

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR25LA027

INVESTIGATIVE SUPPLEMENTAL MATERIAL

ACCIDENT

Location: St. George, UT
Date: October 27, 2024
Time: 1712 mst
Airplane: Cirrus Design Corp. SR20

INVESTIGATIVE SUPPLEMENTAL MATERIAL

IIC Zoë Keliher
National Transportation Safety Board
Portland, OR

Party Member [REDACTED]
Cirrus
Duluth, MN
[REDACTED]
Lycoming Engines
Williamsport, PA

HISTORY OF FLIGHT

On October 27, 2024, about 1712 mountain standard time, a Cirrus Design Corp. SR20 airplane, N27WF, was substantially damaged when it was involved in an accident near St. George, Utah. The flight instructor, student pilot, and passenger were not injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 91 instructional flight.

The flight instructor stated that the purpose of the flight was to drop the passenger off in Provo, Utah, while also providing the owner/student with familiarization experience in the airplane. The flight instructor reported that, during the run-up, he noticed the left magneto was running rough with about a 150-rpm drop. Assuming spark plug fouling, he leaned the mixture for several minutes and then repeated the magneto check, which showed normal operation. Thereafter, they departed from runway 19, and the flight instructor noted that the airplane's acceleration felt sluggish, which he attributed to the added weight. He stated that the airplane climbed normally to about 200 ft above ground level before it would no longer accelerate, although the engine sounded normal.

The flight instructor stated that he cycled the throttle, adjusted the mixture, and confirmed that the flaps were at 50 percent. He reported that, despite those actions, the airplane did not accelerate. The engine rpm was about 2,500 and the airspeed was about 70 knots. With rising terrain ahead, he banked left toward the airport. After realizing that the airplane would not make it back to the runway, he maintained a controlled descent to avoid a stall. During the off-airport landing on soft desert terrain, he flared aggressively to reduce ground speed. The left wing dropped, and the airplane landed hard, which resulted in separation of the landing gear. The airplane then skidded and rotated about 180° to 270° before it came to rest upright. The occupants exited the airplane, and a fire ensued shortly thereafter.

According to the flight instructor, the engine and propeller appeared and sounded normal during the accident flight but did not produce the expected thrust. He recalled that the boost pump was on, but he could not remember which fuel tank was selected because he had followed the checklist and switched tanks after the run-up. He stated that the airbags did not deploy.

RECORDED ENGINE DATA

The airplane was equipped with an Appareo RDM-300 recoverable data module. The recovered file contained about 22 minutes of data, from 1651:12 to 1713:34, and included engine rpm, manifold pressure, fuel flow, calculated percent power, oil pressure and temperature, individual cylinder exhaust gas temperature (EGT) and cylinder head temperature (CHT), and airplane performance parameters.

At 1654:00, the engine started and operated for about 6 minutes 42 seconds. During a ground run-up, the engine speed increased to a maximum of 2,267 rpm. At 1700:42, the engine stopped. The data then recorded several short engine-start attempts before the engine restarted at 1704:45. During the second ground run-up, the engine speed increased to a maximum of 2,475 rpm, decreased to about 600 rpm, and then returned to about 2,200 rpm.

At 1708:31, the manifold pressure increased to about 27 inHg, consistent with the application of takeoff power. The fuel flow increased to about 9 gph, and the engine speed increased to about 2,300 rpm. The engine speed increased gradually as the airplane accelerated and first exceeded 2,500 rpm about 36 seconds later. The airplane reached 70 knots indicated airspeed about 49 seconds after the increase in manifold pressure. The maximum recorded engine speed was 2,636 rpm, slightly below the engine's rated speed of 2,700 rpm.

After the engine speed exceeded 2,500 rpm, the manifold pressure remained between 26.8 and 27.0 inHg, the fuel flow remained between 9.2 and 9.7 gph, and the calculated percent power remained between 82% and 87%. The four recorded EGT values remained between about 1,481°F and 1,583°F, and the CHT values remained between about 317°F and 375°F. The oil pressure remained between about 73 and 81 psi, and the oil temperature increased from about 80°C to 93°C. The recorded engine parameters remained generally stable until about 1712:19, when the manifold pressure, fuel flow, and engine speed decreased during the final seconds of the accident sequence.

A review of the recorded data did not identify an abrupt loss of manifold pressure, fuel flow, oil pressure, or combustion from an individual cylinder during the takeoff or flight. However, the engine did not attain its rated speed despite the manifold pressure remaining near 27 inHG, and the airplane accelerated slowly during the takeoff roll. The data was consistent with reduced available power or thrust during the takeoff and initial climb. The recorded data alone could not determine whether the reduced performance resulted from the engine fuel-metering or mixture system, the ignition system, the propeller system, or an erroneous fuel-flow indication.

Cirrus provided four previous flight recordings from October 21 and October 25, 2024. Two of the previous departures were from St. George Regional Airport and two were from Provo Municipal Airport.

