Aviation Investigation Final Report

Location:	Aspen, Colorado	**Accident Number:**	CEN22LA130
Date & Time:	February 21, 2022, 11:33 Local	**Registration:**	N99AP
Aircraft:	RAYTHEON AIRCRAFT COMPANY HAWKER 800XP	**Aircraft Damage:**	Substantial
Defining Event:	Runway excursion	**Injuries:**	6 None
Flight Conducted Under:	Part 91: General aviation - Business		

Analysis

The flight crew of the business jet was conducting a cross-country flight. Before departure, the airplane and runway were clear of any contaminants, all pre-takeoff checks were normal, and the flaps were set to 15° to reduce the takeoff length. At the time the airplane was cleared to taxi to the departure runway, the reported wind was from 170° at 18 knots (kts) and gusting to 30 kts. This wind report represented a prevailing tailwind that exceeded the airplane's takeoff and landing maximum tailwind limitation, which was 10 kts. About 30 minutes later due to arrival traffic, air traffic control (ATC) provided the takeoff clearance and reported the wind was from 160° at 16 kts, gusting to 25 kts, and the "instantaneous wind" was from 180° at 10 kts. Following the accident, the captain reported that "at takeoff clearance; constant winds were reported by tower at [180° at 10 kts] which was within aircraft maximum tailwind takeoff limitation."

About 30 seconds after receiving the takeoff clearance and the current wind report from ATC, the captain performed a static takeoff, which began at the end of the runway, and the first officer made all the callouts. According to the captain, at rotation speed (V_R), he applied back pressure on the yoke; however, the airplane would not become airborne. After a few seconds without any indication the airplane would take off, the captain called for and performed an aborted the takeoff. The captain reduced the engines to idle, deployed the thrust reversers, and applied the brakes. The airplane subsequently departed the end of the runway into the snow and sustained substantial damage to the right wing and fuselage.

Because postaccident examination of the airplane and flight control system found no anomalies, and findings from an airplane performance study indicate that the airplane should have been able to rotate once it reached the reported V_R, it is very likely that the airspeed did not reach V_R due to tailwind conditions that exceeded the airplane's maximum tailwind limitation. The

airplane was not equipped with a flight data recorder or any additional data sources that could have captured or reported the airplane's airspeed during the attempted takeoff.

Although the flight crew received an unsolicited instantaneous wind report from ATC that was at the airplane's maximum allowable tailwind component of 10 kts, multiple wind reports for 30 minutes before the attempted takeoff were significantly above the tailwind limitation. The flight crew failed to consider the wind conditions that were consistently above the maximum tailwind limitation and decided to attempt the takeoff once they received an instantaneous wind report that did not exceed the tailwind limitation. Per the flight crew statements, they interpreted the instantaneous wind reported by ATC just before takeoff as the constant wind conditions.

The term "instantaneous wind" is used by the airport's ATC tower and is not defined in any Federal Aviation Administration publication. Because the ambiguous term is not defined in available resources, pilots that infrequently operate at that airport are likely not familiar with the definition and potential operational impact.

Probable Cause and Findings

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

The flight crew's decision to takeoff in tailwind conditions that were consistently above the airplane's tailwind limitation, which resulted in a runway overrun following an aborted takeoff. Contributing was the flight crew's use of the instantaneous wind report for the decision to attempt the takeoff.

Findings

Personnel issues	Decision making/judgment - Flight crew
Environmental issues	Tailwind - Effect on operation
Aircraft	Takeoff distance - Not attained/maintained
Organizational issues	Adequacy of policy/proc - ATC
Personnel issues	Knowledge of meteorologic cond - Flight crew

Factual Information

History of Flight

Takeoff-rejected takeoff	Runway excursion (Defining event)
Takeoff-rejected takeoff	Collision with terr/obj (non-CFIT)

On February 21, 2022, at 1133 mountain daylight time, a Raytheon Aircraft Company Hawker 800XP airplane, N99AP, was substantially damaged when it was involved in an accident at Aspen-Pitkin County Airport (ASE), Aspen, Colorado. The two pilots and four passengers were not injured. The airplane was being operated as a Title 14 *Code of Federal Regulations* Part 91 business flight.

