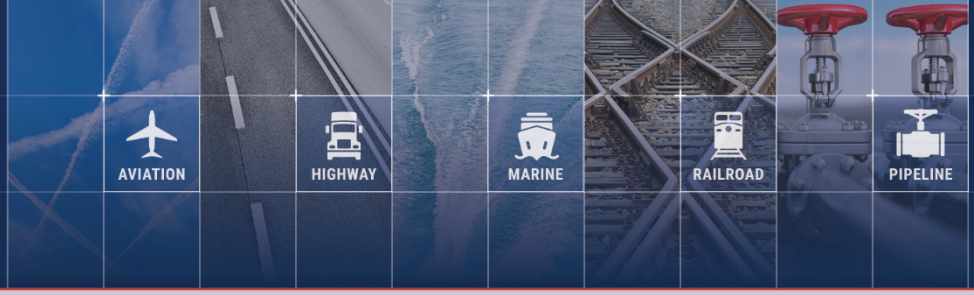

Aviation Investigation Final Report

Location:	Gilmer, Texas	**Accident Number:**	CEN16FA083
Date & Time:	January 12, 2016, 19:54 Local	**Registration:**	N737EZ
Aircraft:	Cessna 172N	**Aircraft Damage:**	Substantial
Defining Event:	Fuel exhaustion	**Injuries:**	1 Fatal, 1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The private pilot and one passenger departed on the approximate 35-minute personal flight with an unknown quantity of fuel onboard. Later that evening, they departed to return to their home airport in night visual meteorological conditions without adding additional fuel during their stop. While on final approach to their home airport, the engine lost total power and the airplane impacted trees and terrain. The passenger stated that the engine did not sound any different during the accident flight than on any of the previous flights and that there was no indication of a problem with the airplane when the engine lost power. Postaccident examination of the wreckage revealed no usable fuel within the airplane's fuel system, and no mechanical anomalies that would have precluded normal operation; therefore, it is likely that the airplane experienced a total loss of engine power as a result of fuel exhaustion. While it is unknown what preflight fuel planning the pilot performed and the extent of his preflight inspection, it is apparent that both were inadequate; had he performed both properly, he likely would not have run out of fuel.

Recorded GPS data showed that the pilot flew the traffic pattern 400-600 ft lower than the recommended 1,000-ft above airport elevation and turned to the base leg of the traffic pattern farther from the runway than recommended. Had the pilot flown the traffic pattern at the recommended altitude and distance from the runway, it may have been possible for the airplane to glide to the runway following the loss of engine power.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inadequate preflight planning and inspection, which resulted in a total loss of engine power due to fuel exhaustion. Contributing to the accident was the pilot's failure to maintain an appropriate traffic pattern altitude and distance from the runway, which may have allowed the airplane to glide to the runway following the loss of engine power.

Findings

Personnel issues	Fuel planning - Pilot
Personnel issues	Preflight inspection - Pilot
Aircraft	Fuel - Fluid level
Aircraft	Altitude - Incorrect use/operation
Aircraft	Descent/approach/glide path - Incorrect use/operation
Personnel issues	Incorrect action performance - Pilot

Factual Information

History of Flight

Approach	Fuel exhaustion (Defining event)
Approach	Loss of engine power (total)
Emergency descent	Collision with terr/obj (non-CFIT)

On January 12, 2016, about 1954 central standard time, a Cessna 172N, N737EZ, was substantially damaged when it impacted wooded terrain following a loss of engine power about 0.5 nautical mile south/southwest of Fox Stephens Field-Gilmer Municipal Airport (JXI), Gilmer, Texas. The private pilot was fatally injured and the passenger sustained serious injuries. The airplane was privately owned and operated by the pilot under 14 *Code of Federal Regulations Part* 91 as a personal flight. No flight plan was filed and the flight was not receiving any air traffic control services. Night visual meteorological conditions (VMC) prevailed for the flight that departed from Sulphur Springs Municipal Airport (SLR), Sulphur Springs, Texas, about 1916 and was returning to JXI.

