



# Aviation Investigation Final Report

<b>Location:</b>	Atlanta, Georgia	<b>Incident Number:</b>	DCA181A026
<b>Date &amp; Time:</b>	November 29, 2017, 11:06 Local	<b>Registration:</b>	N852DN
<b>Aircraft:</b>	Boeing 737-932ER	<b>Aircraft Damage:</b>	None
<b>Defining Event:</b>	Near midair/TCAS alert/loss of separation	<b>Injuries:</b>	169 None
<b>Flight Conducted Under:</b>	Part 121: Air carrier - Scheduled		

## Analysis

The flight crew was conducting an instrument landing system approach to runway 9R. When the airplane was about 3.5 miles from the runway threshold and at an altitude of about 1,230 ft above ground level (agl), the first officer (the pilot flying) disconnected the autopilot, after which the airplane began to deviate to the right of the localizer course. When the airplane was at an altitude of about 500 ft agl, the first officer disconnected the autothrottle; at 300 ft agl, he began correcting to the left to return to the center of the localizer course. When the airplane reached the decision altitude (200 ft agl), the airplane was drifting toward the taxiway N extended centerline, which was parallel to, and about 650 ft to the left of, the runway 9R centerline.

Radar data indicated that the airplane was 1 mile from the runway 9R threshold at the time that the airplane aligned with taxiway N. When the airplane was at an altitude of 120 ft agl and was 600 ft to the left of the runway 9R centerline and 50 ft to the right of the taxiway N centerline, the first officer initiated a go-around after the captain's (the monitoring pilot) command. The airplane descended to about 50 ft above the western end of the taxiway before it began to climb. Engine power increased while the airplane was above and aligned with taxiway N. The airplane was then vectored for an instrument landing system approach for runway 10. The flight crew subsequently landed the airplane uneventfully.

Another airplane (a Boeing MD-88) was taxiing westbound on taxiway N at the time of the incident approach. According to radar data, the airplanes, at their closest distances, were separated by 286 ft horizontally and 257 ft vertically.

The approach became unstabilized when the first officer improperly adjusted the airplane's heading and flew outside of the localizer course. The airline's procedures indicated that an approach would be considered to be stabilized if it maintained, among other things, a "lateral

flight path while in the landing configuration.” The manual warned that, if a stabilized approach could not be established and maintained, pilots were to initiate a go-around and not attempt to land from an unstable approach. Also, the airline’s procedures indicated that an approach should not continue below the decision altitude (200 ft agl in this case) unless “the aircraft is in a position from which a normal approach to the runway of intended landing can be made.” Thus, the flight crew’s actions were not consistent with company procedures.

Further, when the airplane reached the decision altitude for the approach, the flight crew failed to call for a go-around and execute, in a timely manner, the initial steps for a go-around. Specifically, flight data recorder data showed that the takeoff/go-around switch was not selected until 4 seconds after the airplane reached the decision altitude and that a total of 12 seconds elapsed between the time that the airplane reached the decision altitude and the thrust lever began advancing toward go-around power. These delays caused the airplane to descend about 150 ft below decision altitude and come within about 50 ft of an occupied taxiway.

The 1052 hourly weather observation for the destination airport indicated, among other conditions, 1/8 mile visibility, mist, patches of fog, and an overcast ceiling at 300 ft agl. The flight crewmembers received this observation about 1057 (9 minutes before the incident). Thus, the crewmembers were provided with sufficient information to understand the weather conditions that the flight would encounter during the approach to the airport.

The captain and the first officer reported no history of sleep disorders, and a review of their sleep histories revealed that they received adequate rest during the 3 days preceding the incident. Further, sleep opportunities for the captain and first officer were aligned with local nighttime, so circadian disruptions were not an issue. Thus, the captain and the first officer were not likely experiencing fatigue during the incident flight.

