



Aviation Investigation Final Report

Location:	Fort Lauderdale, Florida	Accident Number:	ERA09FA526
Date & Time:	September 20, 2009, 17:50 Local	Registration:	N2467Y
Aircraft:	Piper PA-32R-301T	Aircraft Damage:	Substantial
Defining Event:	Fire/smoke (non-impact)	Injuries:	4 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

While en route to the destination airport, about 3,800 feet over swampy terrain, the pilot declared a mayday and advised air traffic control that there was fire in the engine. The controller asked the pilot's intentions, noting that there were two airports about 25 nautical miles from the airplane's position. The pilot stated that he would like to continue to one of the airports. The controller instructed the pilot to descend to 3,000 feet, and during the next 4 minutes, the pilot made multiple transmissions, including; that he thought he had lost a cylinder, that there was still fire coming off the nose of the airplane, they were getting smoke in the cockpit, and he may have to land on the highway. Approximately five minutes, 45 seconds after his first transmission, the pilot stated "we're on fire." There were no further transmissions from the pilot.

A witness subsequently observed the airplane on fire, in a 20-degree nose-down, 40-degree left bank before it impacted terrain. Postflight examination of the wreckage revealed that the fire had emanated from a fuel leak caused by a fatigue fracture in the No. 5 pressurized fuel supply line. The pilot's operating handbook and Federal Aviation Administration publications noted that in case of fire, the pilot should immediately terminate the fuel flow to the engine and perform a forced landing. Although the failure of the fuel line would have, by itself, likely resulted in an accident, the pilot's loss of control of the airplane was a direct consequence of his failure to immediately perform the required emergency procedures.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

Fatigue failure of the No. 5 engine cylinder fuel supply line, which resulted in an engine compartment fire. Also causal was the pilot's failure to immediately secure the engine/perform a forced landing after discovery of the fire, which resulted in the pilot's loss of control of the airplane.

Findings

Aircraft	Fuel distribution - Failure
Aircraft	Time limits - Not specified
Personnel issues	Incorrect action performance - Pilot
Aircraft	Hoses and tubes - Not serviced/maintained
Personnel issues	Use of checklist - Pilot

Factual Information

History of Flight

Enroute-cruise	Fire/smoke (non-impact) (Defining event)
Emergency descent	Fire/smoke (non-impact)
Uncontrolled descent	Fire/smoke (non-impact)
Uncontrolled descent	Collision with terr/obj (non-CFIT)
Post-impact	Explosion (post-impact)
Post-impact	Fire/smoke (post-impact)

HISTORY OF FLIGHT

On September 20, 2009, at about 1750 eastern daylight time, a Piper PA-32R-301T, N2467Y, registered to Bull Gator Air, Incorporated, operating as a 14 Code of Federal Regulations Part 91 personal flight, crashed in the Florida Everglades, 22 miles east of the Fort Lauderdale Executive Airport (FXE), Fort Lauderdale, Florida. Visual meteorological conditions prevailed and an instrument flight rules flight plan was filed. The certificated private pilot and three passengers were killed, and the airplane was destroyed. The flight originated at Gainesville Regional Airport, Gainesville (GNV) Florida, at 1613.

Review of transcripts of communications provided by the Federal Aviation Administration (FAA) revealed that the pilot contacted the FAA Miami (MIA) approach control at 1740.

At 1745:47, the pilot issued a "mayday" call and reported a "fire in the engine." The controller then asked, "are you going to try and make it to executive airport -that's the closest to you sir." Radar data revealed that at the time, the airplane was on an assigned heading of 110 degrees, at an altitude of 3,800 feet above mean sea level (msl). The airplane subsequently continued on its assigned heading, but a 300-foot descent was noted. The airplane's flight track showed that the airplane was flying over the everglades marshland area during the flight. At the time there were no roads in the vicinity.

At 1746:01, the pilot responded that he had "smoke in the cockpit and we're trying to get to the nearest airport." The controller informed the pilot that "Pahokee Airport" [Palm Beach County Glades Airport (PHK), Pahokee, Florida] was the closest airport, 24 miles from his location. The controller then asked the pilot if he wanted to go to Pahokee or "get to exec?" The pilot responded, "we'd like to get to exec," and added that he thought he had still had power, that "we've lost one cylinder," "that we can see some fire coming off the nose," and that the smoke had dissipated in the cockpit. The airplane maintained an altitude of 3,500 feet for a short period of time before descending to 3,400 feet.

