



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Aviation Investigation Final Report

Location:	Hayden, Colorado	Accident Number:	DCA22LA069
Date & Time:	January 22, 2022, 11:57 Local	Registration:	N760JB
Aircraft:	Airbus A320-232	Aircraft Damage:	Substantial
Defining Event:	Tailstrike	Injuries:	108 None
Flight Conducted Under:	Part 121: Air carrier - Scheduled		

Analysis

JetBlue Airways flight 1748 incurred a tail strike on takeoff from runway 10 at Yampa Valley Airport (HDN) resulting in substantial damage to the airplane.

About 1148 mountain standard time JetBlue's 1748 flight crew announced on the common traffic advisory frequency (CTAF) that they were leaving the ramp area to taxi to runway 10 for departure. A few seconds later, a Beechcraft B300 King Air, N350J, on an instrument flight rules (IFR) flight plan reported on the local CTAF that they were "about 9 minutes out, for ten, coming in from the east, descending out of 17,000 ft". The Universal Communications Frequency (UNICOM) operator responded to N350J stating that there were "multiple aircraft inbound" and winds were calm and provided the altimeter setting. After this exchange, the JetBlue crew began discussing the active runway and the multiple inbound airplanes using runway 10.

Two minutes later, the JetBlue flight crew contacted Denver air route traffic control center (ARTCC) and reported that they were at HDN, preparing for engine start and would be ready for departure in about 6 or 7 minutes. The Denver controller asked the flight crew if they were planning on departing from runway 10, to which the crew concurred, and the Denver ARTCC controller instructed them to contact him when they were ready for departure.

About the time the JetBlue flight crew was starting their second engine and conducting engine checks, the King Air flight crew was contacting Denver ARTCC to cancel their IFR flight plan because they had visually acquired HDN and intended to land on runway 28. The Denver ARTCC controller acknowledged the IFR cancellation, instructed them to squawk 1200 in the aircraft's transponder and approved a radio frequency change. The King Air's flight crew

subsequently announced, about 1153 on CTAF that they were “going to go ahead and land two eight” and were “straight-in two eight right now”. About 10 seconds later, the JetBlue flight crew announced on CTAF they were leaving the ramp area and were taxiing to runway 10 for departure. HDN UNICOM reported that multiple airplanes were inbound, and the winds were calm.

While the JetBlue flight crew was performing an after-start checklist, the King Air announced on CTAF they were on a “12-mile final two eight straight-in”. About 45 seconds later, the King Air asked on CTAF if anyone was about to depart from runway 10, and the JetBlue flight crew replied that they intended to hold on the taxiway near the end of runway 10 and wait for a clearance from Denver ARTCC. The King Air replied they were on a “10-mile final, two eight, straight-in”. The JetBlue flight crew said “alright, copy” and that they would keep an eye out for them. See figure 1 for HDN runway layout.