The passenger, who was the pilot's wife, stated that the pilot filled both of the airplane's wing fuel tanks a couple of days before the flight to SLR. The tanks were fueled from three gas cans that had a capacity of 5 gallons each and one that had a capacity of 6 gallons. However, the investigation could not determine how much total fuel was onboard the airplane following the refueling. The passenger said that she obtained the fuel from the airport in Gladewater, Texas, 1 or 1 1/2 weeks before the accident because the fuel there was cheaper than at JXI. The gas cans had been used solely for fueling the airplane. She said that the flight departed from JXI to SLR, was 33-34 minutes long, and there were no stops.

The pilot's brother, who had dinner with the pilot and his wife near SLR, stated that he did not see the airplane depart from SLR. He said that when he left, the pilot was still getting the airplane warmed up, it was kind of cold outside, and the pilot's wife was already sitting in the airplane. The pilot's brother said that the airplane was tied down, and the pilot untied the tie downs and checked the airplane wings. The pilot then got into the airplane, turned the lights on, had the instrument lights on, and was "looking at things." He said that "he doesn't know how much looking around" at the airplane the pilot was doing and he said that he did not see the pilot reach up and shake the wings because he, the pilot's brother, was not paying attention.

The passenger stated that the return flight was 29-32 minutes long with no stops. The cruise altitude for both legs of the flight was 3,500-3,700 ft. She said that the engine did not sound any different during the accident flight than from previous flights. There was no indication of a problem with the airplane when the engine lost power. She said that there were no alarms, and the pilot did not say anything was wrong before the engine quit.

The airplane was located by law enforcement on January 13, 2016, about 0105, after it was reported overdue by a family member.

Pilot Information

Certificate:	Private	**Age:**	73,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	July 7, 2014
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	September 22, 2015
Flight Time:	259.1 hours (Total, all aircraft), 202.5 hours (Total, this make and model)		

The pilot, age 73, held a private pilot certificate with a rating for airplane single-engine land. The pilot was issued a Federal Aviation Administration (FAA) third-class medical certificate on July 7, 2014, with no limitations.

Review of the pilot's logbook showed that the pilot had accumulated 259.15 total hours of flight experience, of which 202.55 hours were in the accident airplane. The pilot's total flight experience at night was 13.5 hours. The two most recent entries for flight at night were 1.6 hours in February 2014 and 0.8 hours in December 2015.

The pilot's most recent flight review was completed on September 22, 2015, in the accident airplane.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N737EZ
Model/Series:	172N	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	17269373
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	December 9, 2015 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	3 Hrs	**Engines:**	
Airframe Total Time:	2165.9 Hrs at time of accident	**Engine Manufacturer:**	
ELT:	Installed	**Engine Model/Series:**	
Registered Owner:	Pilot	**Rated Power:**	
Operator:	Pilot	**Operating Certificate(s) Held:**	None

The airplane, S/N 17269373, was registered to the pilot in July 2008. It was equipped with a Lycoming O-320-H2AD reciprocating engine, S/N L-3869-76. The airplane's most recent annual inspection was completed on December 9, 2015, about 3 flight hours before the accident.

The airplane was equipped with standard capacity tanks, which held 21.5 gallons each and provided a total capacity of 43 gallons and 40 gallons of usable fuel.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	JXI,415 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	19:55 Local	**Direction from Accident Site:**	200°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.23 inches Hg	**Temperature/Dew Point:**	6°C / 2°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Sulphur Springs, TX (SLR)	**Type of Flight Plan Filed:**	VFR
Destination:	Gilmer, TX (JXI)	**Type of Clearance:**	None
Departure Time:	19:16 Local	**Type of Airspace:**	

The 1955 automated weather observation at JXI included calm wind, clear skies, 10 statute miles visibility, temperature 6°C, dew point 2°C, and an altimeter setting of 30.24 inches of mercury.

According to data from the US Naval Observatory, sunset occurred at 1734 on the evening of the accident, and the end of civil twilight was at 1800. Moonset occurred at 2039. The phase of the moon was a waxing crescent, with 9% of the moon's visible disk illuminated.

