National Transportation Safety Board
Aviation Accident Final Report

Location:	Daytona Beach, Florida	**Accident Number:**	ERA09FA303
Date & Time:	May 25, 2009, 08:46 Local	**Registration:**	N73U
Aircraft:	Aero Commander 500 S	**Aircraft Damage:**	Substantial
Defining Event:	Fuel exhaustion	**Injuries:**	1 Fatal, 1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot departed in the twin-engine airplane with an unknown quantity of fuel and a fuel quantity indicating system that was known to be inaccurate. Immediately after takeoff, approximately 1/2 mile beyond the departure end of the runway, witnesses reported the engine noise from the accident airplane as "surging" as the airplane passed overhead, and one witness described a "radical" turn back to the airport. Two witnesses stated that only one engine was running, and added that it was "revving," and would then stop before revving up again. During the descent to the airport, radar data showed the airplane at 93 knots 700 feet and 1 mile from the runway, and at 90 knots at 500 feet and 1/2 mile from the runway, but the airplane crashed prior to the approach end of the runway. Postaccident examination of the wreckage revealed no evidence of a preaccident mechanical malfunction. The fuel system had a capacity of 226 gallons, was serviced through a single port on top of the left wing, and the tanks were interconnected to a center fuel sump that fed both engines. The fuel cells were opened through access panels and each was intact and contained only trace amounts of fuel. The airplane was leveled, the drain petcock was opened at the center fuel cell sump, and 1 quart of fuel was drained.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A total loss of engine power due to fuel exhaustion as a result of the pilot's inadequate preflight inspection.

Findings

Personnel issues	Preflight inspection - Pilot
Aircraft	Fuel - Fluid level

Factual Information

HISTORY OF FLIGHT

On May 25, 2009, at 0846 eastern daylight time, an Aero Commander 500S, N73U, operated by Commonwealth Aviation Corporation, was substantially damaged following a loss of engine power and collision with terrain during a forced landing after takeoff from Daytona Beach International Airport (DAB), Daytona Beach, Florida. The certificated private pilot was seriously injured, and the pilot-rated passenger was killed. Visual meteorological conditions prevailed and no flight plan was filed for the personal flight that departed about 0843, and was conducted under the provisions of 14 Code of Federal Regulations Part 91.

According to information provided by the Federal Aviation Administration (FAA), the airplane was cleared for takeoff from runway 7R at DAB. About 1 minute after takeoff, the pilot reported "an engine failure" and announced his intention to return for landing on runway 25R. Witnesses in the vicinity of the airport, approximately 1/2 mile beyond the departure end of the runway, reported the engine noise from the accident airplane was "surging" as the airplane passed overhead, and one witness described a "radical" turn back to the airport.

Two witnesses at their motorcycle repair shop stated that only one engine was running. They added that the engine was "revving," and would then "conk out" before revving up again. As the engine surged, the airplane would "shuffle left and right." One witness described the airplane "just hanging there" as it turned back to the airport. The airplane flew west out of view before it crashed on the 1,000-foot grass safety area prior to the approach end of runway 25R.

A review of radar data revealed that the pilot declared the emergency when the accident airplane was leveling off at about 1,000 feet, about 1.75 miles from the departure end of the runway. During the turn back to the airport, the airplane descended to 700 feet, then climbed back to 1,100 feet. During the descent to the airport, the data showed the airplane at 93 knots, 700 feet and 1 mile from the runway, and 90 knots, at 500 feet and 1/2 mile from the runway.

In a written statement, the pilot described performing a "full" preflight inspection of the airplane, and that the fuel gauge read 110 gallons. He described the engine start and pre-takeoff checks and stated that he performed a "normal" takeoff. The pilot stated, "We lost both engines shortly after takeoff, the engines surged from full throttle to idle."

The pilot maneuvered the airplane onto a left base traffic pattern leg to land in the opposite direction of takeoff, and felt he "had the field made." As the airplane descended towards the runway, the pilot prepared for a "normal" landing, and "dropped the gear and gave it full flaps when I felt I had the runway made." The pilot stated that he had "no recollection of the airplane stalling or the impact..."

PERSONNEL INFORMATION

A review of FAA and pilot records revealed that the pilot held a private pilot certificate, with ratings for airplane single-engine land, airplane single-engine sea, airplane multiengine land,

and instrument airplane. His most recent FAA third-class medical certificate was issued on July 17, 2007. The pilot reported 1,250 total hours of flight experience on that date. Review of the pilot's logbook revealed approximately 1,470 total hours of flight experience; of which, 570 hours of which were in the same make and model as the accident airplane.

