



# National Transportation Safety Board Aviation Accident Final Report

---

<b>Location:</b>	Clearwater, FL	<b>Accident Number:</b>	MIA03FA167
<b>Date &amp; Time:</b>	08/21/2003, 1648 EDT	<b>Registration:</b>	N93DC
<b>Aircraft:</b>	Piper PA-31	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>		<b>Injuries:</b>	2 Fatal, 1 Serious
<b>Flight Conducted Under:</b>	Part 91: General Aviation - Business		

---

## Analysis

The airplane experienced an in-flight loss of control and crashed into a residential area. The flight departed VFR and when near the destination airport flew between areas with VIP Level 5 reflectivity. There was no record of a preflight weather briefing. The flight continued towards the destination airport and encountered lesser intensity reflectivity. An individual at the destination airport reported hearing an occupant of the airplane ask, "...for an advisory for the field", and "...what the weather was like." The individual at the airport advised that the winds appeared to be in favor for runway 16, which was left hand traffic, the runway was wet, and the rain seemed to be letting up. There were no further communications from the accident aircraft. A pilot-rated witness located north of the destination airport, and nearly due west of the accident site reported seeing the airplane on what he thought was final approach to runway 16, but the airplane was "very low." The witness reported the airplane made a, "sudden, sharp turn to the left [flying eastbound]." He then lost sight of the airplane and proceeded to the accident site. Another pilot-rated witness who was located in a vehicle approximately 1/4 mile west-northwest of the accident site reported observing an airplane flying from the northwest. The airplane banked to the left flying eastbound at a, "...very slow airspeed and banking and yawing left and right." While flying eastbound it appeared to him that whomever was flying the airplane was executing a go-around as evidenced by the landing gear retracting, followed by the flaps. The airplane then appeared to climb which appeared very unstable, again yawing left and right. The airplane then banked to the right, stalled, and entered a spin impacting the ground. Still another witness who was located approximately 1/10th of a nautical mile east-southeast from the accident site reported he came out of his house after the rain ended and was facing west. He saw the accident airplane from the northwest and thought it had descended lower than normal. The airplane was flying above the tops of nearby trees and while flying in a southeasterly direction, pitched up, "darn near got 90 degrees", rolled to the left, and descended straight down. He reported that he did not hear the engines, and thought he should have been able to hear them if the pilot had "revved them up." He estimated his view of the flight lasted approximately 10-15 seconds, and couldn't tell if the landing gear was extended. He did not see any smoke trailing the airplane, and after the impact he ran into his house, called 911, got into his car, and drove to the scene. He heard an explosion, and saw flames. He got to the airplane and helped rescue a passenger who was beating on the aircraft's door. The

airplane descended nearly vertical in a residential area and damaged trees approximately 30 feet above ground level. A postcrash fire consumed the cockpit, cabin, portions of both wings, and portions of both engines. Examination of the flight controls, both engines, propellers, and propeller governors revealed no evidence of preimpact mechanical failure or malfunction. Accessories of both engines including the magnetos were destroyed by the postcrash fire. Additionally, both servo fuel injectors were heat damaged which precluded bench testing. During disassembly of the right servo fuel injector, the hub stud was found separated from the hub at the fuel diaphragm. No determination was made whether this occurred during disassembly or occurred preimpact. No determination could be made as to who was operating the controls at the time of the accident.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The failure of the flightcrew to maintain airspeed (Vs) resulting in an inadvertent stall, uncontrolled descent, and in-flight collision with the ground.

