# Aviation Investigation Final Report

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| **Location:** | Colorado Springs, Colorado | **Accident Number:** | CEN16FA034 |
| **Date & Time:** | November 9, 2015, 10:52 Local | **Registration:** | N752C |
| **Aircraft:** | CIRRUS DESIGN CORP SR22 | **Aircraft Damage:** | Destroyed |
| **Defining Event:** | Loss of control in flight | **Injuries:** | 2 Fatal |
| **Flight Conducted Under:** | Part 91: General aviation - Personal | | |

## Analysis

The private pilot and his passenger departed on a cross-country flight. Shortly after takeoff, the pilot reported to the controller that he was having an engine problem and wanted to return to the airport. One witness heard the engine surge during the takeoff roll. Another witness stated that the airplane was on the ground longer than he expected but did not report hearing anything abnormal with the engine. A third witness stated that the engine sounded normal and a fourth witness reported seeing the airplane in a steep bank.

The airplane was damaged by impact and a postimpact fire. An examination of the engine, propeller, airframe, and related systems revealed no anomalies that would have precluded normal operation prior to the accident. The damage to the airplane and the witness marks on the ground were consistent with the airplane being in a flat spin at the time of impact.

The density altitude at the time of the accident was 7,446 ft mean sea level. The majority of the pilot's flight experience was conducted at airports with a lower field elevation and he had flown to the accident airport on only two other occasions. It is likely that, after takeoff, the pilot misinterpreted the airplane's reduced engine power and decreased climb performance, due to the high density altitude conditions, as an engine malfunction. During the turn back to the airport the pilot exceeded the airplane's critical angle of attack and experienced an aerodynamic stall and spin.

Although there was evidence that the pilot had used marijuana at some time prior, it is unlikely that the pilot was impaired by marijuana at the time of the accident. The pilot had been diagnosed with mild depression two months before the accident and had started treatment with sertraline. The pilot had not yet followed-up with his physician after starting treatment. Therefore, the investigation was unable to determine if the pilot may have been impaired by the symptoms of his depression.

The pilot was using diphenhydramine, cetirizine, and sertraline, which in combination significantly increased the risk of impairment over each medication alone. The experienced pilot was exposed to a high workload environment following the degradation of airplane performance, but would have been

expected to safely fly the airplane. Therefore, it is likely that when the pilot was exposed to a high workload environment, due to the airplane's degraded takeoff performance, the combination of multiple medications likely impaired his ability to respond safely and, therefore contributed to the subsequent loss of control.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's loss of airplane control during the turn back to the airport after takeoff in high density altitude conditions, which resulted in an inadvertent aerodynamic stall and subsequent spin. Contributing to the accident was the pilot's impaired performance due to his use of a combination of potentially impairing medications.

### Findings

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| **Aircraft** | Airspeed - Not attained/maintained |
| **Aircraft** | Angle of attack - Not attained/maintained |
| **Personnel issues** | Aircraft control - Pilot |
| **Environmental issues** | High density altitude - Effect on operation |
| **Personnel issues** | Use of medication/drugs - Pilot |
| **Personnel issues** | OTC medication - Pilot |
| **Personnel issues** | Prescription medication - Pilot |
| **Personnel issues** | Task overload - Pilot |

# Factual Information

## History of Flight

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| **Takeoff** | Loss of control in flight (Defining event) |

On November 9, 2015, about 1052 mountain standard time, a Cirrus Design Corporation SR22 airplane, N752C, was destroyed when it impacted terrain north of the City of Colorado Springs Municipal Airport (COS), Colorado Springs, Colorado. A postimpact fire ensued. The private pilot and passenger were fatally injured. The airplane was registered to Linkup Aviation LLC. and operated by the pilot under the provisions of 14 *Code of Federal Regulations* Part 91 as a personal flight. Visual meteorological conditions prevailed for the flight, which operated without a flight plan. The personal flight was originating at the time of the accident and was en route to Northwest Regional Airport (52F), Roanoke, Texas.

According to Federal Aviation Administration (FAA) air traffic control transcripts, the accident airplane contacted COS ground control at 1046:41, reported that they were ready to taxi, and requested an intersection departure from taxiway A3. The controller responded "…fly runway heading maintain v f r at or below eight thousand five hundred…" and provided the departure control frequency and transponder setting. The pilot responded "alright we'll maintain eight thousand or below and ah departure is one two four." The controller cleared the pilot to taxi to runway 35L via A3.