According to the flight crew reports and the cockpit voice recorder (CVR) audio, prior to departure, the airplane and runway were clear of any contaminants, and all pre-takeoff checks were normal. At 1102:46, the airplane was cleared to taxi to runway 33 with automatic terminal information service (ATIS) information Bravo. The ATIS indicated that the wind was from 170° at 18 knots (kts) and gusting to 30 kts. During taxi, the flight crew changed the takeoff flaps from 0° to 15° to reduce the takeoff length by 800 ft per the crew's Aircraft Performance Group calculations, and the first officer entered the new airspeeds in the flight management system.

About 1119, the ASE air traffic control (ATC) tower controller informed the flight crew the takeoff would be delayed due to arriving traffic. At 1131:54, the controller provided the takeoff clearance for runway 33 and reported the wind was from 160° at 16 kts, gusting to 25 kts. In addition, the controller provided the "instantaneous" wind, which was from 180° at 10 kts. The captain reported that "at takeoff clearance, constant winds were reported by tower at [180° at 10 kts] which was within aircraft maximum tailwind takeoff limitation."

According to CVR audio, the takeoff was initiated at 1132:26. The captain performed a static takeoff, and the first officer made all the callouts: airspeed alive, 80 kts, takeoff decision speed (V_1) at 111 kts, and rotate (V_R) at 121 kts. The captain reported that, at V_R, he applied back pressure on the yoke; however, the airplane would not become airborne. The captain reported, "the yoke did not have any air resistance or any pressure on it as we experience normally in Hawkers (the weight and pressure on the yoke felt the same as though…the airplane was stationary on [the] ground)."

After a few seconds without any indication the airplane would take off, the captain called for and performed an aborted takeoff by reducing the engines to idle, deploying the thrust reversers, and applying the brakes. The airplane subsequently departed the end of the runway into the snow (see figure 1). The captain secured the airplane and assisted in the evacuation of the passengers.

Figure 1. Accident airplane following runway excursion (Source: ASE airport operations)

Pilot Information

Certificate:	Airline transport	**Age:**	45,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	October 28, 2021
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	June 12, 2021
Flight Time:	7054 hours (Total, all aircraft), 5273 hours (Total, this make and model), 6397 hours (Pilot In Command, all aircraft)		

Co-pilot Information

Certificate:	Airline transport	**Age:**	37,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	July 16, 2021
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	June 18, 2021
Flight Time:	2088 hours (Total, all aircraft), 207 hours (Total, this make and model), 1676 hours (Pilot In Command, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	RAYTHEON AIRCRAFT COMPANY	**Registration:**	N99AP
Model/Series:	HAWKER 800XP	**Aircraft Category:**	Airplane
Year of Manufacture:	1999	**Amateur Built:**	
Airworthiness Certificate:	Transport	**Serial Number:**	258423
Landing Gear Type:	Retractable - Tricycle	**Seats:**	15
Date/Type of Last Inspection:	June 8, 2021 AAIP	**Certified Max Gross Wt.:**	28000 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo fan
Airframe Total Time:	6084.3 Hrs at time of accident	**Engine Manufacturer:**	Honeywell
ELT:	C126 installed, not activated	**Engine Model/Series:**	TFE 731-5BR-1H
Registered Owner:	Roper Aviation LLC	**Rated Power:**	4750 Lbs thrust
Operator:	Nxt Jet, Inc.	**Operating Certificate(s) Held:**	None
Operator Does Business As:	Wing Aviation Group, LLC	**Operator Designator Code:**	

According to the airplane flight manual, the maximum tailwind component for takeoff and landing is 10 knots.