At 1747:02, the controller advised the pilot that FXE was 24 miles away and asked if he still wanted to try to continue to FXE. The pilot advised the controller that he was going to try to continue FXE, and about 40 seconds later, added that he wanted a "visual straight to the runway." Radar data indicated that the airplane was at an altitude of 3,400 feet.

At 1748:12, the controller directed a heading of "one one zero...vectors straight in for runway eight" at FXE for a visual approach. Radar data indicated the airplane was at 3,300 feet during the transmission. The controller then advised the pilot that he was going to keep him at 3,000 feet just in case he had another problem he would be able to glide to the airport, which the pilot acknowledged.

At 1749:08, the controller advised the pilot that if he felt comfortable, the controller would switch the pilot to a discreet frequency so that he could be worked by "just one" controller, "can you do that?" When the pilot acknowledged with the airplane's call sign, the controller provided him the new frequency, and stated that the new controller "knows the situation."

At 1749:40, the new controller acknowledged the pilot's heading, and informed the pilot that "boca is about the same distance, so whichever one you like; twelve o'clock and twenty five miles for executive."

At 1749:52, the pilot advised the controller that "we're getting more smoke in the cockpit, we're thinking we might have to land on runway (unintelligible) highway two seven here." Radar data indicated the airplane was at an altitude of 2,900 feet.

The controller acknowledged the pilot's transmission and requested confirmation of the pilot's decision to land on highway 27, to which the pilot responded, "yes yes." The controller then requested the number of souls onboard the airplane. Radar data indicated the airplane was at an altitude of 2,700 feet.

At 1750:31, the pilot reported, "we're on fire, we're on fire." There were no further transmissions from the pilot, and the radar data went into coast mode.

A Florida Wildlife Conservation officer, located about 1/8 mile from the entrance to the Francis F. Taylor North Treatment Area, stated that he observed the airplane to the north about 75 feet above power transmission lines about 1/2 mile in front of him. The nose of the airplane was approximately 20 degrees below the horizon and the airplane was in a 40-degree left bank. The airplane was trailing black smoke, extending back about 100 yards. Visible flames could be seen on top of the engine cowling, extending back toward the cockpit about 3 feet. The flames closest to the cowling were blue and the flames towards the cockpit were orange. The trailing black smoke was "like the exhaust of an 18-wheel diesel truck." The bank angle continued to increase and the nose continued to lower until the airplane collided with the ground in a near-vertical attitude.

PERSONNEL INFORMATION

The pilot, age 46, held a private certificate, with ratings for airplane single engine land, and instrument airplane. In addition, he held an FAA third class medical certificate issued on December 3, 2008, with no limitations. The pilot reported 2,000 flight hours on his last medical application. The pilot's logbook was destroyed in the accident, and his total flight hours and last flight review could not be determined. According to an insurance application dated May 28, 2009, the pilot indicated a total flight experience of 1,883 hours; of which 1,183 hours were in the PA-32R.

AIRCRAFT INFORMATION

The six seat, low-wing, retractable gear airplane, serial number 32R-8529019, was manufactured in 1985. A Lycoming TIO-540-S1AD, 300-horsepower horizontally opposed six cylinder engine powered the airplane, equipped with a Hartzell three-bladed propeller. Review of the engine logbooks revealed the engine was overhauled on April 11, 1994, and had accumulated 2,030 hours since overhaul. The engine manufacturer recommended that the engine be overhauled after 1,800 hours time in service or 12 years. The last annual inspection was conducted on February 9, 2009, with a total tachometer time and aircraft total time of 3,590.1 hours. The tachometer was not located in the wreckage and the total airframe time could not be determined. Review of the last refueling record from GNV dated September 20, 2009, revealed that the airplane was topped off with 25 gallons of 100 low lead (LL) fuel before the airplane departed on the accident flight.

Review of corporation records revealed that the registered agent was the pilot of the airplane. Further review of the insurance records showed that Bull Gator Air, Incorporated was listed as the applicant and the pilot was listed as the operator.