At 1050:12, the pilot reported to COS air traffic control tower that he was holding short of runway 35L at alpha three and was ready for departure. The controller cleared the pilot for takeoff and later instructed the pilot to fly runway heading. At 1051:44, the pilot reported to the controller that he was "having engine problems we'd like to turn around." The controller instructed the pilot to enter a left downwind for runway 35L. No other transmissions were recorded from the airplane.

One witness described hearing the engine surge during the takeoff. A second witness watched the airplane take off from the intersection. When he looked back toward the airplane, he expected the airplane to be airborne; however, the airplane was still on the ground. He estimated that the airplane was on the ground for several thousand ft before it became airborne and was between 100 and 150 ft above the ground when it passed him. He did not report hearing anything abnormal. A third witness on the ramp witnessed the takeoff and did not hear any unusual sounds from the engine. A fourth witness observed the airplane in a steep bank at the end of the runway but did not witness the accident.

## Pilot Information

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| **Certificate:** | Private | **Age:** | 63,Male |
| **Airplane Rating(s):** | Single-engine land | **Seat Occupied:** | Left |
| **Other Aircraft Rating(s):** | None | **Restraint Used:** | 4-point |
| **Instrument Rating(s):** | Airplane | **Second Pilot Present:** | No |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | Yes |
| **Medical Certification:** | Class 3 With waivers/limitations | **Last FAA Medical Exam:** | November 4, 2013 |
| **Occupational Pilot:** | No | **Last Flight Review or Equivalent:** | February 19, 2015 |
| **Flight Time:** | (Estimated) 2350 hours (Total, all aircraft), 1798 hours (Total, this make and model) | | |

The pilot, age 63, held a private pilot certificate with airplane single engine land and instrument airplane ratings. He was issued a third class medical certificate on November 4, 2013. The certificate contained the limitation "Not valid for night flying or by color signal control. Must wear corrective lenses."

Remains of a Taxlog Tax record flight log were found adjacent to the main wreckage. The start date on the first page of the log could not be determined due to fire damage. The first flight appeared to be a business flight with the duration of 6.6 hours. The start "tach" time was 1,309.8 and the stop "tach" time was 1,316.4. There were 19 pages of records with the first discernable date starting on page 6 of the record in 2009. All of the flights recorded in the log were in the accident airplane. The last entry on the 19th page was dated March 17, 2015, and was from 52F to AEE/VGT, with a start time of 3,095 and end time of 3,108.2. Two flights before that, dated February 19, 2015, the pilot successfully completed the requirements of a flight review and an instrument proficiency check in the airplane. The flight was 2.7 hours in duration and included 3 landings and 3 instrument approaches.

Based upon the remains of this flight log, the airplane was likely based at 52F as the flights recorded all appeared to originate from 52F. This airport was located 3 miles northwest of Roanoke, Texas, at an elevation of 643 ft mean sea level (msl). This flight log reflected that the pilot had flown to COS on two other occasions. The pilot had also flown to Albuquerque, New Mexico, on two different occasions; ABQ at an elevation of 5,354 ft msl and AEG at an elevation of 5,837 ft msl. Otherwise, the majority of the pilot's flying was conducted out of airports with field elevations below 1,000 ft msl.

On the pilot's medical certificate application, dated October 4, 2011, he reported a total flight time of 2,350 hours. He did not report total flight time on the more recent application dated November 4, 2013.

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | CIRRUS DESIGN CORP | **Registration:** | N752C |
| **Model/Series:** | SR22 | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | 2002 | **Amateur Built:** | |
| **Airworthiness Certificate:** | Normal | **Serial Number:** | 0421 |
| **Landing Gear Type:** | Tricycle | **Seats:** | 4 |
| **Date/Type of Last Inspection:** | October 23, 2015 Annual | **Certified Max Gross Wt.:** | |
| **Time Since Last Inspection:** | | **Engines:** | 1 Reciprocating |
| **Airframe Total Time:** | 3204.5 Hrs as of last inspection | **Engine Manufacturer:** | Continental Motors |
| **ELT:** | Installed | **Engine Model/Series:** | IO-550-N27B |
| **Registered Owner:** | On file | **Rated Power:** | 310 Horsepower |
| **Operator:** | On file | **Operating Certificate(s) Held:** | None |

The airplane, a Cirrus SR22 (serial number 0421), was manufactured in 2002. It was registered with the FAA on a standard airworthiness certificate for normal operations. A Teledyne Continental Motors IO-550-N27B engine (serial number 688902) rated at 310 horsepower at 2,700 rpm powered the airplane. The engine was equipped with a Hartzell three-blade, variable pitched propeller.