### Findings

---

Occurrence #1: LOSS OF CONTROL - IN FLIGHT  
Phase of Operation: APPROACH - VFR PATTERN - FINAL APPROACH

#### Findings

1. (C) AIRSPEED(VS) - NOT MAINTAINED - FLIGHTCREW
2. STALL - INADVERTENT - FLIGHTCREW

-----

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER  
Phase of Operation: DESCENT - UNCONTROLLED

#### Findings

3. TERRAIN CONDITION - GROUND

## Factual Information

### HISTORY OF FLIGHT

On August 21, 2003, about 1648 eastern daylight time, a Piper PA-31, N93DC, registered to Clearwater Aircraft, Inc., experienced an in-flight loss of control and crashed into a residential area near Clearwater Air Park, Clearwater, Florida. Visual meteorological conditions prevailed at the time and no flight plan was filed for the reported 14 CFR Part 91 business flight from St. Augustine Airport, St. Augustine, Florida, to Clearwater Air Park. The airplane was destroyed by impact forces and a postcrash fire, and the commercial-rated pilot and pilot-rated right front seat passenger were fatally injured. A pilot-rated passenger sustained serious injuries. The flight originated about 1547, from St. Augustine Airport.

According to a partial transcription of communications with St. Augustine Air Traffic Control (ATC) Tower, at 1537:38, an occupant established contact and advised the controller they would be departing to the west, and requested taxi clearance; the flight was cleared to taxi to runway 13. At 1545:23, an occupant contacted the tower and advised the controller that the flight was ready to depart. The controller questioned the direction of flight and the response was, "westbound towards tampa." At 1546:28, the controller advised, "niner three delta charlie ah roger vfr runway one three cleared for takeoff make your turnout to the ah southwest." An occupant acknowledged the takeoff clearance and southwest departure route and at 1548:43, the tower controller advised the flight frequency change to Jacksonville Approach was approved. An occupant advised the controller that a change in heading was needed for weather avoidance, which the controller approved. An occupant acknowledged the controller approval to the heading change. There were no further communications with the accident airplane with any ATC facilities; the flight proceeded towards the destination airport.

According to an individual located at Clearwater Air Park (destination airport), before the accident occurred, he heard an occupant of an airplane whose registration he could not recall ask, "...for an advisory for the field", and "...what the weather was like." He advised that the winds appear to be in favor for runway 16, which was left hand traffic, the runway was wet, and the rain seemed to be letting up. At a point when the airplane should have landed and had not, he was alerted to the crash by an unknown individual. He called 911, and informed the dispatcher that an airplane had crashed on the runway. He subsequently learned the airplane had not crashed on airport property.

A pilot rated witness located north of the Clearwater Air Park (destination airport), and nearly due west of the accident site reported seeing the airplane on what he thought was final approach to runway 16, but the airplane was "very low." The witness reported the airplane made a, "sudden, sharp turn to the left [flying eastbound]." He then lost sight of the airplane and proceeded to the accident site. Another pilot-rated witness who was located in a vehicle approximately 1/4 mile west-northwest of the accident site reported observing an airplane flying from the northwest. The airplane banked to the left flying eastbound at a, "...very slow airspeed and banking and yawing left and right." While flying eastbound it appeared to him that whomever was flying the airplane was executing a go-around as evidenced by the landing gear retracting, followed by the flaps. The airplane then appeared to climb which appeared very unstable, again yawing left and right. The airplane then banked to the right, stalled, and entered a spin impacting the ground. He called 911 and drove to the Clearwater Air Park. He further reported seeing both propellers rotating during all phases of flight.

Still another witness who was located approximately 1/10th of a nautical mile east-southeast from the accident site reported he came out of his house after the rain ended and was facing west. He saw the accident airplane from the northwest and thought it had descended lower than normal. The airplane was flying above the tops of nearby trees and while flying in a southeasterly direction, pitched up, "darn near got 90 degrees", rolled to the left, and descended straight down. He reported he did not hear the engines, and thought he should have been able to hear them if the pilot had "revved them up." He estimated his view of the flight lasted approximately 10-15 seconds, and couldn't tell if the landing gear was extended. He did not see any smoke trailing the airplane, and after the impact he ran into his house, called 911, got into his car, and drove to the scene. He heard an explosion, and saw flames. He got to the airplane and helped rescue a passenger who was beating on the aircraft's door. Fire rescue arrived and he was told to leave the area.

