Aviation Investigation Final Report

Location:	Gallatin, Tennessee	**Accident Number:**	NYC07LA134
Date & Time:	June 8, 2007, 09:02 Local	**Registration:**	N729P
Aircraft:	Raytheon Aircraft Company A36	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	2 Serious, 2 Minor
Flight Conducted Under:	Part 91: General aviation		

Analysis

The airplane departed an airport in visual meteorological conditions, and approaching the destination airport, the pilot opted to return to the departure airport due to weather. As the airplane was descending toward the departure airport, the engine lost power, and the pilot performed a forced landing to a field, where he landed hard. The pilot indicated that he had flown the return leg utilizing fuel from the right tank, switched to the left tank before the descent, and the engine failed during the descent. Postflight examinations of the airplane revealed no mechanical anomalies that would have precluded normal operation. Approximately 1 gallon of fuel was drained from the right wing tank, and 11 gallons of fuel were drained from the left wing tank, with no indication of fuel leakage from either tank. According to the airplane's operating handbook, there were 3 gallons of unusable fuel in each tank. The fuel selector was found on the left tank at the accident site, and when removed for examination, fuel flowed from all connecting lines except the right main tank. Although the pilot had switched to the left fuel tank at some point, he did not utilize the boost pump (auxiliary fuel pump) as required in the procedures for an engine restart.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's mismanagement of fuel which led to fuel starvation and loss of engine power. Contributing to the accident was the pilot's failure to utilize the proper engine restart procedures, and the hard landing.

Findings

Occurrence #1: LOSS OF ENGINE POWER(PARTIAL) - NONMECHANICAL
Phase of Operation: DESCENT

Findings
1. FLUID,FUEL - STARVATION
2. (C) FUEL MANAGEMENT - IMPROPER - PILOT IN COMMAND

Occurrence #2: FORCED LANDING
Phase of Operation: DESCENT - EMERGENCY

Findings
3. (F) PROCEDURES/DIRECTIVES - NOT COMPLIED WITH - PILOT IN COMMAND

Occurrence #3: HARD LANDING
Phase of Operation: EMERGENCY DESCENT/LANDING

Findings
4. TERRAIN CONDITION - GROUND
5. (F) OBJECT - TREE(S)

Factual Information

HISTORY OF FLIGHT

On June 8, 2007, at 0902 central daylight time, a Raytheon Aircraft Company A36, N729P, was substantially damaged during a forced landing while approaching Sumner County Regional Airport (M33), Gallatin, Tennessee. The certificated private pilot and one passenger were seriously injured, and two passengers incurred minor injuries. The flight, which departed Gallatin at 0710, was originally destined for McGee-Tyson Airport (TYS), Knoxville, Tennessee. Visual meteorological conditions prevailed, and no flight plan had been filed for the business flight conducted under 14 Code of Federal Regulations Part 91.

During a telephone interview, while the pilot was recovering in the hospital, he stated that as the airplane neared Knoxville, he determined that the weather conditions precluded a landing, and opted to return to Gallatin. Nearing Gallatin, at an altitude of about 6,500 feet, the pilot began a descent. When the airplane reached an altitude of "probably 1,500 feet," the engine would not produce any more than 15 inches of manifold pressure. The pilot exercised the throttle and propeller, but could not obtain any additional power. At 500 feet, the pilot decided to shut the fuel off and land in a field.

When asked about any sputtering or other engine noises prior to the lack of power, the pilot responded that there was a "shivering" of the engine about a minute before the loss of power.

When questioned about which fuel tank he had been flying on, the pilot responded that he was operating on the left (wing) tank when the problem occurred. He had been operating on the right tank on the way to Knoxville and the left tank on the return. He also said that he had switched tanks a couple of times before descending, but finally selected the left tank since it had more fuel.

The pilot was also interviewed by Federal Aviation Administration (FAA) inspectors. According to the statement made to one of the inspectors, the purpose of the flight to Knoxville was to look at some real estate. Within 3 miles of the destination, the pilot decided to return to Gallatin due to weather. The airplane returned at 6,500 feet, with headwinds en route to Knoxville, and tailwinds returning. While descending to the final destination, about 4 to 5 miles from the airport, the manifold pressure dropped to 15 inches, and the pilot could not obtain any additional power. He then switched from the left tank to the right tank, but immediately switched back to the left. The engine continued to run with low manifold pressure, but the airplane would not maintain altitude, so the pilot secured the engine and landed in a field.

The pilot also reported to the inspectors that he switched fuel tanks every 30 minutes, and had about 50 to 60 gallons of fuel upon departure from Gallatin. When asked if had turned on the

fuel boost pump after the loss of engine power, the pilot indicated that he had not.