## **Probable Cause and Findings**

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

The flight crewmembers’ failure to properly monitor the airplane’s flightpath, which caused the approach to become unstabilized and resulted in the airplane’s descent below the decision altitude while misaligned with the localizer course. Contributing to the incident were the first officer’s delay in setting go-around thrust after the captain called for the go-around and the captain’s failure to take control of the airplane after go-around thrust was not immediately set, both of which caused the airplane to come within about 50 ft vertically of an occupied taxiway.

## Findings

<b>Personnel issues</b>	Aircraft control - Copilot
<b>Personnel issues</b>	Identification/recognition - Flight crew
<b>Personnel issues</b>	Delayed action - Copilot
<b>Personnel issues</b>	Lack of action - Pilot

## Factual Information

### History of Flight

<b>Approach-IFR final approach</b>	Near midair/TCAS alert/loss of separation (Defining event)
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On November 29, 2017, about 1106 eastern standard time, Delta Air Lines flight 2196, a Boeing 737-900, N852DN, was involved in an incident at Hartsfield-Jackson Atlanta International Airport (ATL), Atlanta, Georgia, after the airplane aligned with a taxiway that was parallel to and left of the intended landing runway. The flight crew performed a go-around, and the airplane landed uneventfully. None of the airplane occupants were injured, and the airplane was not damaged. The flight was operated as a Title 14 *Code of Federal Regulations* Part 121 scheduled domestic passenger flight.

The incident flight departed from Indianapolis International Airport (IND), Indianapolis, Indiana. The first officer was the pilot flying (PF), and the captain was the pilot monitoring (PM).

As the airplane approached the airport, the flight crew requested and received the current weather for ATL from Delta Air Lines dispatch. About 1057 (9 minutes before the incident), the flight crew received, via the aircraft communications addressing and reporting system, the most recent meteorological aerodrome report for ATL. That report, which was issued about 1052, indicated that the wind was from 180° at 5 knots, visibility was 1/8 mile in mist with patches of fog, and an overcast ceiling was at 300 ft above ground level (agl). During a postincident interview, the pilots stated that they were aware of the weather conditions that the flight would encounter on approach to ATL.

According to air traffic control recordings, an approach controller at the Atlanta Terminal Radar Approach Control facility cleared the flight for the instrument landing system approach to runway 9R. According to flight data recorder (FDR) data, when the airplane was about 3.5 miles from the runway threshold at an altitude of about 1,230 ft agl (at 1105:01), the first officer disengaged the autopilot. The first officer reported that he wanted to practice hand flying the approach. (A postincident interview with the Delta Air Lines 737 fleet captain revealed that the company encouraged pilots to hand fly airplanes in appropriate conditions.) The airplane was in visual meteorological conditions at that time. Shortly afterward, the airplane entered instrument meteorological conditions (IMC) and began to drift to the right of the localizer course.

When the airplane was at an altitude of about 500 ft agl (at 1105:50), the first officer disconnected the autothrottle. The captain reported being “surprised” when the first officer disconnected the autopilot and autothrottle as the airplane approached the decision altitude. The captain also reported that the first officer had briefed the approach but did not include in the briefing his intention to disconnect the autopilot and autothrottle. The captain added that,

when the autothrottle was disconnected, “things got squirrely.”

When the airplane was at an altitude of 300 ft agl, the first officer began correcting to the left to return to the center of the localizer course. The airplane crossed the localizer centerline and continued to drift to the left of course. When the airplane reached the decision altitude (200 ft agl) about 1106:10, the airplane was drifting toward taxiway N’s extended centerline, which was parallel to, and about 650 ft to the left (north) of, the runway 9R centerline. When the airplane was at an altitude of 120 ft agl and was 600 ft to the left of the runway 9R centerline and 50 ft to the right of the taxiway N centerline, the captain commanded a go-around. FDR data showed that, at 1106:16, the takeoff/go-around switch (located on the throttle levers) transitioned from not pressed to pressed and that the takeoff/go-around engage parameter transitioned from not engaged to takeoff/go-around. At that time, the airplane was about 1/4 mile from the taxiway N threshold.

