CEN20LA305
CASE FINDINGS

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During the course of the investigation, the following information and findings were obtained.

The purpose of the flight was an exploration flight for the passengers to see if they wanted to pursue flying lessons. The pilot and two passengers boarded the airplane for a local flight from Stinson Municipal Airport (SSF), San Antonio, Texas. The pilot contacted Stinson Ground and reported that they had weather information and requested to depart runway 14 and perform 1 lap in the pattern. When cleared for takeoff the Stinson Tower controller reported a wind from 30° at 12 knots gusting to 20 kts. The airplane was observed to take off with a shallower than normal climb profile. The airplane "wobbled" and then descended into trees and terrain. A post impact fire ensued. One passenger was fatally injured, and the pilot and other passenger were transported to medical facilities where they succumb to their wounds.

Due to agency COVID-19 travel restrictions, this IIC did not travel to the accident site. Instead, inspectors from the San Antonio FSDO responded and documented the site. Accompanying them was a technical representative from Piper Aircraft.

On-scene

The airplane impacted a residential backyard about 2,400 ft southeast of the departure end of runway 14. The first identified point of impact was a damaged tree along the northern fence line of the backyard. The portion of the right wing fuel tank skin was located below the tree. The fiberglass right wingtip was located between the fuel tank and main wreckage. The main wreckage was located at the center of the backyard. Scorch marks extended to the southern edge of the yard and charring was observed to a wood fence.

Fuselage

The fuselage came to rest on its right side. The cabin area had been consumed by fire and was destroyed. The instrument panel and all observed instruments were melted and destroyed. The engine control handles were melted away; the thermally damaged cables remained and appeared to be positioned to full throttle and rich mixture. The carb heat lever was thermally damaged and found positioned to OFF. The fuselage wall containing the fuel selector was destroyed, and the

thermally damaged fuel selector was found in the wreckage of the cabin; damage precluded any testing or determination of its position.

The thermally damaged control tee bar remained in place aft of the instrument panel. The aileron control chain remained routed over the control sprockets and the aileron control cables remained attached. The right aileron control cable terminated in a broomstraw cable separation. The left aileron control cable could be traced through the remains of the cabin and left wing to the aileron bellcrank. The stabilator control cables remained attached to the bottom of the tee bar and could be traced through the remains of the cabin to the stabilator balance weight. The rudder tee bar was thermally damaged but remained in place aft of the firewall. The rudder control cables remained attached to the rudder pedal bar and could be traced through the remains of the cabin to the rudder control horn. The thermally damaged flap handle was noted within the remains of the cabin; it was observed to be positioned to the first notch, or a setting of 10°. The flap cable remained attached to the handle and could be traced to the flap torque tube sprocket.

Left Wing

The left wing came to rest with its wingtip pointing upward and was thermally damaged throughout the wing skins and structure. The inboard end of the wing and fuel tank were consumed by fire. The aileron remained attached to the wing and was thermally damaged. The aileron control cables remained mounted to the aileron control bellcrank and were routed through the wing to the fuselage and was traced to the chain at the tee bar. The balance cable terminated in a broomstraw cable separation near the turnbuckle. The position of the wing precluded visual examination of the bellcrank and stops. The flap remained attached to the wing and was thermally damaged. The main landing gear remained attached to the wing and was thermally damaged.

Right Wing

The impact separated right wing came to rest inverted beside the remains of the fuselage. The leading edge of the wing was accordion crushed aft. The inboard end of the wing was thermally damaged. The right main landing gear remained mounted to the wing and was soot stained. The right aileron remained attached to the wing and was soot stained and buckled. The right aileron bellcrank was observed and the stops displayed no apparent damage. The aileron cables remained attached to the bellcrank. The balance cable terminated in a broomstraw cable separation. The control cable was traced through the wing and into slag. The left flap was impact separated and thermally damaged, coming to rest under the remains of the empennage.

Empennage

The empennage came to rest on its right side beside the remains of the fuselage. Thermal damage and buckling was noted throughout its structure. The vertical stabilizer and rudder remained mounted to the empennage, both displaying buckling and thermal damage. The rudder cables remained connected to the rudder and could be traced through the wreckage to the rudder pedal bar in the cabin area. The right side of the stabilator was impact separated and came to rest beneath the empennage. The left side of the stabilator was impact damaged. The stabilator trim

barrel remained in place within the tailcone; 12 threads, or 1 3/8 inches of trim screw extension was noted from the top of the barrel, correlating to partial nose up trim.

No preimpact anomalies were detected with the airframe.

The wreckage was transported to a secure facility for further examination.

Engine Examination

On May 4, 2021, the engine was examined by investigators with the NTSB with the assistance of representative from Lycoming Engines.

The propeller was removed to facilitate the examination. The top spark plugs were removed and examined. The vacuum pump was removed, and the crankshaft was rotated by hand through the drive pad utilizing a drive tool. The crankshaft was free and easy to rotate in both directions. "Thumb" compression was observed in proper order on all four cylinders. Clean, uncontaminated oil was observed at all four rockerbox areas. Mechanical continuity was established throughout the rotating group, valve train, and accessory section during hand rotation of the crankshaft. The combustion chamber of each cylinder was examined through the spark plug holes utilizing a lighted borescope – no anomalies were detected. Oil soaking of the cylinders 1 & 3 combustion chambers was attributed to the engine positioning at the mishap site and post recovery. The combustion chambers and bottom spark plug electrodes remained mechanically undamaged and there was no evidence of foreign object ingestion or detonation. The valves were intact and undamaged. There was no evidence of valve to piston face contact observed. The gas path and combustion signatures observed at the spark plugs, combustion chambers and exhaust system components displayed coloration consistent with normal operation. There was no oil residue observed in the exhaust system gas path. The exhaust muffler was found free of obstructions.

