

AVIATION INVESTIGATION REPORT

A0300034

RUNWAY EXCURSION

SKYSERVICE AIRLINES INC.

AIRBUS A320-212 C-GJUP

WINDSOR, ONTARIO

11 FEBRUARY 2003

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.

Aviation Investigation Report

Runway Excursion

Skyservice Airlines Inc.
Airbus A320-212 C-GJUP
Windsor, Ontario
11 February 2003

Report Number A03O0034

Summary

Skyservice Airlines Flight 0045, an Airbus A320-212, registration C-GJUP, serial number 645, was on a regularly scheduled instrument flight rules (IFR) flight. The flight had departed Toronto/LBPIA at 1257 eastern standard time, flew to Windsor where additional passengers were picked up, and then continued to Cancun, Mexico. For the return leg, Flight 0045 departed Cancun at 1910 and arrived at Windsor at 2243.

At the time of the occurrence, the aircraft was back-taxiing to position on Runway 25 in preparation for departure from Windsor. The aircraft radio control of aerodrome lighting (ARCAL) system was in use as the tower had closed during passenger deplaning at the terminal. The airfield lighting extinguished while the aircraft was taxiing to the runway and was not re-activated by the copilot until the aircraft neared the end of the runway. The captain observed the runway end lights after the ARCAL lighting system was activated and applied heavy braking. Because of the aircraft's proximity to the end of the runway and the speed at which it was being taxied, the aircraft did not remain within the confines of the runway. After the aircraft stopped, at approximately 2327 eastern standard time, the flight crew shut down the engines and advised London Flight Information Centre (FIC) of their position. There were no injuries to the passengers or crew. The passengers and flight crew deplaned the aircraft and were bused back to the airport terminal.

Ce rapport est également disponible en français.

Other Factual Information

The captain and first officer had not flown together as a crew prior to the day of the occurrence. The captain held a valid airline transport pilot licence (ATPL). He had accumulated over 11 000 hours total flight time of which over 6600 hours were on Airbus A320 aircraft. He was certified and qualified for the flight under existing regulations. He had been awake for 17 hours and had been performing duties as a flight crew member for 12 hours prior to the occurrence. The captain was seated in the aircraft left seat and was the designated pilot flying (PF).

The first officer was an employee of My Travel Airways Ltd., United Kingdom (UK) and was flying for Skyservice Airlines for the winter season as part of a crew sharing arrangement between Skyservice and My Travel. He held a valid UK, Civil Aviation Authority (CAA), ATPL. This licence had been appropriately attached to a Transport Canada, foreign licence validation certificate and was being properly exercised in accordance with the privileges of his UK licence. He had accumulated over 2200 hours total flight time of which 450 hours were on Airbus A320 aircraft. He was certified and qualified for the flight under existing regulations. He had been awake for 16 hours and had been performing duties as a flight crew member for 12 hours prior to the occurrence. The first officer was seated in the aircraft right seat and was the designated pilot not flying (PNF).

On arrival at Windsor, the air traffic controller advised the flight crew that the control tower would be closed by the time the flight was ready to depart. Five minutes later, the tower closed and the aircraft radio control of aerodrome lighting (ARCAL) system was activated. While the tower is closed, runway and taxiway lighting is controlled by the pilot. The system employed at Windsor airport is defined as a "K" type ARCAL system. This system is activated by pressing the transmit button on the aircraft's very high frequency (VHF) aeronautical radio seven times while tuned to the airport tower frequency of 124.7 MHz. Once activated, the airfield lights stay on for fifteen minutes. At any time during the activation time period, the lights may be reset for another 15 minutes by pressing the radio transmit button an additional seven times.

The current automatic terminal information service (ATIS) stated that the tower was closed and advised vehicles operating on the manoeuvring area to broadcast their intentions on 124.7 MHz and to monitor that frequency. En route flight service would be provided by London Flight Service on 126.7 MHz. At 2315¹, the aircraft taxied via Golf and Foxtrot taxiways in preparation for departure from Runway 25. The crew followed the movement instructions and requested the IFR clearance from London Radio on 126.7 MHz. The flight crew did not broadcast their intentions on the aerodrome traffic frequency (ATF) on 124.7 MHz.