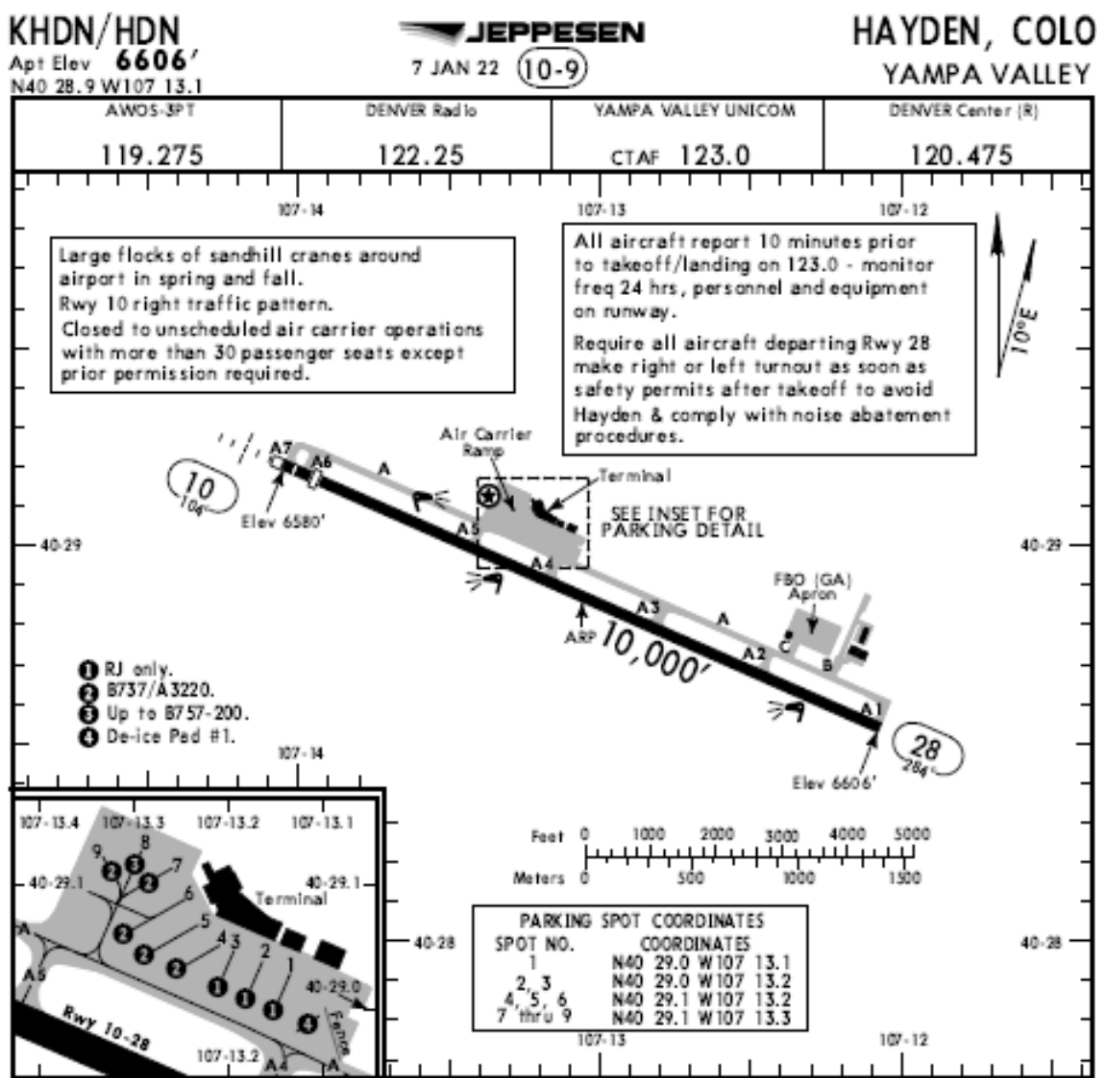


Figure 1: Excerpt from Jeppesen Airport Chart for Yampa Valley Airport (HDN).

About 1155, the JetBlue flight crew contacted Denver ARTCC and reported they were ready for departure on runway 10 at HDN. The Denver center controller cleared them to Fort Lauderdale/Hollywood International Airport (FLL), Fort Lauderdale, Florida, as filed, with a 2-minute clearance void time. The flight crew read back the clearance including the 2-minute void time restriction.

According to the Aeronautical Information Manual (AIM), a pilot may receive a clearance, when operating from an airport without a control tower, which contains a restriction for the clearance to be void if not airborne by a specific time. A pilot who does not depart before the clearance void time must advise air traffic control (ATC) as soon as possible of their intentions.

At 1156, the JetBlue flight crew announced on CTAF that they had received their clearance and would be departing on "runway one zero". Within 5 seconds, the King Air's flight crew reported they "had a king air on final two eight" and that they "had been calling." JetBlue's flight crew replied on CTAF that they thought the King Air was "8 or 9 miles out", to which the King Air replied they were 4 miles out, "even less than that."

The JetBlue first officer, (pilot monitoring (PM)) stated that they looked for the airplane both visually and on their onboard traffic alert and collision avoidance system (TCAS) and did not see any air traffic. JetBlue flight crew acknowledged the King Air, looked for traffic approaching runway 10, and announced on CTAF that they were beginning their takeoff from runway 10 at HDN. The King Air's flight crew replied that they were on a short final and "I hope you don't hit us." According to ADS-B data, when JetBlue taxied onto runway 10 the King Air was on a reciprocal course 4.91 nautical miles from JetBlue.

