Aviation Investigation Final Report

Location:	Acworth, Georgia	**Accident Number:**	ERA10LA454
Date & Time:	August 29, 2010, 16:57 Local	**Registration:**	N451TS
Aircraft:	CIRRUS DESIGN CORP SR22	**Aircraft Damage:**	Substantial
Defining Event:	Fuel starvation	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The certified flight instructor (CFI) and private pilot departed on an instructional flight with 24 gallons of fuel in both the left and right main fuel tank. The CFI could not recall which fuel tank was selected at takeoff; however, he stated that the private pilot was switching fuel tanks every 30 minutes during the flight. The airplane climbed up to 4,500 feet mean sea level (msl) and cruised at 75 percent power to their first destination airport, where they conducted eight touch-and-go practice takeoffs and landings. They continued to the next destination airport at 3,500 feet msl and made one full stop landing, taxied back, conducted an engine run up and departed. They then climbed up to 3,500 feet msl en route to their home base and as they approached their destination (about 8 to 9 miles away), the engine lost power. The CFI took control of the airplane, instructed the student to turn on the alternate air, and he initiated the engine out procedures. The CFI turned and elected to perform a forced landing to a golf course fairway. The airplane collided with two trees on the landing roll and came to a stop. The CFI indicated that the total duration of the flight was 2 hours 28 minutes. A postaccident examination of the airplane revealed the left wing and fuselage received structural damage. The left main fuel tank was ruptured and no browning of vegetation was present under the left wing in indication there was likely no fuel in the tank prior to impact. The right fuel tank was not ruptured and 16 gallons of fuel was recovered from the fuel tank by recovery personnel. The data extracted from a multi function display flash card revealed the fuel used for the flight was 29.9 gallons. The flash card indicated the flight was 2 hours 7 minutes. Subsequently, a test run of the engine was performed with no anomalies noted.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilots improper in-flight fuel management resulting in a total loss of engine power during a

descent due to fuel starvation.

Findings

Aircraft	Fuel - Fluid management
Personnel issues	Use of equip/system - Instructor/check pilot
Environmental issues	Tree(s) - Contributed to outcome

Factual Information

History of Flight

Enroute-descent	Fuel starvation (Defining event)
Enroute-descent	Loss of engine power (total)
Emergency descent	Off-field or emergency landing
Landing-landing roll	Collision with terr/obj (non-CFIT)

On August 29, 2010, at 1657 eastern daylight time, a Cirrus SR22, N451TS, registered to Ellis Aviation LLC, and operated by Aero Atlantic Flight Center, experienced a total loss of engine power while descending in the vicinity of Acworth, Georgia. Visual meteorological conditions prevailed and no flight plan was filed. The certificated flight instructor (CFI) and the private pilot receiving instruction were not injured, and the airplane sustained substantial damage. The instructional flight was operated in accordance with 14 Code of Federal Regulations Part 91. The flight departed from Barwick LaFayette Airport (9A5), LaFayette, Georgia at 1615.

The CFI stated the flight initially originated at Cobb County Airport-McCollum Field (RYY), Atlanta, Georgia. A preflight inspection was conducted and no anomalies were noted. The airplane had 24 gallons of fuel in both the left and right main fuel tanks. The CFI stated that they used 75 percent power in cruise flight and they changed fuel tanks every 30 minutes. The airplane departed RYY at 1430, with the pilot receiving instruction flying, and climbed to a cruising altitude of 4,500 feet mean sea level (msl). The airplane arrived at Dalton Municipal Airport (DNN), Dalton Georgia, at 1455, and conducted eight touch and go landings. The airplane departed DNN at 1530, and climbed to a cruising altitude of 3,500 feet msl en route to 9A5, arriving at 1550. The pilot made a full stop landing, taxied back to the active runway and completed an engine run up, before departing at 1615 to RYY. The CFI stated that prior to departing, the fuel gage indicated the left and right main fuel tanks contained 14 gallons of fuel each.

The flight was at 3,500 feet until the CFI instructed the student to descend to 3,000 feet. They were about 8 to 9 miles west-northwest of RYY when the engine experienced a total loss of engine power. The CFI took control of the airplane and instructed the student to turn the alternate air on as he initiated the engine out procedures. The CFI turned the airplane to the right towards a golf course and assumed the best glide airspeed. He decided not to deploy the ballistic parachute and continued with a forced landing to the golf course. The airplane touched down on the fairway and struck two trees, before coming to a complete stop.

Examination of the airplane on August 30, 2009, by a Federal Aviation Administration inspector revealed the right main fuel tank was intact and fuel was present. The left main fuel tank was ruptured and no fuel was present. There was no browning of vegetation under the left wing of the airplane. Recovery personnel drained 16 gallons of fuel from the right main fuel tank.

The airplane was transported to a salvage company and the Multi-Function Display (MFD) compact flash card was removed and forwarded to the NTSB Vehicle Recorder Division for download. The flash card was in good condition and data were extracted normally from the device. Based on recorded information the fuel used started at 0.1 gallons. The maximum recorded value for fuel used was 29.9 gallons (16:55:44 EDT). The fuel used was then recorded at 0.0.