The captain gave a traffic advisory announcing that the aircraft was taxiing on Foxtrot taxiway crossing Runway 12; however, this advisory was not communicated on the ATF, 124.7 MHz. While the aircraft was taxiing on Foxtrot taxiway, the airfield lighting extinguished and the flight crew continued to taxi the aircraft without activating the ARCAL system. The first officer was unfamiliar with operations at uncontrolled aerodromes, including ARCAL lighting procedures, which resulted in the captain attempting to assist the first officer with his PNF

¹ All times are eastern daylight time (Coordinated Universal Time (UTC) minus four hours) unless otherwise noted.

duties. He directed the first officer to contact London Radio and inform the flight service specialist that they did not observe any snow removal activity and to advise him that nobody was responding to either the tower or ground frequency.

The first officer attempted to contact London Radio several times before the flight service specialist asked Flight 0045 to please standby. Shortly after, the flight service specialist contacted the flight crew to relay the IFR departure clearance. It took over three minutes for the first officer to receive the clearance and read it back correctly. The captain then mistakenly broadcast a traffic advisory on 126.7 MHz announcing that the aircraft was positioning onto the runway.

As the aircraft back-taxed on the runway, the flight crew reviewed the departure clearance, actioned the before take-off checklist, and discussed the lack of runway lighting and the means of activating the ARCAL lighting system. The first officer changed the radio frequency to the ATF 124.7 MHz and activated the ARCAL lighting system; the runway edge lights and the threshold end lights illuminated. The captain then saw the end of the runway and applied heavy braking. The aircraft overran the runway, ran over a lighting bar standard damaging a main wheel tire, travelled down a gentle slope, and stopped at a large drainage ditch running perpendicular to the runway.

After the aircraft came to a stop, the flight crew communicated with London Radio to apprise the flight service specialist of their situation. The London flight service specialist relayed the flight crew's request for maintenance assistance to the Windsor Airport Security Operations Centre (SOC). SOC requested London FIC to direct the flight crew to communicate on the ATF, 124.7 MHz.

A digital, ground-speed readout is displayed in front of each pilot in the upper left corner of the navigation display (ND) cathode ray tube (CRT).

The flight data recorder (FDR) and cockpit voice recorder (CVR) were secured and forwarded to the TSB Engineering Branch in Ottawa. The FDR revealed that the aircraft ground speed increased to approximately 35 knots during the runway back-taxi and remained at that speed for approximately one minute prior to the aircraft exiting the end of the runway. Three seconds after activation of the ARCAL lighting system, the aircraft brake pedals were deflected to a maximum angle of 80 degrees. Tire skidmarks were evident at the centre end of the runway. The aircraft heading was relatively constant until the application of brakes.

A review of the Windsor ATF recorded transmissions indicated that Staff 28, an airport ground vehicle, attempted to contact the flight crew on the ATF as the aircraft was holding short of Runway 25. The flight crew did not respond to this communicate. After communicating with the firehall and Staff 29, Staff 28 attempted to contact the flight crew again; however, again there was no response. Moments later, Staff 28 observed the aircraft proceed onto the unlit runway and back-taxi. There was no broadcast message for this aircraft movement from the flight crew on the ATF.

The aircraft was operating within the manufacturer's specifications for both weight and centre of gravity limitations, and records indicate that the aircraft was properly maintained in accordance with existing regulation. There were no operational or mechanical defects involving either the braking, hydraulic, or nose wheel steering systems. The aircraft's anti-skid system was activated and was functioning properly at the time of the occurrence.

The Skyservice *A320 Flight Crew Operating Manual (FCOM)*, *Standard Operating Procedures (SOPs)*, includes a directive that ground speed during taxi should be monitored by the flight crew. It further provides guidance to

pilots regarding maximum speeds for taxiing and ground manoeuvring. Skyservice FCOM, SOP, Section 3.03.10, Page 2, states: "The normal maximum taxi speed should be 30 knots in a straight line, 10 knots for a sharp turn. As the ground speed is difficult to assess, monitor ground speed on the ND".

Skyservice Airlines company *Flight Operations Manual (FOM)* enables a document entitled "Briefing and Airport Notes". This document is part of the on-board library and contains comprehensive information for flight crews operating into airports that require additional airport specific information. Windsor Airport is not included in this section as an airport requiring extra attention by flight crews.

Transport Canada's *Aeronautical Information Publication (AIP)* includes specific guidance for aircraft operations at uncontrolled aerodromes. AIP, RAC 4.5.1, states, in part: "An uncontrolled aerodrome is an aerodrome without a control tower, or one where the tower is not in operation. There is no substitute for alertness while in the vicinity of an uncontrolled aerodrome. It is essential that pilots be aware of and look for other traffic, and exchange traffic information when approaching or departing from an uncontrolled aerodrome, particularly since some aircraft may not have communication capability. To achieve the greatest degree of safety, it is essential that all radio-equipped aircraft monitor a common designated frequency, such as the published mandatory frequency (MF) or ATF, and follow the reporting procedures specified for use in an MF area while operating on the manoeuvring area or flying within an MF area surrounding an uncontrolled aerodrome."