Airport Information

Airport:	Fox Stephens Field - Gilmer Mu JXI	**Runway Surface Type:**	Asphalt
Airport Elevation:	415 ft msl	**Runway Surface Condition:**	
Runway Used:	36	**IFR Approach:**	None
Runway Length/Width:	4000 ft / 60 ft	**VFR Approach/Landing:**	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 1 None	**Latitude, Longitude:**	32.683887,-94.95111

The airplane came to rest on a heading of about 040° about 0.5 nautical mile south/southwest of runway 36 in a wooded area. A wreckage path measured about 197 ft in length and was oriented on an approximate 050° heading. The airplane was resting on its left side and on top of the left wing, which was folded over and oriented along the length of the fuselage. The wings, flight control surfaces, and stabilizers were attached to the airframe. The wing flap cockpit control and the flap actuator were in the 20° positions. Flight control continuity from the control surfaces to the cockpit controls was confirmed.

There was no fuel smell or leakage at the accident site. Both wing fuel tank caps and the auxiliary fuel tank cap were intact and secure. There was no usable fuel in the wing fuel tanks. About 8 oz of blue-colored liquid consistent in color with 100 low-lead aviation fuel was drained from the auxiliary fuel tank, and about 1 oz was drained from the airframe fuel strainer assembly. The fuel strainer did not contain debris. Removal and disassembly of the carburetor showed that the carburetor bowl contained about 2 oz of a liquid consistent in color with a mixture of oil and fuel. The remaining fuel from the auxiliary fuel tank, airframe fuel strainer, and carburetor bowl was tested for water using water sensing paste; the test showed no indication for the presence of water.

The propeller was attached to the propeller hub and engine. Neither propeller blade exhibited S-shaped bending or chordwise scratching.

The cockpit master/alternator switch was in the off positon, and the magneto key switch was in the both positon.

Throttle and mixture control continuity was confirmed from the cockpit controls to the carburetor. Examination of the engine confirmed the suction and expulsion of air through the top spark plug holes after removal of the spark plugs and when the engine was rotated through by hand using the propeller. Continuity of engine to the accessory section and of the valve train to the accessory section was confirmed during engine rotation. Rotation of both magnetos produced electrical spark through each magneto lead.

An Adventure Pilot iFly multifunction display was recovered from the wreckage and sent to the NTSB Vehicle Recorder Division for download.

Medical and Pathological Information

The Dallas County Medical Examiner's Office conducted an autopsy of the pilot on January 14, 2016. The autopsy report stated that the pilot died as a result of blunt force injuries. The manner of death was accident.

The FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma performed toxicology testing. Testing was negative for carbon monoxide and ethanol. Losartan, an antihypertensive medication, was detected in the liver, and pravastatin, a high cholesterol medication, was detected in the blood and liver. Neither medication is noted to adversely affect pilot performance.

Tests and Research

An Adventure Pilot iFly was recovered from the wreckage. The iFly unit is an externally-powered, multi-function display and GPS receiver with a high resolution, LCD touchscreen display. The unit included a built-in navigational database and was optionally capable of receiving inflight ADS-B information, including weather radar, airport weather reports, weather forecasts, and traffic advisories. The navigational and information features included terrain warnings, airspace alerts, and display of en route visual flight rule and instrument flight rule (IFR) navigational information and IFR approach charts.

Download of the recovered iFly unit showed two log files that corresponded to the date of the accident flight. The most recent log, the accident flight, spanned from 19:16:21 to 19:53:53, which captured the accident flight from JXI to SLR. The second log file spanned from 16:42:46 to 17:26:59 and captured the previous flight from SLR to JXI.

During the last minute of flight, the airplane's speed steadily decreased from 79 knots to the last recorded speed of 29 knots. The GPS altitude also steadily decreased from 832 ft to 425 ft. At 19:53:16 the airplane was at 649 ft GPS altitude, 74 kts, and about 35 degrees past and .43 miles from the approach end of runway 36 at JXL. At 19:53:27 the airplane was at 583 ft GPS altitude, 70 kts, and about 55 degrees past and .62 miles from the approach end of runway 36.

Figure 1 shows the flight track the airplane followed, which is consistent with a left downwind and a left base leg for runway 36 at JXI, which had an airport elevation of 415 feet. The GPS track indicated the airplane began a turn for the left base when the airplane reached about 55 degrees past abeam the approach end of runway 36, as depicted in Figure 1.