AIRCRAFT INFORMATION

According to FAA and maintenance records, the airplane was manufactured in 1973, and had accrued 3,363 total aircraft hours. The most recent annual inspection was completed December 10, 2008, at 3,360 total aircraft hours.

The airplane was originally delivered with Lycoming IO-540 six-cylinder engines. On November 18, 1978, Lycoming IO-720 eight-cylinder engines, with twin turbochargers, were installed.

On April 1, 2009, a maintenance receipt from an airframe and powerplant mechanic, hired to diagnose a fuel quantity indication problem, stated, "Fuel gauge off... installed replacement gauge...still reads off" and recommended further troubleshooting. The hobbs meter time reflected 2,208.7 hours.

In an interview with an FAA aviation safety inspector, the mechanic who diagnosed the fuel quantity indication problem stated that the troubleshooting was performed on the airplane at the pilot's home airport (DAB), and not at his maintenance facility at Ormond Beach Municipal Airport (OMN), Ormond Beach, Florida. He explained to the pilot/owner that further troubleshooting and repair of the airplane would require defueling of the airplane, and that he possessed the means to accomplish that task, even with full tanks. On that occasion and in subsequent discussions, the pilot stated that he would prefer to "wait until the quantity was reduced through use of the airplane" rather than have the mechanic defuel the airplane.

METEOROLOGICAL INFORMATION

At 0853, the weather reported at DAB, included few clouds at 14,000 feet, scattered clouds at 25,000 feet and winds from 220 degrees at 4 knots. The visibility was 10 miles. The temperature was 24 degrees Celsius (C) and the dew point was 20 degrees C.

WRECKAGE AND IMPACT INFORMATION

The airplane was examined at the site on May 25, 2009. There was no odor of fuel, and all major components were accounted for at the scene. The airplane came to rest on flat, grassy terrain on the airport property, 267 feet prior to the approach end of runway 7R. The wreckage path was oriented 240 degrees magnetic and was 140 feet in length. The airplane came to rest oriented 360 degrees.

Measurement of the size, dimension, and shape of initial ground scars, approximately perpendicular to the wreckage path, revealed that they were consistent with the right wing, the right engine nacelle, the right main landing gear, the nose enclosure, and the left main landing gear. One propeller blade was partially buried in the scar consistent with the right engine

nacelle. The right main landing gear and the right aileron were separated from the airplane and scattered along the wreckage path.

The wings remained attached to the fuselage, but the wing box structure was collapsed into the cabin area. The cabin was cut at the windshield and first cabin posts by rescue personnel. The leading edge of the right wing was crushed aft, and the wing was wrinkled along its entire span upwards toward the tip.

The nose was crushed upwards and aft into the cockpit area. The instrument panel was fractured in several places. The throttle, mixture, and idle cutoff levers for each engine were full forward. The empennage was fractured aft of the wing box structure, but was intact aft of that point. The vertical fin, rudder, and elevators were all intact and moved freely in their hinges from stop to stop.

The engines were intact in their nacelles. The right engine showed minor impact damage to the No. 1 and No. 3 intake tubes. The No. 1 cylinder bottom spark plug was broken by impact. The alternator was separated from its mounts due to impact. Two of the three propeller blades showed twisting and aft bending with chordwise scratching at the tips. One blade was separated, and located at the initial impact point.

The wreckage was removed from the site and the examination was resumed on the parking ramp on May 26, 2007. Examination of the cockpit revealed that the left and right fuel valve switches and the left and right fuel boost switches were in the "on" position. Both magneto switches were in the "both" position. The floor panels were opened, and flight control cable continuity was confirmed from the cockpit to all flight control surfaces. Examination revealed that the landing gear were in the down and locked position, and the flaps were deployed.

The left engine crankshaft was rotated by hand at the propeller, and continuity was established through the powertrain and valvetrain to the accessory section. Compression was confirmed using the "thumb" method. The single-drive, dual magneto was removed, rotated by hand, and it produced spark at all 16 terminal leads. The main fuel inlet line to the engine driven fuel pump was disconnected, and 3 drops of fuel were collected. The fuel and the line were absent of water and debris. The spark plugs were removed, and the electrodes on all 16 were intact. Twelve electrodes were light tan and gray in color, and 4 were oil-fouled due to the at-rest position of the wreckage.