The AIP provides further specific guidance for pilots operating IFR departures from uncontrolled airports. AIP, RAC 7.9, states: "Where a pilot-in-command intends to take-off from an uncontrolled aerodrome, the pilot shall:

- (a) obtain an ATC clearance if in controlled airspace;
- (b) report on the appropriate frequency his/her departure procedure and intentions before moving on to the runway or before aligning the aircraft on the take-off path; and
- (c) ascertain by radio on the appropriate frequency and by visual observation that no other aircraft or vehicle is likely to come into conflict with the aircraft during take-off".

Skyservice does not include operations at uncontrolled airports in either initial or recurrent ground training for flight crews.

The Windsor Airport is a certified controlled airport between the hours of 0630 and 2230 hours local time. Outside of these hours of operation, the airport is uncontrolled, meaning the ATC tower is not staffed. Ground and air movements are facilitated by traffic advisories made over a common radio frequency by the pilots of each aircraft operating on, or in the vicinity of the airport. IFR clearances, en route flight information, and other aviation services are provided by London FIC via remote communication outlet (RCO).

Runway edge lighting comprised variable intensity white lights, spaced at 200-foot intervals, at the runway edges along the full length of the runway. There are runway threshold end lights along the width of each runway end. These are variable intensity lights, each of which is coloured red and green. The red is visible while within the confines of the runway and the green is visible while on approach to the runway. The airport has two asphalt-covered runways: runway 12/30 is 5150 feet long and 150 feet wide, and runway 07/25 is 9000 feet long and 200 feet wide.

A runway condition report for runway 07/25 taken at 2230 indicated that the runway was 100 per cent bare and dry. According to the routine aviation weather report (METAR) for 2300, Windsor Airport reported an overcast cloud layer at 2000 feet above ground level (agl). Visibility was reported to be 1 statute mile (sm) in light snow/ drifting snow. The wind was 240°M at 23 knots gusting to 31 knots. The observation recorded at 2349 reported an overcast cloud layer at 2600 feet agl, visibility one and a half sm in light snow/blowing snow and wind 290°M at 35 knots gusting to 47 knots.

During taxi and ground manoeuvring operations, blowing and drifting snow can create false impressions of speed and movement. Hawkins, F.H. (1987), *Human Factors In Flight*, Hants, UK: Ashgate on Illusions In Taxiing writes that in winter, blowing snow may be sweeping across an airfield, giving a false impression of relative movement. Inappropriate control action can be initiated based on this illusion. For instance, an impression can be given that the aircraft is stationary when it is still moving, and a pilot could apply the brakes in a more abrupt manner than he would if he knew the aircraft was moving. Alternatively, the aircraft could slowly creep forward, colliding with an obstruction, when it was thought to be stationary.

Analysis

In this occurrence, a number of factors combined, resulting in the runway excursion. This analysis will examine those factors, including the flight crew's unfamiliarity with and non-adherence to uncontrolled aerodrome procedures, the flight crew's failure to activate the ARCAL lighting system in a timely manner, the illusions created by drifting snow during low visibility taxi and ground manoeuvring, and lastly, the flight crew's non-conformance with company SOPs.

The first officer was unfamiliar with procedures at uncontrolled aerodromes. He transmitted the initial aircraft manoeuvring on the apron on the appropriate ATF and then, in error, requested the IFR departure clearance on this frequency. He then contacted London FIC on the appropriate radio frequency to obtain the departure clearance. The first officer made it known to the captain that he was not familiar with uncontrolled aerodrome procedures and as a result the captain assisted the first officer in his PNF duties, thereby increasing his own workload. The captain made the subsequent appropriate radio calls while manoeuvring on the taxiways and prior to back-taxiing on the runway; however, these radio calls were transmitted on radio frequencies other than the ATF. This non-use of the ATF and the captain's expectancy to receive a response on either the tower or ground frequency indicated that he was not fully aware of the environment in which he was operating. The flight crew did not monitor the published ATF, and, as a result, they did not hear any of the radio transmissions directed to them by Staff 28.