JetBlue's crew increased thrust for takeoff about 1157. About 11 seconds later, just prior to the 80 knots call out, the PM asked the PF if the King Air was on runway 28. The captain (pilot flying (PF)) asked "is he?" to which the PM said "Yes, he is on 28, do you see him?" to which the PF said no. After the event, the JetBlue first officer explained that he observed traffic directly ahead on the TCAS during the takeoff run and pointed it out on the display to the captain.

About 20 seconds after JetBlue started their take off on runway 10, the flight crew of the King Air asked JetBlue if they were going to do a quick turn-out, to which they replied, "yes sir." Concurrent to this conversation, JetBlue's captain pitched the airplane up, 24 knots before rotation speed, to avoid the approaching King Air and subsequently struck the tail of the airplane on the runway's surface. He began a climbing right turn away from the traffic indicated on the TCAS. JetBlue's captain and first officer both stated they never visually acquired the approaching King Air. According to ADS-B data, when JetBlue began its right turn

after departure from runway 10 the King Air was on a reciprocal course with 2.27 nautical miles of separation between the converging airplanes. See figure 2.

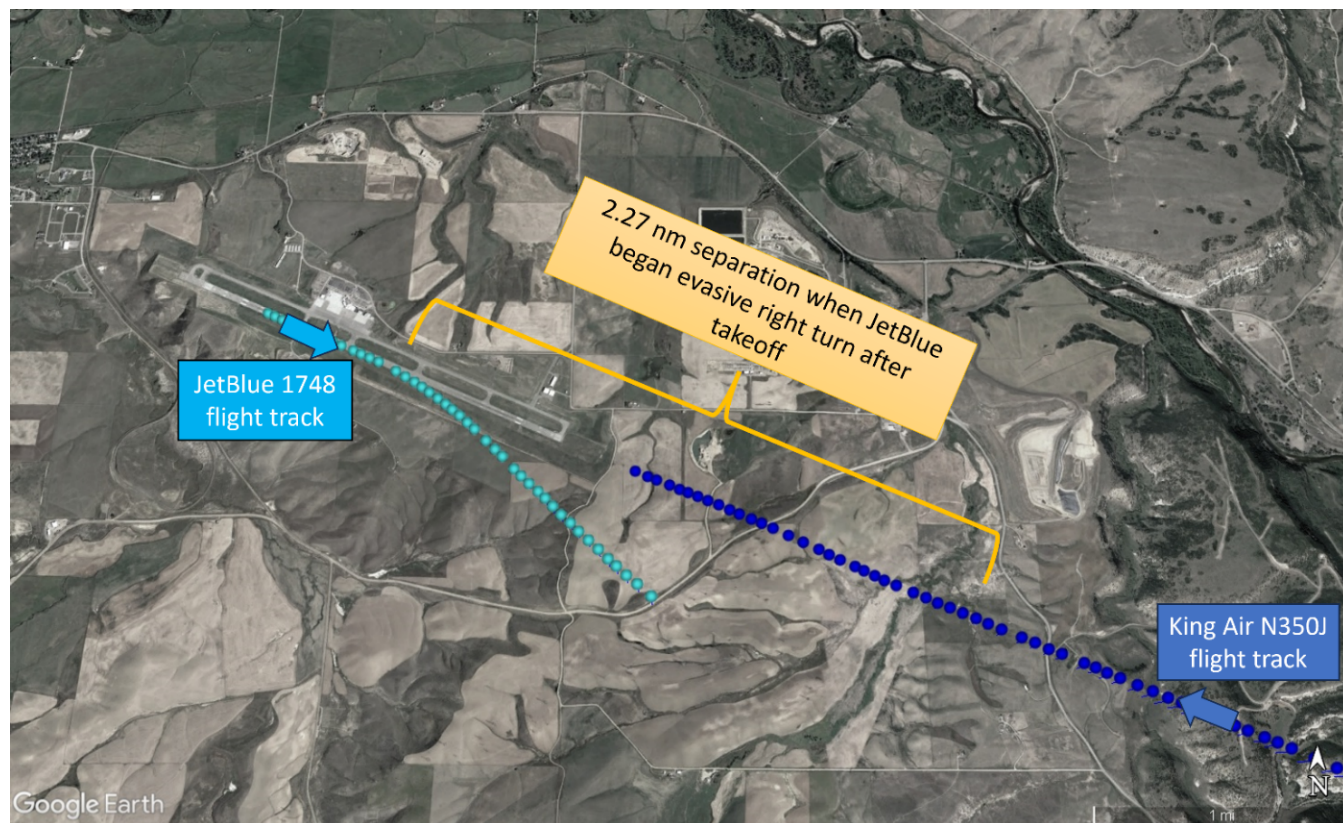


Figure 2: ADS-B data overlaid on Google Earth image.

Based on FDR data, the tail strike occurred about 1157, the crew continued their departure procedures and discussed if they experienced a tail strike, initially deciding to continue the flight to FLL. At 1203, they asked the flight attendants what they felt in the back of the airplane, to which the flight attendants stated they felt a tail strike. At this time, the aircraft was about 16,000 feet in altitude. Within 2 minutes of getting the flight attendant feedback, about 20,000 feet altitude, they contacted the airline's maintenance controller for guidance although the aircraft had not annunciated any warnings regarding a pressurization issue. About 5 minutes later, when climbing through 26,000 feet, the maintenance controller recommended they land immediately so the airplane could be inspected for damage. They leveled the aircraft at FL310 and decided to divert to DEN, where they made a safe landing.

King Air N350J CTAF Communications

FAA Advisory Circular 90-66b describes the "self-announce" procedure that pilots use at uncontrolled airports, such as HDN, where pilots broadcast their call sign, position, altitude, and intended activity on the designated CTAF. In this event, N350J made several calls on CTAF