The airplane was registered to Linkup Aviation LLC., operated by the pilot, and maintained under an annual inspection program. The maintenance records were not recovered. An invoice provided by the family indicated that an annual inspection was completed on October 23, 2015, at a Hobbs meter reading of 3,204.5 hours. During the annual inspection, the sparkplugs were replaced and a 500-hour inspection was completed on the magnetos.

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual (VMC) | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | KCOS,6170 ft msl | **Distance from Accident Site:** | 1 Nautical Miles |
| **Observation Time:** | 10:54 Local | **Direction from Accident Site:** | 160° |
| **Lowest Cloud Condition:** | 23000 ft AGL | **Visibility** | 10 miles |
| **Lowest Ceiling:** | Broken / 23000 ft AGL | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | 8 knots / | **Turbulence Type Forecast/Actual:** | / None |
| **Wind Direction:** | 200° | **Turbulence Severity Forecast/Actual:** | / N/A |
| **Altimeter Setting:** | 29.98 inches Hg | **Temperature/Dew Point:** | 14°C / -13°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | Colorado Spring, CO (KCOS) | **Type of Flight Plan Filed:** | None |
| **Destination:** | Roanoke, TX | **Type of Clearance:** | None |
| **Departure Time:** | 10:51 Local | **Type of Airspace:** | Class C |

The closest official weather reporting station was COS located just south, southeast of the accident site. The routine aviation weather report (METAR) for COS recorded the wind at 200° at 8 knots, sky condition broken clouds at 23,000 ft, temperature 14° Celsius, dewpoint temperature -13° Celsius, and an altimeter setting of 29.99 inches of mercury.

Calculations using relevant meteorological data indicated that the density altitude was 7,446 ft. The FAA Airplane Flying Handbook and the performance data in the Cirrus Design SR22 Pilot's Operating Handbook both discuss the negative effect of density altitude on airplane performance.

## Airport Information

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| **Airport:** | CITY OF COLORADO SPRINGS MUNI COS | **Runway Surface Type:** | |
| **Airport Elevation:** | 6187 ft msl | **Runway Surface Condition:** | Dry |
| **Runway Used:** | 35L | **IFR Approach:** | None |
| **Runway Length/Width:** | 11022 ft / 150 ft | **VFR Approach/Landing:** | None |

COS is a public, controlled (Class C) airport, located 6 miles southeast of Colorado Springs, Colorado, at a surveyed elevation of 6,187 ft. The airport had 3 open runways, 17L/35R (13,501 ft by 150 ft, concrete), 17R/35L (11,022 ft by 150 ft, asphalt), and 13/31 (8,270 ft by 150 ft, asphalt).

The available runway length for departure on runway 35L from the taxiway A3 intersection is 6,000 ft.

## Wreckage and Impact Information

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| **Crew Injuries:** | 1 Fatal | **Aircraft Damage:** | Destroyed |
| **Passenger Injuries:** | 1 Fatal | **Aircraft Fire:** | On-ground |
| **Ground Injuries:** | N/A | **Aircraft Explosion:** | None |
| **Total Injuries:** | 2 Fatal | **Latitude, Longitude:** | 38.830833,-104.71833 |

The airplane came to rest in a field about 1/2 mile north of the departure end of runway 35L. The accident site was located in an open field at an elevation of 6,200 ft msl, and the airplane came to rest on a heading of 270°. A large ground scar was located just to the east of the main wreckage. The scar was about 30 ft in length with three prominent craters consistent in location/position with the main landing gear and the engine. Fragments of fiberglass were located in each of the three craters. The field where the airplane crashed was burned in a radius immediately surrounding the wreckage and then to the north at least a half mile.

The airplane was upright, and the wreckage included the fuselage, engine and propeller assembly, both wings, and the empennage. The entire wreckage was charred, melted, and partially consumed by fire.

The fuselage included four seats, personal effects, and the instrument panel. The left cabin door separated from the airframe and was located 45 ft to the west of the wreckage. The right cabin door separated from the airframe and was located 45 ft to the north of the wreckage. The instrument panel was impact and fire damaged and provided the following information:

Kollsman window 30.01
Attitude indicator 20° nose down
Airspeed indicator 0 knots

The engine gauges and remaining instruments did not provide any reliable readings.

Both the fuel mixture control and the engine throttle control were found in the forward position in the cabin. Impact and fire damage precluded a functional check of these control cables. The engine throttle was in the idle position at the engine, and the cable was stretched in tension. The fuel mixture was close to full rich at the engine, and the control cable rod end was impact damaged. The fuel selector valve handle was in the left detent, and the shaft was separated. The fuel selector valve assembly was disassembled, and the valves were in a position consistent with the right fuel tank being selected.

