Aviation Investigation Final Report

Location:	Daytona Beach, Florida	**Accident Number:**	ERA18FA152
Date & Time:	May 22, 2018, 19:30 Local	**Registration:**	N89864
Aircraft:	Cessna 140	**Aircraft Damage:**	Destroyed
Defining Event:	Fuel starvation	**Injuries:**	1 Fatal, 1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The commercial pilot and pilot-rated passenger were practicing touch-and-go takeoffs and landings in the tailwheel-equipped airplane. Witnesses reported that, during the third touch-and-go, as the airplane was climbing about 200 to 300 ft above ground level near the end of the runway, the engine lost all power and the airplane turned back toward the runway before spiraling to the ground. Examination of the airframe and engine revealed no evidence of any preimpact mechanical malfunctions or abnormalities that would have precluded normal operation. Each of the wing fuel tanks was about 1/4 full at the accident site. The fuel tanks were not breached and about 1 tablespoon of water was found in both tanks. Both the airplane's operations manual and markings on the fuel gauges in the cockpit indicated that the pilot should not take off with less than 1/4 tank of fuel. A warning supplement issued by the airplane manufacturer stated that, in certain flight maneuvers, the fuel may move away from the fuel tank supply outlet. If the outlet is uncovered, fuel flow to the engine may be interrupted and a temporary loss of power may result. It is possible that the pilot initially departed with more than 1/4 tank of fuel; however, after the third touch-and-go landing, the fuel level was at or below 1/4 tank. During the initial climb after the touch and go, the fuel moved away from the fuel supply outlet line and starved the engine of fuel, resulting in a total loss of power. The airplane's position at the time of the loss of engine power did not allow for a suitable off airport landing location. Following the loss of power, it is likely that the pilot attempted to return to the runway and failed to maintain sufficient airspeed during the turn, which resulted in the airplane exceeding its critical angle of attack and entering an aerodynamic stall.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inadequate fuel planning, which resulted in a total loss of engine power due to fuel

starvation during the initial climb, and his failure to maintain adequate airspeed while turning back to the runway, which resulted in an exceedance of the airplane's critical angle of attack and an aerodynamic stall.

Findings

Personnel issues	Fuel planning - Pilot
Aircraft	Fuel - Fluid level
Personnel issues	Aircraft control - Pilot
Aircraft	Airspeed - Not attained/maintained
Aircraft	Angle of attack - Not attained/maintained

Factual Information

History of Flight

Initial climb	Fuel starvation (Defining event)
Initial climb	Loss of engine power (partial)
Initial climb	Aerodynamic stall/spin
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On May 22, 2018, about 1930 eastern daylight time, a Cessna 140, N89864, was destroyed when it impacted terrain at Spruce Creek Airport (7FL6), Daytona Beach, Florida. The commercial pilot was seriously injured, and the pilot-rated passenger was fatally injured. The airplane was privately owned, and the pilot was operating the airplane as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Visual meteorological conditions prevailed, and no flight plan was filed for the local flight.

A friend of the accident pilot reported that he flew in the accident airplane with the pilot 3 days before the accident. Before departing on that flight, the pilot sumped the airplane's fuel tanks several times to remove water. He flew again with the accident pilot on the morning of the accident to a nearby airport to get breakfast. He reported that the pilot did not fuel the airplane before or after their flight.

Another friend of the pilot reported that the accident pilot arrived at the airport about 1910 on the day of the accident and began a preflight inspection of the accident airplane. The friend spoke with the pilot as he performed the inspection and stated that the pilot showed him a sump bottle "full of water" and joked with him about whether he needed to sump the fuel tank more than once. The pilot then returned to the right wing to continue sumping the fuel tank. The friend subsequently departed the airport and did not witness the accident.

A witness, located near the end of the runway 6, observed the airplane perform three touch-and-go landings on runway 6. During the third touch-and-go, the airplane reached an altitude about 200 to 300 ft above ground level when the engine "sputtered," revved up, sputtered a second time, and then lost all power. He further stated that the airplane then made a left turn like it was returning to the runway. During the left turn, the airplane descended steeply and impacted the ground.

Spruce Creek Airport was privately-owned and operated as part of a residential, "fly-in" community. Residences and trees were present around the majority of the runway, including about 800 ft from the departure end of runway 6.

Due to his injuries, the pilot did not recall the flight.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	23,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	August 29, 2017
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	July 28, 2017
Flight Time:	735.2 hours (Total, all aircraft), 46.7 hours (Total, this make and model), 206 hours (Last 90 days, all aircraft), 62.4 hours (Last 30 days, all aircraft)		

Pilot-rated passenger Information

Certificate:	Commercial	**Age:**	22,Male
Airplane Rating(s):	Single-engine sea	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 None	**Last FAA Medical Exam:**	August 22, 2014
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	0 hours (Total, all aircraft), 0 hours (Total, this make and model)		

