Aviation Investigation Final Report

Location:	Presque Isle, Maine	**Accident Number:**	DCA19FA089
Date & Time:	March 4, 2019, 11:29 Local	**Registration:**	N14171
Aircraft:	Embraer EMB145	**Aircraft Damage:**	Substantial
Defining Event:	Wrong surface or wrong airport	**Injuries:**	3 Minor, 28 None
Flight Conducted Under:	Part 121: Air carrier - Scheduled		

Analysis

The flight crew of an Embraer EMB145XR airplane was attempting to land on runway 1 at Presque Isle International Airport (PQI), Presque Isle, Maine. Snow was falling at the time. A Notice to Air Mission issued 2 hours 19 minutes before the accident indicated that runway 1 was covered with 1/4 inch of dry snow, and the PQI maintenance foreman stated that the airport had been conducting snow removal operations to maintain that condition on the runway surface.

Accident Sequence

The first instrument landing system (ILS) approach to runway 1 appeared to be proceeding normally until the first officer (the pilot flying) transitioned from instrument references inside the flight deck to outside references. During a postaccident interview, the first officer stated that he expected to see the runway at that time but instead saw “white on white” and a structure with an antenna that was part of the runway environment but not the runway itself. The captain (the pilot monitoring) stated that she saw a tower and called for a go-around. (Both flight crewmembers were most likely seeing the automated weather observing system wind sensor pole, which was located about 325 ft to the right of the runway 1 centerline and about 870 ft beyond the runway threshold, and the damage to the lightning arrester at the top of the wind sensor pole was likely due to contact with the accident airplane as it flew over the pole.) According to the cockpit voice recorder (CVR), after the go-around, the first officer asked the captain if she saw the runway lights during the approach. The captain responded that she saw the lights but that “it’s really white down there that’s the problem.”

Airport personnel stated that snow plowing operations on the runway had finished about 10 minutes before the first approach. The CVR recorded the flight crew’s discussion about turning on the pilot-controlled runway lights and sounds similar to microphone clicks before and after the discussion. However, the PQI maintenance foreman stated that, after the first approach,

the runway lights were not on. Thus, the investigation could not determine, based on the available evidence, whether the flight crew had turned on the runway lights during the first approach.

The captain thought that the airplane had drifted off course when the first officer transitioned from flight instruments to the outside, so she instructed the first officer to remain on the instruments during the second approach until the decision altitude (200 ft above ground level [agl]). The second approach proceeded normally with no problems capturing or maintaining the localizer and glideslope. During this approach, the captain asked airport maintenance personnel to ensure that the runway lighting was on, and the PQI maintenance foreman replied that the lights were on "bright"(the high-intensity setting). Thus, the flight crew had a means to identify the runway surface even with the reported snow cover at the time.

As the airplane approached the decision altitude, the captain instructed the first officer to disconnect the autopilot, which he did. About nine seconds later, the airplane reached the decision altitude, and the captain called, "runway in sight twelve o'clock." This callout was followed by the first officer's statement, "I'm stayin' on the flight director 'cause I don't see it yet." A few seconds later, while the airplane was below 100 ft agl, the captain and the first officer expressed confusion, stating "what the [expletive]" and "I don't know what I'm seein'," respectively, but neither called for a go-around.

The airplane subsequently impacted the snow-covered grassy area between runway 1 and a parallel taxiway. During a postaccident interview, the first officer stated that, when he transitioned from flight instruments to the outside during the second approach, he again saw "white on white" as well as blowing snow and that the airplane touched down before he could determine what he was seeing. The maintenance foreman estimated that, at the time of the accident, the runway had about 1/8 inch of snow with about 20% to 25% of the runway visible.

Flight Crew Performance

The first officer was relatively new to the EMB145; he received his type rating for the airplane about 7.5 months before the accident. Even though the first officer did not see the runway at the decision altitude, he might have continued the second approach to a landing because he trusted that the captain had the runway in sight. Also, the captain had instructed the first officer to "stay in" multiple times as the airplane descended through 100 ft agl. The captain had apparently intended for the first officer to focus on the flight director and not look outside for the approach lights or the runway.

Company policy stated that the pilot flying should monitor the instruments until the callout "runway in sight" and then transition to outside references no later than 100 ft above the touchdown zone elevation. Company policy also stated that a pilot should call for a go-around if either the runway environment was not in sight by the decision altitude or the successful completion of the approach was in doubt. Thus, when the first officer looked outside after the captain's "runway in sight" callout and did not see the runway, one or both flight crewmembers should have called for a go-around.

Further, the captain reported that, during the second ILS approach to runway 1, she saw the tower again but explained that the airplane had leveled off to clear the tower before continuing to descend. However, the appearance of the tower should have prompted the captain to call for a go-around, just as she did during the first approach. The captain should have recognized that an airplane that was on the proper vertical and horizontal paths of an ILS approach would not have flown that close to a 30-ft tower while descending below the decision altitude.

The National Transportation Safety Board considered why the flight crew might have continued the second approach rather than call for and perform another go-around, especially since the CVR recorded the captain telling the first officer that, if they did not see the runway during the second approach, they would go to their alternate airport. The CVR also recorded the first officer stating, "if there's nothing there then we'll go." Confirmation bias is a type of cognitive bias that involves a tendency to seek information to support one's belief instead of information that is contrary to that belief. In this case, the localizer and glideslope information indicated that the airplane was aligned with the runway centerline, and the captain stated that she had the runway in sight. However, the first officer did not have the runway in sight, and both flight crewmembers expressed confusion about what they were seeing outside the airplane when it was below 100 ft agl.