Seatbelt assemblies consistent with lap belts and shoulder harnesses were found latched for both front seat occupants. Pilot and passenger seat energy absorption modules were crushed flat.

The right wing remained partially attached to the fuselage and included the right aileron and right flap. The right wing, right aileron, and right flap were charred, melted, and partially consumed by fire. Control continuity to the right aileron was confirmed from the right aileron actuation pulley inboard to the center portion of the fuselage. The right main landing gear separated and came to rest directly under the right wing. The right main landing gear assembly was charred, melted, and partially consumed by

fire.

The left wing remained partially attached to the fuselage and included the left aileron and left flap. The left wing, left aileron, and left flap were charred, melted, and partially consumed by fire. Control continuity to the left aileron was confirmed from the left aileron actuation pulley inboard to the center portion of the fuselage. The left main landing gear remained partially attached and came to rest directly beneath the left wing. The left main landing gear assembly exhibited exposure to heat and fire.

The flap actuator jack screw was extended about 2 inches, consistent with 50% or 16° of flap extension.

The empennage included the horizontal and vertical stabilizers, the rudder, and the elevator. The left and right sides of the horizontal stabilizer and elevator were impact damaged and exhibited exposure to heat and fire. The vertical stabilizer and rudder were impact damaged. Control continuity to the rudder and elevator was confirmed from the control surfaces forward to the center portion of the fuselage.

The engine and propeller assembly separated partially from the fuselage at the firewall. The engine cowling was mostly consumed by fire. The propeller remained attached to the engine. One propeller blade came to rest directly beneath the engine.

The engine assembly exhibited exposure to heat and fire. The upper bank of spark plugs was removed and exhibited normal signatures as compared to a Champion Spark Plug chart. The No. 3 spark plug was clean, and the remaining plugs had sooty signatures. The cylinders were borescoped and exhibited normal signatures. The fuel pump was removed and the drive coupling was intact. The fuel pump could not be actuated by hand and exhibited fire damage.

The propeller blades were arbitrarily labeled A, B, and C for identification purposes in the report. Blade A was bent about 45° and exhibited leading edge scoring and abrasions at the bend. The tip of the blade was curled. Blade B was bent greater than 90° and exhibited leading-edge scoring. Blade C was bent nearly 180° and exhibited leading edge and blade face scoring. The pitch change knobs for blades A and B remain attached. The pitch change knob for blade C was no longer attached.

The Kevlar straps from the ballistic recovery parachute extended aft of the wreckage to the south. The parachute remained in its packed state. The rocket was located to the south of the parachute pack and remained attached to the pack and bridle. The propellant for the rocket was expended. The enclosure cover was located adjacent to the wreckage.

No preaccident mechanical malfunctions or failures were found that would have precluded normal operation.

## Flight recorders

The airplane was equipped with an Avidyne Primary Flight Display (PFD) and an Avidyne Multi-Function Display (MFD). The flash memory device from the MFD was recovered and sent to the National Transportation Safety Board (NTSB) Vehicle Recorders Laboratory in Washington, DC, for

download.

The MFD was heat damaged in the postimpact fire. The card was not read under normal procedures but rather examined using forensic software. The card contained Global Positioning System (GPS) track data and 61 engine log files. One data file was associated with the accident flight and was 11 minutes and 6 seconds in duration.

The recording began at 1034:06 where GPS track data showed the airplane was located near a tie down area between taxiways A2 and A3 at COS. Immediately after engine start, manifold pressure was recorded at 12 in of mercury (inHg) and rpm was recorded at 920. For the first 3 minutes of the recording, values for exhaust gas temperature (EGT) on cylinder No.5 ranged from 0° Fahrenheit (F) to about 1,000° F. The data could not be validated as either a true reading of EGT for that cylinder or an anomalous reading due to a sensor issue. Additionally, anomalous EGT values for cylinder No. 4 were recorded over the course of the entire data file.

As the recording continued, values for EGT (aside from cylinder No. 4) and cylinder head temperature (CHT) rose as the engine continued to run. Around 1041:18, manifold pressure increased slightly to 13 inHg and rpm increased to a local maximum of about 1,560. Two rpm drops were present in the recording between 1041:12 and 1042:12. During this time, the GPS data showed the airplane was taxiing to runway 35L at COS. At 1044:24, manifold pressure increased to a value between 22 and 23 inHg. and rpm reached a maximum of 2,620. The recording ended at 1045:12, where GPS data showed the airplane was near the departure end of runway 35L at COS.

