



Aviation Investigation Final Report

Location:	Cleveland, Ohio	Accident Number:	CEN18LA094
Date & Time:	February 4, 2018, 19:24 Local	Registration:	N570TM
Aircraft:	RAYTHEON AIRCRAFT COMPANY 400A	Aircraft Damage:	Substantial
Defining Event:	Runway excursion	Injuries:	4 None
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled		

Analysis

The two airline-transport pilots and two passengers departed on a cross-country flight in the chartered airplane. Preflight planning had noted the destination airport's runway conditions as "good." As the flight neared the destination airport and the crew conducted the approach checklist, the captain stated, "light snow ... maybe slippery."

When the crew checked the airport's automated terminal information service, the broadcast included "light freezing rain." The flight was transferred to the tower controller, who told the crew that the airport operations crew was on the runway about 20 minutes earlier and advised that it was starting to pick up traces of ice. The captain acknowledged the transmission and, after conducting a missed approach to runway 6L, requested to land on runway 24R. During the approach to runway 24R, the tower controller reported wind at 020° at 25 knots and also at 010° at 25 knots.

The crewmembers reported that, after touchdown, they applied maximum braking; however, the airplane did not slow and skidded off the end of the runway into the engineered material arresting system (EMAS), which resulted in substantial damage to the fuselage and a collapsed nose gear. The crew stated that the runway grooves had been "smoothed out" by ice accumulations. A first responder reported that the ramp and taxiways were very icy, adding that the end of the runway and EMAS had a sheet of ice.

A review of the airport's snow and ice control plan noted that the airport did not have pavement surface sensors and that operations personnel would monitor the airfield as conditions dictated. An airport operations log entry for a runway and field inspection, recorded about 24 minutes before the accident, noted a temperature of 31°F and a braking coefficient of 40+, with runways and taxiways wet. A log entry for a runway and field inspection recorded about 6 minutes after the accident noted a braking coefficient of 30-35, with runways and taxiways wet. The Runway Condition Assessment Matrix contained in Advisory Circular 150/5200-30D states that a braking coefficient of 40 or higher is the

equivalent of a pilot-reported braking action of "good," while a braking coefficient of 30-35 would be medium to poor.

The field conditions noted during the pilots' preflight planning indicated "good" braking conditions; however, the captain's statement of "light snow ... maybe slippery," along with the tower controller's report that the runway was starting to pick up traces of ice, indicated that the crew was aware of the potential for braking conditions that were less than good, which would decrease braking action and increase the stopping distance. Further, the crew's selection of runway 24R, which led to the presence of a tailwind, also would decrease braking action.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The airplane's reduced braking performance due to an ice-covered runway, which resulted in a runway excursion. Contributing to the accident was the crew's selection of a runway with a tailwind.

Findings

Environmental issues	Freezing rain/sleet - Effect on operation
Environmental issues	Runway/landing area condition - Effect on operation
Personnel issues	Incorrect action selection - Pilot
Environmental issues	Tailwind - Not specified

Factual Information

History of Flight	
Landing-landing roll	Runway excursion (Defining event)
Landing-landing roll	Collision with terr/obj (non-CFIT)

On February 4, 2018, about 1924 eastern standard time, a Raytheon (Hawker) 400A airplane, N470TM, overran the end of the runway after landing at the Burke Lakefront Airport (KBKL) Cleveland, Ohio. The two pilots and two passengers were not injured, and the airplane sustained substantial damage. The airplane was registered to Aircraft Holding Company One, LLC, and operated by Traffic Management Company, LLC, under the provisions of Title 14 Part 135 air taxi flight. Instrument meteorological conditions prevailed at the time of the accident, and the flight was on an instrument flight rules (IFR) flight plan that originated from the Teterboro Airport (KTEB), Teterboro, New Jersey, about 1804.

The pilots reported to a Federal Aviation Administration (FAA) inspector, that during as part of the preflight planning for the flight, they received NOTAMS (notices to airman) with a FICON (field condition) of 5/5/5, and they'd calculate landing distances for a wet or dry runway.

As the flight neared KBKL, the crew conducted their approach briefing and before the checklist was completed, the captain stated, "light snow .. maybe slippery". The crew contacted Cleveland approach control, who told them to expect the instrument landing system (ILS) approach to runway 24R and circle to land on runway 6L. At 1901, the crew then monitored the airport's automatic terminal information service (ATIS) information Lima, which, in part, was broadcasting a 2357 zulu [1857 EST] observation, wind 340 degrees at 17 (knots) gusts to 25 (knots), visibility 4 (miles), light freezing rain, sky conditions ceiling 700 overcast, temperature minus 3, dewpoint minus 4, altimeter 29.80.

The captain repeated to the first officer, 340 at 17, gust to 25, light freezing rain, "so the runway is going to be wet, 25-degree crosswind" ... adding that they were at the limit.

