



CASE FINDINGS

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On February 2, 2020, about 1355 mountain standard time, a Piper PA28-150 airplane, N5969W, was substantially damaged when it was involved in an accident near Florence, Colorado. The pilot and one passenger were seriously injured, and one passenger was fatally injured. The airplane operated under the provisions of Title 14 *Code of Federal Regulations* Part 91 as an instructional flight.

On-Scene

On-scene documentation was completed on February 3, 2020, by this IIC, inspectors from the Federal Aviation Administration, and a representative from Lycoming Engines. The student pilot seated in the front left seat was receiving instruction from the flight instructor/airplane owner in the front right seat. The student pilot's brother was seated in the right aft seat. The airplane had departed from the Fremont County Airport (1V6), Florence, Colorado, using runway 29 (5,399 ft long asphalt runway). The airplane impacted rolling terrain about 1,000 ft southwest of the departure end of runway 29. The initial impact point was scuffing along the ground which followed up an embankment along a 125° magnetic heading. The airplane rotated and came to rest upright facing a 347° magnetic heading. The left wing was impact separated and broken in several locations. The left wing fuel tank was breached but did contain some fuel. The right wing remained attached to the airplane and the fuel tank contained fuel. About 20-25 gallons of fuel were drained from airplane. The tachometer displayed 2995.81 hours and a Hobbs meter showed 610.4 hours. After documentation, the airplane was transported to a secure facility for further examination.

Examination

Flight control continuity was traced from the flight controls to the control surfaces. The flap handle was set to the first notch, which corresponded to 10° flap extension. The trim screw displayed about 1 inch (7 threads visible) approximating a neutral to nose up pitch trim setting. The propeller remained mounted to the engine crankshaft flange. The spinner was crushed aft against the propeller hub. One propeller blade was bent aft about 90°, with chordwise polishing

observed; some leading edge denting and chipping was noted. The other blade was straight and appeared to be free of scraping and chipping.

The engine was examined. All filters and screens were clear of debris. Valve train continuity and thumb compression was obtained for each cylinder. The magnetos produced spark at each terminal. The carburetor was impact separated and when examined showed signatures of hydraulic pressure to one of the floats. The fuel pump remained attached to the engine and was not damaged. Pressure from the pump was felt when operated by hand.

No preimpact anomalies were detected with the airframe or engine.

Logbooks

A review of maintenance logbooks found the most recent annual inspection occurred on December 26, 2019, at a tachometer time of 2,985.89 hours. A 100-hour inspection was conducted on the engine on the same day with 940.58 hours since major overhaul. No other maintenance entries were located and the only discrepancy was noted on the pilot's dispatch log with the discrepancy "transponder inop".

Following the annual inspection, according to the pilot's flight logs, he had flown in the accident airplane at least 10 times logging about 10.9 hours.

Paperwork provided by the flight instructor/owner shows that he had flown with the student pilot prior to the accident on January 12, 2020.

Density Altitude

At 1350, the automated weather reporting facility located at 1V6 recorded a wind from 280° at 6 knots, visibility 10 miles, a clear sky, temperature 24° C, dew point -15° C, and a barometric pressure of 29.78 inches.

Using this information, density altitude was calculated to be 7,931 ft.

The FAA's Density Altitude document (FAA-P-8740-2), dated 2008, states:

Whether due to high altitude, high temperature, or both, reduced air density (reported in terms of density altitude) adversely affects aerodynamic performance and decreases the engine's horsepower output. Takeoff distance, power available (in normally aspirated engines), and climb rate are all adversely affected. Landing distance is affected as well; although the indicated airspeed (IAS) remains the same, the true airspeed (TAS) increases. From the pilot's point of view, therefore, an increase in density altitude results in the following:

- *Increased takeoff distance.*
- *Reduced rate of climb.*

- *Increased TAS (but same IAS) on approach and landing.*
- *Increased landing roll distance.*

It also provides a Koch Chart to estimate the effect of altitude and temperature. When charting the information for the accident flight, takeoff distance increases 140%, and climb performance is reduced by 65%.