According to the operator, at takeoff, the airplane's weight was 23,916 pounds (lbs), and the location of the center of gravity (C.G.) was -.02 inches from datum or 17.93% mean aerodynamic chord. The operator reported that the maximum gross weight limit was 25,288 lbs., the forward C.G. limit was -2.11 inches, and the C.G. aft limit was 9.28 inches.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KASE,7720 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	11:53 Local	**Direction from Accident Site:**	144°
Lowest Cloud Condition:	Few / 3600 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 6000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	16 knots / 25 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	160°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.61 inches Hg	**Temperature/Dew Point:**	1°C / -9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Aspen, CO	**Type of Flight Plan Filed:**	IFR
Destination:	Austin, TX (AUS)	**Type of Clearance:**	IFR
Departure Time:		**Type of Airspace:**	Class D

An automated system at ASE reported wind conditions every 5 minutes. Table 1 shows wind information within 30 minutes before and after the accident.

Time	Wind direction	Wind magnitude (kts)	Gusting (kts)
11:05	170	16	
11:10	160	14	
11:15	160	13	
11:20	180	18	
11:25	160	10	15
11:30	180	17	24
11:33 - accident			
11:35	160	10	16
11:40		17	
11:45	150	11	
11:50	150	15	
11:53	160	16	25

Table 1. Winds from automated ASE weather station

Airport Information

Airport:	ASPEN-PITKIN COUNTY/SARDY FLD ASE	**Runway Surface Type:**	Asphalt
Airport Elevation:	7837 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	33	**IFR Approach:**	None
Runway Length/Width:	8006 ft / 100 ft	**VFR Approach/Landing:**	None

ASE ATC is serviced as a level 6 combined control facility, which is defined as an ATC facility that provides approach control services for one or more airports as well as en route air traffic control (center control) for a large area of airspace. Some facilities may provide tower services along with approach control and en route services.

ASE is equipped with multiple windsocks, an automated surface observing system (ASOS) (maintained by the National Weather Service) and a standalone weather sensor (SAWS) (maintained by the Federal Aviation Administration (FAA) Technical Operations), which are located about 20 ft from each other on the north side of taxiway A1 (see figure 2).