#### PERSONNEL INFORMATION

The left seat occupant was the holder of a FAA commercial pilot certificate with airplane single engine land, airplane multi-engine land, and instrument airplane ratings. He also was the holder of a FAA certified flight instructor certificate with airplane single engine, airplane multi-engine, and instrument airplane ratings. He was issued a first class medical certificate on July 24, 2002, with the restriction, "must wear corrective lenses." A review of the application for the medical certificate revealed he listed a total time of 600 hours.

The right seat occupant (pilot-in-command) was the holder of a FAA private pilot certificate with airplane single engine land, airplane multi-engine land, instrument airplane, and glider ratings. He was issued a second class medical certificate on July 18, 2002, with the restriction, "must wear corrective lenses and possess glasses for near & intermediate vision." A review of the application for the medical certificate revealed he listed a total time of 760 hours.

No determination could be made as to who was manipulating the controls at the time of the accident.

#### AIRCRAFT INFORMATION

The airplane was manufactured by Piper Aircraft Corporation as a model PA-31, and designated serial number 31-7712017. It was certificated in the normal category and equipped with two Lycoming TIO-540-A2C engines rated at 310 horsepower at 2,400 rpm, and two constant speed, manual feathering Hartzell HC-E3YR-2ATF propellers with FC8468B-6R propeller blades.

A review of the airplane maintenance records revealed the airplane was last inspected in accordance with an annual inspection that was signed off as being completed on August 5, 2002. The airplane total time on that date was 6,019.8 hours. The last entry in the airframe logbook was dated February 8, 2003. The entry indicated replacement of the directional gyro; the airplane total time was 6,042.3 hours.

#### METEOROLOGICAL INFORMATION

There was no record that the pilot obtained a preflight weather briefing for the intended flight. According to the NTSB Meteorological Factual Report, the closest airport with a surface weather observation was the St. Petersburg-Clearwater International Airport (KPIE), St. Petersburg, Florida, which was located approximately 134 degrees and 6 nautical miles from the accident site. A METAR taken at the airport at 1653, or approximately 5 minutes after the

accident, indicates the wind was from 120 degrees at 16 knots gusting to 23 knots. The visibility was 10 statute miles, the present weather-thunderstorms; broken clouds existed at 4,300 feet and 5,500 feet, and overcast clouds existed at 8,000 feet. The temperature and dew point were 24 and 23 degrees Celsius, respectively, and the altimeter setting was 30.02 inHg. The remarks section of the METAR indicated lightning was noted in all quadrants, and rain ended at 1645.

The NTSB Meteorological Factual Report also indicates that the surface analysis chart for 1700 hours, or approximately 12 minutes after the accident does not show any fronts over Florida. A pilot report (PIREP) over PIE at 2,500 feet on the day of the accident at 1615, or approximately 33 minutes before the accident, indicates overcast clouds existed at 2,500 feet. A plot of the flight path of the airplane overlaid onto a image of visible data for the time 1645, or approximately 3 minutes before the accident, indicates at the end of the flight path, clouds were visible. Additional plotting of the flight path of the airplane overlaid onto Tampa Bay Weather Surveillance Radar (TBW WSR-88D) radar images revealed that at 1633:39, the airplane was in an area of NWS/FAA Intensity Level (VIP) 1 reflectivity. Another image at 1638:45, indicates the airplane was between reflectivity of VIP level 5. The reflectivity were approximately 2-3 miles either side of the airplane's ground track. Still another image at 1643:52, indicates the airplane was in an area of VIP level 2 reflectivity.

#### COMMUNICATIONS

The communications to and from the Clearwater Air Park Airport were not recorded. There were no reported communication difficulties.

#### AIRPORT INFORMATION

The Clearwater Air Park Airport is equipped with one runway designated 16/34. The asphalt runway is 3,300 feet long by 75 feet wide, and is equipped with a 4-box visual approach slope indicator (VASI) on the left side of runway 16.

