



# Aviation Investigation Final Report

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<b>Location:</b>	Lansing, West Virginia	<b>Accident Number:</b>	ERA21FA377
<b>Date &amp; Time:</b>	September 26, 2021, 10:09 Local	<b>Registration:</b>	N3342L
<b>Aircraft:</b>	Beech C23	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Aerodynamic stall/spin	<b>Injuries:</b>	3 Fatal
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

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## Analysis

The pilot and two passengers were departing on the return flight following a weekend of camping. Three witnesses watched as the pilot initiated a takeoff from runway 22 (2,950 ft long), then aborted the takeoff. The pilot continued to the end of the runway, turned the airplane around, and initiated a takeoff from runway 04, which he also aborted. The airplane continued to the departure end of runway 04, turned around, and began another takeoff from runway 22.

One of the witnesses reported that, "...he was going too fast to stop at the end of the runway but not fast enough to take off." The airplane lifted off "maybe" 800 ft before the departure end of the runway, cleared trees at the departure end, and flew over a creek which ran below and perpendicular to the runway. The terrain on the opposite bank was higher than the runway and included mature trees. The airplane banked steeply left and disappeared below the trees. A witness estimated the airplane's bank angle as 45° and said that the engine sound was smooth and continuous from engine start until the sound of impact.

Postaccident examination of the airplane revealed no evidence of mechanical malfunctions or anomalies that would have precluded normal operation. The airplane had a useful load of about 862 lbs. The airplane's weight and balance at the time of the accident was calculated using the known weights of the pilot, passengers, and baggage (a total of about 797 lbs) and estimates of the airplane's fuel state at the time of the accident based on its likely fuel consumption during the 2.5-hour flight to the accident airport. The amount of fuel onboard at the time of the accident could not be determined; however, the airplane's weight at the time of the accident would have exceeded its maximum gross weight with a center of gravity aft of the aft limit, even with only about 1 hour of fuel onboard.

Toxicology testing revealed that the pilot had used cannabis; low concentrations of THC and its inactive metabolite, THC-COOH, were detected in his blood. Peak effects from using cannabis typically occur in the first couple of hours and concentrations typically fall below 5 ng/mL after three hours. Since THC is stored in fatty tissues and slowly released days and weeks after using cannabis, low concentrations can be detected long after use, especially in more chronic users. While the pilot's pattern of cannabis use is unknown, given the low concentration of THC in his blood and none in his liver, it is unlikely that the pilot was under the influence of THC. Thus, while the pilot was found to have cannabis in his body, it is unlikely that the effects of the pilot's use of cannabis contributed to this accident.

One laboratory detected ethanol in the pilot's pleural blood at 0.026 gm/dL; the other lab did not detect ethanol in his cavity blood. One would expect similar concentrations in both blood samples. The pilot's internal organs had many lacerations, which can increase microbial spread and microbial production of ethanol. A concentration of 0.026 is close to the concentration where some minor effects from ethanol use can be observed. Given the differing and low level of ethanol and the condition of the body, it is likely that the identified ethanol was from sources other than ingestion. Thus, the identified ethanol did not contribute to this accident.

The pilot's decision to operate the airplane outside of its weight and balance limitations likely resulted in degraded performance and handling characteristics, including a longer ground roll during the takeoff, reduced climb performance, and instability due to the aft center of gravity. Given the previous two aborted takeoffs, it is likely that the pilot recognized the airplane's poor takeoff performance; however, he chose to both attempt and continue a third takeoff. After becoming airborne, it is likely that the pilot was maneuvering to avoid trees at the end of the runway when he exceeded the airplane's critical angle of attack, resulting in an aerodynamic stall and loss of airplane control.

## **Probable Cause and Findings**

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

The pilot's exceedance of the airplane's critical angle of attack while maneuvering to avoid trees and terrain after takeoff, which resulted in an aerodynamic stall and loss of control. Also causal was the pilot's decision to operate the airplane outside of its weight and balance limitations and his decision to continue the takeoff after two previous aborted takeoffs during which the airplane demonstrated reduced performance.