Also, during his previous flight to PQI, the first officer noticed an "incongruency" between the pink needle (providing guidance from the airplane's flight management system) and the green needle (providing guidance from the ILS localizer signal). Although the first officer shared this information with the captain during the predeparture briefing, neither flight crewmember considered that a navigational air error could be occurring, even though the captain saw a tower (first and second approaches) and the first officer saw a structure with an antenna (first approach). Thus, the crewmembers discounted their confusion about the runway environment and continued the approach likely because of confirmation bias.

The captain was ultimately responsible for the flight. However, she demonstrated poor judgment and decision-making when she instructed the first officer to stay on the flight instruments as the airplane descended below the decision altitude. By the time that the first officer transitioned outside the airplane, not enough time remained for him to determine the airplane's position in relation to the runway. Although cognitive biases, including confirmation bias, can affect judgment, decision-making, and behaviors, a review of the captain's training records revealed deficiencies regarding her piloting abilities. For example, the CommutAir vice president of flight operations stated that, while the captain was a De Havilland Canada DHC-8 first officer, she received a disciplinary letter and agreed not to pursue captain upgrade training and be monitored for 9 months. Also, in September 2017, the captain received a notice of disapproval from the Federal Aviation Administration (FAA) for her EMB145 type rating. In addition, twice in September 2017, CommutAir placed the captain under "increased scrutiny" due to training failures, including a failed proficiency check. Even though the captain received her EMB145 type rating in early October 2017 and upgraded to captain afterward, her repeated training problems indicated an inadequate foundation for being a captain, which CommutAir did not effectively address.

In addition, although a review of the flight crew's recent activities determined nothing noteworthy about the captain's activities and her sleep opportunity (7.5 hours) on the night

before the accident, evidence indicated that the first officer was likely fatigued on the day of the accident. Although the first officer stated that he felt rested that day, he had been home with the flu for several days before the accident. Further, the first officer was prescribed a continuous positive airway pressure (CPAP) machine, but he did not consistently use his CPAP between February 26 and March 3, 2019. The daily-use graphic provided in the CPAP download indicated that the first officer used the device for less than 1 hour on February 26, did not use the device between February 27 and March 2, and used the device for about 1 hour 30 minutes between 1200 on March 3 and 1200 on March 4. Due to his illness and lack of CPAP use, the first officer was likely not obtaining adequate sleep during that period.

The first officer commuted to Newark, New Jersey, on the night before the accident. He arrived at a local hotel about 0000 on March 4 due to flight and shuttle delays. The first officer went to sleep about 0100 and awoke about 0600, resulting in a sleep opportunity of 5 hours. The first officer normally slept 7 to 8 hours; thus, he had a sleep debt of about 2 to 3 hours. The quality of his sleep would also have been compromised because he was still coughing and did not use his CPAP. The first officer's fatigue likely exacerbated the cognitive bias that he experienced during the flight.

Localizer Misalignment

Both flight crewmembers reported that the localizer and glideslope needles were centered during the first and second approaches, indicating that the airplane was aligned with the runway centerline. However, postaccident flight testing of the ILS localizer and glideslope revealed that the localizer was out of tolerance by about 200 ft to the right. After the accident, the airport conducted snow removal operations in the area around and in front of the localizer array; the snow depths (on the day before removal operations began) ranged from about 2 to 5 ft. After the snow was removed, a flight check determined that the localizer signal was in alignment.

About 36 hours before the accident (the night of March 2, 2019), a CommutAir flight crew noted the localizer misalignment while on approach to PQI. After landing, the crew reported the misalignment to a controller at the Boston Air Route Traffic Control Center. The controller reported the localizer misalignment to FAA technical operations personnel, including the center's operations manager-in-charge, who then informed the center's National Airspace System operations manager. FAA procedures stated that, for reports of a navigational aid malfunction, air traffic control personnel should request a report from a second aircraft. Because a second pilot report had not yet been received to confirm the localizer misalignment, the National Airspace System operations manager did not act on the initial report about the misalignment. The accident flight was the first instrument flight rules flight to arrive at PQI after the initial report about the localizer misalignment.

FAA procedures for air traffic control personnel also stated that, "in the absence of a second aircraft report, activate the standby equipment or request the monitor facility to activate." However, PQI did not have an air traffic control tower, and air route traffic control centers, including Boston Center, do not have the capability to activate standby equipment.

Airport personnel at PQI stated that they had no means to determine the alignment of the localizer signal and had to depend on pilot reports. However, the March 2, 2019, pilot report about the localizer misalignment was not provided to airport personnel. In addition, although FAA winter operations guidance contained specific criteria for the allowable snow depth around a glideslope antenna, the guidance did not specify similar information for the area around a localizer antenna array. After the accident, the FAA revised its winter operations guidance to state that snow around a localizer array could affect its radiated signal and that a snow accumulation level of 2 ft was the point at which an FAA ILS specialist would need to begin observing the condition of the localizer signal.

Company Reports of Localizer Misalignment

At least six pilots who flew into PQI during the 5 days before the accident (including the accident first officer) encountered issues with the ILS localizer. However, none of those pilots submitted a company aviation safety action program (ASAP) report before the accident. (Four of the pilots submitted an ASAP report after the accident.) During a postaccident interview, the CommutAir managing director of safety stated that he did not know why the reports were not filed before the accident.

