Transportation Safety Board of Canada | Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A04O0336

REJECTED LANDING – COLLISION WITH TERRAIN

AIR CARGO CARRIERS, INC.
SHORT BROTHERS SD3-60 N748CC
OSHAWA MUNICIPAL AIRPORT, ONTARIO
16 DECEMBER 2004

Canada

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

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Summary

Air Cargo Carriers, Inc. Flight SNC2917, a Short Brothers SD3-60 aircraft (registration N748CC, serial number SH3748), was on a charter cargo flight from Toledo, Ohio, USA, to Oshawa, Ontario, with two pilots on board. The crew conducted an instrument flight rules approach to Oshawa Municipal Airport in night instrument meteorological conditions.

At approximately 2000 eastern standard time, the aircraft landed on Runway 30, which was snow-covered. During the landing roll, the pilot flying noted poor braking action and observed the runway end lights approaching. He rejected the landing and conducted a go-around procedure. The aircraft became airborne, but it started to descend as it flew over lower terrain, striking an airport boundary fence. It continued until it struck rising terrain and then a line of forestation, where it came to an abrupt stop. The flight crew exited the aircraft and waited for rescue personnel to render assistance. The aircraft was substantially damaged, and both pilots sustained serious injuries. There was no post-crash fire.

Ce rapport est également disponible en français.

Other Factual Information

History of the Flight

The flight crew members started their day conducting a flight from Detroit, Michigan, to Rockford, Illinois, USA, to pick up freight. The aircraft was then flown to Windsor, Ontario, where the freight was unloaded. The next flight was to Toledo, Ohio, where the aircraft was loaded with nine pallets of autoparts destined for Oshawa, Ontario. It was planned that the last two flights of the day would be from Oshawa to Toronto/Lester B. Pearson International Airport, Ontario, to pick up more freight, and then to Detroit, where the flight crew members would end their duty day.

The first officer was the pilot flying for the flight from Toledo to Oshawa. Air traffic control advised the flight crew to anticipate the localizer backcourse Runway 30 approach at Oshawa Municipal Airport. The flight crew members were given radar vectors and then cleared for the straight-in approach. During the approach, the first officer had difficulty maintaining the backcourse localizer, and the captain took control when the aircraft was 3 to 4 miles from touchdown. While descending on the approach, the flight crew selected 15° of flap and maintained V_{REF} + 10 knots, that is 110 knots indicated airspeed (KIAS). At approximately 900 feet above sea level (asl), about 440 feet above ground level (agl), the flight crew observed the runway edge lights to the right of the aircraft. The captain realigned the aircraft to the runway centreline and continued the approach.

The aircraft touched down at about 2000 eastern standard time,[1] approximately one-third of the way down the runway. After touchdown, the captain selected full reverse. He noted that the rate of deceleration was slower than expected and observed the end of the runway approaching. After 5 to 8 seconds of full-reverse application, he called for a go-around, and the power levers were advanced to maximum take-off power.

With little runway remaining and without referencing the airspeed indicator, the captain rotated to a take-off attitude; the aircraft became airborne prior to the end of the runway. The captain attempted to fly the missed approach; however, after the aircraft flew past level terrain at the end of the runway, it descended and the tail struck the airport perimeter fence. The aircraft flew over a marshy area, the landing gear struck rising, hilly terrain, and the aircraft then struck a line of forestation, coming to an abrupt stop at about 2001. The cockpit area was wedged between two cedar trees; however, the flight crew evacuation was not hampered.

The controller saw the aircraft roll through the runway intersection; however, he did not observe the aircraft conducting the go-around. The emergency locator transmitter sounded, probably when the aircraft struck the trees.

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[1] All times are eastern standard time (Coordinated Universal Time minus five hours).

Air Traffic Control and SNC2917

Air traffic control communications with SNC2917 were normal during the approach and landing. The following information is relative to the occurrence and the crew's decisions.