#### WRECKAGE AND IMPACT INFORMATION

The airplane crashed in the front yard of a house located at 1840 Greenlea Drive, Clearwater, Florida. The residence was not damaged and there were no ground injuries. The accident site was located at 27 degrees 59.189 minutes North latitude and 082 degrees 45.664 minutes West longitude, or 003 degrees and .34 nautical mile from the approach end of runway 16 at Clearwater Air Park (destination airport).

Examination of the accident site revealed the majority of the wreckage came to rest in the driveway of the residence near a road; separated portions of the airplane were located on the ground adjacent to trees in the front yard of the residence. The wreckage was upright on a magnetic heading of 278 degrees. Tree contact associated with the right wing was noted 30 feet above ground level. Parts associated with the right wing were noted near the base of the contacted tree. A tree contact approximately 30 feet above ground level was noted to a tree located immediately adjacent to the location where the main wreckage came to rest. Several tree limbs with diameters of 1.25 inches, 2.5 inches, and 4 inches were found on the ground adjacent to the main wreckage. Examination of the tree limbs revealed several exhibited smooth, 45-degree angle cuts to the long axis of the limb with black/gray colored transfer on the cut surface.

Examination of the wreckage revealed the postcrash fire consumed the cockpit, cabin, sections

of both wings, and portions of both engines. All components necessary to sustain flight remained attached or were in close proximity to the main wreckage. Both wings remained secured to the airframe; the outer 7 feet of the left wing remained secured by the aileron flight control cables. The outer 7 feet section of the right wing was separated from the airplane. A section of the leading edge of the right wing was found embedded in the fork of a tree immediately adjacent to the main wreckage. The leading edge skin piece exhibited a semi-circular indentation that was consistent with tree contact. The nose section of the airplane was crushed aft to the instrument panel. The vertical stabilizer remained attached to the airframe and the rudder remained attached to the vertical stabilizer. A section of the rudder and rudder counterweight were separated but found in close proximity to the main wreckage. Both horizontal stabilizers remained attached to the airframe and both elevators remained attached to the horizontal stabilizers. The lower door of the main cabin door was found secured; post accident the latch mechanism was found to operate normally. The landing gear was retracted, and both flap actuators were symmetrically extended 6.25 inches which equates to near full extension. Flight control continuity was confirmed for rudder and elevator. The turnbuckle of the right aileron flight control cable near the control surface was bent and fractured, and the aileron balance cable exhibited tension overload approximately 3 feet inboard of the right aileron bellcrank. The right aileron trim tab actuator was extended 1.25 inches, which equates to full trailing edge tab down, or right wing down trim. The rudder trim tab actuator was extended 1.25 inches, which equates to trailing edge neutral, and the elevator trim tab actuator was extended .625 inch, which equates to 14 degrees trailing edge tab down, or aircraft nose-up.

Examination of the left wing revealed the leading edge exhibited impact and fire damage, and the wing was damaged by fire. The aileron remained attached at both attach points, and the aileron balance weight remained attached to the aileron. The aileron push/pull rod was attached at the bellcrank near the control surface and also at the control surface. The flap remained attached at all three attach points. Examination of the crossfeed valve revealed the arm was in the "up" position which correlates to the position found in the cockpit, or the "off" position. Also, the fuel selector valve was found positioned approximately 1/4 inch from the full "off" position, while the left fuel selector handle in the cockpit was found in the "off" detent. The fuel selector valve operationally tested satisfactory. The firewall shutoff valve was found positioned midrange; the valve was operational. The fuel strainer screen was examined and found to be clean. The engine remained secured to the airframe and the propeller remained secured to the engine; the engine and propeller were buried in the ground. The firewall was nearly separated from the airframe.

