



Aviation Investigation Final Report

Location:	West Jordan, Utah	Accident Number:	WPR20LA238
Date & Time:	July 25, 2020, 13:38 Local	Registration:	N7677C
Aircraft:	Piper PA32R	Aircraft Damage:	Substantial
Defining Event:	Aerodynamic stall/spin	Injuries:	4 Fatal, 2 Serious, 1 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot and five passengers departed on an instrument flight rules cross-country flight. A security camera located about midfield at the airport captured the airplane as it lifted off about 3,700 ft from the beginning of the 5,862-ft runway; the liftoff point was likely due to the effects of a 7- to 10-knot tailwind. The airplane then began a series of shallow climbs and descents that continued until the airplane was no longer visible on the camera video. About 1 minute 15 seconds after takeoff, the video captured the airplane again as it descended at a steep angle into a residential neighborhood about 1.5 miles southeast of the airport. The airplane struck a tree and three structures before it came to rest on its left side in a backyard of a private residence. A postaccident fire ensued, which consumed most of the wings, the cabin area of the fuselage, and a residence. GPS data revealed that the airplane did not exceed an altitude of 120 ft above ground level.

Recorded engine data revealed consistent operation of the engine throughout the flight until about 15 seconds before the loss of data, when the exhaust gas temperatures and the fuel flow fluctuated likely because the pilot was adjusting the mixture lever. No mechanical malfunctions or failures with the airplane were found that would have precluded normal operations.

The density altitude about the time of the accident exceeded 7,200 ft mean sea level, and the airplane was close to its maximum gross weight. The effects of high-density altitude conditions and a heavy airplane weight on takeoff performance include increased takeoff roll distance and reduced rate of climb. Review of performance charts indicated that the airplane should have been able to climb at a rate around 500 ft per minute; however, the video evidence indicated that, after takeoff, the airplane had difficulty establishing climb performance. It is likely that, after losing ground effect and while experiencing degraded climb performance due to the high-density altitude, the pilot responded by repeatedly pitching the nose down to gain airspeed and then pitching the nose up to climb. The engine data showed that the pilot apparently manipulated the mixture lever to gain power; however, soon afterward, the airplane's critical

angle of attack was likely exceeded, which resulted in an aerodynamic stall, a loss of control, and an impact with structures and terrain.

A debris path of about 95 ft and minor damage to the spinner and front of the engine cowling suggested that the airplane's descent was not consistent with a fully developed aerodynamic stall. However, multiple witness accounts were consistent with the onset of an aerodynamic stall, including one witness who reported that the airplane started to bank before it "fell from the sky."

Probable Cause and Findings

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

The pilot's failure to maintain the airplane's speed during takeoff near the airplane's maximum gross weight in high-density altitude conditions, which resulted in the exceedance of the airplane's critical angle of attack and led to an aerodynamic stall, loss of control, and subsequent impact with structures and terrain.

Findings

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

Factual Information

History of Flight

Initial climb	Aerodynamic stall/spin (Defining event)
Initial climb	Loss of control in flight
Uncontrolled descent	Attempted remediation/recovery
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On July 25, 2020, about 1338 mountain daylight time, a Piper PA-32-300R, N7677C, was substantially damaged when it was involved in an accident near South Valley Regional Airport (U42), West Jordan, Utah. The pilot, two passengers, and one person on the ground sustained fatal injuries; two passengers sustained serious injuries; and one passenger sustained minor injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

According to an employee of the fixed-base operator at the airport, he received a telephone call from a woman who asked to have the airplane “filled up.” The employee also stated that, about 1310 to 1320, the pilot and passengers arrived at the airport and started to load their bags in the airplane. Another employee added 66.8 gallons of 100 low-lead aviation gasoline to the airplane.

A security camera located at U42 and oriented to the northeast also captured images of the pilot and passengers as they arrived at the airplane. The video appeared to show the pilot performing a preflight inspection. Afterward the pilot and passengers boarded the airplane, the engine was started, and the airplane taxied onto taxiway B toward runway 16. While the airplane was on the taxiway, the video showed the windsock indicating that the wind was from the north. About 3 minutes later, the airplane was observed during the takeoff roll.

A second security camera, located near midfield, showed that the airplane lifted off at 1336:54 and appeared to become airborne abeam taxiway A2, which was about 3,700 ft from the beginning of runway 16. The airplane departed the traffic pattern straight out to the south on a magnetic heading of about 170° and made a series of slight climbs and descents until the airplane was no longer visible on the video. About 1 minute 15 seconds after takeoff (1338:09), the airplane reappeared on the video as it descended at a steep angle into a neighborhood, which was followed by a large plume of black smoke.