No preimpact anomalies were detected with the engine.

Pilot Medical Information

The pilot initially survived the airplane crash, but due to thermal injuries perished in the hospital on August 11, 2020. Due to the length of time from the accident and length of care in the hospital, an autopsy and toxicology were not performed.

Weight and Balance Calculations

Based on conversations conducted by FAA Inspector Jason Dunn, the wives of the passengers both stated their husbands were between 220-240 pounds each.

A pilot that flew the airplane the day prior to the accident reporting fueling the airplane and flying a 0.9 flight without any issues. In addition, the pilot stated that there was a box of 12 unopened oil cans in the back seat of the airplane. Running a weight and balance. This pilot also

responded to the accident site and reported that both passengers appeared to weigh over 200 pounds each.

Calculating a weight and balance using 43 gallons of fuel, 220 pounds each for the passengers, the case of oil in the back seat, and not including any baggage (a backpack was not recovered and presumed consumed in the fire):

N716RL W&B	Weight	Arm	Moment
Licensed Empty Weight	1289.9	85.82	110699.218
Oil (within engine)	15	32.5	487.5
Pilot and Front Passenger	415	85.5	35482.5
Passengers Aft	220	117	25740
Fuel (43 gal)	258	95	24510
Baggage Area 1 (Case of oil)	24.6	117	2878.2
Baggage Area 2	0	133	0
	2222.5	89.66542992	199281.418
Over Max gross of 2150	**+72.5**		

Depending on the weight of the occupants and baggage, the actual gross weight could be in excess of 102 pounds over maximum gross weight.

Pilot's Handbook of Aeronautical Knowledge

In the FAA publication, *The Pilot's Handbook of Aeronautical Knowledge* (FAA-H-8083-25B), dated 2016, Chapter 11, Aircraft Performance, states:

> "…the effect of gross weight on takeoff distance is significant, and proper consideration of this item must be made in predicting the aircraft's takeoff distance. Increased gross weight can be considered to produce a threefold effect on takeoff performance:
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> 1. Higher lift-off speed
> 2. Greater mass to accelerate
> 3. Increased retarding force (drag and ground friction)
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> If the gross weight increases, a greater speed is necessary to produce the greater lift necessary to get the aircraft airborne at the takeoff lift coefficient. As an example of the effect of a change in gross weight, a 21 percent increase in takeoff weight requires a 10 percent increase in lift-off speed to support the greater weight."
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> "The effect of wind on takeoff distance is large, and proper consideration must also be provided when predicting takeoff distance. The effect of a headwind is to allow the aircraft to reach the lift-off speed at a lower groundspeed, while the effect of a tailwind is to require the aircraft to achieve a greater groundspeed to attain the lift-off speed."

> "A change in an aircraft's weight produces a twofold effect on climb performance. First, a change in weight changes the drag and the power required. This alters the reserve power available, which in turn, affects both the climb angle and the climb rate. Secondly, an increase in weight reduces the maximum [rate of climb], but the aircraft must be operated at a higher climb speed to achieve the smaller peak climb rate."
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> "If during a soft-field takeoff and climb, for example, the pilot attempts to climb out of ground effect without first attaining normal climb pitch attitude and airspeed, the airplane may inadvertently enter the region of reversed command at a dangerously low altitude. Even with full power, the airplane may be incapable of climbing or even maintaining altitude. The pilot's only recourse in this situation is to lower the pitch attitude in order to increase airspeed, which inevitably results in a loss of altitude."

Obstacles Near Runway

According to the departure procedures listed for Stinson Municipal Airport, from runway 14 there are trees beginning from 72 ft from the departure end, 79 ft left of runway centerline, with heights up to 70 ft above ground level. The airport was the pilot's "home field", having a flight-based business located on field. These obstacles were likely known by the pilot.

Performance Charts

Using the performance charts listed in the Owner's Handbook, the calculated density altitude was about 2,400 ft. The calculated take-off distance was about 1,125 ft and a 550 ft per minute climb rate at maximum gross weight. Airport video showed the airplane rotated about 1,700 ft (about taxiway C) from where the airplane began their takeoff run (abeam the taxiway A intersection). There are no performance charts for operating the airplane over maximum gross weight.

Witness

FAA Inspector Jason Dunn spoke with a San Antonio Police Department (SAPD) Officer who is an observer with the SAPD Helicopter Unit and is also a private pilot. He was jogging on a road in the vicinity of the accident sequence. He observed the airplane takeoff and perceived that the airplane was "pretty damn low" which caught his attention. He continued to watch the airplane and stated the nose of the airplane "kept popping up every 2 or 3 seconds but was still descending." He stated that the engine sounded normal. He saw the airplane descend behind the tree line and heard the crash. He called SAPD dispatch and reported the accident.

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