National Transportation Safety Board
Aviation Accident Final Report

Location:	Charlotte, NC	**Accident Number:**	DCA15LA173
Date & Time:	08/15/2015, 1837 EDT	**Registration:**	N564UW
Aircraft:	AIRBUS A321	**Aircraft Damage:**	Substantial
Defining Event:	Windshear or thunderstorm	**Injuries:**	159 None
Flight Conducted Under:	Part 121: Air Carrier - Scheduled		

Analysis

The flight was descending for landing on runway 36L at CLT with full flaps while passing through scattered rain cells. ATC had informed the flight of a windshear advisory about 12 minutes prior to the landing attempt and of a windshear alert, indicating a pilot report of a 20 knot loss of airspeed on approach, about 1.5 minutes prior to the landing attempt. The captain did not reference the available windshear guidance in the quick reference handbook, which recommended landing with Flaps 3 and increasing the approach speed by 15 knots, and approached with Full flaps and no speed increment. The flight encountered a small microburst on short final about 7 seconds prior to the landing attempt characterized by wind shift from a headwind to a tailwind and back to a headwind. The captain began a go-around after receiving an aural windshear alert/warning from the airplane systems, however, the airplane lost speed and lift and landed hard on the runway suffering a tail strike before they were able to climb. The crew was vectored for a landing on runway 36C following the event and landed without further incident.

Probable Cause and Findings

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

an encounter with a small microburst on short final at low altitude that resulted in a loss of lift and a tail strike during the go-around. Contributing to the accident was the captain's decision to continue the approach without applying appropriate windshear precautions in accordance with published guidance.

Findings

Personnel issues	Weather planning - Pilot (Factor)
Environmental issues	Windshear - Effect on operation (Cause)

Factual Information

On August 15, 2015, about 1837 eastern daylight time (EDT), American Airlines flight 1851, an Airbus A321, N564UW, touched down short of the runway in the paved displaced threshold area and performed a go-around before circling back and successfully landing at Charlotte Douglas International Airport (CLT), Charlotte, North Carolina. There were no injuries to the 6 crew members and 153 passengers onboard. The airplane was substantially damaged when it struck several runway end lights and experienced a tail strike during the go around. The flight was operating under the provisions of Title 14 *Code of Federal Regulations* Part 121, as a scheduled domestic passenger flight from Hartsfield - Jackson Atlanta International Airport (ATL), Atlanta, Georgia to CLT.

The captain was the pilot flying and the first officer (FO)the pilot monitoring. The climb, cruise, and initial descent portions of the flight were uneventful. According to the crew, they planned and briefed an instrument landing system (ILS) approach to runway 36L with CONF FULL (full flaps) as opposed to the normal CONF 3 setting, with autobrake at low due to possible water on the runway. About 1823:16 the FO contacted air traffic control (ATC) at 11,000 feet (ft), indicating they had Automatic Terminal Information Service (ATIS) information Tango. The crew was told to expect 36L and that ATIS information Uniform was current. About 1825:47 the crew acknowledged there was a low-level wind shear advisory in effect for the approach and the captain noted a rain cell close to the airport about 1826:26.

About 1831:32 the captain commented to the FO about the rain showers over the airport and that it prevented him from seeing the runway. ATC cleared the flight for the ILS runway 36L approach about 1832 and the FO noted to the captain about 33 seconds later that, "that thing a really is just like on the approach end isn't it?" About 1832:48 the captain noted the rain shower was "right over the field" and that it "cleared the right half." The captain turned off the autopilot about 1834:34 as they were descending through 2,500 feet and called for flaps to be set to CONF FULL about 30 seconds later.

About 1835:23 the FO contacted the tower and the flight was cleared to land on runway 36L following a CRJ ahead of them. The tower advised the flight of a windshear alert with a 20 knot loss of airspeed on a one mile final and advised that other aircraft had reported 8-15 knot airspeed gains at 300 feet about 1835:27. About 1836:03 the captain noted that somebody just went around, and the FO replied that it was probably the CRJ in front of them. The cockpit voice recorder (CVR) recorded sounds consistent with windshield wipers about 1836:53 and the radio altimeter made an automated aural call out of "one hundred" about 5 seconds later. About 1836:59 the FO noted windshear and the crew received a "WINDSHEAR, WINDSHEAR, WINDSHEAR" aural alert at 1836:59.5. The captain immediately called for "go around, TOGA" (takeoff, go-around power on the engines). The airplane impacted the ground at 1837:02.7.

The FO reported to the tower they were going around, and they had a 20 kt loss of airspeed at about 10 ft. They were vectored for a landing on runway 36C after the go around . The crew noted during the go around they would have to do a good post-flight inspection due to the firmness of the landing.

PERSONNEL INFORMATION

The crew reported they were on a 3-day pairing and the accident flight was the first flight of the second day. The airplane weather radar was on for the flight and in automatic mode.