Downloaded data from the airplane’s onboard GPS unit revealed that the airplane departed U42 about 1336 and traveled southeast on a magnetic heading of 165° for about 1.3 miles and then turned left to a magnetic heading of about 136° for 0.2 miles. The airplane climbed to an altitude of 4,720 ft mean sea level (msl)/about 120 ft above ground level (agl) and accelerated to a groundspeed of about 82 knots. The last GPS point, at 1338:24, recorded the airplane near the accident site at an altitude of 4603 ft msl/about 10 ft agl and a groundspeed of about 1 knot, as shown in figure 1.



Figure 1. GPS flightpath (magenta line) and the airplane's direction of travel (blue arrows).

Multiple witnesses located near the accident site reported that the airplane's engine sounded loud, and others observed the airplane at a very low altitude before it descended nose down to the ground. One witness reported that the airplane "started to bank to the east" and "looked like it fell from the sky." Multiple witnesses also reported that a house in the neighborhood was on fire.

During a postaccident interview, the wife of the pilot (one of the passengers) stated that he planned an instrument flight rules flight over the Grand Canyon and possibly Lake Powell. The pilot computed the airplane's weight and balance and showed her the paperwork "where he planned everything out." She indicated that the pilot was aware of the high temperature and high altitude and that he assured her that "it's all good." She could not recall any details of the flight.

Another passenger who survived the accident stated, during a postaccident interview, that everything was "fine" after the takeoff but that, shortly afterward, the airplane "dropped down," and "the cabin was shaking." The passenger stated that she heard an "on and off buzzing" sound after liftoff that lasted until the airplane impacted the ground. The passenger also stated that, before the flight, the pilot asked about everyone's weight and that the bags were weighed to make sure that they were only a few pounds.

Pilot Information

Certificate:	Private	Age:	43, Male
Airplane Rating(s):	Single-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Unknown
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 2 Without waivers/limitations	Last FAA Medical Exam:	March 5, 2019
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	(Estimated) 108 hours (Total, all aircraft), 5 hours (Total, this make and model)		

Passenger Information

Certificate:		Age:	36, Female
Airplane Rating(s):		Seat Occupied:	Right
Other Aircraft Rating(s):		Restraint Used:	Unknown
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	No
Medical Certification:		Last FAA Medical Exam:	
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:			

Passenger Information

Certificate:		Age:	1, Female
Airplane Rating(s):		Seat Occupied:	Left
Other Aircraft Rating(s):		Restraint Used:	Unknown
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	No
Medical Certification:		Last FAA Medical Exam:	
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:			

Passenger Information

Certificate:		Age:	2, Male
Airplane Rating(s):		Seat Occupied:	Right
Other Aircraft Rating(s):		Restraint Used:	Unknown
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	No
Medical Certification:		Last FAA Medical Exam:	
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:			

Passenger Information

Certificate:		Age:	12, Female
Airplane Rating(s):		Seat Occupied:	Right
Other Aircraft Rating(s):		Restraint Used:	Unknown
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	No
Medical Certification:		Last FAA Medical Exam:	
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:			

Passenger Information

Certificate:		Age:	37, Female
Airplane Rating(s):		Seat Occupied:	Left
Other Aircraft Rating(s):		Restraint Used:	Unknown
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	No
Medical Certification:		Last FAA Medical Exam:	
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:			

Flight instructors who provided instrument flight training to the pilot stated that he handled the airplane easily and without difficulty. One of the flight instructors stated that he reviewed density altitude and normally aspirated engines with the pilot due to the multiple cross-country flights to Utah that the pilot had previously made. The flight instructor stated that the pilot “didn’t understand why” he continued to bring up pressure altitude and density altitude as discussion topics.

The pilot received a high-performance and complex endorsement on December 31, 2019, about 7 months before the accident.

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	Registration:	N7677C
Model/Series:	PA32R 300	Aircraft Category:	Airplane
Year of Manufacture:	1975	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	32R-7680058
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	October 18, 2019 Annual	Certified Max Gross Wt.:	3600 lbs
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:	as of last inspection	Engine Manufacturer:	Lycoming
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	IO-540-K1G5D
Registered Owner:	On file	Rated Power:	
Operator:	On file	Operating Certificate(s) Held:	None

The airplane was powered by a 300-horsepower Lycoming O-540-K1G5D, a normally aspirated engine. The engine was equipped with a Hartzell constant-speed propeller. The last annual inspection performed on the airplane occurred on October 18, 2019, at a total time of 451 hours. The airplane engine was last overhauled on December 28, 2012, at a total time of 3,060 hours.