According to the CommutAir director of operations, a company flight data analyst reviewed ASAP reports "right away," and the analyst provided time-critical information to the appropriate company managers and directors when necessary. Because the reports of the PQI localizer misalignment were submitted after the accident, CommutAir missed an opportunity to make this information available to company flight crews flying to PQI and employ strategies to mitigate any potential threat that the misalignment posed. For example, CommutAir could have alerted those pilots to maintain a heightened awareness of the localizer alignment, restricted the use of the runway 1 ILS approach to higher weather minimums, or prohibited the use of the approach. In addition, if the Boston Air Route Traffic Control Center had received an earlier report of a localizer misalignment, center personnel could have had the opportunity to confirm that report with a second report or take another action to designate the approach as unusable until the localizer signal could be assessed for proper alignment.

Probable Cause and Findings

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

The flight crew's decision, due to confirmation bias, to continue the descent below the decision altitude when the runway had not been positively identified. Contributing to the accident were (1) the first officer's fatigue, which exacerbated his confirmation bias, and (2) the failure of CommutAir pilots who had observed the localizer misalignment to report it to the company and air traffic before the accident.

Findings

Personnel issues	Lack of action - Flight crew
Personnel issues	Delayed action - Other
Environmental issues	Localizer - Accuracy of related info
Personnel issues	Incorrect action selection - Pilot
Personnel issues	Expectation/assumption - Flight crew

Factual Information

History of Flight

Landing	Wrong surface or wrong airport (Defining event)

On March 4, 2019, about 1129 eastern standard time, CommutAir flight 4933, an Embraer EMB145XR, N14171, was attempting to land on runway 1 at Presque Isle International Airport (PQI), Presque Isle, Maine, and impacted terrain to the right of the runway. The first officer and 2 of the 28 passengers sustained minor injuries, and the captain, the flight attendant, and 26 passengers were not injured. The airplane was substantially damaged. The scheduled passenger flight was operating under the provisions of Title 14 *Code of Federal Regulations* Part 121. Instrument meteorological conditions prevailed at the time of the accident.

The first officer's most recent flight to PQI before the accident was on February 27, 2019. As part of the predeparture briefing for the accident flight, the first officer mentioned that, during the previous flight, the instrument landing system (ILS) localizer for runway 1 was offset when the airplane was aligned with the runway during a visual approach. (A localizer uses a radio beam to provide pilots of landing aircraft with lateral navigation information to align with the runway and is one of the two main components of an ILS; the glideslope is the other main component.) During a postaccident interview, the first officer, who was the pilot monitoring for that flight, stated that both he and the captain of that flight noticed an "incongruency" between the pink needle (which provides guidance from the airplane's flight management system) and the green needle (which provides guidance from the ILS localizer signal).

The accident flight departed from Newark Liberty International Airport (EWR), Newark, New Jersey, about 1004. The captain was the pilot monitoring, and the first officer was the pilot flying. The en route portion of the flight was uneventful. According to CommutAir, once the airplane was in range of PQI, the flight crew received an updated airport weather report at the time—a special weather observation at 1031. The observation indicated that the wind was from 090° at 5 knots, visibility was 1/2 mile in moderate snow and freezing fog, and the cloud ceiling was broken at 1,100 ft and overcast at 1,800 ft.

According to the cockpit voice recorder (CVR), at 1101:42, a controller from the Boston Air Route Traffic Control Center (ARTCC) cleared the flight for an ILS approach to runway 1, and the captain acknowledged the instruction. At 1105:35, the controller terminated radar services and instructed the flight crew to change to the PQI common traffic advisory frequency (CTAF); PQI did not have an air traffic control tower. The captain acknowledged this instruction and then announced, over the CTAF, that the flight was 2 miles from FEROG (an approach waypoint) and inbound for the ILS approach to runway 1.

A PQI maintenance staff member (later identified as the maintenance foreman) contacted the flight crew at 1105:59, and the captain responded that the flight was 4 minutes away from the airport. At 1106:14, the first officer stated to the captain, "he said…he was out of the way now, so he's clear," indicating that the runway was clear of snow removal vehicles. Flight data recorder (FDR) data indicated that, at 1106:58, the airplane began its first approach to PQI. At 1107:50, the captain announced over the CTAF that the airplane was nearing the final approach fix for the approach.

The ILS approach to runway 1 at PQI had a decision altitude of 678 ft, which was 200 ft above ground level (agl), and a visibility requirement of 1/2 mile. The captain made the 1,000-ft callout (indicating that the airplane was 1,000 ft above the decision altitude) at 1108:38 and stated that the approach was stable and that she had "ground contact." At 1109:03, the captain asked the first officer if he wanted the airport lights to be turned on. (The runway 1 edge lights, runway end identifier lights, and the approach lighting system were pilot controlled on a published frequency.) The first officer's reply of "yeah. Turn them on" was preceded and followed by a sound similar to five microphone clicks.

The captain made the 500-, 400-, and 300-ft callouts between 1109:20 and 1109:33. The first officer then stated, "autopilot's coming off," which the captain acknowledged. At 1109:40, the captain made the 200-ft callout, which was followed by the "approaching minimums" and "minimums" aural annunciations from the enhanced ground proximity warning system. The CommutAir *EMB 145 Aircraft Operations Manual* stated that pilots should call for a go-around if the runway environment was not in sight by the decision altitude or if the successful completion of the approach was in doubt.