METEOROLOGICAL INFORMATION

The 1753 FXE surface weather observation, located about 22 miles west of the accident site, was: wind from 110 degrees at 7 knots; visibility 10 miles; a few clouds at 2,600 feet above ground level (agl); scattered clouds at 3,400 feet; scattered clouds at 4,500 feet; temperature 29 degrees Celsius; dew point 23 degrees Celsius; altimeter 29.97 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The crash site was located in the Frances Taylor Conservation Area 3A-North in the Florida Everglades. The airplane came to rest inverted in approximately 6 feet of water about 22 nautical miles west of FXE, and on a heading of 258 degrees magnetic. The wreckage was located at 26°32' 61.0" north latitude, 080° 59'15.0" west longitude.

The propeller remained attached to the engine crankshaft flange. Two of the three propeller blades exhibited aft bending and twisting toward the lower pitch stop. The remaining propeller

blade exhibited fore and aft bending. No leading edge damage or rotational scoring was present on the cambered or non-cambered side of the propeller blades.

The engine cowling was fragmented. A small section of the forward baggage compartment and nose gear wheel well was fragmented and contained fragments of the landing gear hydraulic pump and various electrical harnesses with relays. The nose gear was separated and fragmented, and the nose landing gear position was not determined. Only a fragment of the avionics switch panel was located, and it was heat damaged. The firewall was separated from the airframe and all engine mounts were separated from the engine. All engine accessories were separated from their attachment points. The accessory case housing was broken away from the engine and was not located.

The forward and rear cabin areas were fragmented. The instrument panel was fragmented and the flight instruments, gauges and avionics were not located. The flight control "T"-Bar, sprocket tube with sprockets remained attached together. The aileron cables and attachment chains were not located. The pilot's rudder pedal torque tube was bent, and numerous control cables were located within the wreckage and exhibited failure features consistent with overload.

Examination of the cabin area revealed that the main spar box was fire-damaged, and the right 2 feet of spar web were missing. The top spar cap was missing 1.5 feet, and the bottom spar cap was bent downward about 45 degrees. Approximately 4 feet of the forward cabin floor were attached to the spar cap, including the pilot's seat. The trim wheel and landing gear override levers were visible. The forward cabin door frame was damaged. The emergency fuel boost pump remained attached to the cabin flooring, but was heat damaged. The fuel selector valve was heat damaged and the position could not be determined.

The right wing exhibited accordion compression damage straight back along its entire span, and the leading edge skins were separated. Both interconnecting main fuel tanks were fire-damaged and ruptured. The right aileron was attached to its attachments points and was damaged. The aileron cables extended inboard to the wing root and were separated. The aileron cables exhibited failure features consistent with overload. The flap was separated from its attachment point and was damaged. The flap actuator rod was not located, and the position of the flaps was not determined. The right wing tip cap was separated and was not located. The right main landing gear was in the retracted position.

The aft fuselage and empennage were fragmented and fire-damaged. The aft cargo door hinge was intact, and the door was not located. The aft cabin door was fragmented. The right sidewall was torn and fragmented, and the left sidewall was missing. The vertical fin was attached to the fuselage. The fin was separated at about a 45-degree angle at mid-span and attached by the aft attachment fitting. The rudder was attached to the vertical fin by upper hinge point, and was fire damaged. The rudder balance weight was missing and was not located. The rudder stops were in place and intact. The rudder control cables, which remained attached to the control horn, were traced to the forward to the fuselage and exhibited failure

signatures at the separations consistent with overload. Approximately 2 feet of the left and right stabilator tips were separated and damaged. The right stabilator was attached to the fuselage aft bulkhead by its main spar. The top and bottom skins were damaged and exhibited heat damage. The trim tab right half was damaged and remained attached to the stabilator. The left hand side of the stabilator was missing and was not recovered. The left stub spar was heat damaged.

The left wing remained attached to a section of the aft main spar. The spar was severed from the aft main spar. The leading edge of the left wing exhibited accordion crushing straight back along the entire leading edge. The wing skin was separated at their rivet lines from wing root to wing tip, and was fire-damaged. The wing tip cap was separated and was not located. Both interconnecting main fuel tanks were fire damaged and ruptured. The outboard 4 feet of wing tip were bent 45 degrees aft towards the main spar. The aileron cables extended inboard to the wing root and were separated. The cables exhibited failure features consistent with overload. The aileron balance weight was intact. The flap was separated from its outboard attachment point and was damaged. The flap actuator rod was not located and the position of the flaps was not determined. The left main gear was in the retracted position.