Examination of the right wing revealed the leading edge exhibited impact and fire damage, and the wing was damaged by fire. Semi-circular indentations were noted on the leading edge 19 and 67 inches outboard of the inboard aileron root. The wing remained attached at the front attach point and the main spar locations. The upper spar cap of the main spar and 1/2 of the spar web was fractured. The aft spar was burned and separated at the wing root. The aft wing attachment was separated; the attachment bolt remained in position. The flap remained attached at all three attach points. A 19 inch length of aileron remained attached at the inboard hinge to the structurally separated section of the wing. The aileron push/pull rod was bent and fractured near the aileron attach point. The fuel selector valve was positioned to the outboard tank, and the firewall shutoff valve was in the "open" position. The fuel strainer was examined and found to be clean. The propeller remained secured to the engine, but the engine mount

was broken and the firewall was separated from the airframe.

Examination of the cockpit revealed the throttle, propeller, and mixture controls were all forward, and the throttle friction was tight. Examination of the pilot's and co-pilot's seats revealed both were attached to the seat tracks. The forward portion of the pilot's seat was crushed upwards and aft, and the seat pan of the co-pilot's seat was displaced to the right. The left fuel selector was found in the "off" detent, while the right fuel selector was found in the "inboard" detent. The crossfeed selector valve was in the "off" detent. Examination of the combination manifold pressure gauge revealed the left needle was indicating 38 inHg, and the right needle was indicating 42 inHg. Examination of the dual tachometer revealed both needles were off scale low. Both fuel quantity gauges were indicating approximately 3/4 capacity. The airspeed indicator, attitude indicator, and pilot's altimeter were destroyed by the postcrash fire. The vertical speed indicator was indicating 2,600 fpm ascent, and the heading bug on the directional gyro was set to 150 degrees. The radios were destroyed by the post crash fire, and the compass was unreadable.

Examination of the left engine was performed by a representative of the engine manufacturer with FAA oversight. The examination revealed heat damage to the engine and engine accessories which precluded an operational test of the engine. Rotation of the engine crankshaft by hand revealed crankshaft, camshaft, valve train continuity, and continuity to the accessory drives and accessory drive pads. Suction and compression was noted at each cylinder during rotation of the engine crankshaft. Boroscope examination of the tops of each piston and the upper portion of each cylinder revealed no evidence of anomalies. Examination of the servo fuel injector revealed the throttle was at midrange position, and the mixture control was in the rich position. The inlet screen at the servo fuel injector was clean and free of obstructions. The engine compartment flexible fuel lines were fire damaged. Examination of both magnetos revealed heat damage with burned remains of both magnetos attached to the rear of the engine; the steel drive gears of both magnetos were not failed. The ignition harness was destroyed by fire. Examination of the spark plugs revealed the electrode wear was moderate, and the gap settings were normal. The spark plugs from all cylinders with the exception of the bottom plugs from cylinder Nos. 1, 3, and 5 exhibited dry gray color combustion deposits, while the bottom spark plugs from cylinder Nos. 1, 3, and 5 had oil deposits. Examination of the propeller governor revealed the control arm was positioned approximately 1.25 inches from the high rpm stop, and the gasket screen was clean. Examination of the engine-driven vacuum pump revealed heat damage but the pump drive shaft, rotor, and rotor vanes were not failed. The oil filter and oil suction screens were clean; no pre-impact lubrication system anomalies were noted. Examination of the turbocharger components revealed heavy fire damage. The waste-gate was 1/2 open, and the actuator was destroyed. The servo fuel injector, and fuel injector nozzles were retained for further examination.