The captain reported that he decided on CONF FULL and an autobrake low setting for the landing due to a wet runway and the possibility of a tailwind. He reported seeing some rain showers in the vicinity of the airport during the approach, but nothing looked threatening. The captain did recall receiving the windshear advisory in ATIS information Uniform but did not perceive it as a threat since it was an advisory and not a warning. The captain was aware of the Quick Reference Handbook (QRH) windshear guidance and had referenced it on previous flights. He did not reference the QRH for this flight since he did not perceive any hazardous convective weather in the area. The captain reported they encountered windshear very close to the ground, below 50 ft, and the airplane quit flying. He elected to go-around due to the sinking feeling and the aural windshear alert. He had never experienced a windshear event similar to this and the windshear events in training occurred further out and not over the runway.

The first officer reported seeing rain showers in the area on approach, but nothing was affecting traffic. He recalled receiving the windshear advisory in ATIS information Uniform and that it was "non-commensurate with what we saw outside". They had the preceding airplane and runway in sight from well out and experienced some airspeed fluctuations as they passed through a rain shower on approach about 1,000 ft. He did not recall receiving a windshear alert from the tower. They did not reference the QRH because there were no thunderstorms or convective activity in the area. He reported when they experienced the speed degradation, it felt like the airplane fell like a brick. During the approach he recalled that the weather radar was only showing areas of isolated green rain showers.

METEOROLOGICAL INFORMATION

The NTSB performed a weather study for the time period surrounding the accident. The forecast for flight planning expected rain showers in the vicinity of the airport around the landing time and was provided to the crew. The forecast was amended after the flight's departure from ATL to include a temporary period of thunderstorms and moderate rain at the time of the accident, but the amended forecast was not provided to the flight crew.

The CLT Automated Surface Observing System (ASOS) equipment was located about 1.4 miles northeast of the accident location. The observation for 1752 provided to the flight crew indicated wind calm, visibility unrestricted at 10 statute miles, with scattered clouds at 6,000 feet agl in towering cumulus clouds. The next official observation was issued after the accident at 1852 EDT and indicated a southerly wind at 7 knots, visibility 10 miles in light rain, scattered clouds at 6,500 feet in towering cumulus clouds, with towering cumulus clouds to the northeast, and southwest through northwest. The hourly precipitation reported was 0.15 inches, which indicated moderate to heavy rain having occurred within the hour. Thunderstorms were reported at CLT shortly after the accident between 1903 and 2036 EDT.

A review of the 5-minute ASOS data indicated that at 1835 there was wind from 220° at 6 knots, visibility 6 miles in moderate rain, ceiling broken at 6,000 feet agl, broken at 8,000 feet,

overcast at 10,000 feet, temperature 27° C, dew point temperature 18° C, altimeter 30.10 inches of mercury.

The closest National Weather Service Weather Surveillance Radar-1988, Doppler (WSR-88D) to the accident site was located at the Greer, SC forecast office about 64 miles southwest of CLT. Review of the 0.5° base reflectivity images from the WSR-88D showed the rapid development of two defined cells over the approach path and airport between 1829 and 1838 EDT. The cells merged into one larger cell by 1851 EDT. There was no lightning activity associated with the cells and the three-dimensional cross section showed bases near 6,000 feet and tops up to 15,000 feet.

CLT had a Terminal Doppler Weather Radar (TDWR) system located about 9 miles north of the accident site to provide ATC real-time weather information. The TDWR base reflectivity images showed several small echoes along the flight path and a larger echo above the touchdown zone of 36L between 1832 and 1838 EDT. The WSR-88D and TDWR composite reflectivity images showed the development of several defined cells along the approach path and over the touchdown zone of runway 36L between 1832 and 1844 EDT.

The FAA Integrated Terminal Weather System (ITWS) takes data from the various weather sensors around the airport including the ASOS and TDWR to provide current weather information and predictions, including windshear and microburst, to ATC. The FAA ITWS weather display during the period detected windshear conditions at or in the terminal area between 1816 and 1838 EDT. At the time of the accident the system was depicting a 25 knot windshear condition over runway 36L and 36C associated with an area of echoes over the area. The ribbon display indicated a windshear alert for arrivals on 36L with an expected 20 knot loss of airspeed at 1 mile final. This alert was provided to the flight by the approach controller. The ITWS detected several microburst conditions around the airport area in the minutes prior to the accident. There were no microburst alerts active for any of the runways at the time of the accident.

Figure 1 CLT TDWR composite reflectivity image at 1836 EDT depicting two defined cells along and over the flight path marked with black dots

FLIGHT RECORDERS

The CVR from the accident flight was downloaded normally by the NTSB Vehicle Recorder Division. The CVR group transcribed all the communications on the CVR from 1823:13 to 1838:50 EDT during the descent, initial landing attempt, and beginning of the go-around.

The flight data recorder (FDR) from the accident airplane was downloaded normally by the NTSB Vehicle Recorder Division. The recording included 113 hours of data including the accident flight, go-around, and subsequent landing. The FDR data showed the airspeed was maintained between 140 and 145 knots and the ground speed was about 135 knots in the minute preceding impact. About 7 seconds prior to impact, the airspeed began to decrease and dropped below the ground speed while the ground speed began to increase. The wind information showed a headwind of about 10 knots that increased to about 15 knots. The wind switched 180° to a tailwind of about 15 kts about the same time the airspeed began decreasing. The tailwind condition remained for about 7 seconds before switching back to a headwind over

the course of about 4 seconds. The vertical acceleration parameter recorded a spike about +2.6 g's at impact.