During the four previous takeoffs, the engine speed exceeded 2,600 rpm within 4 to 6 seconds after the initial increase in manifold pressure and then stabilized near 2,700 rpm. The manifold pressure stabilized between about 25.3 and 27.0 inHg, and the fuel flow stabilized between about 13.0 and 19.4 gph. The airplane accelerated to 70 knots indicated airspeed within 17 to 23 seconds. At 60 seconds after the application of takeoff power, the GPS altitude had increased between about 219 and 323 ft above the runway elevation.

During the accident takeoff, the manifold pressure increased to about 26.9 inHg, which was comparable to the two previous departures from St. George; however, the engine speed initially remained between about 2,360 and 2,500 rpm. The engine speed did not exceed 2,600 rpm until about 69 seconds after the application of takeoff power and did not exceed 2,636 rpm during the flight. The fuel flow stabilized between about 9.1 and 9.7 gph, which was lower than during each of the four previous takeoffs. The airplane reached 70 knots about 50 seconds after the application of takeoff power. At 60 seconds, the GPS altitude had increased about 33 ft above the runway elevation.

During comparable portions of the two previous St. George takeoffs, the average engine speeds were about 2,703 and 2,710 rpm, and the average fuel flows were about 17.3 and 19.4 gph. During the accident takeoff, the average engine speed was about 2,461 rpm and the average fuel flow was about 9.2 gph. The accident-flight EGT values averaged between about 1,457°F and 1,516°F, compared with about 1,264°F to 1,395°F during the previous St. George takeoffs. The CHT values during the accident takeoff were slightly higher than during the previous takeoffs but remained stable.

The previous takeoff with the lowest recorded fuel flow occurred during a departure from Provo, where the density altitude was about 5,650 ft. During that takeoff, the fuel flow stabilized near 13.0 gph, the engine reached about 2,700 rpm within 6 seconds, and the airplane reached 70 knots within 23 seconds.

Each previous flight recording showed one continuous period of engine operation from the engine start through the flight. The accident recording showed an initial engine operating period that ended after about 6 minutes 40 seconds, a brief subsequent engine-start attempt, and a second sustained engine start before the accident takeoff.

The comparison showed that the combination of nearly full manifold pressure, low fuel flow, delayed engine acceleration, and failure to attain the rated engine speed was not present during the four previous takeoffs.

PERSONNEL INFORMATION

The flight instructor stated that he usually worked as a corporate pilot in St. George, Utah, flying Eclipse and Phenom turbine-powered airplanes. He reported about 5,000 total flight hours, including about 3,000 hours in single-engine airplanes and about 25 hours in the Cirrus. He stated that he had completed Cirrus training at the Cirrus Service Center in St. George. The pilot held a second-class medical certificate issued March 13, 2024, and held commercial pilot privileges with airplane single-engine land and multiengine land ratings, and a flight instructor certificate for airplane single-engine land.

The student pilot/owner had been receiving flight instruction from the flight instructor in an Alpha trainer. According to the flight instructor, they had completed only one previous 30-minute flight together in the Cirrus before the accident flight.

AIRCRAFT INFORMATION

The accident airplane was a Cirrus Design Corp. SR20 G6, serial number 2598, manufactured in 2020. FAA records indicated that the airplane's airworthiness certificate was issued on September 3, 2020. The airplane was equipped with Garmin Perspective Plus avionics.

The airplane was equipped with a Lycoming IO-390-C3B6, four-cylinder, air-cooled, direct-drive, horizontally opposed, fuel-injected engine, serial number L-1215-80E, rated at 215 horsepower at 2,700 rpm.

A review of the maintenance records revealed that the airplane was maintained under the Cirrus 400-hour progressive inspection program until 2023. An entry dated September 22, 2023, recorded completion of an annual inspection at an airframe total time of 1,340.1 hours. An entry dated January 29, 2024, stated that the airplane was no longer maintained under the Cirrus 400-hour progressive inspection program and that a 100-hour/annual inspection had been completed at an airframe total time of 1,509.7 hours. The engine inspection entry documented an oil and filter change, removal and inspection of the oil suction screen with no defects noted, differential compression readings of 78/80, 76/80, 72/80, and 79/80, cleaning and gapping of spark plugs, and magneto timing adjusted to 20° BTC. The entry also documented inspection of the fuel injection lines and clamps in accordance with AD 2015-19-07, with no defects noted.

The flight instructor reported that the airplane had been purchased about 5 months before the accident. He reported that they departed on the accident flight with full fuel because the fixed-base operator at Provo had no refueling option. The flight instructor estimated that the airplane was about 230 pounds below maximum gross weight, and that the rear seat contained the passenger and about 60 pounds of luggage.

Recorded avionics data from previous flights were reviewed to compare takeoff performance with the accident flight. Ground roll distances were estimated using recorded parameters that included airspeed, pitch attitude, and vertical speed. The estimated takeoff ground roll for four previous flights ranged from about 1,800 ft to 2,300 ft. The estimated takeoff ground roll for the accident flight was about 4,200 ft.

