

10/11/02 FRI 09:30 FAX

AVIATION OCCURRENCE REPORT

AIR CANADA

MCDONNELL DOUGLAS DC-8-73F C-FTIR
EDMONTON INTERNATIONAL AIRPORT, ALBERTA
28 MARCH 1989

REPORT NUMBER: 89W0066 (Incident)
INFORMATION SOURCE: Field Investigation
LOCAL TIME: 0550 MST
OPERATION: Domestic Scheduled
DAMAGE: Minor
PILOT LICENCE: Airline Transport

	PILOT-IN-COMMAND		CO-PILOT	
PILOT HOURS:	ALL TYPES	ON TYPE	ALL TYPES	ON TYPE
TOTAL	12,145	2,751	7,679	3,048
LAST 90 DAYS	87	87	159	159

INJURIES:	FATAL	SERIOUS	MINOR/NONE
CREW	-	-	3
PASSENGERS	-	-	2

HISTORY OF THE FLIGHT:

Air Canada Flight 571 is a regularly-scheduled cargo flight originating at Toronto, Ontario with stops at Winnipeg, Manitoba, Edmonton, Alberta and Vancouver, British Columbia. On board was a flight crew of three and two cargo custodians. Flight 571 was scheduled to depart Toronto at 0020 eastern standard time (EST); however, the departure was delayed for approximately one hour. The flight from Toronto to Winnipeg was routine. Ground operations at Winnipeg were routine, and, because of falling snow, the aircraft was de-iced prior to departure. While on the ground at Winnipeg, the flight crew checked the weather, discussed their options, and reviewed their flight time limitations. Because of the 10-hour duty limitation, the flight was now to terminate at Edmonton. Weather conditions forecast for the arrival time of Flight 571 were marginal for a Category I approach. The possibility of overshooting the Edmonton Airport was discussed, and Calgary was selected as the alternate airport.

During the flight from Winnipeg to Edmonton, the second officer monitored the weather en route with specific attention to the Edmonton actual conditions. Prior to the descent into Edmonton, the crew reviewed their options. Pre-descent checks were completed, the descent clearance was issued and acknowledged, and a standard descent profile was flown. The captain briefed the approach and missed approach procedures for runway 01. The captain briefed that he would hand-fly the approach if the weather was at or above Category I limits. The in-range check was completed at about 10,500 feet above sea level (asl).

.../2

10/11/02 FRI 09:31 FAX

INVESTIGATION AIR

- 2 -

89W0066

The aircraft crew was given radar vectors for an instrument landing system (ILS) approach to runway 01 and cleared to descend to and maintain 5,000 feet. Cloud entry occurred just prior to level-off. The ram air temperature at 5,000 feet was about two degrees Celsius, and there was no discernible precipitation. At about five miles from the outer marker, 12 degrees of flap was selected. The first officer queried the captain about the selection of the airframe de-ice as he had noticed a small amount of ice accumulation on the windscreen. The captain chose not to turn it on as the system would not have time to complete a cycle before reaching the outer marker. The landing check was completed. Just before passing the outer marker, 50 degrees of flap was selected. During the approach, the aircraft was in stabilized flight with the ILS course and glide slope cockpit indications centred. During the approach, the first officer's airspeed indicator was three knots lower than the captain's, and the captain adjusted his target bug to 145 knots, three knots above the calculated target speed of 142 knots.

At 100 feet above approach minima, the first officer made the mandatory altitude call and, at minima, called "minimums, lights, runway in sight." When the captain looked up, he could see approach lights and the runway end lights. The aircraft was on centre line, glide slope and airspeed. At about 100 feet above ground level (agl), the second officer called "drift two degrees right", and, as the aircraft passed through about 50 feet, the captain applied a slight back pressure to the control wheel. The captain sensed that the right wing was dropping and applied left control input. The number four engine pod struck the runway, and, almost simultaneously, the right main gear touched down about eight feet from the left edge of the runway. Touchdown speed was about 138 knots. The aircraft ran off the left side of the runway at an angle of about seven degrees. When the left main gear touched down, the number one engine hit a snow bank, ingested snow, and decelerated. Engine thrust reversers were selected, and the aircraft returned to the runway after travelling about 2,000 feet.