- At about 1949, 11 minutes before the aircraft landed, the Oshawa tower controller transmitted to the aircraft that there was a layer [of cloud] at about 100 feet, visibility ½ mile.

- During the approach, SNC2917 had requested a runway condition report (RCR). At about 1957:30, the tower controller transmitted to the aircraft that the RCR was just completed, that the runway was reported snow-covered and slippery underneath, and that the aircraft was cleared to land.

- At 1958:28, SNC2917 requested that the lights be turned up. The controller responded that the runway lights were at 5 (highest) and that the runway identification lights and precision approach path indicators were at 3 (highest).

None of the airport vehicles was equipped with decelerometer equipment and, therefore, a Canadian Runway Friction Index report could not be provided to the tower. A runway surface condition report was completed and transmitted to the tower, indicating that 100 per cent of the runway was covered with ½ inch of slush/wet snow. The information transmitted to the tower was that the runway was snow-covered and quite slippery underneath.

Personnel Information

The captain held a valid airline transport pilot licence. He was certified and qualified for the flight, and had accumulated over 5300 hours of total flying time, 1000 of which were on the Short Brothers SD3-60 aircraft. He had been awake for 13 hours and had been performing duties as a flight crew member for 10 hours before the occurrence. The captain was seated in the left seat and was the pilot flying during the occurrence.

The first officer held a valid commercial pilot licence. He also was certified and qualified for the flight, and he had accumulated 800 hours of total flying time, 400 of which were on the Short Brothers SD3-60 aircraft. He had been awake for 12 hours and had been performing duties as a flight crew member for 9 hours before the occurrence. The first officer was seated in the right seat and was the pilot not flying.

Airport Information

Oshawa Municipal Airport is at an elevation of 459 feet asl and has two asphalt-surfaced runways (see Appendix A). The runway in use, Runway 30, is 4000 feet long and 100 feet wide. The airport has three instrument approaches; the aircraft conducted the LOC (BC)/DME RWY 30 non-precision instrument approach (see Appendix B). The minimum descent altitude and advisory visibility for this approach are 820 feet asl (373 feet agl) and 1¼ statute miles (sm).

The terrain past the end of Runway 30 is level for approximately 200 feet. It then slopes down for the next 150 feet to the airport perimeter fence. Beyond the fence, the terrain continues a downslope for 75 feet before it levels to a 25-foot marshy area. There is then 100 feet of rising, hilly terrain before a line of forestation consisting of large cedar trees is encountered. The elevation of this area is approximately 449 feet asl.

Meteorological Information

There was no weather reporting facility at Oshawa Municipal Airport. The 2000 aviation routine weather report (METAR) for Toronto/Buttonville Airport (approximately 22 nautical miles west of Oshawa) reported the wind from 230° True at 14 knots, visibility 1¾ sm in light snow, broken ceiling at 900 feet, overcast ceiling 1400 feet, temperature 0°C, dew point -1°C, and altimeter setting 29.90. The direct controller/pilot communication reported the weather at Oshawa Municipal Airport as wind from 230° Magnetic at 15 knots and altimeter setting 29.92.

Aircraft Information

The aircraft was not equipped with a flight data recorder or a cockpit voice recorder, nor was either required by regulation. The weight and centre of gravity were within the prescribed limits. During the investigation, aircraft performance calculations were made. The aircraft landing weight was calculated to be approximately 19 500 pounds. From the aircraft performance charts, it was determined that the unfactored landing distance required for a flap-15 landing is about 2473 feet. This unfactored distance reflects a dry runway, normal ambient conditions, and a perfect approach and landing. The 60 per cent operational factor applied to published landing distance charts is intended to cover variations in the approach and landing.

