

HISTORY OF FLIGHT

On November 22, 2016, at approximately 1142 EDT (1542 UTC), Cirrus SR22-3812, registration N217CE, was substantially damaged during takeoff. The pilot reported the engine was not making full power, aborted the takeoff, a loss of directional control ensued, and the airplane went off the side of the runway striking a runway marker light. The pilot and passenger reported no injuries. Day visual meteorological conditions prevailed at the time of the accident.



Figure 1 – Accident site (photo taken off of internet)

The pilot reported the flight was planned for a 1000 departure from Mercer County Airport (KBLF), Bluefield, West Virginia to Hilton Head Airport (KH XD), Hilton Head Island, South Carolina – a 305 nautical mile flight.

The following statement from the pilot was provided by the FAA to the NTSB IIC.

On November 22nd 2016 I (Joshua Eugene Bailey) was planning a flight in Cirrus SR22 N217CE from KBLF to KH XD. The original flight was planned for a 10:00am departure. Upon arrival at KBLF approximately 0930 I conducted an exterior and interior pre-flight of N217CE. I noticed nothing of concern with the preflight of the aircraft. The aircraft was filled fully with approximately 49 gallons of 100LL avgas from the airport lineman at KBLF with 92 usable gallons of fuel on board. Once in the aircraft I had not had the engine preheated as it was brought out from a heated hanger for the departure. I had made a few attempts to start the engine and it would not turn over because of the cold engine. My dad and I got out of the airplane at which time I borrowed an extension cord from the



line office to preheat the aircraft. I plugged the extension cord to an outside outlet and subsequently plugged in the other end to the engine preheat on the aircraft. My dad and I left the airport for approximately 45 minutes to get another extension cord in the case of the airport's extension cord was not working. Coming back to the airport I noticed the engine was not preheating and plugged the extension cord into a known outlet with power inside the terminal. N217CE is equipped with preheat and I noticed what I considered to be an indicator light beside the preheat plug to indicate the engine was preheating. After two attempts from two different extension cords from a known working outlet I determined the engine was not preheating.

After unplugging the cord from the preheat from the aircraft and putting the extension cords back I attempted starting the aircraft again as it was still cool but the aircraft had been in the sun for well over an hour at this point. After approximately 4 attempts the aircraft engine engaged and started. I allowed the engine to warm up for about 10 minutes and then began to taxi to Rwy 5 full length. Winds were variable in direction and speed at the time. After completing the before takeoff checklist, I had noticed the CHT temps were showing hot for a few of the cylinders and I back taxied RWY 5 and shut the engine down upon parking. I restarted the engine again after a few minutes and discovered that all cylinder head temps were reading normally as well as all other engine parameters and I taxied back out to RWY 5 conducting another before takeoff checklist. Announcing departure for takeoff from RWY 5 at approximately 1140 I advanced the throttle to full forward at which time I didn't feel the amount of power I am used to when advancing the throttle full forward in a Cirrus. I have over 400 hours in Cirrus SR22 and I am used to the acceleration when the throttle is advanced full forward with or without passengers and fully fueled. I began to notice the airspeed was not increasing fast enough on the takeoff roll. I noticed the airspeed indicator fluctuating from increasing to decreasing speed during takeoff roll. As I progressed further down RWY 5 and running out of runway it occurred to me that I did not have enough power and airspeed for a safe takeoff. I immediately retarded the throttle and applied full breaking on both main wheels at which time the left wing became airborne and I tried to get the left wing back down on the ground at which time the right wing struck the runway and then I went into the grass with the prop impacting as well in between the taxiway and runway with the airplane coming to rest approximately 180 degrees turned facing RWY 23 with the nose gear sheared away as well as heavy damage to the main gear. I immediately pulled the mixture to cut off grabbed the POH and told my dad to open the door and get way from the aircraft as quickly as possible in case of fire. I never noticed any smoke from the aircraft after deplaning. Then I was eventually picked up away from the aircraft by Sam Hazard on the taxiway and immediately taken to the line office.

This is the recollection of my flight attempt from KBLF to KHXD on November 22nd 2016.

AIR TRAFFIC CONTROL INFORMATION

No ATC data obtained.



WITNESSES

No witness accounts obtained other than pilot account above.

METEOROLOGICAL INFORMATION

On November 22, 2016, at 1152 EDT (1552 UTC), the recorded weather observation at Mercer County Airport (KBLF) was: wind, 290 degrees at 8 knots; visibility, 10 statute miles; ceiling, clear; temperature, -1 degrees C; dew point, -6 degrees C; altimeter setting, 30.29.