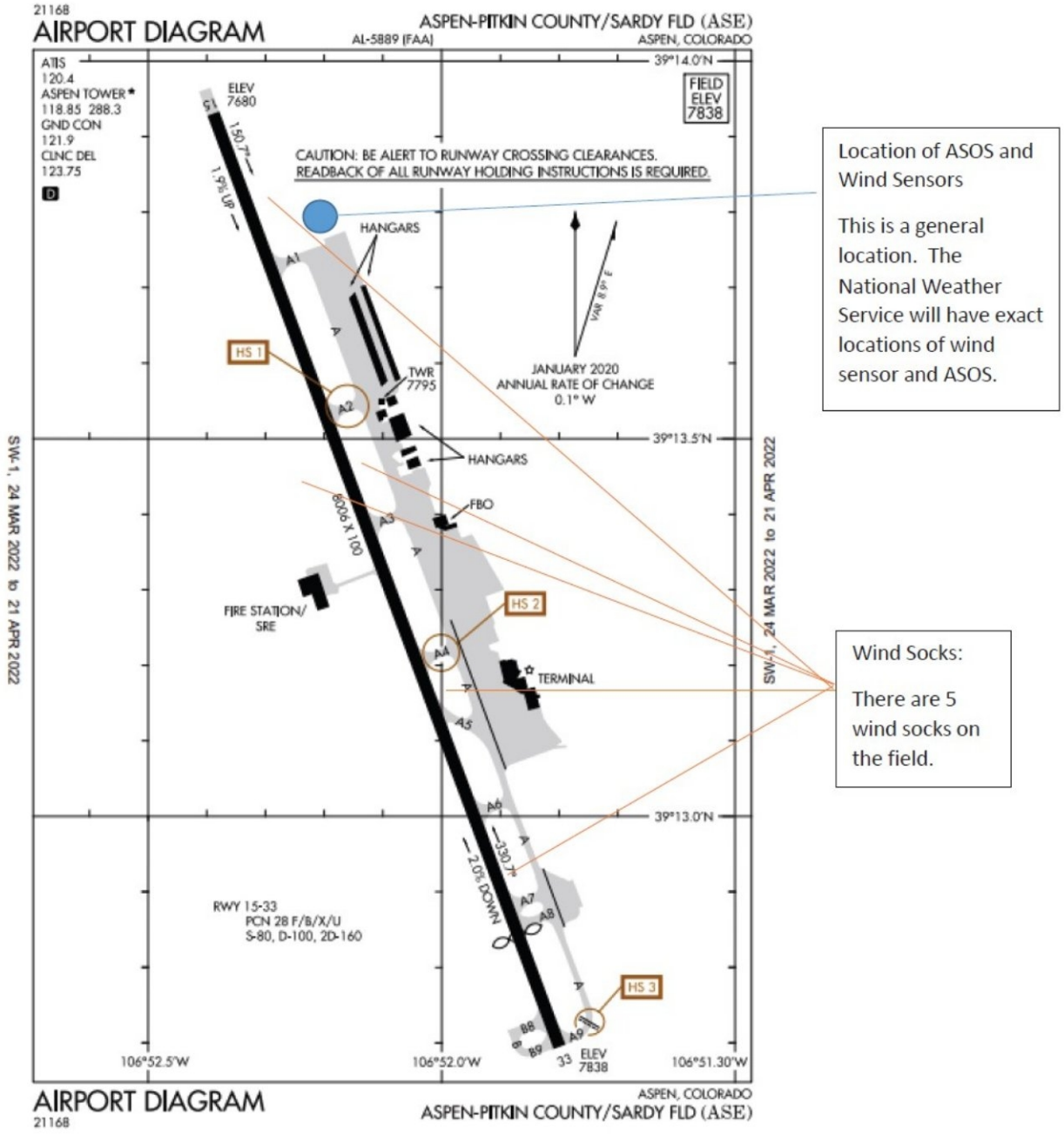

Figure 2. Annotated ASE airport diagram

According to the ASE air traffic manager (ATM), three SAWS displays are in the ATC tower at the ground, local, and radar control positions.

The FAA ASE airport traffic control tower Standard Operating Procedures (SOP), section 1-11 Official Weather, states in part:

a. Official Weather Observer.

1. ASE Terminal RADAR Approach Control in Tower Cab (TRACAB) is a Limited Aviation Weather Reporting Station (LAWRS).

2. Flight Data/Clearance Delivery (FD/CD) is the official weather observer. All factual weather information must be determined by the observer. General weather descriptions including trends may be transmitted to aircraft by any position.

c. Wind.

1. The SAWS Two-Minute Average Wind is defined as the Official Wind and must be given to all aircraft in lieu of any other wind information.

2. The SAWS Two-Minute Average Wind may be supplemented with other information (i.e., the SAWS Instantaneous Wind or the ASOS Two-Minute Average Wind) in the judgement of the controller.

3. If a pilot requests, the instantaneous wind may be issued after the SAWS Two-Minute Average Wind has been given.

4. When the wind is above a 10-knot sustained tailwind or gusting above a 15-knot tailwind between headings 280°-020° for Runway 15 or headings 100°-200° for Runway 33, one of the following statements must be announced on all frequencies and included in the ATIS broadcast:

(a) “USE CAUTION, (affected runway) STRONG TAILWIND CONDITIONS EXIST.”

(b) “USE CAUTION, RAPIDLY CHANGING TAILWIND CONDITIONS EXIST.”

5. Either statement may be utilized individually or combined if needed in the judgement of the controller.

6. Wind statements on the ATIS should be placed after the weather sequence, and prior to the Notices to Airmen (NOTAMs).

"Instantaneous wind" is a term used by ASE that is not defined in any FAA publication of record. After the accident, the ASE ATM was asked why ASE ATC chose to use the phrase “instantaneous wind” when reporting the standalone weather, the manager stated he was not sure where that [term] had originated. He reported that a few operators routinely request the instantaneous wind reports because of their familiarity with ASE operations, but other operators and general aviation pilots may not be aware of instantaneous wind reports or the definition of the term. In addition, as specified in the ASE SOPs, the instantaneous wind report is only supposed to be provided when requested.