Examination of the right engine was performed by a representative of the engine manufacturer with FAA oversight. The examination revealed heat damage to the engine and engine accessories which precluded an operational test of the engine. Rotation of the engine crankshaft by hand revealed crankshaft, camshaft, valve train continuity, and continuity to the accessory drives and accessory drive pads. Suction and compression was noted at each cylinder during rotation of the engine crankshaft. Boroscope examination of the tops of each piston and the upper portion of each cylinder revealed no evidence of anomalies. Examination of the servo fuel injector revealed the throttle was at the full-open position, and the mixture

control was in the mid-range position. The inlet screen at the servo fuel injector was clean and free of obstructions. The engine compartment flexible fuel lines were fire damaged. Examination of both magnetos revealed heat damage with burned remains of both magnetos attached to the rear of the engine; the steel drive gears of both magnetos were not failed. The ignition harness was destroyed by fire. Examination of the spark plugs revealed the electrode wear was moderate to advanced, and the gap settings were normal. The spark plugs from all cylinders exhibited dry gray or brown color combustion deposits. Examination of the propeller governor revealed the control arm was positioned approximately 1. inch from the high rpm stop, and the gasket screen was clean. Examination of the engine-driven vacuum pump revealed the drive shaft was heat damaged; the rotor and rotor vanes were not failed. The oil filter and oil suction screens were clean; no pre-impact lubrication system anomalies were noted. Examination of the turbocharger components revealed heavy fire damage. The wastegate was found open, and the actuator was destroyed. The servo fuel injector, and fuel injector nozzles were retained for further examination.

Examination of the left propeller and propeller governor was performed by a representative of the propeller manufacturer with NTSB oversight. The results of the examination of the propeller revealed heat/impact damage which precluded cycling of the propeller pitch change mechanism. Only a portion of the composite spinner dome remained attached to the spinner bulkhead. Propeller blade Nos. 2 and 3 could be manually turned in the hub. The No. 1 propeller blade exhibited a large radius aft bend of approximately 20 degrees when measured midblade, and was bent aft approximately 55 degrees when measured approximately 8 inches inboard from the blade tip. The blade also exhibited forward and aft bending with no twisting on the outer 1/3 span of the blade. The No. 2 propeller blade was heat damaged with the outer 1/2 span missing, and was bent aft approximately 15 degrees when measured midspan. No indication of blade twisting was noted on the remaining blade section. The No. 3 propeller blade exhibited forward and aft bending. The blade was bent aft approximately 45 degrees when measured at the outboard end of the anti-ice blade boot. Further examination of the blade revealed it was bent aft 12 inches from the blade tip and was bent forward approximately 5 inches from the blade tip. The blade was twisted towards low pitch. Disassembly of the propeller revealed the start locks were not damaged, and the pitch change knob for propeller blade Nos. 2 and 3 were fractured with no evidence of preexisting cracks. The inner feather spring was fractured with evidence of preexisting cracks. Based on impact mark on the "preload plate" of the No. 2 propeller blade, the mark equated to a blade angle of 5 degrees. No impact mark was noted on the "preload plate" of the No. 1 propeller blade, and an impact mark on the "preload plate" of the No. 3 propeller blade was determined to have occurred with the propeller blade at a low blade angle. The left propeller governor which exhibited heat damage was placed on a test stand and the feather rpm occurred at 1,250 (specification is 1,700 rpm). The pressure relief valve occurred at 285 psi (specification is 275-300 psi), and the maximum rpm attained was 2,370 (specification is 2,435 + or - 10 rpm). The pump capacity was 10 quarts-per-minute (specification is 8-12 quarts-per-minute).

Examination of the right propeller and propeller governor was performed by a representative of the propeller manufacturer with NTSB. The results of the examination of the propeller revealed heat/impact damage which precluded cycling of the propeller pitch change mechanism. The spinner assembly was missing, and the No. 1 propeller blade could be manually turned in the hub. The Nos. 2 and 3 propeller blades were at or near the low pitch position. The feather stop was "intact and unremarkable." The No. 1 propeller blade was bent



