

The runway was in and out of sight, but the crew pressed ahead.

# SNOWED



BY MARK LACAGNINA

The view outside the windshield on short final approach was blurred by an intensifying snowstorm. “I don’t see the runway, dude,” the captain said. “Let’s go.” The first officer, the pilot flying, said that he had the end of the runway in sight and continued the approach. Numbed by fatigue, the captain did not insist on going around. For the next few seconds, the cockpit voice recorder (CVR) picked up expletives, gasps and groans, rumbling noises and the sounds of impact. A photograph made soon thereafter shows the airplane belly-deep in snow and ensnared by the airport perimeter fence.

The runway overrun occurred on Feb. 18, 2007, at Cleveland Hopkins International Airport. The airplane, an Embraer ERJ-170 operated by Shuttle America, was substantially

damaged, and three passengers sustained minor injuries. The other 68 passengers and the four crewmembers escaped injury.

In its final report on the accident, the U.S. National Transportation Safety Board (NTSB) said that the probable cause was “the failure of the flight crew to execute a missed approach when visual cues for the runway were not distinct and identifiable.” Among the factors attributed to the overrun were the crew’s use of an incorrect minimum altitude for the approach, a long touchdown on the relatively short, snow-covered runway, failure to use maximum braking and reverse thrust, the captain’s fatigue, and an airline attendance policy that did not permit pilots suffering from fatigue to remove themselves from flight duty without fear of reprisal.

## Insomnia

A former corporate pilot, the captain, 31, had flown for Republic Airways subsidiaries Chautauqua Airlines and Shuttle America since December 2003. He had 4,500 flight hours, including 1,200 hours in type, with all but 100 hours as pilot-in-command. He usually commuted two hours between his home in Louisville, Kentucky, and Shuttle America’s base in Indianapolis.

The captain told investigators that his financial situation for the past year had been poor and was getting worse, and that he and his wife had separated the month before the accident. He also revealed that he had a chronic cough and had developed insomnia about a year earlier; the bouts of insomnia usually lasted for several days.



The captain had been on vacation for seven days, and his leave was scheduled to continue through the day of the accident. However, after an unsuccessful attempt to arrange for company jump seat travel to California to visit his infant son, he had called Shuttle America the night of Feb. 17 to request a flight the next day. He was told to report to the Louisville airport at 0525 local time the next morning so that he could be flown as a non-revenue passenger to Atlanta, where he would begin a two-day trip.

After accepting the assignment, the pilot had an almost sleepless night. “He went to bed at 2000 but did not fall asleep until 0000 ... and then awoke at 0100,” the report said. “He tossed in bed until about 0200, at which time he decided to get up and prepare for the 0525 report time.”

Although he was tired, the captain did not remove himself from duty because he believed that the airline would terminate his employment. A month earlier, he had received written notification that his attendance was unacceptable — with 18 days of unexcused absence from scheduled duty during the previous 12 months — and that “future occurrences would result in corrective

action.” The report noted that a verbal warning had not preceded the written warning, as required by the airline’s attendance policy.

Shuttle America, which operated 47 ERJ-170s and employed 430 pilots, provided no information in its employee handbook about pilots calling in as fatigued or the implications of such action. However, the airline’s pilot contract stated that “even though a pilot may be legal under the FARs [U.S. Federal Aviation Regulations], he has the obligation to advise the company that, in his honest opinion, safety will be compromised due to fatigue if he operates as scheduled or rescheduled.”

The captain had been on duty almost 10 hours and had been awake for about 31 of the 32 preceding hours when the accident occurred. “The captain’s performance during the accident flight was inconsistent with previous reports of his abilities,” the report said. “Specifically, several first officers who had been paired with the captain had positive comments about his leadership and piloting skills.”

### ‘Unusable’ Glideslope

The captain flew with different first officers from Atlanta to Sarasota, Florida, and back to

After landing long and overrunning the short, contaminated runway, the Shuttle America ERJ 170 became entangled in the airport perimeter fence, its nose gear broken.







After Runway 24R at Cleveland Hopkins was closed for snow removal, the flight crew attempted to land on Runway 28, the crosswind runway at the top of the photo.