Air traffic control recordings showed that, at 1106:19, the ATL tower controller instructed the airplane to go around, to which the flight crew responded, “Delta 2196 is on the go.” A few seconds later, the tower controller advised the flight crew, “it looks like you’re over the taxiway.”

The airplane descended to an altitude of about 50 ft above the western end of taxiway N and then began to climb at 1106:21. The FDR recorded movement of the throttles at 1106:23 and the resulting increase in engine speed about 2 seconds later.

Federal Aviation Administration radar data showed that another Delta Air Lines airplane (a Boeing MD-88) was taxiing westbound on taxiway N when the incident flight crew was issued go-around instructions. According to the radar data, the closest distances between the two airplanes was 286 ft horizontally and 257 ft vertically.

The tower controller provided heading instructions to the incident flight crew, and then the approach controller provided the crew with vectors for an ILS approach to runway 10. The airplane landed uneventfully about 1121.

## Pilot Information

<b>Certificate:</b>	Airline transport; Commercial; Flight instructor	<b>Age:</b>	57, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	5-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane multi-engine; Airplane single-engine; Instrument airplane	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 With waivers/limitations	<b>Last FAA Medical Exam:</b>	October 20, 2017
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	October 15, 2017
<b>Flight Time:</b>	9440 hours (Total, all aircraft), 1780 hours (Total, this make and model), 7777 hours (Pilot In Command, all aircraft), 143 hours (Last 90 days, all aircraft), 57 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

## Co-pilot Information

<b>Certificate:</b>	Airline transport; Commercial; Flight instructor	<b>Age:</b>	43, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	5-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	Yes
<b>Instructor Rating(s):</b>	Airplane single-engine; Instrument airplane	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 1 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	August 29, 2017
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	July 21, 2017
<b>Flight Time:</b>	3000 hours (Total, all aircraft), 593 hours (Total, this make and model), 2292 hours (Pilot In Command, all aircraft), 172 hours (Last 90 days, all aircraft), 58 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

The captain reported that he was off duty during the 3 days preceding the incident. On the day of the incident, the captain awoke about 0430 for an 0730 flight from ATL to IND (the flight crew's first flight of the day) and stated that he felt "great" for the incident flight. The captain stated that he needed about 8 hours of sleep to feel rested and that he normally went to sleep about 2200 and awoke at 0630 or 0700. The captain added that his sleep schedule during the days before the incident was "normal." He did not have a history of sleep disorders. The last time that the captain had consumed alcohol was 3 days before the incident. He did not take any medication during the 3 days before the incident that would have affected his performance during the flight.

The first officer reported that, 3 days before the incident, he was at a hotel because of a

30-hour layover. He went to sleep about 2200 and awoke the next day between about 0500 and 0510 for a 0545 pickup at the hotel. The first officer conducted three flights that day and then went off duty. On the day before the incident, the first officer flew from his home to ATL; went to sleep between about 2200 and 2230; and awoke about 0530 feeling “alert,” “energetic,” and “rested.” The first officer reported that, when he was not flying, he normally went to sleep about 2200 and awoke at 0600. He did not have a history of sleep disorders. The last time that the first officer consumed alcohol was during the week before the incident. He did not take any medication during the 3 days before the incident that would have affected his performance during the flight.

### Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Boeing	<b>Registration:</b>	N852DN
<b>Model/Series:</b>	737-932ER 93YER	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	2016	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Transport	<b>Serial Number:</b>	31963
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	
<b>Date/Type of Last Inspection:</b>		<b>Certified Max Gross Wt.:</b>	
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	2 Turbo fan
<b>Airframe Total Time:</b>		<b>Engine Manufacturer:</b>	CFM International
<b>ELT:</b>		<b>Engine Model/Series:</b>	CFM56-7B27E
<b>Registered Owner:</b>		<b>Rated Power:</b>	
<b>Operator:</b>		<b>Operating Certificate(s) Held:</b>	Flag carrier (121)
<b>Operator Does Business As:</b>		<b>Operator Designator Code:</b>	DALA

The airplane was equipped with a primary flight display (PFD) for each pilot. The PFD showed primary flight information, including attitude and direction, airspeed, altitude, vertical speed, and heading. For an ILS approach, the PFD showed lateral (localizer) and vertical (glideslope) position indicators to indicate the airplane's location in relation to both instrument approach guidance systems.