## Findings

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<b>Aircraft</b>	Angle of attack - Capability exceeded
<b>Aircraft</b>	Maximum weight - Capability exceeded
<b>Aircraft</b>	CG/weight distribution - Capability exceeded
<b>Personnel issues</b>	Decision making/judgment - Pilot
<b>Personnel issues</b>	Aircraft control - Pilot

## Factual Information

### History of Flight

Initial climb	Aerodynamic stall/spin (Defining event)
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On September 26, 2021, at 1009 eastern daylight time, a Beech C-23, N3342L, was substantially damaged when it was involved in an accident in Lansing, West Virginia. The private pilot and two passengers were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The airplane was departing New River Gorge Airport (WV32) when the accident occurred. The airport owner, his brother, and a neighbor witnessed the accident, and each provided statements; their versions of events were consistent throughout. The airplane had been parked at the airport in front of the owner's hangar all weekend. On the day of the accident (Sunday), the pilot and two passengers arrived, loaded their luggage and camping gear, and the pilot started the airplane and taxied from its mid-field parking spot to the approach end of runway 22, which was 2,950 ft long.

According to the witnesses, the airplane "powered up" and accelerated. When the airplane reached the point where "airplanes usually lift off," it continued accelerating down runway 22. The takeoff was aborted, the airplane continued to the runway end, turned around, and subsequently attempted to depart from runway 04.

One witness said, "I thought he would take off this time." Instead, the airplane continued to accelerate until engine power was reduced, and the second takeoff attempt was aborted. The airplane continued to the departure end of runway 04, turned around again, and began to takeoff from runway 22 for a third attempt. One witness stated that, as the airplane approached the departure end, "...he was going too fast to stop at the end of the runway but not fast enough to take off."

The airport owner's brother stated that the airplane lifted off "maybe" 800 ft before the departure end of the runway, cleared the trees at the departure end, and flew over Mill Creek, which ran below and perpendicular to the runway. The terrain on the opposite bank was higher than the runway and included mature trees. The airport owner said, "I thought he might make it..." over the trees, but instead the airplane banked steeply left and disappeared below the trees. He estimated that the airplane's bank angle was 45° and that the engine sound was smooth and continuous from engine start until the sound of impact.

## Pilot Information

<b>Certificate:</b>	Private	<b>Age:</b>	38, Male
<b>Airplane Rating(s):</b>	Single-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 3 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	April 15, 2019
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	(Estimated) 395.7 hours (Total, all aircraft), 312.1 hours (Total, this make and model)		

The pilot held a private pilot certificate with ratings for airplane single-engine land and instrument airplane. Review of his logbook revealed 395.7 total hours of flight experience, with an estimated 312 hours of experience in the accident airplane make and model.

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Beech	<b>Registration:</b>	N3342L
<b>Model/Series:</b>	C23	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1977	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal; Utility	<b>Serial Number:</b>	M-1902
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	4
<b>Date/Type of Last Inspection:</b>	December 3, 2020 Annual	<b>Certified Max Gross Wt.:</b>	2450 lbs
<b>Time Since Last Inspection:</b>	135.6 Hrs	<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	3533 Hrs as of last inspection	<b>Engine Manufacturer:</b>	Lycoming
<b>ELT:</b>	C91 installed, activated, did not aid in locating accident	<b>Engine Model/Series:</b>	O-360-A4K
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	180
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KBKW, 2514 ft msl	<b>Distance from Accident Site:</b>	18 Nautical Miles
<b>Observation Time:</b>	10:51 Local	<b>Direction from Accident Site:</b>	188°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	5 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	240°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.2 inches Hg	<b>Temperature/Dew Point:</b>	15°C / 8°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Lansing, WV	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Chesapeake, VA (CPK)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>		<b>Type of Airspace:</b>	Class G

The reported weather conditions resulted in an estimated density altitude of 1,845 ft at the time of the accident.

## Airport Information

<b>Airport:</b>	NEW RIVER GORGE WV32	<b>Runway Surface Type:</b>	Asphalt
<b>Airport Elevation:</b>	1720 ft msl	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>	04/22	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>	2950 ft / 24 ft	<b>VFR Approach/Landing:</b>	None

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	2 Fatal	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	3 Fatal	<b>Latitude, Longitude:</b>	38.08354,-81.06757(est)

The airplane came to rest on the opposite side of Mill Creek, about 880 ft south of the departure end of runway 22. The initial impact point was a treetop about 60 ft above the ground and uphill from where the airplane came to rest. The wreckage path was about 75 ft long and oriented on a magnetic heading of 090°. Several pieces of angularly cut wood were found along the wreckage path. The main wreckage came to rest upright and was also oriented on a 090° heading; all major components of the airplane were accounted for at the scene.

The engine was dislodged from its mounts, rested inverted, and the propeller spinner displayed torsional twisting. The two propeller blades showed similar spanwise bending and leading-edge gouging. The engine firewall, instrument panel, windscreen posts, and cockpit floor were destroyed by impact. The windscreen was separated.