Cleveland approach then transferred the flight to the KBKL tower controller, who told the flight to circle north for runway 6L. The tower controller added that [airport] operations was on the runway approximately 20 minutes earlier and advised [the runway] was starting to pick up traces of ice. The captain acknowledged the transmission and reported that they were getting moderate rime icing on the descent.

During the circling approach to runway 6L, the airplane got too close to obstacles and the crew elected to conduct a missed approach. The captain then requested to land on runway 24R. During the approach to runway 24R, the tower controller reported wind, of 020 [degrees] at 25 [knots] and 010 at 25.

After touchdown, the crew reported they applied maximum braking, but the airplane did not slow and skidded off the end of runway into the Engineered Material Arresting System (EMAS).

The crew and passengers exited the airplane, and the crew reported that the fire department said they were delayed in getting to the airplane due to the slippery conditions. They added that from their observation the runway grooves, had been "smoothed out" by ice accumulations.

A first responder reported that he could see why the airplane left the runway; that the ramp and taxiways were very icy. He added that he did not travel down the runway, but the end of the runway and EMAS had a sheet of ice on it.

A damage assessment of the airplane indicated substantial damage to the fuselage and a collapsed nose gear.

A review of the airport operations log noted that a runway and field inspection recorded at 1900, noted a temperature of 31° F, and a braking coefficient (Mu) of 40+, with runways and taxiways wet. A log entry at 1930, after the incident, noted a braking coefficient (Mu) of 30-35, with runways and taxiways wet. Neither log entry gave any additional field conditions, such as the presence (or absence) of any contaminants on the paved surfaces.

A review of the KBKL Snow and Ice Control Plan, dated March 10, 2009 and revised March 31, 2017 noted:

- The airport does not have pavement surface sensors
- Operations personnel will be responsible to monitor the airfield as precipitation and airfield changes dictate.
 - The extent of monitoring must consider all variable that may effect the runway conditions, including any precipitation conditions, changing temperatures, effects of wind, frequency of runway use, and type of aircraft using the runway.
 - There is no timeline when a condition changes. An Update is disseminated as needed.
- The airport disseminates information on the runway via NOTAMS using the Runway Condition Assessment Matrix (RCAM) in determining runway conditions.

3/8/2017

Table 5-2. Runway Condition Assessment Matrix (RCAM) (for Airport Operators' Use Only)

Assessment Criteria		Downgrade Assessment Criteria		
Runway Condition Description	Code	Mu (µ) ¹	Mu (µ) ¹ Vehicle Deceleration or Directional Control Observation	
• Dry				
 Frost Wet (Includes Damp and 1/8 inch depth or less of water) 1/8 inch (3mm) depth or less of: Slush Dry Snow Wet Snow 	5	40 or Higher	Braking deceleration is normal for the wheel braking effort applied AND directional control is normal.	Good
5° F (-15°C) and Colder outside air temperature: • Compacted Snow	4	Braking deceleration OR directional control is between Good and Medium.		Good to Medium
 Slippery When Wet (wet runway) Dry Snow or Wet Snow (Any depth) over Compacted Snow Greater than 1/8 inch (3mm) depth of: Dry Snow Wet Snow Warmer than 5° F (-15°C) outside air temperature: Compacted Snow 	3	to 30	Braking deceleration is noticeably reduced for the wheel braking effort applied OR directional control is noticeably reduced.	Medium
Greater than 1/8 (3mm) inch depth of: • Water • Slush	2	29	Braking deceleration OR directional control is between Medium and Poor.	Medium to Poor
 Ice² 	1		Braking deceleration is significantly reduced for the wheel braking effort applied OR directional control is significantly reduced.	Poor
 Wet Ice² Slush over Ice² Water over Compacted Snow² Dry Snow or Wet Snow over Ice² 	0	20 or Lower	Braking deceleration is minimal to non-existent for the wheel braking effort applied OR directional control is uncertain.	Nil

The correlation of the Mu (μ) values with runway conditions and condition codes in the Matrix are only approximate ranges for a generic friction measuring device and are intended to be used only to downgrade a runway condition code; with the exception of circumstances identified in Note 2. A triport operators should use their best judgment when using friction measuring devices for downgrade assessments, including their experience with the specific measuring devices used.

In some circumstances, these runway surface conditions may not be as slippery as the runway condition code assigned by the Matrix. The airport operator may issue a higher runway condition code (but no higher than code 3) for each third of the runway if the Mu value for that third of the runway is 40 or greater obtained by a properly operated and calibrated friction measuring device, and all other observations, judgment, and vehicle braking action support the higher runway condition code. The decision to issue a higher runway condition code than would be called for by the Matrix cannot be based on Mu values alone; all available means of assessing runway slipperiness must be used and must support the higher runway condition code. This ability to raise the reported runway condition code 1, 2, or 3 can only be applied to those runway conditions listed under codes 0 and 1 in the Matrix.