The time stamp of the data from the MFD and the FAA ATC transcripts were not correlated or corrected for any error. For additional details on the recovery of the data from the MFD and illustrations of the recovered data please refer to the Cockpit Display – Recorded Flight Data Specialist's Factual Report in the docket for this investigation.

## Medical and Pathological Information

The El Paso County Coroner performed the autopsy on the pilot on November 10, 2015. The autopsy concluded that the cause of death was multiple blunt force injuries and the report listed the specific injuries. The manner of death was accident. Although the autopsy was limited due to the extent of injury, no evidence of natural disease was found.

The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicological tests on specimens that were collected during the autopsy. Results were negative for carbon monoxide and ethanol. The testing detected sertraline at 90 ng/ml, diphenhydramine at 52 ng/ml, and cetirizine in cavity blood. Both diphenhydramine and cetirizine are potentially impairing. Additionally, Rosuvastatin, a prescription cholesterol-lowering medication, and salicylate, a metabolite of aspirin, were detected in urine. Tetrahydrocannabinol (THC), the psychoactive component of marijuana, was detected in lung, but not cavity blood, and its inactive metabolite tetrahydrocannabinol carboxylic acid was detected in tissues and urine.

The El Paso County Coroner toxicology urine drug test was positive for tetrahydrocannabinol carboxylic acid (THC-COOH), diphenhydramine, and naproxen. Femoral blood tested positive for diphenhydramine at less than 50 ng/ml.

A review of the pilot's medical history revealed that the pilot had reported elevated cholesterol to the FAA for many years. As of his most recent medical certification examination had reported the use of Rosuvastatin and niacin, cholesterol-lowering medications that are not generally considered impairing. Two months before the accident the pilot was diagnosed with depression and had started treatment with the antidepressant medication sertraline. Although the medication is not generally considered impairing, symptoms from depression may be.

For more information, see the Medical Factual Report in the docket.

## Tests and Research

Engine Examination

The fuel injector nozzles were free of contamination. The plunger on the fuel manifold was free to move and the internal screen was unremarkable. The spark plugs were dark and sooted and exhibited normal signatures when compared to a Champion Spark Plug Chart.

The left magneto exhibited impact damage, exposure to heat and fire, and would not rotate when actuated by hand. Further examination revealed that the internal gear was partially melted along the gear teeth. Once the gear was removed, the unit could be actuated by hand; further examination revealed no anomalies. The right magneto exhibited impact damage, exposure to heat and fire, and would rotate with resistance when actuated by hand. Further examination revealed no anomalies.

The fuel pump exhibited impact damage and exposure to heat and fire. The spline was intact and the unit would not rotate when actuated by hand, but rotated with resistance when force was applied. Further examination revealed internal heat damage, but was otherwise unremarkable.

The oil pump exhibited impact damage and exposure to heat and fire. The spline was bent and twisted consistent with rotation at the time of impact. Internal examination exhibited a witness mark consist with impact damage and was otherwise unremarkable.

The timing gear on the cam shaft was impact damaged and the piston head on the No. 3 cylinder exhibited a witness mark consistent with a valve strike. The engine was otherwise unremarkable.

Propeller Examination

Blade A was bent forward and the damage and the scoring were consistent with impact at a positive angle under engine power. Blade B was bent aft, and the pressure plate witness mark was consistent with high pitch at the time of impact. Blade C was bent forward.

The pitch change knob for blade C was broken. The pitch change rod was broken on the non-pressurized side of the piston, and the assembly contained oil and grease. Separation signatures were consistent with overload. The other two pitch change knobs were not broken.

Excessive amounts of grease were documented inside the propeller hub cavity. Damage inside of the propeller hub cavity and scoring on the propeller blades were consistent with engine power at the time of impact.

## Administrative Information

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| **Investigator In Charge (IIC):** | Rodi, Jennifer |
| **Additional Participating Persons:** | Randall G Kelley; Federal Aviation Administration; Denver, CO<br>Brannon Mayer; Cirrus Aircraft; Duluth, MN<br>Kurt Gibson; Continental Motors; Mobile, AL<br>Les Doud; Hartzell Propeller Inc; Piqua, OH |
| **Original Publish Date:** | July 26, 2017 |
| **Last Revision Date:** | |
| **Investigation Class:** | Class |
| **Note:** | The NTSB traveled to the scene of this accident. |
| **Investigation Docket:** | https://data.ntsb.gov/Docket?ProjectID=92309 |