In a statement submitted to the National Transportation Safety Board dated June 20, 2007, the pilot stated that he had added 10 gallons to each tank prior to departing Gallatin, "which showed 5/8 tank on each side leaving 20 gallons usable in each tank." The pilot also noted that during the flight, the winds were 30 knots from the west. The pilot also stated that en route to Knoxville, he was flying on the left tank, and upon making the turn back toward Gallatin, he switched to the right tank. Prior to descending from 6,500 feet on the return leg, the pilot switched back to the left tank. The pilot also noted that he lowered the landing gear prior to the landing, and made a "harder landing" to avoid flipping the airplane or hitting a tree row.

In an amended statement dated September 9, 2007, the pilot reported that after he received a weather briefing, he conducted a preflight inspection and boarded the passengers. "The engine did not start normally and took several attempts…Once started, there were no noticeable problems with the engine." The airplane departed Gallatin with 21 gallons of fuel in each tank, and the winds were 20 knots from the west. The pilot also stated that he flew to Knoxville on the left tank, and on the right tank for the return trip. Twelve miles from Gallatin, before descending from 6,500 feet, the pilot switched to the left tank. Approximately 7 miles from the airport, the pilot saw an opening in the cloud cover, and descended through it. Then, about "4.5 miles on a base to runway 17, the manifold pressure began dropping." The pilot noted that the manifold pressure was 15 inches and he could not increase it. The manifold pressure continued to drop with the propeller rpm at 2,300.

After "adjusting the prop and fuel," the pilot "was unable to continue flight." He "feathered" the propeller, pulled the mixture back "to cut the engine off," and attained a glide airspeed of 110 knots. The airplane touched down about 30 seconds later, and during the landing, the airplane came to an "abrupt stop" when the propeller impacted the ground.

The pilot also noted in the amended statement that, "anything to the contrary previously reported was in error."

PERSONNEL INFORMATION

The pilot, age 42, held a private pilot certificate with ratings for single engine and multiengine airplanes. The pilot reported 150 hours of total flight time, with 70 hours in make and model.

AIRCRAFT INFORMATION

The airplane, which was manufactured in 2002, was powered by a Teledyne Continental Motors IO-550-B(39)B engine. The airplane’s Hobbs meter indicated 349.8 hours of operation, and the latest 100-hour inspection was completed on November 1, 2006.

Airport line service personnel confirmed that the pilot requested 10 gallons in each tank the day before the accident flight and provided a copy of the fuel receipt.

WRECKAGE AND IMPACT INFORMATION

The wreckage was examined by representatives from the airframe manufacturer, Hawker-Beechcraft Corporation (which purchased the company from Raytheon), Teledyne Continental Motors, and the FAA. An FAA inspector also provided examination oversight, as well as a review of the manufacturers' reports.

According to the field notes from the airframe manufacturer's representative, the wreckage was located by Sumner County Regional Airport personnel approximately 3 miles from the airport, at 36 degrees, 24.4 minutes north latitude, 86 degrees, 21.5 minutes west longitude, in a recently-baled field. No preexisting conditions were found that would have precluded normal operation of the airframe, and all flight control surfaces were accounted for at the scene.

During the examination of the cockpit, the fuel selector handle was found in the OFF position, and an examination of the fuel selector valve confirmed it was in the OFF position. The fuel selector valve rotated freely to all positions. The fuel selector was removed and during the removal, fuel flowed from all lines except the right main tank fuel feed line. The screen was found installed correctly and absent of debris. The boost pump was removed and connected to a battery charger. When power was applied, the pump operated normally on both low and high settings.

The wreckage recovery crew advised the representative that less than 1 gallon of fuel was drained from the right fuel tank and approximately 11 gallons of fuel were drained from the left fuel tank. No fuel leaked from the airplane during the recovery.

The airframe representative also spoke to the deputy director of emergency services, who reported that he was the first person on scene and assisted the occupants. After egress, the pilot asked him if he could shut off the power and fuel in the airplane. The director boarded the airplane on the right side and laid across the seats to reach the power switch (battery switch). He then reached down the left side of the pilot seat and "tried to turn the red handle clockwise but couldn't until I pushed the white button down," which would be consistent with the fuel selector being on the LEFT TANK position when he switched it to the OFF position.

According to the final field inspection report of the engine manufacturer's representative, the engine was removed from the airframe and examined in a hangar. The examination did not reveal any anomalies that would have precluded normal operation and the production of rated horsepower. Crankshaft continuity was confirmed to all cylinders, the rear of the engine, and the oil pump. Compression was confirmed on all cylinders, and a lighted borescope examination revealed "normal" deposits. The top spark plugs were examined, and the electrodes had light gray deposits, consistent with normal operation. The fuel pump was in place, and the drive coupling was intact. The pump was disassembled, and no damaged was found. Both magnetos sparked at all ignition leads.

The fuel metering unit was impact-damaged. The throttle valve was free to move, as were the throttle and mixture controls. The return line to the pump was separated, and no fuel was observed in the unit. The fuel screen was absent of debris. The fuel manifold was not damaged, and when opened, the fuel screen was absent of debris. All of the fuel nozzles were also absent of debris.