Atlanta the morning of Feb. 18. The first officer assigned to the third leg, the accident flight, was 46 years old and had flown as a copilot in a twin-turboprop regional airplane before being hired by Shuttle America as an ERJ-170 first officer in June 2005. He had 3,900 flight hours, including 1,200 hours as second-in-command in type.

“The accident flight was the first one in which the captain and the first officer had flown together,” the report said. “Shuttle America’s common practice is for the captain to be the flying pilot for the first flight of any crew pairing.” Nevertheless, the captain asked the first officer to fly the airplane. “The first officer reported that he would have preferred not to be the flying pilot because he had just completed a three-day, six-leg trip sequence but that he agreed because of the captain’s references to fatigue and lack of sleep the night before,” the report said.

The ERJ-170, operated as Delta Connection Flight 6448, departed from Atlanta on time at 1305, with an expected arrival in Cleveland at 1451. The destination was forecast to have 5 mi (8 km) visibility in light snow showers and

an overcast ceiling at 2,500 ft, with temporary conditions of 2 mi (3,200 m) visibility and a 1,200-ft overcast.

“The flight dispatcher provided the crew with a weather update about 1310, via the airplane’s aircraft communications addressing and reporting system (ACARS), indicating that visibility [at Cleveland] was unrestricted with no snow,” the report said. The same information was included in an update provided by the dispatcher at 1407.

The Cleveland area recently had received

about 18 in (46 cm) of snow. Neither pilot had read a notice to airmen (NOTAM) included in their preflight paperwork about snow affecting the glideslope-transmission areas for two runways at the airport. The NOTAM advised that although the glideslopes remained in service, only localizer minimums were authorized for the ILS (instrument landing system) approaches because the “glideslope angles may be different than published.”

At 1429, the crew received automatic terminal information service (ATIS) information Alpha, which said that the ILS approach to Runway 24R was in use. Soon thereafter, the 9,000-ft (2,743-m) runway was closed for snow removal, and ATIS information Bravo reported that the ILS approach to Runway 28 was in use. Both ATIS broadcasts said that the glideslope for Runway 28 was “unusable due to snow buildup.” The pilots did not discuss this information.

### Missed Assessment

A Cleveland approach controller was providing radar vectors to the crew at 1453, when the

first officer briefed the Runway 28 ILS approach procedure. The briefing did not include, and the captain did not ask for, the runway length — 6,017 ft (1,834 m) — and the pilots did not review landing distance data.

“Shuttle America did not require landing distance assessments based on conditions at the time of arrival, even though the FAA [U.S. Federal Aviation Administration] had issued a safety alert for operators (SAFO) in August 2006 recommending that such assessments be performed,” the report said.<sup>1</sup> The SAFO also recommended adding a 15 percent “safety margin” to the calculated landing distance.

The landing distance calculated by investigators was 4,872 ft (1,485 m), including a 15 percent safety margin. “This calculation was based on the reported winds, a braking action report of ‘fair’ and the accident airplane’s flaps 5 configuration,” the report said. “The calculation assumed a touchdown point of 1,400 ft [427 m], the use of maximum reverse thrust until 60 kt and full wheel braking.”

The report noted that four transport category airplanes, including two Boeing 737s, had landed safely in the 10 minutes preceding the accident. However, weather conditions deteriorated rapidly during the ERJ-170’s approach. At 1453, the approach controller said that ATIS information Charlie was current; the winds were from 290 degrees at 18 kt, visibility was 1/4 mi (400 m) in heavy snow, and the Runway 28 runway visual range (RVR) was 6,000 ft (1,800 m).

The captain had flown to Cleveland Hopkins before but had not landed on Runway 28. “The captain reported that he flew in snow conditions about four months each year and that the conditions on the day of the accident were the worst winter conditions in which he had ever flown,” the report said. The first officer had not previously flown to Cleveland. “He had flown in snow conditions before but had not experienced a snow squall during landing until the accident flight.”