OCCUPANT INFORMATION

The airplane was piloted by Josh Bailey from the left front crew seat. His father occupied the right front crew seat and was reported to have been holding two small dogs at the time of the accident.

MEDICAL INFORMATION

No medical information was obtained.

AIRPLANE INFORMATION

Cirrus SR22-3812, registration N217CE, received its standard airworthiness certificate on November 16, 2011. The airplane was equipped with: Perspective avionics with: synthetic vision, GFC 700 autopilot with yaw damper, dual Air Data Computers, dual AHRS, Garmin Traffic, engine monitoring, Electronic Stability Protection (ESP), Enhanced Vision System (EVS), Garmin Terrain (TAWS-B), XM radio/weather, a Tanis engine pre-heater, and a Recoverable Data Module (RDM).

The last annual inspection listed in the engine logbook was dated November 15, 2016, at a Hobbs time of: 1,709.1 and a FLIGHT Hobbs time of: 1,416.0.

When SR22-3812 was examined on December 1, 2016, after the accident, the HOBBS meter indicated: 1,715.1 and the FLIGHT meter indicated: 1,420.1.

INVESTIGATIVE TIMELINE

On Wednesday, November 23, 2016, the Cirrus Air Safety Investigations Department noted the subject event on the FAA daily run.

On Monday, November 28, 2016, the NTSB IIC notified Air Safety of the intent to have the FAA and Continental Motors meet in Bluefield, WV to examine the airplane on Thursday, December 1, 2016.



On December 1, 2016, I traveled to Bluefield, WV and met the FAA. The Continental Motors investigator was unable to attend due to a cancellation of her flight due to weather. The airplane was examined and NVM obtained.

WRECKAGE & IMPACT INFORMATION

The airplane was examined in a hangar attached to the local FBO office on December 1, 2016. The following observations were made there unless stated otherwise. Personnel present were:

Name	Organization
Bruce Schemmel	FAA
Ethan Dorothy	FAA
Clint Ransom	Airport Manager for KBLF
Brad Miller	Cirrus Aircraft
Josh Bailey	Pilot of Accident Airplane



The accident airplane was resting on the right main landing gear with the left wing tip up on a railroad tie (to prevent fuel from leaking) and the engine on the ground. A fork lift was used to lift the airplane to facilitate removal of the lower cowlings and examination of the engine.



Figure 2 – Accident airplane.

Fuselage

The fuselage was intact with minor damage present. The left vortex generator was damaged.



Figure 3 – Left vortex generator.

Wing

The wing was intact and exhibited impact damage.

Wing – Right Side

The outboard end of the right lower wing skin exhibited scratches and scuff marks. The right wingtip had impact damage. The upper and lower wing skins were separated for approximately 6 inches along their trailing edge starting at the right wingtip mounting flange and extending inboard. The right wing fuel tank had fuel present and spilled out when an attempt to open the filler cap was made.



Figure 4 – Right wingtip.



Figure 5 – Right wingtip aft edge.



Figure 6 – Right wingtip forward edge.

Wing – Left Side

Scuffing was present just aft of the outboard TKS panel along the outboard 3 feet of the left lower wing skin. The pitot tube mast was separated and damage to the wingtip was present. Someone had applied some type of sealant around the fuel tank NACA vent to prevent fuel leakage. The left flap hinges were bent inboard. The left flap exhibited buckling in multiple locations and there was impact damage to the inboard flap cove consistent with the left main landing gear wheel assembly having struck it. Fuel was present in the left wing fuel tank to just below the tab.



Figure 7 – Left wingtip.



Figure 8 – Outboard left lower wingskin.



Figure 9 – Left wingtip.



Figure 10 – Left lower wingskin.



Figure 11 – Left upper wingskin.



Figure 12 – Left lower wingskin.



The left inboard TKS panel had a dent approximately 6.5 inches outboard of the inboard stall strip. This dent also had yellow paint transfer present. The FAA stated the airplane had struck a yellow runway marker light.

A second dent was present on the inboard TKS panel approximately 28.5 inches outboard of the inboard stall strip.

A 3-inch circular dent was present in the left upper wing skin approximately 10 inches outboard of the inboard stall strip and roughly 8.5 inches aft of the inboard TKS panel.



Figure 13 – Left inboard TKS panel.



Figure 14 – Left inboard TKS panel.