On the localizer course scale, the pointer (a diamond-shaped marker) moved left and right to indicate the airplane's position in relation to the center of the localizer course. According to Boeing, for the 737-900, the pointer could move a maximum of 2.43 “dots.” (A dot is a measurement of the airplane's position to the left or right of the localizer center, with 2 dots considered to be the full-scale deflection from the localizer center.) According to the airplane

performance study for this incident, at the time that the flight crew engaged the takeoff/go-around switch, the airplane was more than 2.5 dots to the left of the intended landing runway.

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Instrument (IMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	ATL,980 ft msl	<b>Distance from Accident Site:</b>	2 Nautical Miles
<b>Observation Time:</b>	10:52 Local	<b>Direction from Accident Site:</b>	0°
<b>Lowest Cloud Condition:</b>	Scattered	<b>Visibility</b>	
<b>Lowest Ceiling:</b>	Overcast / 300 ft AGL	<b>Visibility (RVR):</b>	2800 ft
<b>Wind Speed/Gusts:</b>	5 knots /	<b>Turbulence Type Forecast/Actual:</b>	None / None
<b>Wind Direction:</b>	180°	<b>Turbulence Severity Forecast/Actual:</b>	N/A / N/A
<b>Altimeter Setting:</b>	30.31 inches Hg	<b>Temperature/Dew Point:</b>	13°C / 13°C
<b>Precipitation and Obscuration:</b>	Light - Patches - Fog		
<b>Departure Point:</b>	Indianapolis, IN (KIND)	<b>Type of Flight Plan Filed:</b>	IFR
<b>Destination:</b>	Atlanta, GA (KATL)	<b>Type of Clearance:</b>	IFR
<b>Departure Time:</b>	09:45 Local	<b>Type of Airspace:</b>	Class B

## Airport Information

<b>Airport:</b>	Atlanta-Hartsfield Internation KATL	<b>Runway Surface Type:</b>	Concrete
<b>Airport Elevation:</b>	1026 ft msl	<b>Runway Surface Condition:</b>	Wet
<b>Runway Used:</b>	9R	<b>IFR Approach:</b>	ILS
<b>Runway Length/Width:</b>	9000 ft / 150 ft	<b>VFR Approach/Landing:</b>	None

## Wreckage and Impact Information

<b>Crew Injuries:</b>	6 None	<b>Aircraft Damage:</b>	None
<b>Passenger Injuries:</b>	163 None	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>		<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	169 None	<b>Latitude, Longitude:</b>	33.636665,-84.42778

## Organizational and Management Information



## Flight Crew Responsibilities

The Delta Air Lines *Flight Operations Manual* stated that the captain has full responsibility for the safe operation of the aircraft and directs the activities of all crewmembers in a manner that promotes “maximum safety, efficiency, and operational effectiveness.” The manual also stated that first officer’s primary responsibility is to assist the captain in the safe and efficient operation of the aircraft while performing assigned duties and that the first officer’s responsibilities also included “immediately informing the captain of unsafe conditions or improper handling which could place the aircraft in jeopardy.” In addition, the manual stated that the primary responsibility of the pilot flying is to control and monitor the aircraft’s flightpath, including autoflight systems (if engaged) and that the primary responsibility of the pilot monitoring is to immediately bring any concern to the attention of the pilot flying.