The Aircraft Flight Manual (AFM) chart for a 15° flap landing ("Maximum Landing Weight for Landing Distance Available") requires a landing distance (factored) of about 4120 feet for the aircraft's weight of 19 500 pounds. Using the AFM chart "Effect of a Slippery Surface on Landing Distance Required" and entering with the dry landing distance (4120 feet), the landing distance required on a slippery runway (coefficient of friction = 0.5) is about 7400 feet. Although the 7400-foot figure would vary depending on the coefficient of friction at the time of landing, it is probably representative of a snow-covered, slippery runway.

The AFM also states, "Reverse thrust is authorised for ground manoeuvring at speeds not exceeding 40 knots" and "Reverse thrust must not be used during a normal landing."[2]

On 31 March 2004, the aircraft manufacturer issued All Operator Message (AOM)[3] No. SD002/04 on advanced notification of impending airworthiness directive. This communiqué highlighted a remote possibility that a fatigue failure on a mid or outer flap actuator, in combination with a dormant seal failure on the same wing's outer or mid actuator, could occur, leading to a

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[2] Aircraft Flight Manual, Section 2, Limitations, Power Plant Limitations, p. 8.

[3] The prime intent of the All Operator Message was to seek input as to the level of disruption that a particular requirement may impose on a company's operation.

significant reduction in roll control due to flap asymmetry. Based on AOM No. SD002/04, Air Cargo Carriers, Inc. prohibited the normal use of full flap (30°) on those aircraft where the life of the affected actuators could not be demonstrated to be within the declared fatigue life, and operators were required to use the mid flap setting (15°) for landings.

On 29 September 2004, the aircraft manufacturer conducted a forum in Orlando, Florida, USA, for SD3 operators, which was attended by three Air Cargo Carriers, Inc. management employees. All of the operators were briefed to the effect that the aircraft manufacturer had cleared the flap actuators to match the aircraft life. Thus, the Airworthiness Directive was not going into effect, and normal use of flap 30° was approved.

The aircraft manufacturer also advised of its intent to test beyond aircraft life to cover the scenario of actuators moving between airframes. On 20 October 2004, the aircraft manufacturer issued AOM No. SD006/04, which cleared the flap actuators for a life of 100 000 flights and stated that, based on fleet utilization data, it is inconceivable that any actuator has attained or is likely to attain 100 000 flights in service in the near future.

On 18 November 2004, the aircraft manufacturer issued AOM No. SD007/04, stating that the United Kingdom Civil Aviation Authority had agreed that the in-service life of the flap actuators need not to be tracked and that the removal of this component from the Life Limited Components section of the Aircraft Maintenance Manual would be actioned at the next appropriate manual revision.

Examination of the aircraft at the occurrence site indicated that the flaps were extended approximately 15°. The flap selector was found near the 30° position; however, the selector was damaged during the impact and its position was considered unreliable in determining the actual flap position. The landing gear lever was in the down position and the landing gear was down and locked during the impact sequence. The aircraft tail section was damaged when it struck the perimeter fence. Both of the 6-bladed propellers struck the trees at high power, and all 12 blades were broken from the propeller hubs.

Ground Effect

During take-offs and landings, the ground interferes with the formation of the large wing-tip vortices, the interference causing a reduction in induced drag. The effect is the greatest when very close to the ground and vanishes when the aircraft's height is approximately equal to the wingspan of the airplane. This phenomenon is known as ground effect. During take-off, if the pilot rotates the airplane to a nose-high attitude before it reaches the normal rotation speed, ground effect reduces induced drag and the airplane is able to reach a speed at which it can fly.

If the pilot stays in ground effect (low), the aircraft will accelerate to normal speeds. However, if the pilot attempts to gain altitude before increasing the flying speed, ground effect diminishes, resulting in increased induced drag. The power required to fly the airplane rises sharply as the induced drag increases, and a deficit in power would result in a sink rate. As the airplane starts settling, the angle of attack is increased because of the downward movement and, since the

angle was at the raw edge to begin with, the airplane stalls and contacts the ground. Some factors that may contribute to this type of accident are short runways, rough ground, grass or snow, high airport elevation, high air temperature, a weak engine, and a heavy load.