Figure 15 – Left upper wing skin.

Stabilizers

The empennage was intact and no obvious damage was noted. The horizontal and vertical stabilizers had no obvious damage. The rudder and elevators had no obvious damage. The tail tie down had no evidence of ground contact present.



Figure 16 – Empennage.



Figure 16 – Empennage.

Landing Gear

The nose landing gear separated from the airplane. The landing gear strut separated above the wheel assembly, the oleo separated from its top mounting point, and the strut assembly separated from the two mounting points at the engine mount / weldments. The forward portion of the nose landing gear wheel pant separated, and scuffing / scratches were present on the nose wheel fork assembly.



Figure 17 – Nose landing gear.



Figure 18 – Nose wheel assembly.



Figure 19 – Nosewheel assembly.



Figure 20 – Nose landing gear strut.



The right main landing gear remained attached to the wing and exhibited impact damage. The bottom of the wheel pants were cracked. The fairings were not removed for further inspection of the gear strut assembly and mounting location.



Figure 21 – Right main landing gear.

The left main landing gear remained attached to the wing and exhibited impact damage. The bulk of the landing gear strut assembly was delaminated. The fairings were not removed for further inspection of the gear strut upper mounting location. Brake fluid was present on the ground below the tire.



Figure 22 – Left main landing gear.

Both the right and left brake temperature indicators were white. White indicates the brakes have not been over temped.



Doors

The cabin doors remained attached and no obvious damage was present. Both doors functioned normally when operated.

The baggage door remained attached and no obvious damage was present. It functioned normally when operated.

Cockpit Documentation

The FAA stated he took photos at the accident site of the cockpit controls.

At the December 1st examination the fuel selector was in the left tank position but was moved to the OFF position during the examination.

Flight controls moved freely and correctly (ailerons, elevator, rudder). The FAA stated, he noted no anomalies also.

The crew seats were equipped with AmSafe seatbelt airbags – they did not fire.

Recovered Non-Volatile Data

The FAA had removed the SD card from the Perspective Multifunction display (MFD). He allowed me to make a copy of all files on the card. I forwarded a copy of the accident flight log file to parties to the investigation and a copy of all the files to the NTSB IIC.

I accessed the RDM USB connector in the empennage and downloaded the last five hours of recorded data. I provided copies of this download to parties to the investigation.

Engine

I disconnected BAT1 and pulled the circuit breakers for BAT2 to prevent any electrical sparking as there was fuel and TKS leaking from the left side of the wing. A forklift was used to lift the front of the airplane off the ground to facilitate removal of the lower cowling.

Visual inspection of the exterior of the engine did not reveal any signs of catastrophic failure – i.e. hole in the crank case, or other obvious anomalies.

The throttle lever was actuated in the cockpit through its entire range of motion several times. The throttle arm and throttle shaft at the throttle body were noted to move in unison and from stop-to-stop appropriately in response to the cockpit throttle selections.

The mixture lever was actuated in the cockpit from the idle/cut-off position to full rich setting several times. The fuel pump mixture arm and mixture shaft at the engine driven fuel pump were noted to move in unison and from stop-to-stop appropriately in response to the cockpit mixture lever selections.



The FAA drained the fuel from the gascolator using a sampling tool. The fuel appeared blue, and clean. I removed the gascolator bowl and visually examined the fuel screen. No anomalies were noted. I reinstalled the fuel bowl finger tight after examining it.

I removed the top spark plugs. No anomalies were noted, however, four of the six plugs appeared somewhat black and sooty. When asked, the pilot stated his normal practice is to leave the mixture full rich during ground operations. The spark plugs were reinserted into their respective locations and finger tightened at the completion of the engine exam.

I used an endoscope attached to my laptop to view the interior of the cylinders. No anomalies were noted on the piston domes, cylinder walls, or valve faces. The lighting and visibility / depth of field was poor and although no anomalies were noted this visual inspection should not be considered a thorough one with a proper borescope.

I removed the hose from the alternate induction air valve – no anomalies were noted. The hose was reinstalled afterwards.

Propeller

The propeller spinner was intact. The tip of the spinner was flat but no determination could be made if this occurred during impact or handling afterwards.

All three composite propeller blades exhibited impact damage.



Figure 23 – Propeller.



TEST & RESEARCH

Recoverable Data Module (RDM) Data

Five hours of data was downloaded from the RDM. Four power cycles associated with the accident were identified.

