



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Aviation Investigation Final Report

Location:	Stevensville, Montana	Accident Number:	WPR17LA064
Date & Time:	February 23, 2017, 13:00 Local	Registration:	N3803J
Aircraft:	Beech A36TC	Aircraft Damage:	Substantial
Defining Event:	Miscellaneous/other	Injuries:	2 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot reported that before takeoff from his home airport for the personal flight, he noted the midfield windsock at the airport and believed that he would have a straight crosswind with gusts coming from both directions.

The pilot reported that the airplane lifted off about 80 knots. However, the airplane would not climb or accelerate, and the pilot felt that there was a rapid decrease in power. He ensured that the engine controls were in their appropriate positions for full takeoff power, but the airplane still would not climb. The airplane struck level terrain adjoining the right side of the runway and came to rest upright, about 300 ft from the runway centerline.

A witness reported that the airplane's engine sounded "strong and loud." The airplane lifted off about 2,400 ft from the runway threshold and attained an altitude of about 50 ft above ground level when the airplane began a steep right descending turn.

Although the pilot reported that he referenced the windsock and believed that he would be taking off with a direct crosswind, the airport's automated weather observation system indicated a tailwind component of about 8.5 to 11.2 knots for the takeoff runway at the time.

The accident runway was 3,800 ft long. Review of the airplane manufacturer's performance data indicated that a takeoff with maximum allowable gross weight and no flaps from a level runway with a 10-knot tailwind would have required a ground roll of about 2,109 ft and required about 3,385 ft to clear a 50-ft obstacle. The airplane manufacturer's published performance data did not account for tailwind components above 10 knots. The runway had a 1.94% uphill slope in the takeoff direction, but the performance data did not account for runway slope. Calculations indicated that the airplane was about 220 lbs above the maximum allowable takeoff weight. Each of these three factors would increase the takeoff distance and decrease the airplane climb performance, but there were no means for the pilot or investigators to quantify their individual or collective effects.

Examination of the airplane and engine did not reveal any preimpact mechanical malfunctions or failures that would have precluded normal operation and performance. However, it is likely that the overweight condition of the airplane, the significant tailwind, and the uphill runway slope combined to affect the takeoff so that the airplane had insufficient energy to climb out of ground effect.

Probable Cause and Findings

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

The pilot's decision to conduct a takeoff with a tailwind on an upsloping runway in an overweight airplane, which resulted in the airplane having insufficient energy to climb out of ground effect.

Findings

Personnel issues	Decision making/judgment - Pilot
Personnel issues	Use of available resources - Pilot
Personnel issues	Aircraft control - Pilot
Personnel issues	Weight/balance calculations - Pilot
Environmental issues	Tailwind - Contributed to outcome

Factual Information

History of Flight

Prior to flight	Aircraft loading event
Prior to flight	Miscellaneous/other (Defining event)
Takeoff	Loss of lift

On February 23, 2017, about 1300 mountain standard time, a Beechcraft A36TC airplane, N3803J, was substantially damaged when it impacted terrain shortly after takeoff from Stevensville Airport (32S), Stevensville, Montana. The private pilot and his passenger received minor injuries. The airplane was registered to Big Sky Specialized Carriers and operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed at the time of the accident and no flight plan was filed. The cross-country flight was originating at the time of the accident.

According to the pilot, he based the airplane at 32S. The takeoff was conducted from runway 12. Before takeoff, the pilot noted that the windsock indicated a straight cross wind with gusts coming from both directions. The pilot confirmed manifold pressure and fuel consumption as he held the brakes. The pilot then "accelerated" the airplane to "80" [knots] and then lifted off. Shortly after, the airplane "couldn't climb or accelerate." The pilot stated that he was unaware of the cause of the problem, and that it felt like there was a "rapid decrease in power." He reported that he ensured that the engine controls were in their appropriate positions for full takeoff power, but that the airplane "would not lift" any further. The pilot reported that he had insufficient time to scan the engine power instruments or diagnose the problem, due to the airplane's proximity to the ground. The pilot did not retract the landing gear during the event. He did not report his maximum altitude, but he did report that he had previously experienced problems with the turbocharger system.

Ground scars indicated that the airplane struck terrain about 300 ft to the right side of runway centerline and traveled a few hundred ft after initial ground contact. The airplane came to rest upright.