The airport operator must also continually monitor the runway surface as long as the higher code is in effect to ensure that the runway surface condition does not deteriorate below the assigned code. The extent of monitoring must consider all variables that may affect the runway surface condition, including any precipitation conditions, changing temperatures, effects of wind, frequency of runway use, and type of aircraft using the runway. If sand or other approved runway treatments are used to satisfy the requirements for issuing this higher runway condition code, the continued monitoring program must confirm continued effectiveness of the treatment.

Caution: Temperatures near and above freezing (e.g., at 26.6° F (-3°C) and warmer) may cause contaminants to behave more slippery than indicated by the runway condition code given in the Matrix. At these temperatures, airport operators should exercise a heightened level of runway assessment, and should downgrade the runway condition code if appropriate.

1

The Aeronautical Information Manual (AIM), basic dated October 12, 2017, Chapter 4, Section 3, Airport Operations:

4 3 9. Runway Condition Reports

a. Aircraft braking coefficient is dependent upon the surface friction between the tires on the aircraft wheels and the pavement surface. Less friction means less aircraft braking coefficient and less aircraft braking response.

b. Runway condition code (RwyCC) values range
from 1 (poor) to 6 (dry). For frozen contaminants on
runway surfaces, a runway condition code reading of
4 indicates the level when braking deceleration or
directional control is between good and medium.
c. Airport management should conduct runway
condition assessments on wet runways or runways
covered with compacted snow and/or ice.
1. Numerical readings may be obtained by using
the Runway Condition Assessment Matrix (RCAM).
The RCAM provides the airport operator with data to
complete the report that includes the following:
(a) Runway(s) in use

(b) Time of the assessment

(c) Runway condition codes for each zone (touchdown, mid point, roll out)

Pilot Information

Certificate:	Airline transport	Age:	54
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	5-point
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 1 With waivers/limitations	Last FAA Medical Exam:	January 15, 2018
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	November 11, 2017
Flight Time:	12487 hours (Total, all aircraft), 1762	2 hours (Total, this make and model), 4	4342 hours (Pilot In

Command, all aircraft), 100 hours (Last 90 days, all aircraft)

Co-pilot Information

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Certificate:	Airline transport	Age:	23
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	5-point
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 1 With waivers/limitations	Last FAA Medical Exam:	September 27, 2017
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	November 14, 2017
Flight Time:	2509 hours (Total, all aircraft), 156 l all aircraft)	nours (Total, this make and model), 15	56 hours (Last 90 days,

Aircraft and Owner/Operator Information

Aircraft Make:	RAYTHEON AIRCRAFT COMPANY	Registration:	N570TM
Model/Series:	400A NO SERIES	Aircraft Category:	Airplane
Year of Manufacture:	2000	Amateur Built:	
Airworthiness Certificate:	Transport	Serial Number:	RK-292
Landing Gear Type:	Retractable - Tricycle	Seats:	
Date/Type of Last Inspection:	January 27, 2018 AAIP	Certified Max Gross Wt.:	
Time Since Last Inspection:		Engines:	2 Turbo fan
Airframe Total Time:	9332.1 Hrs	Engine Manufacturer:	WILLIAMS
ELT:	Installed, not activated	Engine Model/Series:	FJ 44 SERIES
Registered Owner:	AIRCRAFT HOLDING COMPANY ONE LLC	Rated Power:	2800 Lbs thrust
Operator:	Travel Management, Inc	Operating Certificate(s) Held:	Commuter air carrier (135)
Operator Does Business As:		Operator Designator Code:	T17A

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	Condition of Light:	Dusk
Observation Facility, Elevation:	KBKL	Distance from Accident Site:	
Observation Time:	19:00 Local	Direction from Accident Site:	
Lowest Cloud Condition:		Visibility	4 miles
Lowest Ceiling:	Overcast / 700 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	22 knots / 30 knots	Turbulence Type Forecast/Actual:	/
Wind Direction:	10°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.79 inches Hg	Temperature/Dew Point:	-2°C / -4°C
Precipitation and Obscuration:	N/A - None - Mist		
Departure Point:	Teterboro, NJ (KTEB)	Type of Flight Plan Filed:	IFR
Destination:	Cleveland, OH (KBKL)	Type of Clearance:	IFR
Departure Time:	18:04 Local	Type of Airspace:	

Airport Information

Airport:	Burke Lakefront KBKL	Runway Surface Type:	Asphalt;Ice
Airport Elevation:	583 ft msl	Runway Surface Condition:	Ice;Wet
Runway Used:	24R	IFR Approach:	ILS
Runway Length/Width:	6604 ft / 150 ft	VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	2 None	Aircraft Damage:	Substantial
Passenger Injuries:	2 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	4 None	Latitude, Longitude:	41.518333,-81.681663

Administrative Information

Investigator In Charge (IIC):	Hatch, Craig
Additional Participating Persons:	Rob Kaman; FAA FSDO; Cleveland, OH
Original Publish Date:	November 6, 2019
Last Revision Date:	
Investigation Class:	<u>Class</u>
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=96719

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available <u>here</u>.