1st Power Cycle

The data showed the first power cycle began at 0938 EDT and lasted about 12 minutes prior to power off at 0951 EDT. During this power cycle the data was consistent with 18 unsuccessful engine start attempts. Main bus voltage at the beginning of the power up was 23.5 volts and prior to shut down was 19.7 volts.

2nd Power Cycle

The data shows the second power cycle occurred at 1102 EDT, approximately 71 minutes after the 1st power cycle. This is consistent with the pilot's account of having plugged the plane in and having left the airport for a period of time. The second power cycle lasted about 23 minutes prior to power-off at 1125 EDT.

During this power cycle the engine started on the sixth attempt and the data was consistent with the accident airplane having taxied out towards Runway 5 where it performed a run-up on the taxiway. After the run-up, the airplane taxied back to the parking ramp. This is consistent with the pilot's account of having noted "the CHT temps were showing hot for a few of the cylinders" and then having returned to the parking area.

A review of the data showed the #1 & #3 cylinder head temperatures (CHTs) exceeded 420 degrees during the engine run-up which is the bottom of the caution range (yellow). Prior to shut-down on this power cycle data showed the #2, #4, and #6 cylinders were in the caution range of 420-460 degrees (yellow). The #1, #3, and #5 cylinders were in the warning range (red) and exceeded 460 degrees.

3rd Power Cycle

The third power cycle occurred at 1631 roughly 6 minutes later. It lasted about a minute and included 3 unsuccessful engine start attempts.

4th Power Cycle

The fourth power cycle occurred at about 1633 and lasted about 10 minutes. During this power cycle the engine started on the third attempt. The data is consistent with an engine run-up having been performed and the flap switch was set to 50% prior to the aborted takeoff.

At approximately 16:42:05 (17953), the airplane was on runway heading and engine power began to increase for takeoff. Runway 5 is 4,743 feet long by 100 feet wide. Plotting the data on Google Earth showed that while on the blast pad / stopway area, the aircraft RPM was increased to about 2,300 to 2,400 rpm until the plane crossed over the runway threshold line whereupon it went to full power.



At 16:42:17 (17965), about 700 feet from the start of the runway 5 pavement, full power was achieved. Data indicated the engine rpm was around 2,600 rpm and about 28 gallons per hour fuel flow. Expected takeoff rpm is approximately 2,700 rpm and the maximum power fuel flow chart in the POH shows 25.1 as the target fuel flow for 2,000 feet pressure altitude to obtain the performance data shown in section 5 of the POH.¹ I consulted with personnel in the Engineering Flight Test department and they stated that while the numbers presented did not reflect optimal performance, more than adequate takeoff power was readily available to the pilot. The note in the POH for the Maximum Power Fuel Flow chart states: “Excessively rich mixture will occur if the Mixture control is set to FULL RICH above 7,500 feet pressure altitude.”

At 16:42:23 (17971), about 1,325 feet from the start of the runway 5 pavement, the data indicated the airplane had achieved 73 knots indicated airspeed. The POH recommends rotation at 70-73 knots.

At 16:42:29 (17977), approximately 2,150 feet from the start of the runway 5 pavement, data indicated a power reduction. The data shows a decrease in engine rpm from about 2,600 rpm to about 1,500 rpm. 2,590 feet of runway feet remained at this time. Up to this time there is no indication in the data of rotation occurring, however when the power reduces pitch attitude goes to 7 degrees nose up, one second later 1 degree nose up, one second after that 7 degrees nose up, followed by 3 degrees nose down the following second. After this point all dashes appear in the data for accelerometer related data (pitch, yaw, and roll attitude and rates).

At 16:42:37 (17985), approximately 3,300 feet from the start of the runway 5 pavement, data indicated: a GPS altitude of 2,864 feet; indicated airspeed 79 knots; vertical speed 1,328 fpm (the vertical speed one second prior was +176); and the stall horn was on. Google Earth shows the elevation at the coordinate given for this data point as 2,855 feet, which gives the airplane an estimated altitude of approximately 9 feet agl.

At 16:42:39 (17987), approximately 3,500 feet from the start of the runway 5 pavement, data indicated that the airplane departed the right side of the runway with approximately 61 knots of groundspeed.

¹ RDM data indicated the pressure altitude to be approximately 2,500 feet so I rounded down to 2,000 feet pressure altitude for the Maximum Power Fuel Flow chart in Chapter 4.