A pilot-rated eyewitness who was situated on the northeast side of the runway, about 2,400 ft from the runway 12 threshold, reported that his attention was called to the airplane by its engine sound. He reported that the engine sounded normal, which he elaborated as both "strong and loud" and "ear piercing loud." The airplane just broke ground as it passed abeam of him, and he then mentioned to a person who was with him to watch the airplane, because its takeoff appeared to be unusual. The airplane achieved a maximum altitude of about 50 ft above the ground, and then began a "steep right descending turn." The right wingtip struck the ground first; it exhibited a brief flash of fire which quickly extinguished. The witness stated that runway 12 has a "substantial" uphill slope, and the terrain and trees also rise in that direction. He also reported that at the time, there was a "quartering tailwind" from the "northwest" of about 15 knots.

Pilot Information

Certificate:	Private	Age:	47, Male
Airplane Rating(s):	Single-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Unknown
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 3 Without waivers/limitations	Last FAA Medical Exam:	April 27, 2015
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	569 hours (Total, all aircraft), 162 hours (Total, this make and model), 51 hours (Last 90 days, all aircraft), 20 hours (Last 30 days, all aircraft)		

The pilot held a private pilot certificate with a single-engine airplane land rating, which was issued in June 2015. According to information provided by the pilot, he had 569 total hours of flight experience, including about 162 hours in the accident airplane make and model. His most recent Federal Aviation Administration (FAA) third-class medical certificate was issued in April 2015.

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	Registration:	N3803J
Model/Series:	A36TC UNDESIGNAT	Aircraft Category:	Airplane
Year of Manufacture:	1980	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	EA-171
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	September 24, 2016 Annual	Certified Max Gross Wt.:	3651 lbs
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:	2859 Hrs as of last inspection	Engine Manufacturer:	Continental
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	TSIO 520
Registered Owner:		Rated Power:	
Operator:	On file	Operating Certificate(s) Held:	None

The single-engine airplane was manufactured in 1980, and was equipped with a Continental TSIO-520 series engine. The pilot purchased the airplane in February 2016.

The airplane was equipped with Genesis Aero wingtip fuel tanks, via Supplemental Type Certificate (STC) SA2460CH. These tanks enabled the carriage of 40 gallons total of additional fuel and were

installed in June 2008. The STC also provided for a maximum takeoff weight increase from the original value of 3,650 lbs to the new value of 3,833 lbs.

A review of the maintenance records indicated that the most recent annual inspection was completed on September 24, 2016. The corresponding airframe logbook entry did not indicate an airframe total time (TT) in service but did note a tachometer time of 2,859.0 hours. The most recent airframe entry was dated February 1, 2017, and indicated a tachometer time of 2,920.9 hours. That entry also indicated a TT of the same value.

The engine logbook indicated that in August 2010, the engine was "major overhauled to manufacturer's specifications." At that time the engine had a TT of 2,282.1 hours. The engine logbook indicated that as part of the September 2016 annual, all six cylinders were removed and replaced with "new Continental Loaded Cylinders." The most recent engine logbook entry, for an oil change, was dated February 17, 2017. That entry cited an airframe TT of 2,920.9 hours, and a time since major overhaul of 633.7 hours.

The propeller logbook indicated that the airplane was equipped with a Hartzell Model PHC-C3YF-1RF propeller, which was in accordance with the A36TC type certificate data sheet. The 3-blade propeller was overhauled in September 2005, when it had a TT of 1,877.8 hours, and the governor was overhauled at the same time as the 2010 engine overhaul.

At the time of the accident, the tachometer registered about 2,927 hours.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	32S,3610 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	13:00 Local	Direction from Accident Site:	0°
Lowest Cloud Condition:		Visibility	10 miles
Lowest Ceiling:		Visibility (RVR):	
Wind Speed/Gusts:	12 knots / 16 knots	Turbulence Type Forecast/Actual:	/
Wind Direction:	350°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.97 inches Hg	Temperature/Dew Point:	2°C / -6°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Stevensville, MT (32S)	Type of Flight Plan Filed:	
Destination:	Chandler, AZ (CHD)	Type of Clearance:	None
Departure Time:	13:00 Local	Type of Airspace:	

The airport's sole windsock, which the pilot stated he referenced during his taxi-out, was situated about 400 ft northeast the runway centerline, and about 1,500 ft along the runway 12 axis. The windsock was about 100 ft west-southwest of a hangar. It was mounted on a pole about 20 ft high. The taxi route from the pilot's hangar to the runway ran adjacent to this windsock.

