



Here Comes The Iceman

An F-27 accident investigated by U.S. NTSB revealed the flight crew could have possibly avoided the situation by better pre-flight visual inspection and by properly using anti-ice.

Winter — and ice — is already making its presence known in the northern hemisphere, along with its many trials for pilots, meteorologists, aviation mechanics and schedulers.

Although ice takes its annual toll, many pilots still fail to give it the respect it deserves. “Out of sight, out of mind” appears to be the credo of some flight crews. And engine ice is often “out of sight.” Consider the following:

An F-27, with three crewmembers and 21 passengers on board, was taking off from New York’s John F. Kennedy International Airport (JFK) on a winter afternoon for a scheduled commuter flight to Ottawa.

When the non-flying captain raised the landing gear, the propeller on the left engine autofeathered. As he initiated emergency procedures, the right engine experienced a power loss, and the aircraft began to descend.

The flying copilot maintained directional control, and the captain immediately put the landing gear lever in the down position. The F-27 struck the runway while the gear was still extending and skidded for approximately 1,200 feet before coming to a stop.

The captain and 13 passengers received minor injuries, and the flight attendant, who had been seated in the rear jump seat, sustained a fractured spine. The aircraft was substantially damaged, but there was no post-impact fire.

Following its investigation, the U.S. National Transportation Safety Board (NTSB) determined that “the probable cause of this accident was the flight crew’s failure to use engine anti-ice on the inbound flight to JFK (from Groton-New London Airport, Conn.), the captain’s failure to conduct a thorough pre-

flight inspection and the flight crew’s decision to use engine anti-ice on takeoff from JFK, which led to power losses on both engines.”

During the inbound flight to JFK, light icing conditions were encountered at an altitude of 4,000 feet. The captain told NTSB investigators that the ice disappeared when the aircraft reached 3,000 feet on its descent to the airport. The wing de-icing and engine cowling de-icing/anti-icing systems were not employed.

Prior to departing for Ottawa, the captain completed his pre-flight inspection and supervised the refueling of the aircraft with 2,120 pounds of Jet A fuel. During the pre-flight inspection, he said he noted a thin strip of ice along the leading edges of both wings and, based on prior experience, determined that it posed no safety hazard and that wing de-icing prior to departure was not required.

He did not conduct a thorough inspection of the aircraft’s Rolls-Royce Dart 514-7 engines, whose inlets are partially concealed by the propeller nose cones. As a consequence, the interiors of the inlets are not visible from the ground. A thorough inspection requires the use of a ladder, and one was not employed in this instance.

Engine start was uneventful. Both the captain and copilot told NTSB investigators that no snow or slush was thrown back by the Boeing 727 they trailed during their taxi to the runway. Nor did they encounter any pools of water or slush. The fuel heat was on for more than the required two minutes.

The takeoff roll and rotation were normal. When the aircraft was 50 to 100 feet above the runway, the copilot called for the landing gear to be raised. The captain complied and immedi-

ately observed that the left engine autofeather light had illuminated. He told the copilot, "Left engine, we just lost it," and then, "OK, keep her going."

At that point, the aircraft was still under control at an air speed of approximately 110 knots. But, one second later, the cockpit voice recorder (CVR) recorded the sound of decreasing rpms on the right engine, and power was lost.

The aircraft landed on the runway with the landing gear unlocked and in transit to the down position. It hit first about 6,000 feet from the runway threshold and 60 feet to the right of the centerline. It then slid for approximately 600 feet on the runway before veering off the right side and into snow, where it skidded for another 600 feet before coming to a stop. The captain recalled that both power levers were full forward and that both high-pressure fuel cocks were open when the aircraft came to a halt.

NTSB Analyzes the Circumstances

The flight crew had employed the anti-ice system while the F-27 was being taxied prior to takeoff, noted the NTSB in its accident analysis. However, the system's heating elements had not activated until weight was removed from the landing gear. The Board report added:

"Once the airplane was off the ground, electricity was supplied to the engine de-ice system. Thereafter, the application of heat to the inlet cowls would have been sufficient to start to melt and dislodge accumulated ice in less than 30 seconds. (The board concluded that there was a half-inch accumulation of ice in each engine inlet.)

"The potential hazards of activating the engine anti-ice system after ice has accumulated are discussed in the F-27 operations manual and the Rolls-Royce engine manual and should have been known to the flight crew. The instructions clearly warn that 'a possibility of flame extinction' exists shortly after the system starts operating if large pieces of ice break off and enter the engine.