### ‘It’s a Localizer’

At 1458, the crew heard the controller clear the pilots of another airplane for the ILS approach

and advise them that the glideslope was unusable. While completing checklist actions, the ERJ-170 crew discussed the apparent contradiction in a clearance to conduct an ILS approach with an unusable glideslope. “It’s not an ILS if the glideslope is unusable,” the captain said. “Exactly,” the first officer said. “It’s a localizer.”<sup>2</sup>

“During postaccident interviews, both pilots stated that they were confused by the term ‘unusable,’” the report said. “Nevertheless, neither [pilot] asked the controller for clarification about the status of the glideslope. ... Other Shuttle America pilots who were interviewed after the accident stated that they were familiar with the term ‘unusable’ in reference to a glideslope, and one check airman stated that he had used this specific term in various simulator scenarios.”

At 1500, the approach controller issued a heading to intercept the localizer and cleared the crew to conduct the ILS approach, adding,

**“The captain reported that the conditions on the day of the accident were the worst winter conditions in which he had ever flown.”**

## Embraer ERJ-170



© Joey Collura/Airliners.net

The ERJ-170, which first flew in 2002, has 70 to 80 passenger seats and is powered by General Electric CF34-8E5 engines. Standard maximum weights are 79,344 lb (35,990 kg) for takeoff and 72,311 lb (32,800 kg) for landing. Maximum range is 2,000 nm (3,704 km).

The ERJ-190, which has a longer fuselage and wing, and 100 to 114 passenger seats, was introduced in 2004. The “ERJ” designation has been dropped, and production of standard and long-range versions of the 170 and 190 continues. The accident airplane is shown above.

Source: *Jane's All the World's Aircraft*



“glideslope unusable.” When the captain established radio communication with the airport traffic controller, he said that the airplane was established on the “localizer to two eight.” The controller cleared the crew to land and advised that the winds were from 310 degrees at 12 kt and that braking action had been reported as fair.

After acknowledging the clearance, the captain told the first officer, “This is just ... feels wrong.” The first officer replied, “Yeah, something’s [expletive] up.”

While conducting the landing checklist at 1501, the captain said that he had ground contact. About a minute later, the first officer said that the glideslope had been captured by the autopilot. “During a postaccident interview, the first officer stated that he and the captain did the ‘mental math’ [i.e., a distance-height calculation] for a three-degree glideslope and that, on the basis of this calculation, they assumed that the glideslope was functioning normally,” the report said. “Also, the captain stated that the cockpit instrumentation showed the airplane on the glideslope with no warning flags.”

The published minimum RVR for the ILS approach was 2,400 ft (750 m), and the decision height (DH) was 1,018 ft. The applicable minimum RVR for the localizer approach was 4,000 ft (1,200 m), and the minimum descent altitude (MDA) was 1,220 ft.

Assuming that the glideslope was working properly, the pilots set up for the ILS approach,

instead of the localizer approach. “The flight crew should not have disregarded the information provided by the controller and on the ATIS information broadcasts about the glideslope being unusable and should have ... set up, briefed and accomplished the approach to localizer (glideslope-out) minimums,” the report said.

### Below Minimums

The airplane was crossing the final approach fix — the outer marker — at 1502, when the controller advised that Runway 28 RVR was 2,200 ft, which was below minimums for both the ILS and localizer approaches. The captain told the first officer, “We’re inside the marker. We can keep going.”<sup>3</sup> He then added, “This is [expletive] up.”

At 1503, the controller advised that Runway 28 RVR was 2,000 ft. The first officer said, “Jesus.” The captain said, “Got to be fun. Got to have twenty-four to shoot the fricken ILS.” He then called out 1,000 ft above DH and said that he was “getting some ground contact on the sides [but] nothing out front.”

CVR data and postaccident interviews revealed that neither pilot had the runway environment in sight when the airplane reached the MDA for the localizer approach. “It is important to note that [they] would have been required to execute a missed approach if they had been using the localizer approach,” the report said.

The radio altimeter apparently had been set to the DH, and, at 1504:46, an electronic callout,

“approaching minimums,” was generated, followed six seconds later by “minimums.” The airplane was about 190 ft above ground level (AGL) at 1504:53, when the captain said, “I got the lights.” The first officer replied, “And continuing.”

“About 1504:58, the captain [again] announced that the

No one was hurt while deplaning, but NTSB said that using the evacuation slide, rather than a step ladder, would have been safer.

U.S. National Transportation Safety Board



runway lights were in sight but then stated that he could not see the runway,” the report said. “This statement was immediately followed by, ‘Let’s go [around].’”