According to the airport manager, a DigiWx brand automated weather observation system (AWOS) was

installed at 32S in November 2016. The system sensed and recorded multiple parameters, including wind direction, steady state speed and gusts, and temperature, on a one-minute interval basis. At the time of the accident, due to its recent installation, the system had not been assigned its own discrete broadcast radio frequency for pilots to obtain the weather observations. Instead, the information was broadcast on the airport's CTAF frequency; pilots could prompt a broadcast by a series of 5 microphone clicks on the CTAF frequency. The pilot never clarified whether he obtained the AWOS broadcast.

The wind speed and direction sensor for the AWOS system was located near the approach end of runway 12. The sensor was about 300 ft northeast of the runway centerline, and about 100 ft along the runway 12 axis. The sensor was mounted on a mast about 10 ft high, on moderately flat, open terrain, with no nearby obstructions.

The AWOS data for the period of the accident from 1256 to 1303, recorded the wind from 340° and 350° magnetic, between 9 and 12 knots, with numerous gusts to 16 kts. The averaged values were 347° at 11 kts, with 16 kt gusts. The observations also reported visibility 10 miles, temperature 2° C, dew point -6° C, and an altimeter setting of 29.98 inches of mercury (In Hg).

The above values resulted in the following computed values for a departure from runway 12:

- Wind component (steady state): - 8.5 kts (tailwind)
- Wind component (gust): - 11.2 kts (tailwind)
- Station Pressure: 26.27 In Hg
- Pressure altitude: 3,556 ft
- Density altitude: 2,914 ft

Airport Information

Airport:	Stevensville 32S	Runway Surface Type:	Asphalt
Airport Elevation:	3610 ft msl	Runway Surface Condition:	Dry
Runway Used:	12	IFR Approach:	None
Runway Length/Width:	3800 ft / 60 ft	VFR Approach/Landing:	None

According to FAA information, 32S was equipped with a single runway, designated 12/30, which was paved, and measured 3,800 ft long. The runway alignment was 133° true, which was 117° magnetic. Airport elevation was 3,610 ft above mean sea level.

Runway 12 had a significant uphill slope. The threshold of runway 12 was at an elevation of about 3,540 ft, and the threshold of runway 30 was at an elevation of about 3,614 ft. These values resulted in an overall slope of 1.94%. Intermediate elevation values at 500 ft distance increments along the runway all yielded similar slope values, indicating that the runway slope was essentially constant.

Wreckage and Impact Information

Crew Injuries:	1 Minor	Aircraft Damage:	Substantial
Passenger Injuries:	1 Minor	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Minor	Latitude, Longitude:	46.521389,-114.048889(est)

The engine mount was partially separated from the firewall, and the cowling and propeller were significantly damaged. The fuselage exhibited some crush, twist, and wrinkling deformation, but retained the cabin occupiable volume.

The wings and the tail aerodynamic surfaces all remained attached to the fuselage. The flaps were observed to be in the fully retracted position. Both wingtip fuel tanks were fractured, and the left wing leading edge incurred crush damage. The nose and left main landing gear were completely fracture-separated from the airplane. The right main landing gear was partially separated from the airplane. There was no fire.

The front seats remained attached to their mounts, and the occupant restraint belts remained intact. The aft, club-seating arrangement cabin was reported to be "full" of luggage and other cargo items by first responders. At the request of the NTSB, the personal effects and baggage were recovered from the wreckage and weighed by the first responders. These weights are presented in another section of this report.

A Garmin GPSMap 396 device was present in the airplane. The device was sent to the NTSB recorders laboratory in Washington DC for download. The device did not capture the accident flight.

The examination of the engine did not reveal any abnormalities that would have precluded normal operation and production of horsepower. (see docket for engine examination report)

Additional Information

The Pilots Operating Handbook (POH) recovered from the airplane stated that the airplane maximum takeoff weight (MTOW) was 3,650 lbs. A POH supplement, which was provided with the wing tip fuel tank STC, indicated that the MTOW was increased to 3,833 lbs. According to airplane documentation filed with the FAA, that tip tank installation was completed in June 2008, and the "weight and balance [was] updated to reflect this change."

The most recent weight and balance record for the airplane was dated June 14, 2008, and it incorporated the tip tank installation. That document indicated that the airplane empty weight (EW) was 2,724.38 lbs, and an EW center of gravity (CG) of 81.44 inches.