Analysis

A number of operational factors contributed to this occurrence. During night instrument meteorological conditions, the captain observed the approach become laterally unstable when the first officer had difficulty maintaining the localizer. As a result, he elected to take control of the aircraft and fly the rest of the approach. When the flight crew visually acquired the airport environment, Runway 30 was to the right of the aircraft. The captain turned the aircraft to centre the localizer and realign the aircraft to Runway 30 for landing.

Given the weather and contaminated runway conditions, the flight crew would have been aware of the approximate landing distance required and the need for an early touchdown point on the 4000-foot runway. Similarly, the flight crew would have been aware that a slower, flap-30 approach would result in a shorter landing distance. Nevertheless, the crew conducted the faster flap-15 approach, based on company advice in accordance with AOM No. SD002/04 to not use full flap. This would have resulted in a higher touchdown speed. This AOM was superseded on 20 October 2004 by AOM No. SD006/04, which cancelled any potential flap-setting prohibition. The flight crew most likely did not reference the AFM performance chart "Effect of a Slippery Surface on Landing Distance Required" to determine that landing the aircraft on the 4000-foot, snow-covered runway with flap-15 was inappropriate.

On touchdown on the snow-covered runway, the captain, being aware of the runway condition, applied full reverse before he determined that the rate of deceleration was slower than expected. By selecting reverse thrust on touchdown, the captain was no longer operating the aircraft in accordance with the AFM, as reverse thrust is authorized for ground manoeuvring only. With the runway end lights rapidly approaching, he called for a go-around at a point on the runway where it would have been prudent to continue full braking and remain on the ground.

With the application of maximum take-off power and premature rotation by the pilot flying, the aircraft became airborne in ground effect and remained in ground effect until striking the airport perimeter fence. When the aircraft struck the fence, the damage was limited to the tail section of the aircraft, indicating that the aircraft was in a nose-up attitude when it struck the fence.

The crew members made some questionable decisions during the preparation and execution of the approach and landing.

- They flew an approach to and landed on a 4000-foot runway when the required runway length (for a dry, uncontaminated runway) was over 4100 feet.

- They flew an approach and landed at night in weather conditions (reported to them as a layer at about 100 feet, visibility ½ mile) that were well below the minimum descent altitude and advisory visibility. Under current Canadian regulations, this is allowed.

- They were advised on final approach that the runway was snow-covered and slippery. Apparently, they did not take this information into account before landing.

- They continued with the approach and landing at Oshawa when they had a suitable alternate.

- The captain elected to conduct a go-around after landing and applying reverse thrust.

Findings as to Causes and Contributing Factors

1. The crew planned and executed a landing on a runway that did not provide the required landing distance.

2. The flight crew most likely did not reference the Aircraft Flight Manual performance chart "Effect of a Slippery Surface on Landing Distance Required" to determine that landing the aircraft on the 4000-foot, snow-covered runway with flap-15 was inappropriate.

3. After landing long on the snow-covered runway and applying full reverse thrust, the captain attempted a go-around. He rotated the aircraft to a take-off attitude and the aircraft became airborne in ground effect at a slower-than-normal speed.

4. The aircraft had insufficient power and airspeed to climb and remained in ground effect until striking the airport perimeter fence, rising terrain, and a line of large cedar trees.

5. The flight crew conducted a flap-15 approach, based on company advice in accordance with an All Operator Message (AOM) issued by the aircraft manufacturer to not use flap-30. This AOM was superseded on 20 October 2004 by AOM No. SD006/04, which cancelled any potential flap-setting prohibition.

Other Finding

1. The flight crew members were not advised that the potential Airworthiness Directive announced in the original AOM was not going into effect and that the use of flap-30 was acceptable, as relayed in the follow-up AOM.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 18 October 2005.