At 1109:54, the captain stated, "runway in sight. See it?" to which the first officer responded, "yeah" and "well I got somethin' [that] looks like a runway up there." The CVR recorded the aural annunciation "one hundred [ft]" at 1109:59. About 3.5 seconds later, the captain stated, "watch your speed," which was followed by sounds similar to the stickshaker. At 1110:09, the captain stated, "go missed" twice; less than 1 second later, the first officer stated, "yeah we're goin' missed." During a postaccident interview, the captain stated that she saw the approach lights but that she also saw a tower that looked "very close" to the airplane's position. The first officer stated that, when he transitioned from looking at the instruments to looking outside, he expected to see the runway but saw what he described as "white on white." The first officer also stated that he saw a structure with an antenna that was part of the runway environment but not the runway itself, so he executed the go-around. The maintenance foreman stated, during a postaccident interview, that the runway lights were not on after the first approach.

FDR data showed that the airplane had descended to a minimum pressure altitude of 703 ft (169 ft agl) before beginning to ascend. At 1110:33 and 1110:56, the captain stated over the CTAF that the flight was "going missed." At 1111:05, the captain notified the Boston ARTCC that the flight "went missed…[and] we're gonna give it another try." The controller acknowledged the information and then instructed the flight crew to climb to and maintain 3,200 ft. At 1113:28, the captain contacted PQI maintenance and stated that the flight "went missed" and that she would call back again "for another try."

Between 1113:50 and 1114:08, the captain and the first officer discussed the previous approach. The captain asked the first officer whether he lost the localizer, and he stated, “I don’t think so…I went outside the airplane, too early, and I didn't have the runway.” The first officer continued, “I thought I had the runway then I was like that is not the runway,” to which the captain responded, “yeah I thought that too.” At 1114:13, the first officer stated that, for the second approach, he would “stay inside on the localizer,” and the captain agreed. At 1115:20, the controller provided vectors for the ILS approach to runway 1, which the captain acknowledged.

At 1116:20, the captain contacted PQI maintenance about the second approach to the runway, and the maintenance foreman stated, “we’ll be all clear runway one.” The captain stated, “can you make sure those lights are on for us?” The maintenance foreman replied, “yes we will.” During a postaccident interview, the maintenance foreman reported that he turned on the lights to the high-intensity setting. At 1116:46, the first officer asked the captain, “did you ever see the lights at all last time?” The captain stated that she saw the lights but that “it’s really white down there that’s the problem.” The first officer agreed and stated, “everything is washed out.” The captain also stated, “if we don’t see it we’ll just go to, Vermont.” (The captain was referring to Burlington International Airport, South Burlington, Vermont, which was the alternate airport for the flight.) The first officer replied, “you got it.”

Between 1118:36 and 1118:42, the first officer stated, “so this time I’ll stay on the flight director until things start screaming minimums…then I’ll look up…if there’s nothing there then we’ll go, if there is something there we’ll land.” The captain commented, “yup, sounds good.” The first officer also stated that he would specifically look for the lights that surround the runway and that, during the previous approach, “all I saw was the antennas at the end of the runway.”

Between 1119:00 and 1120:41, the captain and the first officer began discussing the previous approach and the second approach. The captain repeated, “it’s really white down there,” and instructed the first officer to “stay inside and I’ll let you know when you can look up.” The captain also instructed the first officer on the actions to take if she commanded “go missed” again.

The captain contacted PQI maintenance at 1121:46 and stated that the airplane was about 16 miles and 7 minutes away from the airport. The maintenance foreman replied, “we’ll be clear runway one and the lights are on bright.” The maintenance foreman stated he had again activated the lights to high intensity.

At 1123:41, the controller told the flight crew that the airplane was about 8 miles south of the locator outer marker for the ILS runway 1 approach and cleared the flight for the approach. The controller also instructed the flight crew to report when the airplane was established on the localizer. The captain acknowledged this information. At 1125:03, the captain told the first officer, “localizer’s comin’ in alive,” and the first officer responded, “localizer is alive so is the glideslope.” The captain then informed the controller that the airplane was established on the localizer. The controller instructed the flight crew to change to the CTAF, and the captain acknowledged this instruction and notified local traffic that the airplane was inbound for runway 1.

FDR data showed that, at 1126:51, the airplane started its final descent to PQI. At 1126:51, the captain announced over the CTAF that the airplane was 4 miles from runway 1. The captain made the 1,000-ft callout at 1127:21 and stated that the approach was stable. After the captain made the 500-ft callout at 1127:57, the first officer stated, "five hundred cleared to land. I'm inside you're outside." The captain made the 400-ft callout shortly afterward and instructed the first officer to keep the autopilot on until 200 ft agl. The first officer stated, "I will," which was followed by the captain's 300-ft callout. At 1128:22, the captain stated, "there's two hundred, get the autopilot off," and the first officer stated "off" about 6 seconds later. At 1128:30 and 1128:37, the enhanced ground proximity warning system announced "approaching minimums" and "minimums," respectively; in between those annunciations, the captain made the 100-ft callout.

According to the CVR, about 2 seconds after the "minimums" annunciation, the captain called, "runway in sight twelve o'clock." During a postaccident interview, the captain stated that the localizer and glideslope needles were centered when she called the runway in sight; also, the CVR did not record any discussion between the flight crewmembers about a localizer or glideslope deviation. Federal Aviation Administration (FAA) automatic dependent surveillance-broadcast data showed that the airplane was aligned to the right of the runway 1 centerline during both approaches (with the last data point for the second approach recorded when the airplane was about 23 ft agl), and FDR data showed that the localizer and glideslope needles were mostly centered with only small deviations consistent with normal piloting.