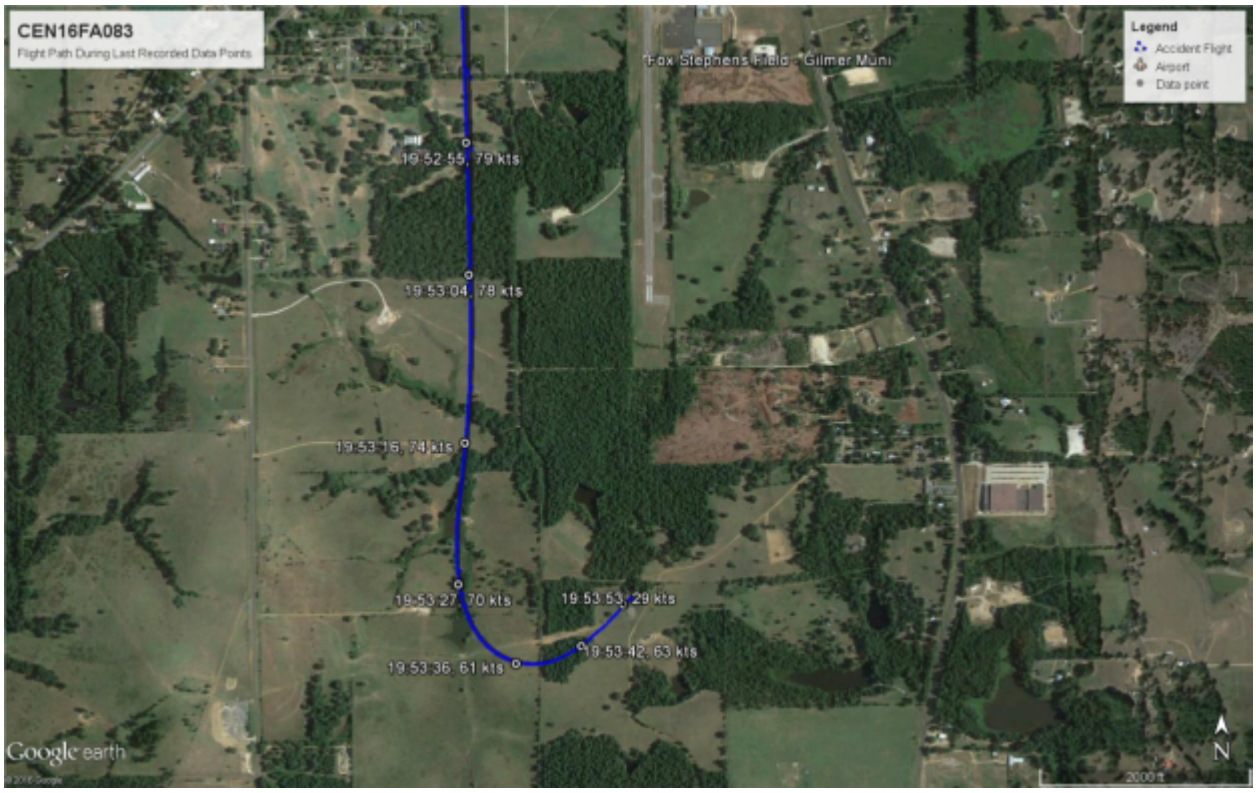

Figure 1.

Plot of recorded data points for the accident flight showing the accident location near JXI.

Additional Information

Title 14 *Code of Federal Regulations* 61.57 Recent flight experience: Pilot in command, states in part:

(b)Night takeoff and landing experience.

(1) Except as provided in paragraph (e) of this section, no person may act as pilot in command of an aircraft carrying passengers during the period beginning 1 hour after sunset and ending 1 hour before sunrise, unless within the preceding 90 days that person has made at least three takeoffs and three landings to a full stop during the period beginning 1 hour after sunset and ending 1 hour before sunrise, and –

(i) The person acted as the sole manipulator of the flight controls; and

(ii) The required takeoffs and landings were performed in an aircraft of the same category, class, and type (if a type rating is required), and, if the aircraft to be flown is an airplane with a tailwheel, the

takeoffs and landings must have been made to a full stop in an airplane with a tailwheel.