Comparing the airplane's log to temperatures found on the previous days, the worst case density altitudes would have been:

18 Jan 2020: Max Temp 42.8 F, 30.24 inches, density altitude 5,330 ft

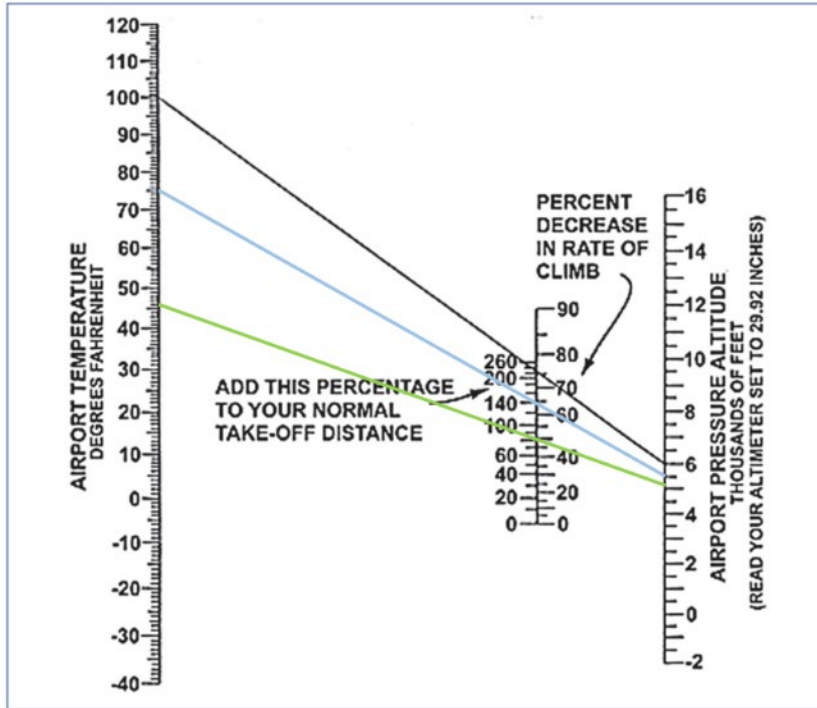
23 Jan 2020: Max Temp 42.8 F, 30.14 inches, density altitude 5,430 ft

29 Jan 2020: Max temp 42.8 F, 30.05 inches, density altitude 5,520 ft

On the day of the accident, it was the warmest temperature at the airport since the pilot purchased the airplane in January.

Previous Flight

A student pilot that flew with the instructor in the accident airplane about a month prior to the accident provided a video of the takeoff sequence logged on January 5, 2020. The student reported the flight involved himself, a passenger, and the instructor. He recalled there was 20 gallons of fuel on board for the one-hour flight. In the provided video, the airplane when the airplane is rotated about 72 kts, the stall warning light illuminated and continued to flicker as the airplane climbed and accelerated towards 85 kts. In the video, the student asked if "that" (the stall warning light) was normal. The instructor replied, "Yeah, it's pretty sensitive but we are no where near a stall." Later during the climb out, the instructors remarked that the airplane "is not climbing today." A review of weather information for that flight showed that the temperature was 46.4° F, with a pressure altitude of 5,122 ft. The Koch Chart showed a decrease in climb performance of about 50% (below in green). The accident flight is charted in blue.



Accident Flight: temperature 75.2F, pressure alt 5,528 ft

Previous Flight (video): temperature 46.4F, pressure alt 5,122

Figure 1 Koch Chart

A review of the flight instructor's logbook showed he accrued about 469.6 hours total time, with 50.5 hours of instruction given. The CFI logged about 9.5 hours in the accident airplane. In addition to the Piper PA28-150 that he owned, the pilot recently flew a Cessna 210-5A, Piper PA28-180, Cessna 182T. He regularly flew out of 1V6 and Pueblo Memorial Airport. His last flight review was on February 16, 2019 in a Cessna 182T. On January 8, 2020, he was issued an FAA second-class medical certificate without limitations. On that date he reported 451.3 total hours with 71.7 hours in the preceding 6 months.

Weight & Balance

The most recent weight & balance calculated for the airplane was dated October 10, 2008, and listed the empty weight as 1,350.96, arm 87.29, and Moment at 117931.95. It listed useful load at 799.04 lbs.

For the accident flight, the following weights were used:

- CFI: 190 lbs (last FAA medical)
- Front seat passenger: 200 lbs (estimated)
- Rear seat passenger: 185 lbs (from wife)
- Fuel: 20 gallons (recovered from scene)

The accident flight was estimated to be 105 lbs below maximum gross weight. Not accounting for any bags removed before we arrived at the accident site.

	Weight	Arm	Moment 1000
Empty	1,350.96	87.29	117.93195
CFI	190	85.5	16.245
Pax 1	200	85.5	17.100
Rear Pax	185	118.1	21.8485
Fuel: 20 gal	120	95	11.400
Total	2,045		

Center of gravity, about 90.1 inches.

According to the type certificate data sheet the maximum gross weight is 2,150 lbs.

Density Altitude

The FAA's Density Altitude document (FAA-P-8740-2), dated 2008, states:

At power settings of less than 75 percent, or at density altitude above 5,000 feet, it is also essential to lean normally aspirated engines for maximum power on takeoff (unless the aircraft is equipped with an automatic altitude mixture control). Otherwise, the excessively rich mixture is another detriment to overall performance.