Data recovered from an engine data monitor (EDM) revealed engine performance parameters for the accident flight, as shown in figure 2. The data revealed consistent engine operation for the first 10 minutes of operation. About 1337, the exhaust gas temperature (EGT) of all cylinders increased rapidly from about 1,280°F to a maximum of about 1,600°F, and the fuel flow decreased from about 28 to 19 gallons per hour. About 5 seconds later the EGTs for all cylinders decreased to about 1,500°F, and the fuel flow increased to about 22 gallons per hour, consistent with adjustments being made to the mixture control. The EDM data stopped recording about 1338.

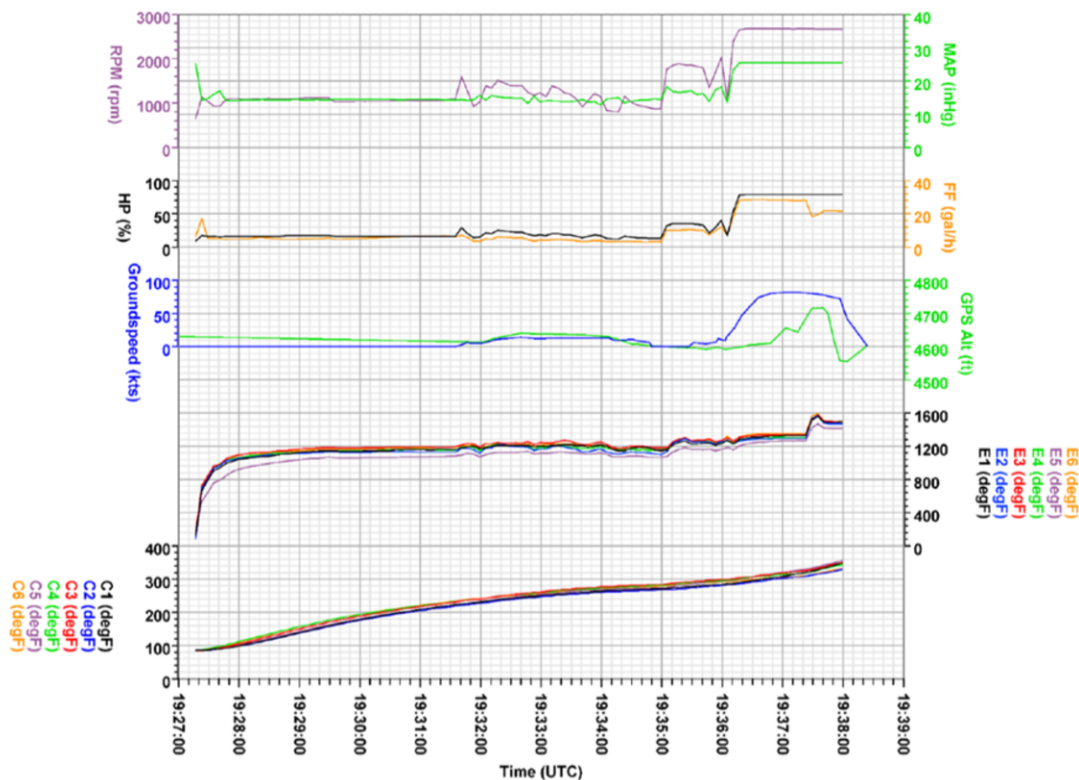


Figure 2. Engine performance and GPS data from the accident flight.

The calculated airplane weight at the time of takeoff was about 3,531 pounds. A weight and balance for the airplane, which was attached to the *Pilot's Operating Handbook* (POH) recorded a basic empty weight of 2,257 pounds. The fuel weight equaled 564 pounds. The estimated weights of the pilot and passengers totaled about 690 pounds. On the basis of the items found in the wreckage, 10 pounds of baggage was estimated for the forward storage area, and 10 pounds was also estimated for the baggage in the aft storage area. The calculated weight and balance showed that the center of gravity was 92.84 inches aft of datum. The POH listed

the maximum aft center of gravity as 95 inches and the maximum gross weight as 3,600 pounds.