Advisory Circular 90-66A - Recommended Standards Traffic Patterns for Aeronautical Operations at Airports without Operating Control Towers, stated in part:

c. It is recommended that airplanes observe a 1,000-foot above ground level (AGL) traffic pattern altitude. Large and turbine-powered airplanes should enter the traffic pattern at an altitude of 1,500 feet AGL or 500 feet above the established pattern altitude. A pilot may vary the size of the traffic pattern depending on the aircraft's performance characteristics.

d. The traffic pattern altitude should be maintained until the aircraft is at least abeam the approach end of the landing runway on the downwind leg.

e. The base leg turn should commence when the aircraft is at a point approximately 45 degrees relative bearing from the runway threshold.

The Cessna 172N airplane flight manual, Section 3, Amplified Emergency Procedures, Engine Failure, contained a chart of maximum glide distance, which is shown in Figure 2.

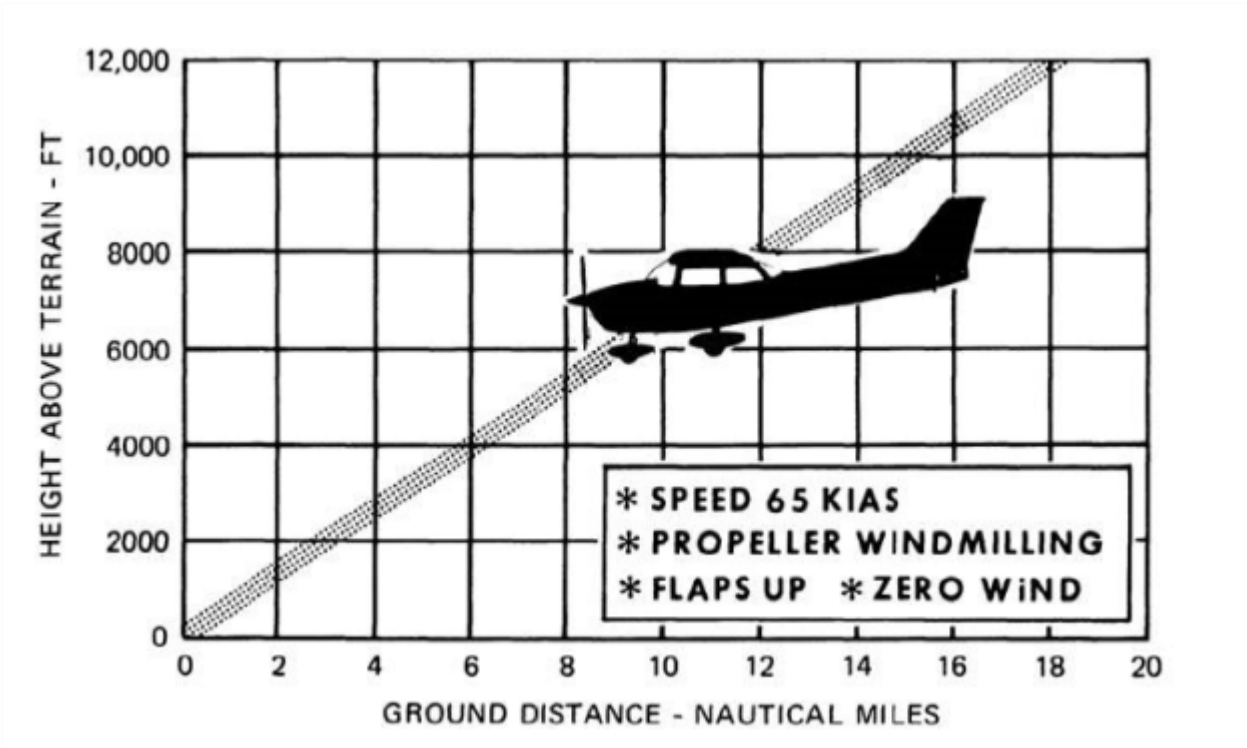

Figure 2.

The Cessna 172N flight manual chart for maximum glide distance shows an approximate glide distance of 1 nautical mile at an altitude of 500 ft above ground level with a speed of 65 knots indicated airspeed, propeller windmilling, flaps up, and zero wind.

Administrative Information

Investigator In Charge (IIC):	Gallo, Mitchell
Additional Participating Persons:	Robert Bennett; Federal Aviation Administration; North Texas FSDO; Irving, TX Peter Basile; Textron Aviation; Wichita, KS John Butler; Lycoming Engines; Williamsport, PA
Original Publish Date:	July 20, 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=92568