The imprecise terminology of the captain’s command might have suggested to the first officer that it was tentative. Nevertheless, the report said, “When the captain called for a go-around because he could not see the runway environment, the first officer should have immediately executed a missed approach, regardless of whether he had the runway in sight.”

The report also said, “When the first officer did not immediately execute a missed approach, as instructed, the captain should have reasserted his go-around call or, if necessary, taken control of the airplane.”

### ‘Complete Whiteout’

An electronic callout of 50 ft AGL was being generated when the captain asked the first officer if he had the runway in sight. About a second later, however, the captain said, “Yeah, there’s the runway. Got it.”

Recorded flight data indicated that the airplane crossed the runway threshold at 40 ft AGL and was 1,050 ft (320 m) beyond the threshold at 1505:19 when an electronic callout of 10 ft AGL was generated. The first officer said, “Oh, [expletive], dude.” The captain also voiced an expletive.

“During a postaccident interview, the first officer stated that ... he momentarily lost sight of the runway because a snow squall came through and he ‘could not see anything,’” the report said, noting that the first officer should have conducted a go-around. RVR had dropped to 1,400 ft (400 m).

Groundspeed was 105 kt when the airplane touched down about 2,900

ft (884 m) beyond the runway threshold at 1505:29. The ground spoilers deployed automatically, and the captain applied reverse thrust. However, he applied full reverse thrust for only two seconds before reducing it to idle at an indicated airspeed of about 85 kt.

“In addition, [recorded flight] data showed that the first officer’s initial wheel brake application was about 20 percent of maximum and remained relatively steady for about eight seconds before increasing to 75 percent of maximum,” the report said. “Braking then increased to about 90 percent of maximum when the captain applied his brakes [with 450 ft (137 m) of runway remaining]. The anti-skid system did not modulate the brake pressure until the captain and the first officer applied their brakes aggressively.”

The first officer told investigators that he could not see the end of the runway or any distance-remaining signs during the roll-out. Groundspeed was about 42 kt when the ERJ-170 overran the runway.

“The CVR recorded the sound of numerous impacts starting about 1505:50 and a sound similar to the airplane coming to a stop about 1505:57,” the report said. Aircraft rescue and fire fighting (ARFF) personnel arrived about four minutes later. An ARFF official told investigators that his crews faced “blizzard conditions and a complete whiteout” while responding to the accident.

After confirming that no fire or fuel leaks existed, and that no one was seriously injured, the captain decided to keep everyone aboard the airplane until buses arrived to transport them to the terminal. The nose gear had collapsed, and the occupants were evacuated through the front cabin door with the aid of a stepladder.

Three passengers reported neck, back, spine, shoulder and/or arm pain. “Two of these passengers were

transported to a hospital after the accident, but neither was admitted,” the report said.

### Call for Training

Based on the findings of the investigation, NTSB recommended that U.S. air carrier, commuter, air taxi and fractional ownership program pilots receive simulator training on rejecting landings when visual cues rapidly decrease below 50 ft AGL and conducting maximum-performance landings on contaminated runways.

The board also recommended that the FAA work with industry and pilot organizations to develop and adopt a “specific, standardized policy that would allow flight crewmembers to decline assignments or remove themselves from duty if they [are] impaired by a lack of sleep.”

This article is based on NTSB Accident Report NTSB/AAR-08/01, *Runway Overrun During Landing; Shuttle America, Inc., Doing Business as Delta Connection Flight 6448; Embraer ERJ-170, N862RW; Cleveland, Ohio; February 18, 2007.*

### Notes

1. After the accident, Shuttle America and Embraer developed an automated airplane performance system that uses data entered by the flight crew and sent via ACARS to Embraer, which performs a landing distance calculation and sends the data to the crew within 30 seconds. At press time, an FAA-approved six-month operational trial of the system was ongoing.
2. The report noted that the FAA’s *Instrument Procedures Handbook* states that “the name of an instrument approach, as published, is used to identify the approach, even if a component of the approach aid is inoperative or unreliable.”
3. FARs Part 121, the air carrier regulations, permits pilots to continue an approach if they receive a report that visibility is below minimums after they have begun the final approach segment.