the earlier alert service letter where applicable. The agency explained that while parked or during ground operations in rain, a 560XL can accumulate a large amount of water that pools in the lowest point of the stinger. "This water sprays onto the rudder bias cables and pulley due to the inflow of air into the stinger," it said. "Therefore, as the airplane climbs to temperatures below 32 degrees F, the water freezes on the cables, pulleys and mounting brackets. The ice acts as an adhesive, which prevents the pulleys from rotating and the cables from sliding on the pulleys."

NTSB has told FAA that although it believes the airworthiness directive will "accomplish the desired safety result," Cessna 560XL owners should modify their airplanes before the allotted 12 months or 800 flight hours. "Accomplishing the AD in the shortest time frame is appropriate, given that the loss of rudder authority may go undetected until the moment it is needed."