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	4 None	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	6 None	**Latitude, Longitude:**	39.232582,-106.87346(est)

Postaccident examination of the airplane revealed no malfunctions or failures that would have precluded normal operation.

Flight recorders

The airplane was equipped with a Universal CVR-30B CVR that recorded a minimum of 30 minutes of digital data stored on solid-state modules. The CVR contained four sources of audio input: one channel for each flight crew, one spare channel (that is, for an observer), and one channel for the cockpit area microphone. The captain, first officer, and spare channels were recorded independently for a minimum of 30 minutes. The National Transportation Safety Board (NTSB) Vehicle Recorders Laboratory completed a summary report of the recorded audio. The captain and first officer audio channels were categorized as good recording quality.

Tests and Research

Airplane Performance Study

An NTSB airplane performance study was completed based on automatic dependent surveillance—broadcast (ADS-B) data provided by the FAA. The airplane's CVR recorded the takeoff roll and accident sequence.

ADS-B coverage of the takeoff roll (see figure 3) did not start until 1132:53, when the airplane was already at a groundspeed of 135 kts. The airplane accelerated to 165 kts by 1133:01.6 when it was about 3,300 ft from the end of the runway, it then decelerated and left the paved surface at a groundspeed of 120 kts (see figure 4).

Figure 3. Aircraft takeoff roll with times and distance to end of runway

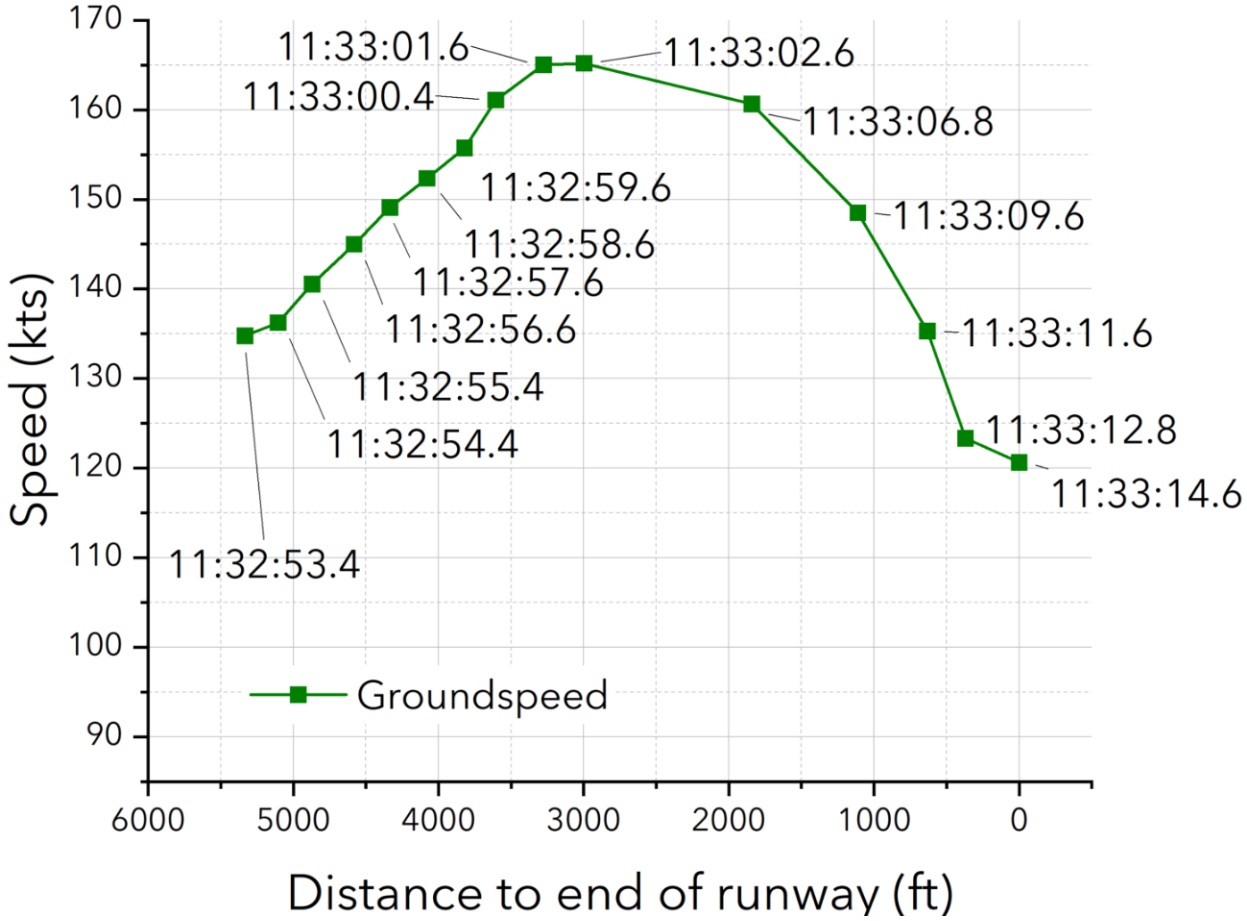

Figure 4. Calculated groundspeed versus distance to end of runway.

The flight crew, using a weight of 23,916 lbs and flaps 15°, calculated the airplane's V_1 and V_R airspeeds to be 111 kts and 121 kts. The flight crew called out when the airspeed passed V_1 (1132:55) and V_R (1132:59), and then when the takeoff was aborted (1133:10). The flight crew reported that the airplane did not rotate after V_R. Figure 5 shows the groundspeed and three calculated calibrated airspeeds (CAS) based on three wind conditions. The 111 kts V_1 speed was in line with what calibrated airspeed would be for a 17 kt wind from 180°, which was the automated wind report for 11:30 (See table 1). The V_R callout falls between the CAS for 17 kts and 24 kts (gusting condition), suggesting a possibility that the wind increased between the V_1 and V_R callouts.