including their original intent to land on runway 10, and then their decision to switch to runway 28. However, the composition of these calls had the potential to be clearer.

In order to help identify one airport from another, AC 90-66b states that “the correct airport name should be spoken at the beginning and end of each self-announce transmission.” In particular, the repetition of the airport name at the end of a transmission also reinforces the airport to which the transmission relates to others on the frequency in case the first annunciation of the name was missed or garbled. All calls N350J made omitted identifying the airport at least once at the beginning or end of the transmission and sometimes they completely omitted the airport name. This non-standard phraseology reduced the effectiveness of their radio calls by providing opportunity for their call to be dismissed as relating to a different airport, or not relevant for the airport at hand.

It is common for pilots to omit the word “runway” when referencing an airport’s runway numbers, however standard ATC phraseology (as referenced in FAA Order 7110.10, 11-1-13 Number Usage) uses the word “runway” followed by the separate digits of the runway designation. For this airport, references to the runways would be expected to be “runway one zero” and “runway two eight.” All N350J’s radio calls omit “runway” when indicating the runway “two eight” they intended to land on. While context clues in the transmission can be used to ascertain the correct meaning of “two eight,” the prefix of “runway” would have provided a cue to listen that would have been more difficult to overlook in the face of expectation bias. Expectation bias is further discussed below.

UNICOM Communication

HDN had a Universal Communications Frequency (UNICOM), which is a nongovernment air/ground radio communication station that may provide airport information. UNICOM operators are not required to communicate with pilots, and if they do, there are no standards for the information conveyed. During this event, the UNICOM operator communicated with both JetBlue and N350J stating that “multiple airplanes” were inbound and that winds were calm. The UNICOM operator had the opportunity to improve the situational awareness in the pattern by including runway in use information in his brief. For example, when briefing N350J, he could have added that the latest call (which was from JetBlue) was using runway 10. Further, when briefing JetBlue when they left the gate, the UNICOM operator had the opportunity to advise them that an aircraft was inbound for runway 28 instead of noting only that “multiple aircraft inbound.”