Using a gross weight of about 3,150 lbs, a pressure altitude of 2,785 ft, and an outside air temperature of 22°C, the Pilot's Operating Handbook takeoff performance chart indicated a

takeoff ground roll of 2,362 ft and a total distance to clear a 50-ft obstacle of 3,217 ft. The recorded avionics data included a pilot-entered gross weight of 3,092 lbs.

Engine power during the accident takeoff roll was also evaluated. Based on the Lycoming performance chart for the IO-390 engine, the engine was producing about 88 percent power during the takeoff roll. The Lycoming performance chart did not include fuel flow as an input for the power calculation. The avionics data indicated that the engine produced about 85 percent power.

The Pilot's Operating Handbook indicated that fuel flow should be at the top of the green arc during takeoff. For the approximate 4,300-ft density altitude at the time of takeoff, the expected takeoff fuel flow was between 16 and 18 gallons per hour.

MAINTENANCE RECORD EXCERPTS

Make: Lycoming Model: IO-390-C3B6 Eng S/N: L-1215-80E Reg# N27WF	Advntge Aviation [REDACTED]	Flight: 1509.7 TSN: 1509.7
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This aircraft is no longer maintain on the Cirrus 400 HRS Progressive Inspection Program as of this date January 29, 2024. C/W 100 HR/Annual inspection IAW Cirrus Design SR-20 Maintenance Manual & Single Engine Inspection Guide. Changed oil and filter. Removed oil suction screen and inspected. No defects found. Reinstalled oil suction screen. Serviced engine with 7 quarts of Phillips XC 20W50 oil and a new AA48110-2 filter, cut and inspected filter no defects noted. Performed differential compression test, as follows: 1 78/80 2 76/80 3 72/80 4 79/80. Cleaned and gapped all spark plugs. Checked magneto to engine timing and adjusted as needed to 20 BTC. C/W AD 2015-19-07 (Fuel inj. Lines) by inspection of all lines and clamps IAW Lycoming MSB 342G. No defects found. Due each 100 hours or again at 1609.7. Tighten up the oil dipstick tube and resafety wire. Performed routine maintenance and servicing. Washed engine. Run up, ops and leak checks good. I certify that this engine has been inspected in accordance with a 100 HR/Annual inspection and found to be airworthy this date.

The aircraft, airframe, aircraft engine, propeller or appliance identified above was repaired and inspected in accordance with current Federal Aviation Regulations and is approved for return to service. Pertinent details of the repair(s) are on file at this Facility under the [REDACTED] Work Order.

Date: January 30, 2024 Signature: [REDACTED]

EXAMINATION

A majority of the fuselage was consumed by fire including most of the wing structure. The right wing flap actuator jackscrew was found fully extended in the flaps 0 percent position, which was also noted to be consistent with the recorded data. The vertical stabilizer was partially consumed by fire, and the rudder remained attached. The horizontal stabilizer center section was consumed by fire, and both elevators remained attached. The left and right main landing gear and the nose gear were consumed by fire. The cabin doors, baggage door, and cockpit seats were also consumed by fire.

Flight control cable continuity for the aileron, rudder, and elevator systems could not be determined due to postimpact fire damage.

ENGINE

The post accident examination revealed that the engine remained attached to the airframe by the engine mount and had sustained severe thermal damage from the postimpact fire. The accessory case housing and attached accessories, including the magnetos, fuel pump, vacuum pump, and oil filter, had been consumed by fire. The No. 4 cylinder head had been partially consumed by fire. The accessory gears were exposed and intact.

Rotation of the crankshaft was precluded by thermal damage to the engine case and cylinders. The rocker covers were removed. The valve train in the rocker box areas for cylinders Nos. 1, 2, and 3 appeared free of preaccident mechanical malfunction. The combustion chambers were examined through the spark plug holes with a lighted borescope. The combustion chambers and bottom spark plug electrodes remained mechanically undamaged, and there was no evidence of foreign object ingestion. The valves were intact and undamaged, and there was no evidence of valve-to-piston contact.

Additional borescope examination through holes drilled in the top of the engine case allowed visualization of the connecting rods, crankshaft, and cam lobes. Investigators reported no evidence of lubrication deprivation or contamination. The crankshaft and connecting rods were free of heat distress. The roller tappet camshaft was intact, and each cam lobe exhibited its characteristic elliptical shape. The accessory gears, including the crankshaft gear, bolt, and dowel, were intact and exhibited no evidence of a preimpact malfunction.

PROPELLER

The propeller remained attached at the crankshaft flange. All three blades remained attached to the hub. The blades were bent aft in a smooth arc and exhibited leading-edge damage, torsional twisting, chordwise striations on the cambered surfaces, and trailing-edge S-bending, consistent with the absorption of rotational forces at the time of impact. The propeller governor remained attached at its mounting pad, and its control arm was positioned about 3/16 inch off the low-pitch/high-rpm adjustment screw. The governor drive was intact and could be rotated by hand.