"In the absence of any mechanical or electrical problems to cause the losses of power, the facts of the accident strongly indicate that the left engine power loss and autofeather resulted from an ingestion of ice from the engine inlet cowls. Any engine inlet cowl ice would have become dislodged upon rotation through the normal operation of the engine anti-ice system.

"The loss of power to the left engine would have triggered an autofeather of the left propeller after the low torque was sensed. There was no indication on the CVR of any activity by the flight crew that would account for the power loss of the left engine, and there was no reason for the flight crew to change power settings when the left engine was shut down.

"As a result, the Safety Board concludes that the power loss to the left engine resulted from an ingestion of ice from the engine inlet cowl.

Ice Ingestion Causes Right Engine Loss

"The right engine continued to operate normally for seven seconds after the power loss on the left engine at 1442:22. A power loss on the right engine was noted by the flight crew and confirmed at 1442:29 by an audio spectral diagram of the CVR tape. The right engine power loss occurred precisely at the same time the captain announced the manual feather procedure for the left engine.

"A possible explanation for the power reduction on the right engine is that the captain mistakenly reduced power on the right engine rather than retarding the left engine high-pressure cock (the correct F-27 feathering procedure).

"However, the captain denied taking any action which would have reduced power on the right engine, and there were no indications on the CVR of other flight crew activity that would account for an inadvertent power loss on the right engine. Furthermore, . . . F-27 flight tests did not produce audio traces or physical evidence which indicated that the captain moved the right engine high-pressure cock, leading to a power reduction on the right engine. Consequently, the Safety Board believes that the loss of power on the right engine was not caused by actions of the flight crew.

"Therefore, the Safety Board believes that the explanation for the power loss of the right engine also is ice ingestion. Since the right engine had been exposed to the same conditions as the left engine, the power loss on the right logically can be attributed to the same factors that caused the left engine power loss.

"Therefore, the Safety Board concludes that the right engine experienced a power loss when ice was ingested into the engine after application of the engine anti-ice system. The right engine did not autofeather because the autofeather system on the operating engine is locked out as soon as one engine is shut down and its propeller autofeathered.

Captain's Inspection Considered Inadequate

"The captain's visual inspection of the exterior of the airplane revealed ice on the leading edges of the wings. However, he stated that, in his opinion, the ice did not constitute a hazard to flight. The Safety Board believes that the captain's pre-flight inspection was inadequate, since he failed to observe the substantial one-half-inch thick ice accumulation noted after the accident, which, in the absence of precipitation, had to have been on the wing at the time of his inspection, and because he made no attempt to remove the ice.

“The effects on airplane performance of ice on the fuselage, wings and control surfaces are well known. The observation of this condition should have prompted the captain to remove the ice and to inspect the airplane more thoroughly. The need for these actions should have been anti-ice on the preceding flight and since he knew he probably would encounter more icing conditions on takeoff.

“The consequences of ice ingestion were explained in the crew’s flight manual. Additionally, 14 CFR 91.209 specifically prohibits a takeoff with snow or ice adhering to wings, stabilizers or control surfaces or with frost, snow or ice on any propeller or powerplant installation. Finally, 14 CFR 121.629(b) requires the captain to de-ice an airplane before takeoff.

“The use of engine anti-ice during takeoff was a company-prescribed procedure for the flight crew to employ in the prevailing meteorological conditions. However, because the flight crew had not used engine anti-ice on the inbound trip to

JFK, it was important that a very thorough examination of the engine inlet cowls be conducted before using the engine anti-ice system on takeoff to ensure that no ice was present.

“Consequently, the Safety Board concludes that the flight crew’s failure to use engine anti-ice on the inbound flight to JFK, the captain’s failure to conduct a thorough pre-flight inspection and the flight crew’s decision to use engine anti-ice on takeoff from JFK led to the power losses which resulted in the accident. While company procedures allowed the use of anti-ice on takeoff, the consequences of doing so under these circumstances should have been well known to the flight crew.

“The Safety Board is concerned also that the flight crew did not use continuous ignition during takeoff. Although it was not required (by the company), continuous ignition was available and may have prevented the power loss on the right engine. This omission also indicates that the flight crew did not give adequate consideration to all the circumstances surrounding the takeoff.” ♦

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