At 1128:42, the first officer stated, "I'm staying on the flight director 'cause I don't see it yet," which was followed by the captain stating "stay in" several times within a 5-second period. At 1128:53, the captain stated, "what the [expletive]," and the first officer stated, "I don't know what I'm seein'." FDR data showed that, at 1128:56, the air-to-ground switch parameter changed from air to ground; about 1 second later, the vertical acceleration parameter reached its maximum value of 3.35 Gs. At 1129:14, the airplane's groundspeed was 0 knots.

During a postaccident interview, the first officer stated that, when he transitioned from the instruments to the outside during the second approach, he saw "white on white" again and blowing snow. The first officer also stated that it was difficult to comprehend what he was seeing outside the airplane because everything was covered in snow and that, before he could determine what he was seeing, the airplane touched down. The first officer added that he did not see the structure with the antenna during the second approach because the airplane had flown over it by the time that he looked outside. The captain reported that she saw the tower again but that the airplane had leveled off to clear the structure before continuing to descend.

The captain recalled that, after touchdown, the airplane was "bouncing up and down a few times" before coming to a stop. The flight attendant reported that the landing was "rough and violent" with seat cushions and passenger belongings falling into the cabin aisle as the airplane came to a stop. The airplane came to rest in the snow-covered grassy area between runway 1 and a parallel taxiway located about 630 ft to the right of the runway. The airplane's resting location was about 3,600 ft beyond the runway threshold, about 305 ft to the right of the runway centerline, and about 230 ft from the right edge of runway. Airport personnel estimated that, when the airplane landed, visibility was about 1/2 mile, and about 30 minutes had elapsed since the time that the runway was last plowed.

Postaccident Events

At 1129:18, the captain instructed the passengers to remain seated; 3 seconds later, the flight attendant provided the same instruction. At 1129:24, the captain instructed the first officer to run the engine shutdown checklist, which he did.

The flight attendant reported that, after the airplane came to a stop, she called the flight deck and received no answer, but she could hear the flight crew from her aft-facing jumpseat and decided to wait for the captain to contact her because an immediate evacuation was not necessary. The flight attendant then moved out of her seat, looked outside, and walked through the cabin to check on the passengers and remove items that had fallen into the aisle. When the flight attendant returned to the front of the cabin, the captain opened the flight deck door and told her that an evacuation would be occurring, and the flight attendant relayed that information to the passengers.

After the main cabin door was opened, the flight attendant noticed that the snow reached the bottom of the belly of the airplane. Firefighters came aboard the airplane; one attended to the first officer, who was injured, and one walked through the cabin to check on passengers. A snow plow created a walkway so that the crewmembers and passengers would not have to walk through the snow after exiting the airplane.

Emergency personnel took the first officer off the airplane, and the flight attendant then directed the passengers to exit the airplane via a ladder that firefighters had brought to the airplane. After the passengers had exited, the flight attendant checked to make sure that no one was left behind, and the captain and the flight attendant then exited the airplane. A bus transported the captain, flight attendant, and passengers to the terminal.

Pilot Information

Certificate:	Airline transport	**Age:**	40,Female
Airplane Rating(s):	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 Without waivers/limitations	**Last FAA Medical Exam:**	May 10, 2018
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	February 11, 2019
Flight Time:	5655 hours (Total, all aircraft), 1044 hours (Total, this make and model)		

Co-pilot Information

Certificate:	Airline transport	**Age:**	51,Male
Airplane Rating(s):	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:**	October 9, 2018
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	January 6, 2019
Flight Time:	4909 hours (Total, all aircraft), 470 hours (Total, this make and model)		

The Captain

The captain began working for CommutAir in March 2013 as a first officer on the De Havilland Canada DHC-8 airplane. The captain left the company in November 2015 and joined another air carrier. In May 2016, the captain left that air carrier and returned to CommutAir as a first officer on the DHC-8. The CommutAir vice president of flight operations stated that, while the captain was a DHC-8 first officer in 2016, she received a disciplinary letter from the company and agreed to forgo an upgrade to captain and be monitored for 9 months.

During September 2017, the captain received a notice of disapproval from the FAA for her EMB145 type rating due to difficulties in performing steep turns and an engine failure takeoff. She received an EMB145 type rating in October 2017 and upgraded to captain shortly afterward.

In addition, twice in September 2017, the company placed the captain under “increased scrutiny” due to training failures, including a failed proficiency check, on the EMB145. The captain received remedial training to address these failures in March 2018. (See the Organizational and Management Information section of this report for more information about the company’s increased scrutiny policy.)

On March 1, 2019, the captain reported to work at 1115. She flew three flight legs and finished her workday at 2044, after which she commuted home, arriving about 0000 on March 2. The captain was off duty that day. She was also off duty on March 3 and commuted to EWR for the flight to PQI the next day. She arrived at a local hotel about 2200 and went to sleep about 2330. The captain reported that she slept well and had no problems falling or staying asleep. On March 4, the captain awoke about 0700 and started her workday at 0830. The captain reported that she felt “great” when she awoke. The captain reported that she had no sleep disorders or issues.

The First Officer

The first officer began working at CommutAir in May 2018 as a first officer on the EMB145. He received his airline transport pilot certificate and EMB145 type rating in July 2018.

The first officer called in sick after a flight from PQR to EWR on February 28, 2019. He flew home afterward (to Palm Beach, Florida) and was subsequently diagnosed with the flu. The first officer reported that he felt "much better" on March 3. That night, he commuted to EWR for the flight to PQI the next day, arriving at a local hotel later than expected—about 0000 on March 4—due to flight and ground transportation delays. The first officer went to sleep about 0100 and awoke about 0600; he reported that he felt "normal" and "rested" but that he was still coughing.