Examination of the engine revealed that it was damaged on all sides, and the front section of the crankcase was fractured and broken open. The engine case halves exhibited multiple cracks, and the crankshaft was broken in half aft of the front main bearing. All six cylinder assemblies were damaged, and the push rods were crushed. The induction air box was crushed, and the air filter was not located. The induction air manifold was fragmented and was not located. The oil sump was fragmented and partial remains recovered included the engine identification data plate and the oil suction screen, which was found free of contaminants. The oil filter was damaged and separated from the engine. The oil filter element was free of contaminants. The oil cooler was damaged and separated from the engine. The starter and alternator were fragmented.

The engine exhaust system was crushed and the turbo charger system assembly was separated from the engine and damaged. The dual magneto was separated and was not located. The ignition harness was torn apart and shredded. The top and bottom spark plugs were all broken in their respective cylinders. The spark plugs were removed and the electrodes exhibited contamination from exposure to marsh water. All of the rocker box covers were damaged and removed. The No.1 cylinder intake rocker arm and the No.4 cylinder exhaust rocker arms were separated from the respective cylinders and were not located.

The engine driven fuel pump was separated from the accessory housing and damaged. No fuel was present in the engine driven fuel pump. The outlet fuel hose remained attached to the engine driven fuel pump and was separated from the Injector servo. The pump inlet fuel hose to the airframe firewall was broken at the elbow fitting. The fuel injector servo was damaged and separated from the engine assembly. The throttle linkage was attached to the fuel servo and broken. The mixture control arm was separated and was not located. The brass regulator plug on the servo was intact and secure.

Examination of engine compartment revealed that localized fire damage was noted on the rear right section of the engine, in the vicinity of the No. 5 cylinder. Thermal damage was noted on the top section of the engine cowling, and around the right side air intake louvers. The fire was further isolated to the rear right section of the engine, in the vicinity of the turbo charger. The manifold fuel line supplying pressurized fuel to the fuel injector of the No. 5 cylinder, which was located under the turbo charger, was fractured at the fuel injection nozzle.

MEDICAL AND PATHOLOGICAL INFORMATION

The Office of the Broward County Medical Examiner of Fort Lauderdale, Florida conducted postmortem examinations on September 22, 2009, of the limited remains recovered from the pilot and passengers. The reported cause of death for all occupants was "multiple blunt force trauma." Evidence of "thermal injury" was noted on the upper back of a passenger seated in the rear of the aircraft. No other thermal injury was noted on any other examined remains, and no blood was available for carbon monoxide testing for any of the occupants.

Forensic toxicology was performed on specimens from the pilot by the Federal Aviation Administration Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma. No blood, urine, or vitreous was available for analysis. The toxicology report stated that 49 (mg/dL, mg/hg) of ethanol was detected in the muscle, and 11 (mg/dL), mg/hg) of ethanol was detected in the lung. 23 (mg/dL, mg/hg) of methanol was detected in the lung. 15 (mg/dL, mg/hg) of N-Butanol was detected in the muscle, and 5 (mg/dL, mg/hg) was detected in the lung. 4 (mg/dL, mg/hg) of N-Propanol was detected in the muscle.

TESTS AND RESEARCH

The fractured No.5 fuel line was sent to the NTSB Materials Laboratory for further examination. According to the factual report, the examination of the fuel line revealed that the fracture plane was orthogonal to the tube longitudinal axis. There were no 45-degree shear lips on the inner or outer diameters. Brazing filler metal was adhered to the outer diameter of the tube from approximately the 1 o'clock position, continuing counterclockwise to the 6 o'clock position. Faint thumbnail-shaped crack arrest lines were observed in that region, emanating from the tube outer diameter consistent with fatigue crack initiation and propagation.

Review of the airplane Airworthiness Directive compliance records revealed that the fuel injection lines and clamps were inspected at the last annual inspection. No defects were reported during the inspection.