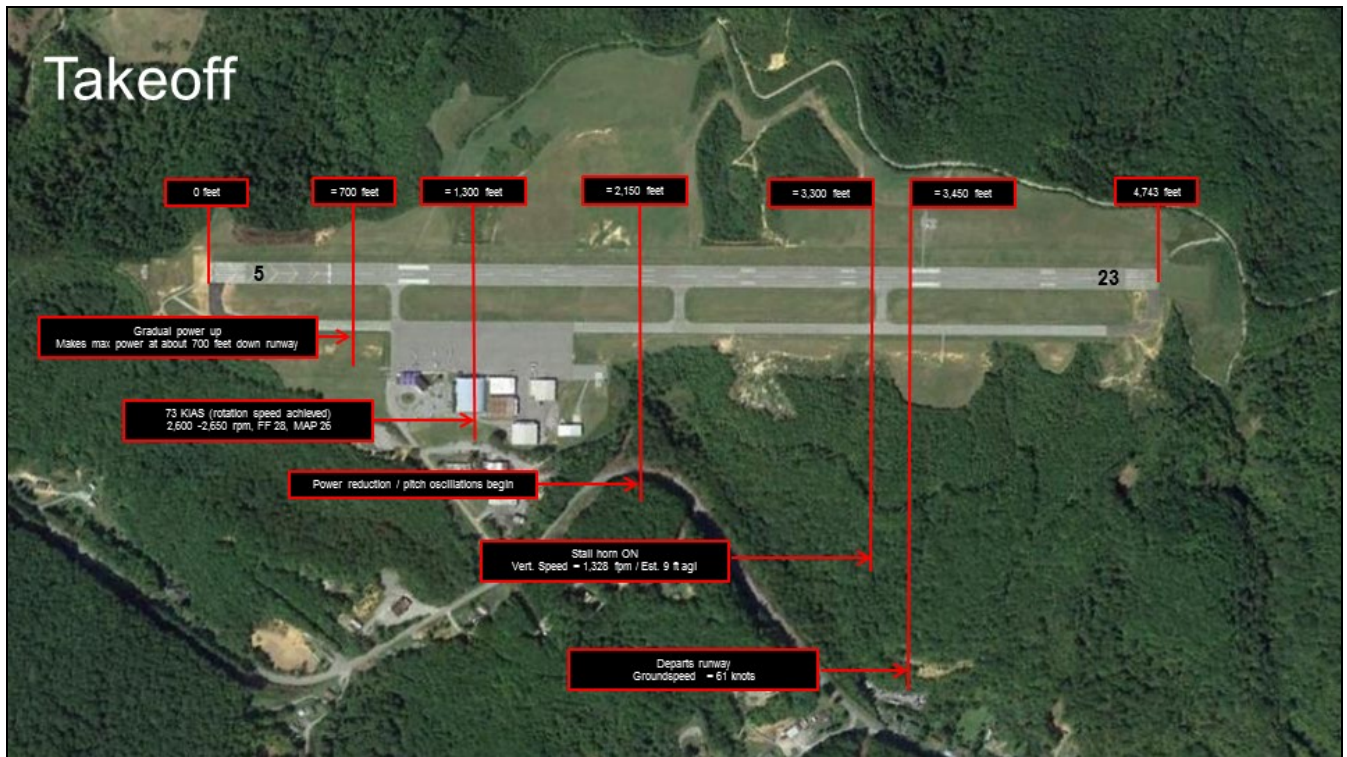


Figure 24 – Takeoff diagram.

Engine Examination at Continental Motors

The accident engine was examined and run in a test cell at Continental Motors on April 4, 2017. According to the Continental Motors Engine Run Report, the engine had 1,420.1 hours total time and 5.3 hours since its last annual inspection on November 15, 2016.

The report summary stated:

During the pre-test run examination, it was noted that the magneto-to-engine timing was set in advance of that specified for this engine model. The timing was not adjusted and remained in the as-received condition. The engine was placed on a test cell and run for 30 minutes at various RPM settings, to include full throttle, with no pre-accident anomalies noted.

The report also noted damage to the starter adapter components that was consistent with other starter adapters that have been involved in engine kickback events. The crankshaft gear bolts did not have any visible damage but were retained for further examination by Continental Motors. According to an email dated May 22, 2017 from Nicole Charnon, the materials lab at Continental Motors conducted a magnetic particle inspection and detailed visual inspection on the bolts and did not find any damage. No report was written up for the inspection.

The Continental Motors report is located in Appendix M.