JetBlue Crew Expectation

Throughout JetBlue’s pushback from the gate, taxi, and beginning of takeoff roll, the JetBlue crew believed the King Air traffic was approaching runway 10. In response to hearing that the King air was on a 4-mile final, they expedited their departure so they would not interfere with the King Air’s landing, which they believed was going to happen behind them once they

departed runway 10. This assumption also caused them to only scan for traffic on the approach end of runway 10 before entering the runway.

Expectation bias is a psychological concept which causes an incorrect belief to persist despite available contradictory evidence. In this case, the crew's expectation that the King Air was arriving on runway 10, biased their perception of incoming information such that contradictory evidence (radio calls indicating the King Air was landing on runway 28) was ignored or manipulated in the brain to be consistent with the person's current expectation. This bias occurs as part of basic information processing, and a person may not be actively aware of such biases at the perceptual level.

The crew's initial assessment of the situation was correct, as N350J initially checked into the CTAF indicating they were inbound to Runway 10. While one of N350J's calls (12 mile straight in) conflicted with checklist completion in the cockpit, the remainder of the calls did not conflict with attentional resources needed in the cockpit and the crew directly engaged several times with N350J on the CTAF. Despite these conversations, the detail of N350J arriving on the opposite runway and being a head on conflict, was not actualized by the crew until their takeoff roll as a result of expectation bias.

JetBlue flights out of HND were seasonal and normally departed and arrived on runway 10. This combined with the flight crew's limited experience flying out of non-towered airports, and time sensitive nature of the takeoff clearance could have exacerbated their expectation bias.

JetBlue Crew Inflight Response to Possible Tail Strike

JetBlue's Flight Crew Operating Manual (FCOM) Volume I cautions that "if a tail strike occurs, avoid flying at an altitude that requires pressurizing the cabin and to return to the originating airport for a damage assessment." The QRH procedure for a tail strike is to land as soon as possible and that a pilot should climb at a maximum of 500 feet per minute (fpm) and descend at a maximum rate of 1000 fpm to minimize pressure changes all the while not exceeding 10,000 ft msl or minimum safe altitude.

The JetBlue crew took about 6 minutes to establish they had a tail strike. At this point, they were climbing through 16,000 feet. The terrain east of HDN along the flight's path prompted established minimum safe altitudes at 16,600 feet. Based on the procedure, this would have been an appropriate time to conduct the QRH procedure since both sets of guidance refer to actions "when a tail strike is experienced" rather than when a tail strike is "suspected." However, the crew did not discuss the QRH, and recorded climb/descent rates and altitudes reached above 16,600 suggest they did not reference the QRH. Higher than normal workload in the cockpit from discussion of the event, liaising with company maintenance, and the resulting diversion may explain their omission of this checklist after they confirmed the tail strike.

Past Investigation, Quincy, IL

The National Transportation Safety Board (NTSB) investigated an accident that occurred at an uncontrolled airfield that had a much different outcome. It occurred at Quincy Municipal Airport, near Quincy, Illinois, on November 19, 1996, when United Express flight 5925, a Beechcraft 1900C collided with a Beechcraft King Air A90. Flight 5925 was completing its landing roll on runway 13, and the King Air was in its takeoff roll on runway 04. The collision occurred at the intersection of the two runways. All 10 passengers and two crewmembers aboard flight 5925 and the two pilots aboard the King Air were killed.

The NTSB determined that the probable cause of the Quincy accident was the failure of the pilots in the King Air A90 to effectively monitor the CTAF or to properly scan for traffic, resulting in their commencing a takeoff roll when flight 5925 was landing on an intersecting runway. The Board also determined that contributing to the cause of the accident was an interrupted radio transmission from a pilot from another airplane, which led to flight 5925 pilots' misunderstanding of the transmission as an indication from the King Air that it would not take off until after flight 5925 had cleared the runway.

JetBlue Safety Actions following Flight 1748 Tail Strike

JetBlue's safety team worked with JetBlue University instructors to develop training curriculum for flightcrew on non-towered operations, un-annunciated failures and QRH procedures, and time compression that would be a two-hour brief using JFK to Burlington with an arrival or departure after the tower has closed as an example.