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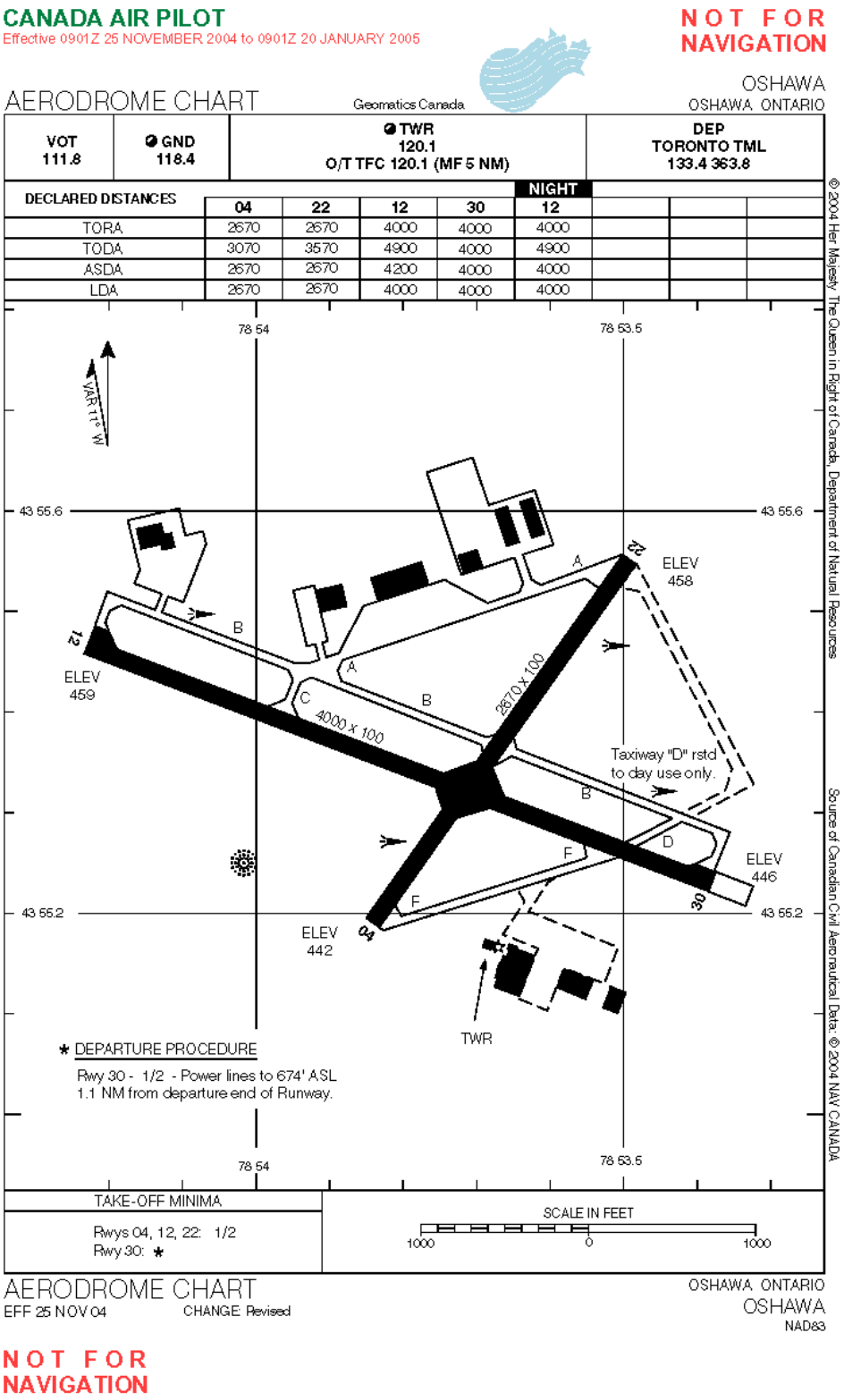
Appendix A – Oshawa Aerodrome Chart



Appendix B – LOC(BC)/DME RWY 30