The leading edges of both wings were crushed aft in compression, and the skin of the right wing outboard of the right main landing gear was separated and found uphill from the main wreckage. The right aileron remained attached to the separated section. Flight control cable continuity was established for all flight controls.

The engine crankshaft was rotated through the vacuum pump drive. Engine continuity was established through the accessory section to the powertrain and valvetrain. Compression was confirmed using the thumb method. The magnetos each produced spark at all leads. The spark plugs displayed minimal normal wear signatures. Fuel was observed at the fuel pump and the carburetor. The carburetor fuel inlet screen was clean and absent of debris.

Two pipes used for smoking cannabis were found in the personal effects. One pipe was found by first responders, the other pipe and cannabis were found by the investigative team and turned over to police.

## **Medical and Pathological Information**

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According to the State of West Virginia, Office of the Chief Medical Examiner, Charleston, West Virginia autopsy report, the cause of the pilot's death was generalized blunt impact injuries and the manner of death was accident. No significant natural disease was identified.

Toxicology testing performed by the FAA Forensic Sciences Laboratory detected the primary psychoactive compound of cannabis, tetrahydrocannabinol (THC), in the pilot's cavity blood at 1.1 nanograms per milliliter (ng/mL); THC was not detected in his liver tissue. THC's inactive metabolite carboxy-delta-9-tetrahydrocannabinol (THC-COOH) was detected in the pilot's

cavity blood and liver tissue at 6.1 ng/mL and 30.9 nanograms per gram, respectively. Ethanol was not detected in cavity blood. Toxicology testing performed for the medical examiner's office was positive for THC at 1.2 ng/mL and THC-COOH at 8.0 ng/mL in the pilot's pleural blood. Ethanol was detected in pleural blood at 0.026 grams per deciliter (gm/dL).

Tetrahydrocannabinol (THC) is the primary psychoactive cannabinoid compound in cannabis. THC's mood-altering effects include euphoria and relaxation. In addition, cannabis causes alterations in motor behavior, time and space perception, and cognition. Significant performance impairments are usually observed for at least 1-2 hours following cannabis use, and residual effects have been reported up to 24 hours.

THC is rapidly metabolized, but the rate of metabolism is not linear and depends on the means of ingestion (smoking, oil, and edibles), potency of the product, frequency of use, and user characteristics. The primary metabolite, 11-hydroxy-delta-9-THC, is equally psychoactive but is rapidly metabolized to the non-psychoactive metabolite THC-COOH. THC is fat soluble, so is stored in fatty tissues and can be released back into the blood long after consumption. So, while the psychoactive effects may last a few hours, THC can be detected in the body for days or weeks. Very little THC is excreted in urine. Instead, THC-COOH can be found in urine days to weeks after the last use of the drug. Thus, both blood and urine test results do not necessarily reflect recent use and cannot be used to prove that the user was under the influence of the drug at the time of testing.

According to the FAA Guide for Aviation Medical Examiners (AME), "AMEs should not issue airmen medical certifications to applicants who are using these classes of medications... This includes medical marijuana, even if legally allowed or prescribed under state law."

Ethanol is a social drug commonly consumed by drinking beer, wine, or liquor. It acts as a central nervous system depressant; it impairs judgment, psychomotor functioning, and vigilance. Ethanol is water soluble, and after absorption it quickly and uniformly distributes throughout the body's tissues and fluids. The distribution pattern parallels water content and blood supply of the tissue. A small amount of ethanol can be produced after death by microbial activity, usually in conjunction with other alcohols. Extensive trauma increases the spread of bacteria and raises the risk of ethanol production after death.

## **Additional Information**

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The maximum allowable gross weight of the airplane was 2,450 lbs, and the calculated useful load of the accident airplane was 862.4 lbs.

The luggage and camping gear onboard the airplane was weighed with a bathroom scale and the total cargo weight was 253 lbs. The estimated occupant weight combined with the cargo weight was an estimated 813 lbs. Total fuel weight was estimated at either 193 lbs (32.2 gallons) or 83 lbs (13.8 gallons) based on either full tanks (60 gallons) or 2/3 tanks (40 gallons) at the time of departure from the airplane's home base and the fuel likely consumed during the 2.5-hour flight to WV32. The pilot did not purchase fuel at WV32 before departing on the accident flight.