Probable Cause and Findings

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

The captain's rotation of the airplane pitch before the rotation speed on takeoff due to his surprise about encountering head on landing traffic, which resulted in an exceedance of the airplane's pitch limit and a subsequent tail strike.

Contributing to the accident was the flight crew's expectation bias that the incoming aircraft was landing on the same runway as they were departing from, and the conflicting traffic's nonstandard use of phraseology when making position calls on the common traffic advisory frequency.

Findings

Personnel issues	Incorrect action performance - Pilot
Personnel issues	Decision making/judgment - Pilot
Personnel issues	Monitoring other aircraft - Flight crew
Personnel issues	Situational awareness - Flight crew
Personnel issues	(general) - Flight crew

Factual Information

History of Flight

Takeoff	Tailstrike (Defining event)
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Pilot Information

Certificate:	Airline transport; Flight instructor	Age:	45,Male
Airplane Rating(s):	Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Unknown
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane multi-engine	Toxicology Performed:	
Medical Certification:	Class 1 With waivers/limitations	Last FAA Medical Exam:	September 1, 2021
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	11590 hours (Total, all aircraft), 6616 hours (Total, this make and model), 190 hours (Last 90 days, all aircraft), 55 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Co-pilot Information

Certificate:	Airline transport; Flight instructor	Age:	40,Male
Airplane Rating(s):	Multi-engine land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	Unknown
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane multi-engine	Toxicology Performed:	
Medical Certification:	Class 1 With waivers/limitations	Last FAA Medical Exam:	April 1, 2021
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	3307 hours (Total, all aircraft), 2981 hours (Total, this make and model), 91 hours (Last 90 days, all aircraft), 26 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Airbus	Registration:	N760JB
Model/Series:	A320-232	Aircraft Category:	Airplane
Year of Manufacture:	2008	Amateur Built:	
Airworthiness Certificate:	Transport	Serial Number:	3659
Landing Gear Type:	Retractable - Tricycle	Seats:	200
Date/Type of Last Inspection:	January 21, 2022 Continuous airworthiness	Certified Max Gross Wt.:	161900 lbs
Time Since Last Inspection:		Engines:	2 Turbo fan
Airframe Total Time:	50588 Hrs at time of accident	Engine Manufacturer:	IAE
ELT:	C126 installed, not activated	Engine Model/Series:	V2500-A5
Registered Owner:	JETBLUE AIRWAYS CORP	Rated Power:	33000 Lbs thrust
Operator:	JETBLUE AIRWAYS CORP	Operating Certificate(s) Held:	Flag carrier (121)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:		Distance from Accident Site:	
Observation Time:		Direction from Accident Site:	
Lowest Cloud Condition:		Visibility	
Lowest Ceiling:	Broken	Visibility (RVR):	
Wind Speed/Gusts:	/	Turbulence Type Forecast/Actual:	/
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:		Temperature/Dew Point:	
Precipitation and Obscuration:			
Departure Point:	Hayden, CO	Type of Flight Plan Filed:	
Destination:	Fort Lauderdale, FL (FLL)	Type of Clearance:	None
Departure Time:		Type of Airspace:	Airport advisory area

Airport Information

Airport:	Yampa Valley International Airport HDN	Runway Surface Type:	Asphalt
Airport Elevation:	6609 ft msl	Runway Surface Condition:	Snow;Wet
Runway Used:	10	IFR Approach:	None
Runway Length/Width:	10000 ft / 150 ft	VFR Approach/Landing:	

Wreckage and Impact Information

Crew Injuries:	6 None	Aircraft Damage:	Substantial
Passenger Injuries:	102 None	Aircraft Fire:	None
Ground Injuries:		Aircraft Explosion:	None
Total Injuries:	108 None	Latitude, Longitude:	40.2887,-107.1306

Administrative Information

Investigator In Charge (IIC):	Silva, Sathya
Additional Participating Persons:	Kaushik Narayan Ramesh; JetBlue; Long Island City, NY Patrick Lusch; FAA Vincent Ecalte; BEA Albert Urdiroz; Airbus
Original Publish Date:	December 12, 2023
Last Revision Date:	
Investigation Class:	Class 4
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=104551

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

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