All the cargo, with the exception of two items, was weighed after the accident. Based on the known weights for the cargo, pilot, passenger, fuel, and other items, plus the estimated weight (68 lbs) of the

two items that did not get weighed, the calculated weight of the airplane was 4,053 lbs. That value was about 220 lbs above the maximum allowable takeoff weight, and about 400 pounds above the original (non-STC'd) maximum allowable takeoff weight.

The actual loading of the baggage was not determined. CG calculations, that assumed that the cargo CG was located at the approximate mid-point of the seating and cargo area behind the two front seats, resulted in a loaded airplane CG of 85.5 inches. Investigation-created straight-line extrapolations of the forward and aft CG boundaries to the calculated takeoff weight indicated that the calculated CG would have been within those boundaries, towards the extrapolated forward limit of 85 inches. However, such extrapolations are not authorized by either the manufacturer or the FAA; they were done strictly as an investigative aid to develop some sense of where the calculated CG was relative to the approved envelope.

The pilot's written report to the NTSB stated that the airplane maximum gross weight was 3,600 lbs, and that the weight of the airplane for the takeoff was 2,800 lbs. The STC-permitted maximum takeoff weight was 3,833 lbs, and the NTSB-calculated takeoff weight was 4,053 lbs. The reasons for the discrepancies between the pilot-stated values and the actual values were not able to be determined, because the pilot did not provide the bases for his values.

Airplane Takeoff Performance

Takeoff performance distance data (ground roll, and total over 50 ft obstacle) for the airplane were presented in graph form in the POH. The performance chart values were predicated on the following conditions:

- Gross weight: 3,650 lbs
- Power: "Take-off Power Set Before Brake Release"
- Flaps: 0°
- Landing gear retracted after lift-off
- Runway: paved, level, dry surface
- Takeoff speeds: lift off, 74 kts; 50 ft height, 80 kts

The charts provided for variations in the following parameters:

- Tailwind component (to 10 kts)
- Pressure altitude
- Ambient temperature

POH-derived 0° flap takeoff distances calculated using the ambient conditions, level runway, 3,650 lb weight, and 8.5 kt tailwind component were:

- Ground roll: 1,650 ft
- 50 ft obstacle: 2,800 ft

The same calculations using a 10 kt tailwind component yielded:

- Ground roll: 1,900 ft
- 50 ft obstacle: 3,050 ft

The tip tank STC for the gross weight increase to 3,833 lbs specified increasing the 3,650 lb takeoff

distance values by 11%

Therefore, the 3,833 lb, 8.5 kt tailwind distances were:

- Ground roll: 1,831 ft
- 50 ft obstacle: 3,108 ft

The same calculations using a 10 kt tailwind component yielded:

- Ground roll: 2,109 ft
- 50 ft obstacle: 3,385 ft

Neither the original POH nor the wing tip fuel tank POH supplement provided, nor was either required to provide, performance data to enable users to account for the over-limit takeoff weight (220 lbs excess), the uphill runway slope (1.94%), or the actual tailwind (11.2 kts) component, all of which would increase the ground roll and the distance over a 50 ft obstacle.

Ground Effect

The section "Ground Effect on Takeoff" of Chapter 5 (Takeoffs and Departure Climbs) in the FAA Airplane Flying Handbook (FAA-H-8083) contained the following information regarding this topic:

Ground effect is a condition of improved performance encountered when the airplane is operating very close to the ground. Ground effect can be detected and measured up to an altitude equal to one wingspan above the surface...When the wing is under the influence of ground effect, there is a reduction in upwash, downwash, and wingtip vortices. As a result of the reduced wingtip vortices, induced drag is reduced...Consequently, the effects of ground effect are of greater concern during takeoff and landing.

On takeoff, the takeoff roll, lift-off, and the beginning of the initial climb are accomplished in the ground effect area...Due to the reduced drag in ground effect, the airplane may seem to be able to take off below the recommended airspeed. However, as the airplane rises out of ground effect with an insufficient airspeed, initial climb performance may prove to be marginal because of the increased drag. Under conditions of high-density altitude, high temperature, and/or maximum gross weight, the airplane may be able to become airborne at an insufficient airspeed, but unable to climb out of ground effect. Consequently, the airplane may not be able to clear obstructions, or may settle back on the runway.

Administrative Information

Investigator In Charge (IIC):	Huhn, Michael
Additional Participating Persons:	Troy Meskimen; FAA; Helena, MT Christopher Lang; Continental Motors; Mobile, AL Henry Soderland; Textron Aviation; Wichita, KS
Original Publish Date:	May 28, 2020
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=94772

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](#).