During the runway back-taxi and after conducting the before take-off check, the flight crew discussed the lack of runway lighting and the means of activating the ARCAL lighting system. Skyservice Airlines does not specifically address the operational use of ARCAL lighting systems in either its initial or recurrent ground school for flight crew members. It likewise does not address operations at night at uncontrolled aerodromes in either company SOPs or the company operations manual. There is no Transport Canada regulation requiring them to do so; however, instructions for using ARCAL lighting exist in the *Canada Flight Supplement (CFS)* as well as the *Air Canada Route Manual Supplement*, which is Skyservice's primary source of airport supplementary information. Both of these documents are part of the on-board library and were available to the flight crew.

The flight crew back-taxied the aircraft on the runway in conditions of rear quarterly gusting winds and blowing snow at night without the benefit of runway lighting. During the low visibility taxi, both flight crew members indicated that they could visually reference the end of the runway; however, they did not consider the

illusions of relative movement to which they were being subjected. The strong tailwind with blowing snow conditions would have given the crew the illusion of moving slower than they were actually moving. Activation of the ARCAL lighting system prior to entering the runway is not only good airmanship, as it indicates to other airport vehicles that the runway is in use, but it also would have provided the flight crew with a visual cue as to the aircraft's relative movement as it back taxied about 5500 feet of runway. It also would have clearly indicated the end of the runway to the flight crew.

Contrary to company SOPs, the flight crew did not monitor the aircraft ground speed to ensure a safe taxi speed while back-taxiing on the runway. The aircraft exceeded the normal maximum straight line taxi speed of 30 knots and exited the end of the runway at approximately 35 knots.

The following TSB Engineering Branch report was completed:

LP010/2003 - FDR/CVR Examination

Findings as to Causes and Contributing Factors

1. The flight crew continued to taxi at night in low visibility conditions after the airfield lighting had extinguished, which deprived the crew of important visual cues to clearly identify the end of the runway and cues as to the taxi speed of the aircraft.
2. The flight crew did not monitor the aircraft's ground speed to ensure a safe taxi speed while back-taxiing on the runway. The aircraft exceeded the normal maximum straight line taxi speed of 30 knots and exited the end of the runway at approximately 35 knots.
3. The flight crew did not consider the illusion of relative movement caused by the tailwind and blowing snow on the runway. This contributed to the aircraft ground speed inadvertently increasing to 35 knots.
4. The captain observed the runway end lights after the ARCAL lighting system was activated and applied heavy braking; however, because of the aircraft's proximity to the end of the runway and the speed at which the aircraft was taxied, it failed to remain within the confines of the runway.
5. The first officer was unfamiliar with procedures for operating at uncontrolled aerodromes and in the use of ARCAL lighting and, as a result, the captain conducted both PF and PNF duties, which increased his workload.

Findings as to Risk

1. The captain made the appropriate radio calls while manoeuvring the aircraft on the taxiways and prior to proceeding onto the runway; however, these transmissions were not made on the ATF of 124.7 MHz. The flight crew did not adhere to uncontrolled aerodrome procedures and as a consequence were not aware of any communiques directed to them on the ATF.
2. Skyservice does not include operations at uncontrolled aerodromes in either initial or recurrent ground training for flight crews.