The captain taxied off the runway onto the first available taxiway and informed company dispatch that he required their assistance. The tower was advised that the aircraft had stopped. After the damage was assessed, the number one and four engines were shut down, and the aircraft was taxied onto the ramp.

When the flight crew exited the aircraft, they walked around the aircraft and noticed that the nose gear had about one and one-half inches of ice on some of the components. The main wings had ice on the leading edge, and there was a rough buildup of ice on the bottom of the wing. The horizontal stabilizer had ice on the leading edge.

.../3

10/11/02 FRI 09:32 FAX

- 3 -

89W0066

PERTINENT INFORMATION:

The published ILS approach minimum in the Canada Air Pilot for runway 01 at Edmonton International Airport is 200 feet and one-half mile visibility, or a runway visual range (RVR) of 2,600 feet. In accordance with Air Regulation 555, the pilot could carry out an approach to the decision height as long as the RVR did not measure less than 1,200 feet prior to the aircraft passing the final approach fix.

The flight data recorder (FDR) was analysed at the TSB Engineering Laboratory. The ILS approach to runway 01 was a stabilized approach with about four degrees of right drift required to maintain the centre line. At a radio altimeter height of about 150 feet, the pilot applied left control wheel and left rudder, and the aircraft then began a roll to the left to an attitude of about eight degrees. The control wheel was centred almost immediately, and the left rudder was maintained. The aircraft continued to roll slowly left and began to deviate from the localizer, toward the left edge of the runway. With the aircraft banked left, additional left wheel control inputs were made, and, while the aircraft was banked 8.2 degrees to the left with 40 degrees of left control wheel, right rudder (cross control) was applied. The aircraft initially remained left-wing-down, side-slipping to the left as the nose was yawed to the right. The aircraft began to roll right to 6.4 degrees right-wing-down, and the main gear and number four engine pod contacted the ground. Large amounts of left control wheel and left rudder were applied once the aircraft began to roll right, just prior to ground contact. The aircraft crossed the threshold at about 55 feet and at an indicated airspeed of 145 knots. Touchdown airspeed was 138 knots. As the aircraft left the runway, the number one engine contacted a snow bank. The engine ingested snow and lost power. The aircraft proceeded to track along the left side of the runway, and, shortly after thrust reversers were selected, the aircraft returned to the runway.

The engine anti-icing and Radome anti-icing were selected on about 10 minutes prior to touchdown. Ram air temperature was approximately minus 10 degrees Celsius during the final descent.

The terminal forecast for the Edmonton Terminal Area issued at 0430 Coordinated Universal Time (UTC) indicated low stratus and fog with a mixture of freezing rain, snow and fog, reducing visibility below visual flight rules (VFR). The area forecast indicated extensive low ceilings and visibility for the entire region. Ceilings were forecast to range from surface to 1,000 feet, along with frequent visibility in the three-quarter to three statute mile range. Moderate mixed icing was forecast for the entire period for altitudes below 5,000 feet asl.

.../4

10/11/02 FRI 09:33 FAX

INVESTIGATION AIR

000000

- 4 -

89W0066

The flight crew reviewed the weather prior to departing Winnipeg, and, during the flight to Edmonton, the second officer monitored the actual weather sequences. During the descent and approach, the flight crew received the current RVR readings several times. Based on the relatively high RVR reading provided by air traffic control (ATC), the captain decided to hand-fly the approach. During radar vectors to the on-course for the ILS approach, RVR readings as low as 1,800 and as high as 2,400 feet were reported. Just before crossing the outer marker, an RVR reading of 2,200 feet was passed to Flight 571 from the tower controller.

The 1200 UTC weather observation was ceiling 100 feet obscured, visibility one-quarter mile in fog, sea level pressure 1007.4 millibars, temperature minus four degrees Celsius, dew point minus five degrees Celsius, wind from 340 degrees true at five knots, and altimeter 29.65 inches of mercury. The obscuring phenomenon was 10/10 fog and rime ice was noted on the indicator. At 1251 UTC, immediately after the occurrence, a special weather observation gave ceiling 100 feet obscured, visibility one-quarter mile in very light freezing drizzle and fog, wind from 350 degrees at four knots, and 10/10 fog. The 1200 UTC Automatic Terminal Information Service (ATIS) broadcast the same ceiling and visibility information, with a temperature of minus four degrees Celsius and a dew point of minus six degrees Celsius.