The pilot held a commercial pilot certificate with ratings for airplane single- and multi-engine land and instrument airplane. He held a flight instructor certificate with ratings for airplane single- and multi-engine and instrument airplane. He held a Federal Aviation Administration first-class medical certificate issued August 29, 2017. At the time of the accident, the pilot had 735 total hours of flight experience, with 47 hours in the accident airplane make and model.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N89864
Model/Series:	140 UNDESIGNAT	**Aircraft Category:**	Airplane
Year of Manufacture:	1946	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	8909
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	September 29, 2017 Annual	**Certified Max Gross Wt.:**	1451 lbs
Time Since Last Inspection:	62 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	3473.79 Hrs at time of accident	**Engine Manufacturer:**	CONT MOTOR
ELT:	C91 installed, not activated	**Engine Model/Series:**	O-200A
Registered Owner:		**Rated Power:**	100 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The two-seat, high-wing, tailwheel-equipped airplane was manufactured in 1946. It was powered by a Continental O-200-A, 100-horsepower engine equipped with a McCauley two-blade fixed-pitch propeller. The last annual inspection was completed on September 29, 2017. At the time of the accident, the airframe total time was 3,473.79 hours; the airplane had accrued 62 hours since the most recent annual inspection, and the engine had accrued 565 hours since major overhaul.

The airplane was equipped with two 12.5-gallon fuel tanks from which fuel is gravity-fed to the engine. The fuel pick-up line was located mid-tank.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KEVB,10 ft msl	**Distance from Accident Site:**	5 Nautical Miles
Observation Time:	23:50 Local	**Direction from Accident Site:**	111°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Broken / 3400 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.07 inches Hg	**Temperature/Dew Point:**	24°C / 22°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Daytona Beach, FL (7FL6)	**Type of Flight Plan Filed:**	None
Destination:	Daytona Beach, FL (7FL6)	**Type of Clearance:**	None
Departure Time:	19:30 Local	**Type of Airspace:**	Class G

The 1950 recorded weather at New Smyrna Beach Municipal Airport (EVB), New Smyrna Beach, Florida, located 5 miles southeast of the accident site, included calm wind; 10 statute miles visibility; a broken cloud ceiling at 3,400 ft; temperature 24°C; dew point 22°C; altimeter 30.08 inches of mercury.

Airport Information

Airport:	SPRUCE CREEK 7FL6	**Runway Surface Type:**	Asphalt
Airport Elevation:	24 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	06	**IFR Approach:**	None
Runway Length/Width:	4002 ft / 176 ft	**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 1 Serious	**Latitude, Longitude:**	29.084999,-81.041664(est)

The wreckage was located in a wooded area about 300 ft left of the departure end of runway 6. All major components of the airplane were accounted for at the scene. A wreckage path was observed consisting of a descending path of broken tree branches that extended about 15 ft along a magnetic heading of 270° to the main wreckage. The main wreckage came to rest upright. The engine and propeller were pushed aft into the instrument panel and upward at a 45° angle. The leading edges of both wings displayed tree impression marks along their lengths. About 3 ft of the right-wing tip was suspended in a tree about 15 ft above the ground directly above the main wreckage. About 3.2 gallons of 100LL aviation fuel was found in each wing fuel tank, and about 1 tablespoon of water was found in both tanks. Both fuel tanks were intact and not breached. Control cable continuity was confirmed from the cockpit flight controls to all flight control surfaces. The fuel selector valve was in the right tank position. The elevator trim was in the neutral position. The throttle and mixture controls were in the full-forward position. The magneto switch was in the both position.

The instrument panel was fractured in several places. The master switch was in the on position. Both control yokes were fractured behind the instrument panel and pushed to the side of the fuselage. The seat belts and shoulder harnesses were installed. The left main landing gear was bent aft and pushed under the fuselage. The cabin was crushed by impact forces. The wing flap handle was in the flaps-retracted position. The rudder and elevator remained attached and exhibited small dents on the leading edges.

The engine and propeller remained attached to the airframe. One propeller blade was bent aft mid-blade and the other blade was straight. There was no rotational scoring, gouging, or scraping on the propeller blades. The spinner dome was crushed by tree contact and tree bark was impacted into the propeller hub. The engine was clean and free of debris. The starter, left magneto, and carburetor were all separated due to impact forces. Thumb compression was established on all cylinders and lighted borescope inspection of the pistons and valves revealed no anomalies. Valve train continuity was established by rotating the propeller and observing movement of the rear accessory gears and rocker arms. Examination of the engine did not reveal any preimpact mechanical malfunctions or abnormalities that would have precluded normal operation.

Additional Information

The Cessna 140 Operations Manual states, "Do not take off on less than 1/4 tank."

Cessna's Pilot Safety and Warning Supplements document contains a warning about flight coordination vs. fuel flow:

The shape of most airplane wing fuel tanks is such that, in certain flight maneuvers, the fuel may move away from the fuel tank supply outlet. If the outlet is uncovered, fuel flow to the engine may be interrupted and a temporary loss of power might result.

Administrative Information

Investigator In Charge (IIC):	Boggs, Daniel
Additional Participating Persons:	Larry Hammerbeck; FAA ; Orlando, FL Peter Basile; Textron; Wichita, KS
Original Publish Date:	July 8, 2019
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=97302