WRECKAGE AND IMPACT INFORMATION

Inspection of the airplane revealed that the aft lower fuselage suffered abrasion damage over an area about 20 feet long by 5 feet wide. The abrasion damage was concentrated at the frame and stringer locations. There were several punctures of the lower fuselage skin and several fractured or deformed fuselage frames. The potable water service door was separated. The inboard tire on the left main landing gear had several cuts and pieces of metal embedded in the tire.

Inspection of the runway found damage to several lights and evidence of fuselage contact with the paved overrun surface. Left and right main landing gear tire marks began prior to the last row of High Intensity Approach Lighting System with Sequenced Flashing Lights (ALSF-2). There was an area of scraping damage about 46 feet long by 3 feet wide with blue paint and aluminum metal transfer beginning about 106 feet from the runway 36L threshold. Three ALSF-2 lights and two runway end identifier lights were sheared off at the bases. Light debris, small pieces of blue fuselage skin, and a blue access door were recovered from the paved overrun and runway 36L surfaces.

ADDITIONAL INFORMATION

The American Airlines Quick Reference Handbook (QRH) provides windshear guidance to pilots in the OD Pages section when the possibility exists for windshear on takeoff or landing. The guidance classifies the risk as High (windshear likely) if there are specific runway alerts, Pilot Reports (PIREPs) with airspeed changes greater than or equal to 15 knots, or low level wind shear alert systems (LLWAS) alerts with wind speed changes greater than or equal to 20 knots, The guidance classifies the risk as Medium (windshear possible) if there are LLWAS wind speed changes less than 20 kts or PIREPs with airspeed changes less than 15 knots. The windshear precautions for landing under these conditions include use of the longest suitable runway, CONF 3 flaps, and a recommendation to use an increased approach speed up to 15 knots above landing reference speed.

History of Flight

Approach-IFR final approach	Windshear or thunderstorm (Defining event)

Pilot Information

Certificate:	Airline Transport	**Age:**	58, Male
Airplane Rating(s):	Multi-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
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:**	05/08/2015
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	04/30/2015
Flight Time:	13621 hours (Total, all aircraft), 10030 hours (Total, this make and model)		

Co-Pilot Information

Certificate:		**Age:**	40, Male
Airplane Rating(s):	Multi-engine Land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
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:**	05/08/2015
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	06/09/2015
Flight Time:	1877 hours (Total, all aircraft), 838 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	AIRBUS	**Registration:**	N564UW
Model/Series:	A321 231	**Aircraft Category:**	Airplane
Year of Manufacture:	2012	**Amateur Built:**	No
Airworthiness Certificate:	Transport	**Serial Number:**	5374
Landing Gear Type:	Retractable - Tricycle	**Seats:**	198
Date/Type of Last Inspection:	Continuous Airworthiness	**Certified Max Gross Wt.:**	205900 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo Fan
Airframe Total Time:		**Engine Manufacturer:**	IAE
ELT:	C91A installed, not activated	**Engine Model/Series:**	V2533-A5
Registered Owner:	American Airlines	**Rated Power:**	31600 lbs
Operator:	AMERICAN AIRLINES INC	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:		**Operator Designator Code:**	AALA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Dusk
Observation Facility, Elevation:	KCLT, 769 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	2235 UTC	**Direction from Accident Site:**	335°
Lowest Cloud Condition:	Scattered / 6000 ft agl	**Visibility**	6 Miles
Lowest Ceiling:	Overcast / 10000 ft agl	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	220°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.1 inches Hg	**Temperature/Dew Point:**	27°C / 18°C
Precipitation and Obscuration:	Rain		
Departure Point:	ATLANTA, GA (ATL)	**Type of Flight Plan Filed:**	IFR
Destination:	Charlotte, NC (CLT)	**Type of Clearance:**	IFR
Departure Time:	1745 EDT	**Type of Airspace:**	Class B

Airport Information

Airport:	CHARLOTTE/DOUGLAS INTL (CLT)	**Runway Surface Type:**	Concrete
Airport Elevation:	748 ft	**Runway Surface Condition:**	Unknown
Runway Used:	36L	**IFR Approach:**	Unknown
Runway Length/Width:	9000 ft / 150 ft	**VFR Approach/Landing:**	Unknown

Wreckage and Impact Information

Crew Injuries:	6 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	153 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	159 None	**Latitude, Longitude:**	35.213611, -80.949167 (est)

Administrative Information

Investigator In Charge (IIC):	Timothy LeBaron	**Report Date:**	06/08/2020
Additional Participating Persons:	David Gerlach; Federal Aviation Administration; Washington, DC John DeLeeuw; American Airlines		
Publish Date:	06/08/2020		
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=91811		