With 32 gallons of fuel on board at departure, the airplane's calculated weight was 2,574 lbs, which was 124 lbs above the maximum allowable gross weight and aft of the airplane's aft cg limit. With 14 gallons of fuel on board at departure, the airplane's calculated weight was 2,463.4 lbs, which was 13 lbs above the maximum allowable gross weight and aft of the airplane's aft cg limit.

Based on the C23 Pilot's Operating Handbook, Take-Off Distance – Hard Surface performance chart, and the following conditions: max gross weight of 2,450 lbs, density altitude of 1,845 ft, headwind of 4 knots, and temperature 15°C, the interpolated ground roll was 1,280 ft and the distance to clear a 50 ft obstacle was 2,239 ft. The liftoff speed was 65 knots and 74 knots at 50 ft. Stall speed with flaps retracted in a 45° bank was 74 knots.

A piece of notebook paper titled, "1/25/2021 New Personal Minimums" was found inside the back cover of the pilot's personal logbook. The paper included a section titled, "Aircraft Performance," which listed the maximum gross weight of the airplane, empty weight, and maximum fuel capacity. The list included a 328-lb "non-pilot" weight, which was consistent with the airplane's payload capacity given full fuel tanks and the weight of the accident pilot.

The section also listed, "Min rwy: 2400 ft (std); 3000 ft (hot)." (see figure.)

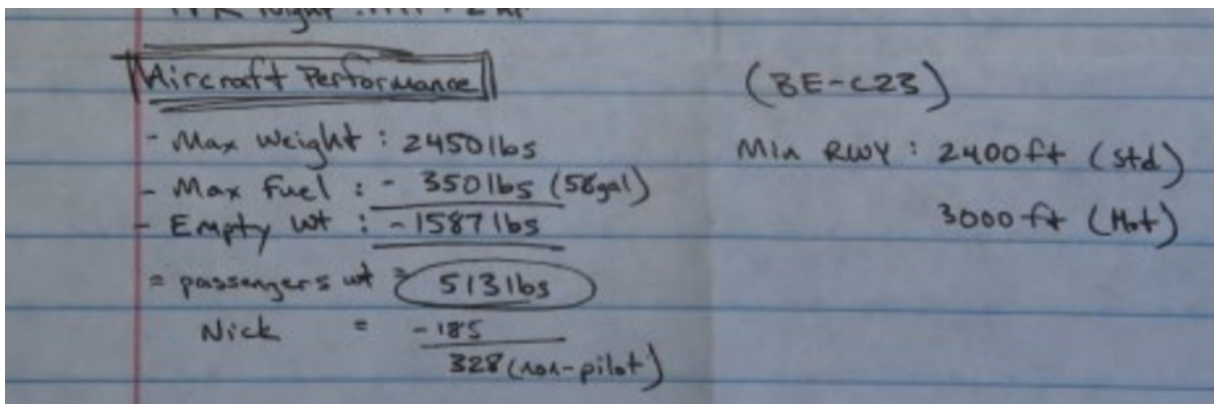


Figure. Excerpt from "Personal Minimums" document found in pilot's logbook

The FAA Weight and Balance Handbook, FAA-H-8083-1, stated:

*Most modern aircraft are so designed that, when all seats are occupied, the baggage compartment is full, and all fuel tanks are full, the aircraft is grossly overloaded. This type of design requires the pilot to give great consideration to the requirements of each specific flight. If maximum range is required, occupants or baggage must be left behind, or if the maximum load must be carried, the range, dictated by the amount of fuel on board, must be reduced.*

*Overloading an aircraft can create a variety of problems:*

- The aircraft needs a higher takeoff speed, which results in a longer takeoff run.*
- Both the rate and angle of climb are reduced.*
- The service ceiling is lowered.*
- The cruising speed is reduced.*
- The cruising range is shortened.*
- Maneuverability is decreased.*
- A longer landing roll is required because the landing speed is higher.*
- Excessive loads are imposed on the structure, especially the landing gear.*

*The POH or AFM includes tables or charts that give the pilot an indication of the performance expected for any weight. An important part of careful preflight planning includes a check of these charts to determine if the aircraft is loaded so the proposed flight can be safely made.*

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Rayner, Brian
<b>Additional Participating Persons:</b>	Jeffrey Burch; FAA/FSDO; Charleston, WV Peter Basile; Textron Aviation; Wichita, KS Troy Helgeson; Lycoming Engines; Williamsport, PA
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<b>Investigation Class:</b>	<a href="#">Class 3</a>
<b>Note:</b>	
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=103961">https://data.nts.gov/Docket?ProjectID=103961</a>

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](#).