ADDITIONAL INFORMATION

The Pilot's Operating Handbook (POH) states, on page 3-13, paragraph 3.17 FIRE IN FLIGHT, that if an engine fire is present, switch the fuel selector to OFF and close the throttle. The

mixture should be at idle cut-off. Turn the electric fuel pump OFF. In all cases, the heater and defroster should be off. If radio communication is not required, select master switch off. If the terrain permits, a landing should be made immediately.

FAA Airplane Flying Handbook, FAA-H-8083-3A, under "In-Flight Fire," states that an in-flight fire "demands immediate and decisive action." The pilot, therefore, must be familiar with the procedures outlined to meet this emergency contained in the POH for the particular airplane. The Handbook further states: "By the time a pilot becomes aware of an in-flight engine compartment fire, it usually is well developed. Unless the airplane manufacturer directs otherwise in the AFM/POH, the first step in discovering a fire should be to shut off the fuel supply to the engine...."

In addition, "The pilot must be familiar with the airplane's emergency descent procedures. The pilot must bear in mind that:

- The airplane may be severely structurally damaged to the point that its ability to remain under control could be lost at any moment.
- The airplane may still be on fire and susceptible to explosion.
- The airplane is expendable and the only thing that matters is the safety of those on board."

According to the Conoco Phillips Aviation Gasoline, 100 LL Material Safety Data Sheet, the auto ignition temperature is 824 degrees Fahrenheit or 444 degrees Celsius. The POH states, on page 5-27, that the cruise peak temperature of the engine exhaust gas is 1,650 degrees Fahrenheit.

Lycoming Service Bulletin (SB) 342E states, in paragraph 4: "Any cushioned clamp, where the cushion has deteriorated or is missing, must be replaced with a new cushion clamp...Compliance with the bulletin must be noted in the aircraft logbook."

FAA Airworthiness Directive (AD) 08-14-07 states, in Inspection Criteria: "Inspect the fuel injector fuel lines and clamps between the fuel manifold and the fuel injector nozzles, and replace, as necessary, any fuel injector fuel line and clamp that does not meet all conditions specified in Lycoming Engines MSB No. 342E, dated May 18, 2004."

A review of the logbook AD pages revealed that the lines and clamps were checked in accordance with AD 08-14-07, on February 4, 2009, at a tachometer time of 3,590.1, and it was noted that no defects were found.

Pilot Information

Certificate:	Private	Age:	46, Male
Airplane Rating(s):	Single-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 3 Without waivers/limitations	Last FAA Medical Exam:	December 23, 2008
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	(Estimated) 1883 hours (Total, all aircraft), 1183 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	Registration:	N2467Y
Model/Series:	PA-32R-301T	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	32R-8529019
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	February 9, 2009 Annual	Certified Max Gross Wt.:	3600 lbs
Time Since Last Inspection:	2030 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	3590 Hrs as of last inspection	Engine Manufacturer:	Lycoming
ELT:	Installed, not activated	Engine Model/Series:	TIO-540-S1AD
Registered Owner:	On file	Rated Power:	300 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	FXE,13 ft msl	Distance from Accident Site:	20 Nautical Miles
Observation Time:	17:53 Local	Direction from Accident Site:	30°
Lowest Cloud Condition:	Scattered / 3400 ft AGL	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	7 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	110°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.96 inches Hg	Temperature/Dew Point:	29°C / 23°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Gainesville, FL (GNV)	Type of Flight Plan Filed:	IFR
Destination:	Fort Lauderdale, FL (FXE)	Type of Clearance:	IFR
Departure Time:	16:13 Local	Type of Airspace:	Class G

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:	3 Fatal	Aircraft Fire:	Both in-flight and on-ground
Ground Injuries:	N/A	Aircraft Explosion:	On-ground
Total Injuries:	4 Fatal	Latitude, Longitude:	26.326389,-80.596389

Administrative Information

Investigator In Charge (IIC):	Alleyne, Eric
Additional Participating Persons:	Daniel E Cahoon; FAA Fort Lauderdale FSDO; Fort Lauderdale, FL Edward Rogalski; Textron/ Lycoming; Williamsport, PA Tom McCreary; Hartzell Propeller Incorporated; Piqua, OH Ronald J Maynard; Piper Aircraft; Vero Beach, FL
Original Publish Date:	August 22, 2011
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=74771

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

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](#).