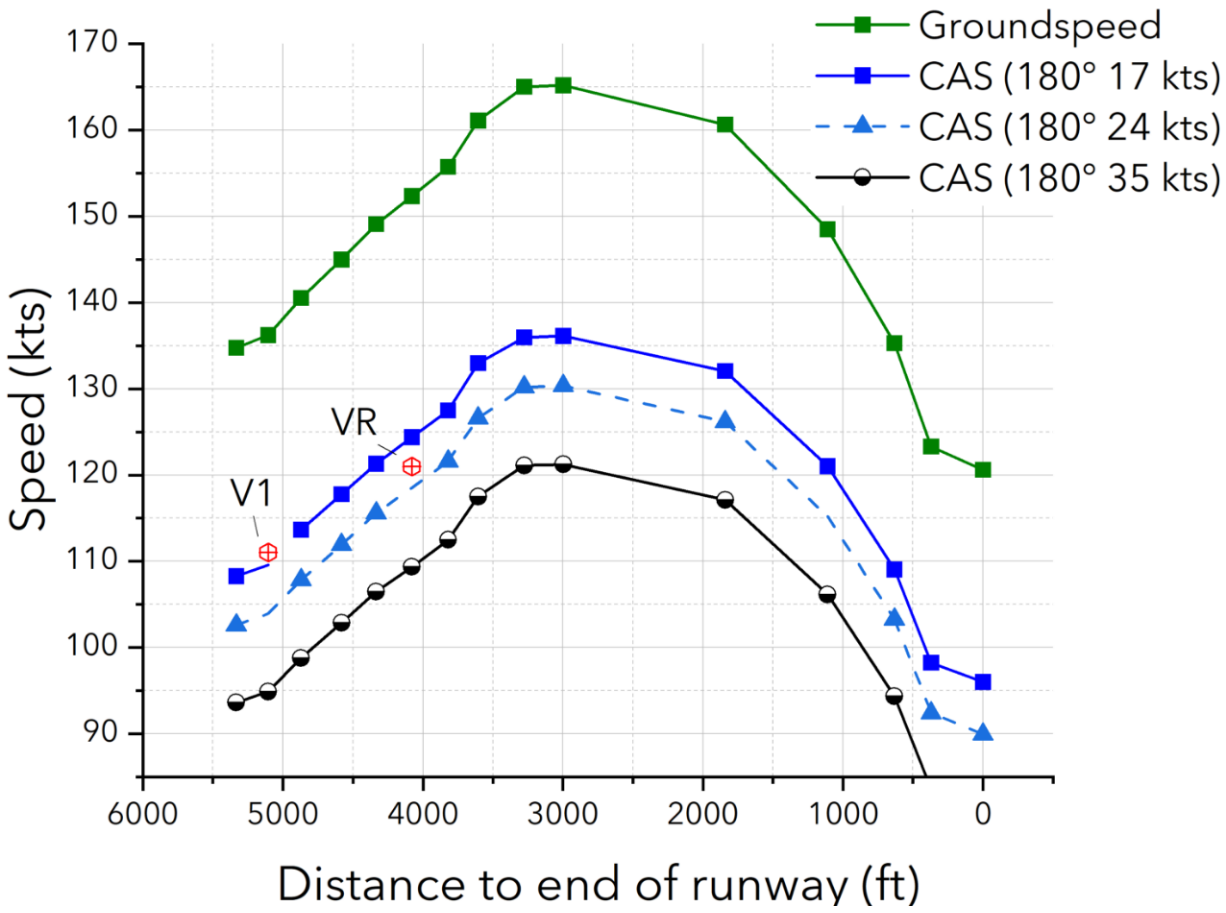

Figure 5. Calculated CAS for three different wind conditions

At V_R, the airplane's pitch control authority should have been sufficient to raise the airplane's nose and begin liftoff. However, the flight crew reported that the airplane did not rotate. This could imply that when the pilot pulled back on the yoke, that the airplane's airspeed was insufficient to induce rotation.

The black line in Figure 5 shows the calculated CAS for 35 kt wind from 180°. At the maximum achieved ground speed of 165 kts, a wind of this magnitude would lower the airplane's indicated airspeed to just below V_R. Title 14 *Code of Federal Regulations* Part 25.107, Takeoff Speeds, requires that the V_R be at least 10% greater than the minimum calibrated airspeed at which the airplane can safely rotate and lift off.

Therefore, for a reported V_R of 121 kts, the airplane should have lifted off after reaching an airspeed of 110 kts. A 35-kt wind would not reduce the maximum achieved ground speed of 165 kts sufficiently to prevent the airplane from flying, and thus after achieving V_1 (111 kts), the flight crew should have had sufficient air load to rotate the airplane. This was not consistent with the flight crew account that the yoke did not have any air resistance when the yoke was pulled back, considering that the wreckage examination revealed no discrepancies with flight control continuity to the elevator system. Even if a tailwind increased to more than the

maximum reported gusting of 25 kts after V_R or if the flight crew call to rotate was made before V_R was achieved, the airplane's airspeed should have resulted in noticeable air resistance when the yoke was pulled back. These discrepancies could not be resolved with the available evidence.

Additional Information

Following the accident, the operator informed its flight crews to no longer consider "instantaneous wind" reports in their decision-making process.

Administrative Information

Investigator In Charge (IIC):	Sauer, Aaron
Additional Participating Persons:	Nelson Wolfmeier; FAA; Denver, CO Brian Rogers; Wing Aviation Group; FL Ricardo Asensio; Textron Aviation ; Wichita, KS Jennifer McDuffie; Honeywell; Phoenix, AZ
Original Publish Date:	March 16, 2023
Last Revision Date:	June 24, 2024
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=104676