The oil filter was not damaged, and there were no metal particles observed on the internal element.

RECORDERS

A hand-held global positioning system (GPS) unit was downloaded at the Safety Board Recorders laboratory. The tracklog indicated that the GPS was activated in flight, at 0730, and the last recorded position occurred at 0902. The track commenced with the airplane about 3.5 miles east of Gallatin, at 5,800 feet (GPS altitude), headed eastbound. Approximately 10 minutes later, the airplane descended to 3,011 feet while in a left 360-degree turn. The airplane then climbed back up to 5,700 feet and continued east. At 0800, the airplane started a left turn, passed through a north heading, and completed the turn to the west at 0803. During the turn, the airplane climbed to 6,700 feet, and maintained that approximate altitude until 0846, when it began a descent.

METEOROLOGICAL INFORMATION

Weather, reported at an airport 18 nautical miles to the southwest, at 0909, included a broken cloud layer at 2,500 feet and surface winds from 230 degrees true, at 6 knots.

ADDITIONAL INFORMATION

According to excerpts from the Beech Bonanza A36, pilot's manual:

- Fuel Cells -

"The fuel system consists of a rubber fuel cell located in each wing leading edge. The fuel capacity consists of two 40-gallon cells (37 gallons usable.)"

- Auxiliary Fuel Pump Switch -

"The HI position is used for priming the engine during cold starts and also to provide an alternate source of fuel pressure in the event the engine-driven fuel pump fails. HI boost must not be used during flight unless the engine-driven fuel pump has failed. The increased pressure of the HI boost will over-drive the fuel control unit producing abnormally high fuel flows which, in turn, will cause engine roughness. In some cases, engine combustion will cease."

- Fuel Tank Selection -

"The OFF position is forward and to the left. A stop (lock-out) button prevents inadvertent selection of the OFF position. To select OFF, depress the stop button and rotate the handle to the full clockwise position. Depression of the lock-out stop is not required when moving the handle counter-clockwise from OFF to LEFT MAIN or RIGHT MAIN. When selecting the LEFT MAIN or RIGHT MAIN fuel tanks, position handle by sight and feel for the detent.

Warning: Position selector valve handle in detents only. There is no fuel flow to the engine between detents (indicated by red arc.)"

- Engine Failure -

"Note: The most probable causes of engine failure are loss of fuel flow, ignition system malfunction or blockage of the induction system."

- In Flight -

1. Airspeed – With Sufficient Altitude……..110 KTS
2. Fuel Selector Valve…… SELECT OTHER TANK
3. Magnetos…… CHECK BOTH
4. Aux Fuel Pump……..HI
5. Mixture…….. FULL RICH THEN LEAN AS REQUIRED

Warning: If power is restored with the Auxiliary Fuel Pump –HI, then manual adjustment of the mixture control will be required for all power changes to prevent engine roughness. Do not retard throttle until landing is assured."

Pilot Information

Certificate:	Private	**Age:**	42,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3	**Last FAA Medical Exam:**	May 1, 2006
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	November 1, 2006
Flight Time:	150 hours (Total, all aircraft), 70 hours (Total, this make and model), 79 hours (Pilot In Command, all aircraft), 31 hours (Last 90 days, all aircraft), 9 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Raytheon Aircraft Company	**Registration:**	N729P
Model/Series:	A36	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	E-3469
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	November 1, 2006 Annual	**Certified Max Gross Wt.:**	3650 lbs
Time Since Last Inspection:	90 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	349 Hrs at time of accident	**Engine Manufacturer:**	Teledyne Continental
ELT:	Installed, not activated	**Engine Model/Series:**	IO-550
Registered Owner:	HALO Limited, LLC	**Rated Power:**	300 Horsepower
Operator:	Alvin D. Hale	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	BNA,599 ft msl	**Distance from Accident Site:**	18 Nautical Miles
Observation Time:	09:09 Local	**Direction from Accident Site:**	220°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Broken / 2500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	230°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	27°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Gallatin, TN (M33)	**Type of Flight Plan Filed:**	None
Destination:	Knoxville, TN (TYS)	**Type of Clearance:**	None
Departure Time:	07:10 Local	**Type of Airspace:**	

Airport Information

Airport:	Sumner County M33	**Runway Surface Type:**	
Airport Elevation:	584 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious, 2 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Serious, 2 Minor	**Latitude, Longitude:**	36.406665,-86.358886

Administrative Information

Investigator In Charge (IIC):	Cox, Paul
Additional Participating Persons:	Lynn D Heath; FAA/FSDO; Nashville, TN Timothy Rainey; Hawker-Beechcraft; Wichita, KS John Kent; Teledyne Continental Motors; Mobile, AL
Original Publish Date:	November 25, 2008
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=65942

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The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties … and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available here.