The flight crew reported that the light conditions during the final approach were poor. Although the captain could make a distinction between the ground and cloud, it was only in relation to shades of grey. The approach and runway end and edge lights were diffused, as were the aircraft landing lights.

About three hours after the occurrence, an examination of the ice on the aircraft revealed a jagged covering of ice on the wings and horizontal stabilizers. The ice on the wings covered the leading edge uniformly for the entire span and extended further along the bottom than on the top. The ice varied in thickness from one-quarter to one inch and had the appearance of a mixture of rime and clear ice. The leading edge of the horizontal stabilizer had a rough covering of ice over the entire span and was about three-quarters of an inch in thickness. Some grass had adhered to the surface of the ice on the horizontal stabilizer. Ice was also evident on the nose gear strut. The flight and ground crews confirmed that the ice thickness and consistency was about the same as they had noted immediately after the aircraft was parked.

The aircraft is fitted with an airfoil de-icing system which removes ice from the leading edges of the wing and the leading

.../5

10/11/02 FRI 09:33 FAX

INVESTIGATION AIR

0006

- 5 -

89W0066

edges of the horizontal stabilizer. Hot air from the low-pressure pneumatic system is distributed to the leading edges through a system of ducts and by electrically-controlled, pneumatically-operated valves. The aircraft is not fitted with ice-detection systems, and flight crews use a corner of the wind screen as an ice detector. During the descent and approach, the wind screen ice accumulation was minor, and the captain did not perceive a need to select wing de-ice.

A description of the type and amount of ice was provided to the Douglas Aircraft Company. According to their data, one to one and one-quarter inches of leading edge ice would increase the stall speed by 25 to 30 per cent for the DC-8-73. Considering the gross weight of the aircraft, about 245,000 pounds and full-down flaps, the normal (ice-free) 1 G stall speed is 110.5 knots equivalent airspeed (KEAS). With the noted ice, the speed would increase to 138 to 143 KEAS.

ANALYSIS:

The approach was stable and accurately flown. At about 135 feet above ground, the aircraft began a gentle uninterrupted roll left which was induced by pilot control inputs. At 55 feet above ground, or approximately the runway threshold, the aircraft began to deviate to the left of runway centre line. Cross control of rudder and aileron resulted in the aircraft yawing right and then rolling to the right. The right yawing moment induced the right roll. As the aircraft rolled right, corrective aileron and rudder application was too late to stop the right engine pod (number four) from contacting the runway. The deviation to the left associated with the initial left roll and right yaw placed the aircraft well to the left of the centre line. As a result, the aircraft continued left off the runway and onto the grass. Although the ice accumulation on the wings and horizontal stabilizers would have increased the stall speed substantially, it could not be determined if a stall occurred during the landing sequence. However, had the captain decided to overshoot during the final stages of the approach, the ice contamination would have been a detrimental factor in obtaining the lift performance required.

Neither the pilot at the controls nor any crew member recognized the initial left roll, and the pilot flying was not aware that he had applied left aileron and right rudder. It was not until the right roll began that the pilot recognized and reacted to the aircraft manoeuvres.

The following laboratory report was completed: LP 57/89 - FDR/CVR Analysis.

.../6

10/11/02 FRI 09:34 FAX

INVESTIGATION AIR

007

- 6 -

B9W0066

CONCLUSIONS:**Findings:**

1. Area and terminal forecasts forecast moderate mixed icing in cloud.
2. The flight crew did not activate the aircraft airfoil de-icing system prior to entering an area of forecast icing.
3. The flight crew did not respond to the indicated and reported presence of ice buildup by failing to activate the de-icing system.
4. Ambient light conditions were poor.
5. Left drift and right roll were induced by aileron and rudder cross control inputs.
6. A right roll at low level resulted in the number four engine pod contacting the runway.
7. On initial touchdown, the right main gear of the aircraft touched down about eight feet from the left edge of the runway.
8. The leading edges of the wings and horizontal stabilizer were contaminated with about one inch of mixed clear and rime ice.
9. Wing ice contamination degraded the aircraft flight characteristics with respect to lift and drag.
10. The aircraft's 1 G stall speed increases by 25 to 30 per cent.

Causes:

While transitioning from instrument to visual flight, the aircraft landing approach was not adequately controlled during the landing procedure.