The airplane propeller was repaired and the fuselage was strapped to a truck in preparation for an engine run. Fuel was hooked up to the left side fuel system and the aircraft battery was charged. The engine was started normally using the airframe electrical system. The engine was allowed to remain at idle power but an oil leak was observed and the engine was shut down.

The engine was examined and it was determined that the standby alternator mounting flange had sustained damaged during the accident sequence and was leaking oil. Two quarts of oil were added to the oil sump and the engine was restarted. The engine power was advanced and a magneto check was preformed. The magneto drops were within the normal operating range. The engine power was advanced to 2,700 rpm, and 25 inches of manifold pressure. The oil pressure indicated 50 psi. The engine power was then reduced to idle power and the engine was shut down using the mixture control.

Fuel calculations were computed for the flight using performance data from Section 5 of the SR22 Pilot Operating Handbook (POH), fuel flow data provided by the pilot, and the outside air temperature at the time of the accident.

According to the POH, the airplane has 1.5 gallons of un-usable fuel in each fuel tank. The engine will use 1.5 gallons of fuel for engine start, taxi and takeoff. The engine will use 1.3 gallons of fuel while climbing to cruise altitude. At 74 percent power, 29 degrees Celsius, and a pressure altitude of 4,000 feet the engine will use 18.5 gallons per hour. It was not determined how much fuel the engine would use for the eight touch and go landings. The engine would use 1.5 gallons of fuel for the one full stop landing and taxi back for takeoff, engine run-up and takeoff to its destination airport. In addition, it would use 1.3 gallons of fuel to climb to its cruise altitude. The pilot's total estimated flying time was 2 hours 20 minutes. The total fuel required at a fuel rate of 18.5 gallons per hour in the left main fuel tank would be 47.41 gallons. The fuel remaining after changing fuel tank one time at a 30 minute interval would have been about 35.46 gallons. The MFD flash card indicates the pilot flew for 2 hours 7 minutes. The total fuel used was 29.9 gallons. The fuel required for the flight was about 46.25 gallons. If the fuel tank was changed one time at a 30 minute interval the fuel remaining would have been about 37 gallons.

The operator stated the fuel burn rate for the airplane is about 14 to 15 gallons per hour. The same criteria were used except for a fuel use rate of 14 gallons per hour. The total fuel required at a fuel rate of 14 gallons per hour in the left main fuel tank would be 39.67 gallons. If

the fuel was changed one time he would have 32.67 gallons of fuel remaining. The MFD flash card indicates the pilot flew for 2 hours 7 minutes. The total fuel used at 14 gallons was 36.64 gallons. If he changed the fuel selector one time he would have 29.64 gallons of fuel remaining.

Flight instructor Information

Certificate:	Commercial; Flight instructor	**Age:**	31,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	
Instructor Rating(s):	Airplane single-engine	**Toxicology Performed:**	No
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	March 9, 2010
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	April 23, 2010
Flight Time:	2012 hours (Total, all aircraft), 310 hours (Total, this make and model), 1920 hours (Pilot In Command, all aircraft), 180 hours (Last 90 days, all aircraft), 68 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Student pilot Information

Certificate:	Private	**Age:**	44,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	July 6, 2009
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	May 11, 2010
Flight Time:	2580 hours (Total, all aircraft), 8 hours (Total, this make and model), 70 hours (Last 90 days, all aircraft), 35 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	CIRRUS DESIGN CORP	**Registration:**	N451TS
Model/Series:	SR22	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	0542
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	August 6, 2010 100 hour	**Certified Max Gross Wt.:**	3400 lbs
Time Since Last Inspection:	153 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	3111 Hrs at time of accident	**Engine Manufacturer:**	CONT MOTOR
ELT:	C91 installed, not activated	**Engine Model/Series:**	IO-550N
Registered Owner:	ELLIS AVIATION LLC	**Rated Power:**	300 Horsepower
Operator:	Aero Atlanta Flight Center	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	RYY,1041 ft msl	**Distance from Accident Site:**	8 Nautical Miles
Observation Time:	16:58 Local	**Direction from Accident Site:**	330°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Broken / 11000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	130°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.2 inches Hg	**Temperature/Dew Point:**	29°C / 18°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	LaFayette, GA (9A5)	**Type of Flight Plan Filed:**	None
Destination:	Atlanta, GA (RYY)	**Type of Clearance:**	None
Departure Time:	16:15 Local	**Type of Airspace:**	Class D

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	34.049167,-84.764442

Administrative Information

Investigator In Charge (IIC):	Smith, Carrol
Additional Participating Persons:	James Sayre; FAA Atlanta FSDO; Hapeville, GA John Kent; Teledyne Continental; Mobile, AL Brad Miller; Cirrus Design Corporation; Duluth, MN
Original Publish Date:	May 11, 2011
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=77128