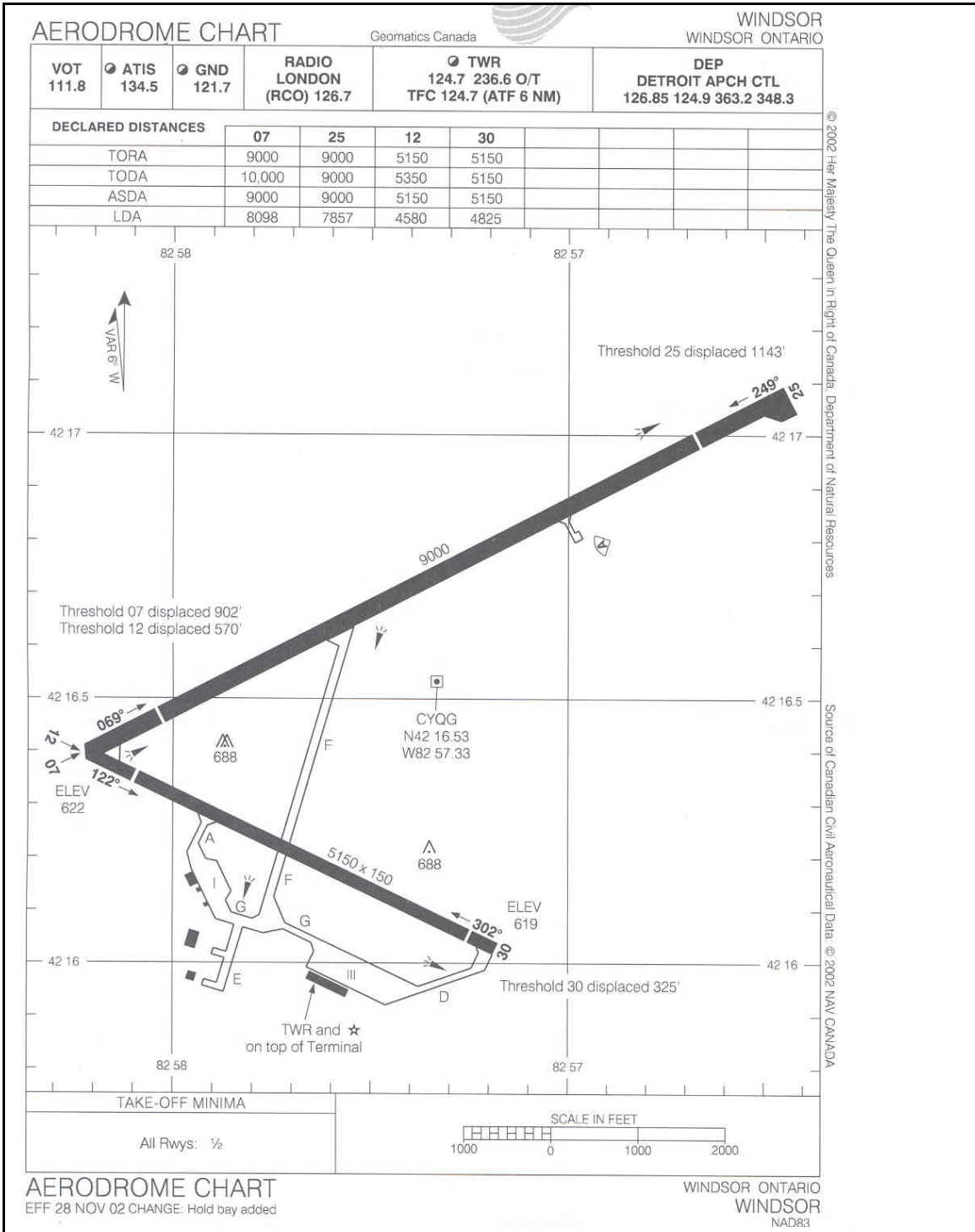
Safety Action

As a result of this occurrence, Skyservice Airlines identified 10 safety actions that were implemented in 2003. They are as follows:

1. Operations at uncontrolled airports in Canada to be addressed during company indoctrination training for all Skyservice pilots.
2. Use of ARCAL airfield lighting systems to be addressed during company indoctrination training for all Skyservice pilots.
3. Winter operations training now includes a discussion of the illusion effects created by drifting snow during ground operations.
4. Operations at uncontrolled airports and/or where ARCAL lighting is in use to be addressed in the Briefing and Airport Notes manual. Such information could be addressed in a summary section with a list of applicable airfields included.
5. Special airspace and ATC procedures unique to Windsor Airport and the surrounding airspace to be addressed in the Briefing and Airport Notes manual.
6. The role of the PNF as a monitoring pilot during all flight phases will be emphasized in ground and simulator training and during line training and checking. Special emphasis of monitoring of taxiing path and ground speed during ground operations to be included.
7. Low visibility taxiing and ground operations in conditions involving surface contamination will be addressed in simulator training.
8. Develop a set of "best practices" techniques which serve as an enhancement to SOP's. Best practices include methods for maintaining an appropriate level of flight discipline during dynamic phases of flight.
9. Pilots involved in any reportable accident or incident where damage is incurred or suspected must not operate as flight crew until a thorough assessment of the accident/incident has been made by the VP flight operations in accordance with FOM DIV 111, 17.10.3.
10. Any movement of aircraft following an excursion from a paved surface will be conducted only under the guidance of Skyservice maintenance, who will ensure that the aircraft manufacturer's guidelines are followed.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 25 February 2004.

Visit the Transportation Safety Board's Web site (www.tsb.gc.ca) for information about the Transportation Safety Board and its products and services. There you will also find links to other safety organizations and related sites.



Appendix A - Windsor Aerodrome Chart