The first officer also reported that he normally slept 7 to 8 hours and that he used a continuous positive airway pressure (CPAP) machine. (The first officer was diagnosed with moderate obstructive sleep apnea after a sleep study in 2012.) The daily-use graphic provided in the CPAP machine download showed that the first officer used the device for less than 1 hour on February 26, 2019; did not use the device between February 27 and March 2; and used the device for about 1 hour 30 minutes between 1200 on March 3 and 1200 on March 4. The first officer stated that he did not think that he used his CPAP machine during the early morning hours of March 4 because he had arrived in his hotel room later than planned and wanted to go to sleep.

Aircraft and Owner/Operator Information

Aircraft Make:	Embraer	**Registration:**	N14171
Model/Series:	EMB145 XR	**Aircraft Category:**	Airplane
Year of Manufacture:	2004	**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	14500859
Landing Gear Type:	Retractable - Tricycle	**Seats:**	
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	Turbo fan
Airframe Total Time:		**Engine Manufacturer:**	Rolls-Royce
ELT:		**Engine Model/Series:**	AE3007A1E
Registered Owner:	Wells Fargo Trust Co Na Trustee	**Rated Power:**	
Operator:	Commutair	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:	United Express	**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PQI,534 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	11:18 Local	**Direction from Accident Site:**	0°
Lowest Cloud Condition:		**Visibility**	0.5 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	60°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.68 inches Hg	**Temperature/Dew Point:**	-3°C / -4°C
Precipitation and Obscuration:			
Departure Point:	Newark, NJ (KEWR)	**Type of Flight Plan Filed:**	IFR
Destination:	Presque Isle, ME (KPQI)	**Type of Clearance:**	IFR
Departure Time:	10:04 Local	**Type of Airspace:**	Unknown

PQI had an automated weather observing system that provided meteorological aerodrome reports each hour (at 56 minutes past the hour) with special weather observations as conditions warranted. The weather conditions at 1118 (11 minutes before the accident) included wind from 060° at 4 knots, visibility 1/2 mile in moderate snow and freezing fog, temperature -3°C, dew point temperature -4°C, and altimeter 29.68 inches of mercury. The remarks section indicated that the hourly precipitation was less than 0.01 inch (a trace).

The weather conditions at 1143 (14 minutes after the accident) included wind from 070° at 5 knots, visibility 3/4 mile in light snow, scattered clouds at 800 ft agl, ceiling overcast at 1,300 ft agl, temperature -1°C, dew point -4°C, and altimeter 29.67 inches of mercury. The remarks section indicated that the hourly precipitation since 1056 was less than 0.01 inch (a trace).

An automated weather observing system wind sensor pole was located about 325 ft to the right of the runway 1 centerline and about 870 ft past the runway 1 threshold. The pole was about 30 ft tall and had a lightning arrester at the top.

Airport Information

Airport:	Presque Isle Intl KPQI	**Runway Surface Type:**	Asphalt
Airport Elevation:	455 ft msl	**Runway Surface Condition:**	Snow
Runway Used:	1	**IFR Approach:**	ILS
Runway Length/Width:	7439 ft / 150 ft	**VFR Approach/Landing:**	None

Notices to Air Mission

The most current field condition notice to air mission (NOTAM) at the time of the accident was issued at 0910 (2 hours 19 minutes before the accident). The NOTAM stated that the touchdown, midpoint, and rollout portions of runway 1 had medium braking action with 100% coverage of 1/4 inch of dry snow.

After the accident, a NOTAM was issued at 1234 to indicate that the ILS runway 1 localizer and glideslope were out of service.

Snow Removal Operations on Day of Accident

According to a postaccident interview with the maintenance foreman at PQI, light snow was falling at the airport throughout the day of the accident. He estimated that 1 to 2 inches of snow had fallen before the accident and that a total of 4 to 5 inches had fallen that day. Snow removal operations were underway throughout the morning to maintain runway conditions to 1/4 inch or less of dry snow. The maintenance foreman stated that plowing operations on the runway were finished about 10 minutes before the accident flight's first approach and estimated that, at the time that the flight arrived, about 1/8 inch of snow was on the runway. The maintenance foreman also stated that "the snow wasn't over the entire runway at the time of the accident as there were spots of blacktop visible due to some heat coming off the runway." The maintenance foreman thought that 20% to 25% of the runway was visible.

Instrument Landing System

On March 2, 2019 (2 days before the accident), the flight crew of another company flight, CommutAir flight 4939, conducted an ILS approach to runway 1 at PQI. As the airplane descended through 2,500 ft, the airplane's instruments showed that the airplane was centered over the runway, but the airplane appeared to be aligned to the right of the runway centerline. The flight crewmembers discontinued the ILS approach when they saw the runway and noted that, when the airplane was visually aligned with the runway centerline, the airplane's instruments indicated that the airplane was located to the left of the ILS course. The airplane made an uneventful landing.

After the airplane vacated the runway (about 2345 on March 2), the crew of flight 4939 reported the localizer misalignment (an offset to the right of course all the way to the runway) to the Boston ARTCC. According to the captain of that flight, the center controller stated that he would "forward that information onward." The controller then informed center technical

operations personnel, including the operations manager-in-charge, who then informed the National Airspace System operations manager

FAA Order JO 7110.65X, Air Traffic Control, states that, for reports of a navigational aid malfunction, "request a report from a second aircraft…if the second aircraft confirms the malfunction or in the absence of a second aircraft report, activate the standby equipment or request the monitor facility to activate." CommutAir flight 4939 was the last scheduled instrument flight rules flight into PQI before the accident flight.