The company’s *Flight Operations Manual* also provided information on the flight crewmembers’ responsibilities regarding a go-around. The manual stated that the pilot flying and the pilot monitoring are responsible for monitoring the approach and that, if either pilot observes flight parameters outside the stabilized approach criteria, a go-around must be called and honored.

## Automation Policy and Procedures

The Delta Air Lines *Flight Operations Manual* stated that “manual flight (for the primary purpose of maintaining proficiency) should normally be exercised under suitable environmental and low workload conditions. Sound pilot judgment is paramount to the judicious use of this policy.” According to the Delta Air Lines *737 Operations Manual*, the autopilot should be used for ILS category I approaches when the runway visual range was below 4,000 ft or visibility was below 3/4 mile. The 1052 meteorological aerodrome report for ATL (which the flight crew received at 1057) indicated that the runway 9R visual range varied between 2,800 and 4,000 ft and that the visibility was 1/8 mile.

In addition, Delta Air Lines standard operating procedures required its pilots to call out and acknowledge any automation changes, including the use or disconnection of the autopilot or autothrottle.

## Stabilized Approach Criteria

The Delta Air Lines *737 Operations Manual* defined a stabilized approach as “maintaining a stable speed, descent rate, and lateral flight path while in the landing configuration.” The manual included the following warning: “At any altitude, if the following stabilized approach criteria cannot be established and maintained, initiate a go-around. Do not attempt to land from an unstable approach.” The manual stated that, by 1,000 ft above field elevation, the airplane should be “aligned with the intended landing runway,” but an explanation of such alignment was not provided in the operations manual or other company manuals. During a postincident interview, the Delta Air Lines 737 chief line check pilot stated that more than 1 dot deviation on the localizer below 300 ft agl would warrant a go-around.

## Continuation of Approach Below Decision Altitude

The Delta Air Lines *737 Flight Crew Training Manual* stated that an approach should not be continued below the decision altitude/height unless “the aircraft is in a position from which a normal approach to the runway of intended landing can be made and suitable visual reference can be maintained.” Similarly, the Delta Air Lines *Airway Manual* stated that, upon reaching the decision altitude/decision height/minimum descent altitude and at any time before the missed approach point, the pilot can continue the approach and touch down if “the aircraft is continuously in a position from which a descent to a landing can be made at normal rate of descent using normal maneuvers...where that descent rate will allow touchdown to occur within the touchdown zone of the intended runway” and the pilot has at least one of the visual references listed in the manual for the intended runway “distinctly visible and identifiable.”

## Crew Resource Management

Delta Air Lines *Flight Crew Training Manual* detailed crew resource management (CRM) skills such as decision-making, planning, communication, workload management, and monitoring. A threat and error management model was used to procedurally implement CRM into operations, and CRM was discussed during indoctrination, initial qualification, continuing qualification (recurrent training), and captain leadership training.

Indoctrination training included a 0.5-hour online CRM module and a 2.75-hour instructor-led course. Initial qualification training incorporated CRM into procedures training and line operational simulations, which consisted of four 6-hour modules that included six evaluations. CRM was also formally checked during line-oriented exercises.

Continuing qualification training occurred every 9 months, and CRM was reviewed during two scenario-based modules on flightpath management and special-purpose operational training. CRM was formally checked during maneuvers validation and line-oriented exercises.

The CRM component of captain leadership training included the following subjects: leadership qualities, differences between first officer and captain roles, the importance of operational priorities, the captain's authority as defined by the *Federal Aviation Regulations* and the company's *Flight Operations Manual*, exercising authority responsibly, conflict resolution, and the captain's function and impact as a role model and mentor. In addition, the training included modules on decision-making, planning resources, and planning skills.

## Administrative Information

**Investigator In Charge (IIC):** Lovell, John

**Additional Participating Persons:**

**Original Publish Date:** May 10, 2022 **Investigation Class:** 3

**Note:** The NTSB traveled to the scene of this incident.

**Investigation Docket:** <https://data.nts.gov/Docket?ProjectID=96406>

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).