The right engine crankshaft was rotated by hand at the propeller, and continuity was established through the powertrain and valvetrain to the accessory section. Compression was confirmed using the "thumb" method. Both turbocharger impellers spun freely. The single-drive, dual magneto was removed, rotated by hand, and it produced spark at all 16 terminal leads. The main fuel inlet line to the engine driven fuel pump was disconnected, and no fuel was collected. The fuel pump and the line were absent of water and debris. The spark plugs were removed, and the electrodes on all 16 were intact. However, the electrodes on the top spark plug were of the massive type, and the electrodes on the bottom plugs were of the fine-wire type. Fifteen of the electrodes were light tan and gray in color, and one was oil-fouled due to the at-rest position of the wreckage.

The fuel system had a capacity of 226 gallons, was serviced through a single port on top of the left wing, and the tanks were interconnected to a center fuel sump that fed both engines. The fuel cells were opened through access panels and each was intact and contained only trace amounts of fuel. The airplane was leveled, the drain petcock was opened at the center fuel cell sump, and 1 quart of fuel was drained. The sample contained trace amounts of sediment and water.

ADDITIONAL INFORMATION

On December 12, 2008, the pilot/owner retrieved the airplane from the maintenance facility at OMN at the completion of the annual inspection. The pilot departed with an unknown quantity of fuel, and flew to DAB.

Examination of maintenance records revealed that the airplane had accrued 4.3 hours on the hobbs meter from the date of the annual inspection until the day of the accident. The hobbs meter was operated by weight-on-wheels switch. Interpolation of the pilot's logbook revealed that the pilot had logged 6.5 hours, and as many as 21 takeoffs in the accident airplane over the same period.

Entries in the "Remarks" section of the pilot's logbook revealed that the pilot noted his fuel purchases with either a "topped off tanks" entry, or a "bought gas" entry. The pilot noted that he "bought gas" on December 12, 2008, and January 31, 2009, and fuel receipts from DAB on those dates confirmed purchases of 64 gallons and 74 gallons respectively.

According to the Lycoming Operator's Manual, the fuel consumption rate per engine at normal rated power was 33.9 gallons per hour. At 75 percent performance cruise, the fuel consumption rate per engine was 23.3 gallons per hour. Those rates did not account for engine start, taxi, takeoff, and climb.

History of Flight

Initial climb	Fuel exhaustion (Defining event)

Pilot Information

Certificate:	Private	**Age:**	45,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	July 17, 2007
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	August 28, 2008
Flight Time:	1470 hours (Total, all aircraft), 574 hours (Total, this make and model), 7 hours (Last 90 days, all aircraft), 2 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Information

Certificate:	Commercial	**Age:**	80,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	5000 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Aero Commander	**Registration:**	N73U
Model/Series:	500 S	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal; Utility	**Serial Number:**	3162
Landing Gear Type:	Retractable - Tricycle	**Seats:**	7
Date/Type of Last Inspection:	December 10, 2008 Annual	**Certified Max Gross Wt.:**	6750 lbs
Time Since Last Inspection:	4 Hrs	**Engines:**	2 Reciprocating
Airframe Total Time:	3360 Hrs as of last inspection	**Engine Manufacturer:**	LYCOMING
ELT:	C91 installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-720
Registered Owner:		**Rated Power:**	400 Horsepower
Operator:		**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	DAB,34 ft msl	**Distance from Accident Site:**	250 Nautical Miles
Observation Time:	08:53 Local	**Direction from Accident Site:**	1°
Lowest Cloud Condition:	Few / 14000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	220°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.98 inches Hg	**Temperature/Dew Point:**	24°C / 20°C
Precipitation and Obscuration:			
Departure Point:	Daytona Beach, FL (DAB)	**Type of Flight Plan Filed:**	Unknown
Destination:	New Smyrna Bch, FL (EVB)	**Type of Clearance:**	VFR
Departure Time:	08:43 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	Daytona International Airport DAB	**Runway Surface Type:**	Asphalt
Airport Elevation:	34 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	25R	**IFR Approach:**	None
Runway Length/Width:	10500 ft / 150 ft	**VFR Approach/Landing:**	Forced landing;Straight-in

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 1 Serious	**Latitude, Longitude:**	29.184722,-81.046386

Administrative Information

Investigator In Charge (IIC):	Rayner, Brian
Additional Participating Persons:	Scott Strickland; FAA/FSDO; Orlando, FL John B Butler; Lycoming Engines, Inc; Arlington, TX
Original Publish Date:	August 12, 2010
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=73892

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