During a postaccident interview, the National Airspace System operations manager stated that he assumed that the lack of a second pilot report (before the accident) was an indication that the localizer misalignment was no longer a problem. As a result, the National Airspace System operations manager did not notify the organization that monitored the status of the ILS equipment at PQI—the Atlantic Operations Control Center in Atlanta, Georgia—about the reported localizer misalignment. ILS malfunctions, including a localizer misalignment, generate an alert at the Atlantic Operations Control Center and the Bangor, Maine, systems service center (which was responsible for maintaining and inspecting the ILS equipment at PQI). Because all ILS equipment at PQI was operational before the accident, no alert was generated about the localizer misalignment, and no report was made to the systems service center.

CommutAir included a document, titled "Crewmember Daily Read," in dispatch releases to provide a flight crew with important information about a flight. The Crewmember Daily Read in the dispatch release for the accident flight (which was issued at 0834) contained several items related to PQI, including the requirement for the flight crew to obtain an updated runway condition code no more than 1 hour before landing, a reminder for the crew to determine if any existing NOTAMs were still in effect, and a reminder of the frequency to activate the runway lights at the airport. The document did not mention any issues related to the localizer for the runway 1 ILS approach.

Postaccident Inspection of Instrument Landing System

On March 7, 2019 (3 days after the accident), the FAA conducted a postaccident flight inspection of the runway 1 ILS to determine localizer and glideslope accuracy. The inspection revealed that the localizer was out of tolerance by about 200 ft to the right of course and that the glideslope provided a "fly up" signal instead of the required "fly down" signal at 890 ft. The snow around and in front of the localizer and glideslope antennas was subsequently removed. (The area outside the runway lights along the length of the runway was also cleared of snow.) Surveys taken the previous day found snow depths ranging from about 2 to 5 ft near the area of the localizer antenna array, which was about 1,000 ft from the end of runway 1.

On March 13, the FAA conducted another flight inspection, which found that the localizer and glideslope were within tolerances. The ILS was put back into service on March 14, and the NOTAM indicating that the ILS was out of service was canceled.

Airport operations personnel at PQI stated that problems with the localizer signal had occurred during previous winters. PQI does not have the ability to monitor the signal quality of the

localizer, so airport operations would learn about localizer signal problems from FAA technical operations personnel conducting ground checks of the signal (either as a routine check or in response to a reported problem). After a failed check, airport operations personnel would remove snow until the problem with the localizer signal was resolved.

Wreckage and Impact Information

Crew Injuries:	1 Minor, 2 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	2 Minor, 26 None	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	3 Minor, 28 None	**Latitude, Longitude:**	46.692779,-68.044723

Postaccident examination found that the airplane's nose was damaged through the first bulkhead at the top and was either damaged or missing through the nose gear position at the bottom. The nose cone, radar, glideslope antenna, and nose gear doors were all missing. The nose gear wheels were found aft of their normal position. The right-side nose gear door actuator was broken at the door attachment point; the left-side gear door actuator was still attached to the door attachment point, but the door was missing.

The left main gear was lodged between the left engine nacelle and fuselage. The fuselage structure in the area of the gear was ripped and damaged, and the fuselage around the gear wheels was distorted. The landing gear trunnion had penetrated the left engine gear box.

Figure 2: Left main landing gear lodged between left engine nacelle and the aircraft fuselage

The left-wing inboard flap was shifted aft, and the flap trailing edge was found above the fully retracted position. The right-wing outboard flap appeared to be extended (the extension angle could not be determined), the inboard jackscrew was broken, and the aft-most flap panel (close to the outboard edge) was cracked. The right-wing inboard flap and inboard jackscrew were missing, and the outboard jackscrew was broken.

The left engine inlet and nacelle were distorted around the wheel location. The right engine inlet was damaged on the inboard side. Both engine inlets had rotational scoring in the area of the fan blades. About one-half of the fan blades on both engines had leading-edge damage (nicks or gouges).

The aft fuselage appeared to be undamaged. The left and right sides of the vertical stabilizer and the localizer antenna appeared to be intact and undamaged.

Examination of the airplane's interior found two small penetration holes on the cabin wall near a seat on the left side of the aft cabin. The corresponding interior cabin wall panel seams were distorted on both the forward and aft sides. Five of the 50 passenger seats were found with a broken recline actuator hinge.

The lightning arrester at the top of the automated weather observing system wind sensor pole was found bent after the accident. The FAA installed a new wind sensor pole on March 13, 2019.

Medical and Pathological Information

After the accident, the captain and the first officer were tested for drugs and alcohol in accordance with 14 *Code of Federal Regulations* Part 120, Drug and Alcohol Testing Program. The test results were negative.

Organizational and Management Information

CommutAir was founded in 1989. According to its website (accessed June 23, 2022), CommutAir "is a regional airline operating flights on behalf of United Airlines as a United Express partner." At the time of the accident, CommutAir's fleet consisted of 32 EMB145 airplanes.

Flight Procedures

The CommutAir *EMB145 Aircraft Operations Manual* stated that, for a normal instrument approach, the pilot flying would "monitor the instruments until the callout 'Runway in sight,' then transition to outside references no later than 100 feet above the touchdown zone (TDZ) elevation." The manual also stated that the pilot monitoring would "monitor the approach, deliver the proper callouts and visually acquire the runway."