According to performance charts for the airplane, for the weight and the environmental conditions at the time of takeoff, the predicted gear-up rate of climb was calculated to be about 500 ft per minute. The stall speed was calculated to be about 65 knots calibrated airspeed with flaps up and 61 knots for flaps 25°. The POH did not provide other flap position data.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	U42,4606 ft msl	Distance from Accident Site:	1 Nautical Miles
Observation Time:	13:15 Local	Direction from Accident Site:	339°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:		Visibility (RVR):	
Wind Speed/Gusts:	6 knots / None	Turbulence Type Forecast/Actual:	None / None
Wind Direction:	150°	Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	30.07 inches Hg	Temperature/Dew Point:	32°C / 7°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	West Jordan, UT (U42)	Type of Flight Plan Filed:	IFR
Destination:	Page, AZ (PGA)	Type of Clearance:	None
Departure Time:	13:36 Local	Type of Airspace:	Class G

At 1355 (17 minutes after the accident), the automated weather for U42 reported the wind as 320° at 7 knots, 300° variable 10 knots, 10 statute miles visibility, clear skies, temperature 32°C, dew point temperature 7°C, barometric pressure 30.06 inches of mercury. Density altitude was calculated to be 7,292 ft msl.

Airport Information

Airport:	South Valley Regional Airport U42	Runway Surface Type:	Asphalt
Airport Elevation:	4606 ft msl	Runway Surface Condition:	Unknown
Runway Used:	16	IFR Approach:	None
Runway Length/Width:	5862 ft / 100 ft	VFR Approach/Landing:	Forced landing

U42 is an uncontrolled airport. The Salt Lake City Terminal Radar and Approach Control reported that a controller had not spoken to the pilot before the accident flight was underway.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:	2 Fatal, 2 Serious, 1 Minor	Aircraft Fire:	On-ground
Ground Injuries:	1 Fatal	Aircraft Explosion:	None
Total Injuries:	4 Fatal, 2 Serious, 1 Minor	Latitude, Longitude:	40.618331,-111.98889(est)

The airplane first impacted a tree and the edge of a roof on a house. The tree exhibited multiple 45° cuts to branches, consistent with contact from a rotating propeller. The airplane then struck a second house and its detached garage before coming to rest in the backyard of a third house located about 1.5 miles southeast of U42. The debris path extended about 95 ft from the wreckage on a magnetic heading of about 130°. The airplane came to rest on its left side on a magnetic heading of about 170°.

All major components of the airplane were found within the main wreckage. Both wings separated from the fuselage at their respective roots and came to rest about 20 ft behind the main wreckage. A postimpact fire consumed the left wing and damaged most of the right wing and the cabin. According to the airplane manufacturer representative, the right flap was observed in the 10°/first-notch position, and the flap torque tube’s right control arm was observed to be at the 1:00 position, which is consistent with that flap setting.

Flight control continuity was established from the aileron control cable (attached to the T-bar) to the breaks at the wing root areas of the fuselage. The cable breaks exhibited a splayed, broomstraw appearance. Continuity was also established at the wing roots to the aileron bell cranks and to the aileron of the right wing. The left aileron was consumed by the fire. Elevator control continuity was established from the T-bar to the elevators. Flight control continuity of the rudder was established from the rudder pedals to the rudder. The nose and right main landing gear were retracted. The left main landing gear was consumed by fire.

Postaccident examination of the engine revealed that 6 of the 12 spark plugs (4 on the top and 2 on the bottom) had severely worn electrodes. The No. 3 3 cylinder had severely worn electrodes on the top and bottom spark plugs. According to the engine manufacturer, the worn spark plug electrodes were still capable of producing a spark. No mechanical malfunctions or anomalies were observed that would have precluded normal engine operation.

Additional Information

Federal Aviation Administration (FAA) Pamphlet FAA-P-8740-2, Density Altitude, states that “high density altitude corresponds to reduced air density and thus to reduced aircraft performance.” The publication outlines hazards associated with high-density altitude operations and states, in part, the following:

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....

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.

According to the FAA's *Airplane Flying Handbook* (FAA-H-8083-3C), "under conditions of high-density altitude...the airplane may be able to lift off but will be unable to climb out of ground effect. Consequently, the airplane may not be able to clear obstructions."

The FAA's *Pilot's Handbook of Aeronautical Knowledge* (FAA-H-8083-25B) states, in part, the following:

Due to the reduced drag in ground effect, the aircraft may seem capable of takeoff well below the recommended speed. As the aircraft rises out of ground effect with a deficiency of speed, the greater induced drag may result in marginal initial climb performance. In extreme conditions, such as...high density altitude...a deficiency of airspeed during takeoff may permit the aircraft to become airborne but be incapable of sustaining flight out of ground effect.

Administrative Information

Investigator In Charge (IIC):	Salazar, Fabian
Additional Participating Persons:	Stephen Grover; Federal Aviation Administration; Salt Lake City, UT Damian Galbraith; Piper Aircraft Inc; Vero beach, FL Mark Platt; Lycoming Engines; Phoenix, AZ
Original Publish Date:	September 7, 2022
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=101669

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