As previously stated, the CommutAir *EMB145 Aircraft Operations Manual* stated that pilots should call for a go-around if the runway environment was not in sight by the decision altitude or if the successful completion of the approach was in doubt. The manual also noted that either flight crewmember could call for a missed approach/go-around at any time during the approach and transition to landing and that, upon that call, the pilot flying must execute the maneuver without hesitation.

The CommutAir *General Operations Manual* stated that, during a straight-in instrument approach, the pilot can continue the approach below the decision altitude to touchdown if the

airplane can land within the touchdown zone using normal maneuvers and a normal descent rate, the visibility is not less than the visibility prescribed in the approach procedure, and a visual reference for the intended runway is visible and identifiable. The manual also stated that the pilot must execute a missed approach upon reaching the decision altitude or missed approach point if any of the required conditions for a straight-in approach are not met.

Aviation Safety Action Program

CommutAir had an aviation safety action program (ASAP). The CommutAir *General Operations Manual* stated that the program "fosters a voluntary, cooperative, non-punitive environment for the open reporting of safety of flight concerns." The CommutAir director of operations stated that a company flight data analyst reviews deidentified ASAP reports "right away" and notifies the appropriate managers and directors about any time-critical information that warrants action.

According to a postaccident interview with the CommutAir safety program manager, four ASAP reports involving the ILS runway 1 localizer misalignment at PQI were submitted after the accident. Two of the reports were submitted by the flight crewmembers of CommutAir flight 4939 on March 2, 2019 (referenced in the Airport Information section of this report). Two other ASAP reports were filed by the flight crewmembers of a CommutAir flight on March 1, 2019. The safety program manager thought that visual conditions prevailed during both of these flights to PQI and that the airfield was seen "well above minimums."

The captain of the March 1 flight to PQI stated that the flight was his first time at the airport and attributed the localizer misalignment to a lack of familiarity with the airport and the approach. The first officer of that flight stated that he and the captain both noted that the airplane appeared to be flying to the right of the runway, even though the ILS needles were centered. Neither ASAP report mentioned whether the flight crew notified air traffic control about the misalignment. The first officer of the accident flight reported that he did not complete an ASAP report after his previous trip to PQI (February 27, 2019) because the captain of that flight stated that they did not need to submit a report about the inconsistency between the flight management system and ILS localizer indications.

The CommutAir managing director of safety stated that he did not know why the ASAP reports were not filed before the accident. He thought that the pilots might not have recognized the importance of a misaligned localizer signal or did not know that such a misalignment needed to be reported. The managing director of safety further stated that, after the accident, navigational aid discrepancies became a mandatory reporting item.

Increased Scrutiny Policy

The CommutAir *General Operations Manual* discussed that low-time pilots (as defined in the manual) would be subject to increased scrutiny if they failed one checking event or one remedial training event. The manual also stated that pilots who are not considered to be low time but have repetitive failures would be subject to increased scrutiny if they failed any checking event or two remedial training events during a 2-year period. (Remedial training was

defined as required additional training to complete a regular training event.) In both cases, increased scrutiny included the following:

- A 6-month recurrent ground school cycle for a period of 1 year for any failure of a ground school written exam and/or a failure of an oral checking event.

- A 6-month line check cycle for a period of 1 year for any failure of a practical checking event.

Postaccident Actions

After the accident, CommutAir implemented several actions to increase safety. These actions are detailed in the docket for this accident investigation.

Additional Information

Confirmation Bias

Confirmation bias is an unconscious cognitive bias that involves a tendency to seek information to support a belief instead of information that is contrary to that belief. As a result of confirmation bias, pilots might continue with an original plan despite changing conditions. Thus, confirmation bias can negatively affect aeronautical decision-making.

Airport Winter Operations Safety

FAA Advisory Circular (AC) 150/5200-30D, "Airport Field Condition Assessments and Winter Operations Safety," dated July 29, 2016, provided guidance to airports for developing a snow and ice control plan (an FAA-approved document). Although the AC stated that any snow or ice that affects the signal of an electronic navigational aid should be removed, the ILS guidance discussed snow clearance areas only for the glideslope.

On October 29, 2020, the FAA issued a revision to AC 150/5200-30D. The revised AC incorporated additional guidance for airport operators about snow removal around navigational aids. Regarding the localizer, the AC stated the following:

> *The accumulation of large amounts of snow can change the surface area in front of the Localizer and consequentially may affect its radiated signal. A snow accumulation level of two (2) feet is the limit at which point the* [FAA] *system* [ILS] *specialist needs to start observing the condition of the Localizer signal.*

The guidance also noted, “when a determination is made that snow or ice accumulations jeopardize signal strength from the Localizer or GS [glideslope] antenna, ensure a NOTAM is issued by the individual with NOTAM authority.” This guidance in the revised AC was aligned with the interim change to FAA Order JO 6750.49B, “Maintenance of Instrument Landing Systems (ILS) Facilities,” which was transmitted with a November 1, 2019, letter to airport sponsors.

In addition, FAA guidance published in November 2015 provided engineering tips for snow removal at ILS facilities. This guidance, which was for FAA technical operations personnel, stated that ILS specialists should conduct a ground check to determine the effects that a ground contour change resulting from snow could have on a localizer’s radiated signal.

Administrative Information

Investigator In Charge (IIC):	Lovell, John
Additional Participating Persons:	John Darke; CommutAir Airlines/United Express; North Olmsted, OH David Keenan; FAA; Washington DC Chris Heck; ALPA
Original Publish Date:	July 12, 2022
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=99050