aft approximately 45 degrees at 1/4 span, and was slightly twisted towards low pitch. Rotational scoring was noted on the cambered side of the blade. The No. 2 propeller blade was heat damaged with the outer 1/3 span missing. The outboard end of the blade was bent forward, but the remaining portion of the blade did not exhibit indication of twisting. The No. 3 propeller blade was bent aft approximately 5 degrees when measured near the blade tip; no blade twisting was noted. Disassembly of the propeller revealed the start locks were not damaged, both feather springs were not failed, and the pitch change knob for propeller blade No. 1 was fractured with no evidence of preexisting cracks. Based on impact mark on the "preload plate" of the No. 1 propeller blade, the mark equated to a blade angle of 7 degrees. No impact marks were noted on the "preload plates" of the Nos. 2 and 3 propeller blades. The right propeller governor was not bench tested. Examination of the governor revealed movement of the control arm did not result in movement of the pilot valve. Disassembly of the right propeller governor revealed oil sludge under the head. The pilot valve/speeder spring and rack assembly did not move freely. The control shaft was not failed/fractured. The flyweights, pressure relief valve, relief valve spring, and pump gears were satisfactory. An "old" style relief valve was noted to be installed.

#### MEDICAL AND PATHOLOGICAL INFORMATION

Postmortem examinations of the pilot and passenger were performed by the District Six Medical Examiner's Office. The cause of death for both was listed as multiple blunt trauma.

Toxicological analysis of specimens of the pilot was performed by the FAA Toxicology and Accident Research Laboratory (CAMI), and the District Six Medical Examiner's Office (M.E.'s Office). The results of analysis of specimens of the pilot by CAMI was negative for carbon monoxide, cyanide, volatiles, and tested drugs. The results of analysis of specimens of the pilot by the M.E.'s Office was negative for ethanol, and the drug screen. Caffeine was detected in the urine specimen, and less than 10 percent carbon monoxide saturation was detected in the heart blood specimen.

Toxicological analysis of specimens of the right front seat occupant was also performed by CAMI, and the M.E.'s Office. The results of analysis by CAMI was negative for carbon monoxide, cyanide, volatiles, and tested drugs. The results of analysis of specimens of the passenger by the M.E.'s Office was negative for ethanol, and the drug screen. Caffeine was detected in the urine specimen, and less than 10 percent carbon monoxide saturation was detected in the chest blood specimen.

#### TESTS AND RESEARCH

Review of the airplane maintenance records revealed the servo fuel injector (S/N 71338) which was installed on the right engine at the time of the accident, was overhauled on November 3, 1998, by an "FAA Approved Station #NK2R034L" named D & G Supply. According to the president of the company that last overhauled the servo fuel injector, they purchase fuel and air diaphragms from three separate vendors depending on stock availability. Their records of the overhaul were not available as the FAA only requires them to keep records 2 years. Following overhaul, it was first installed on the left engine of the accident airplane on July 15, 1999. The servo remained installed on the left engine of the accident airplane for 105.4 hours time in service, at which time the left engine was removed for overhaul on October 15, 1999. On that date the maintenance records reflect a different engine by serial number was installed on the left position of the accident airplane. The servo (S/N 71338) which had 105.4 hours time since

overhaul was installed on the right engine position of the accident airplane on November 18, 2000. There was no record that the servo installed on the right engine was removed from that date to the date of the accident.

Examination of both servo fuel injectors and the fuel injector nozzles from both engines was performed with NTSB oversight. Heat damage to both servo fuel injectors precluded bench testing. Disassembly of the left servo fuel injector revealed the upper stem fuel regulator nut was in position, the membrane of the fuel and air diaphragms were destroyed by fire, and the fuel diaphragm stem was not fractured or failed. The mixture packings were also destroyed by fire. Examination of the right servo fuel injector revealed the regulator cover which was noted to be safety wired was removed and the upper stem fuel regulator nut was in position. The membrane of the air diaphragm was destroyed by fire. The upper stem fuel regulator nut removed easily during disassembly. The lower fuel stem adjustment nut was in-position and also removed easily during disassembly. The remaining parts of the regulator assembly were removed and following removal of the center body assembly, the fuel diaphragm hub stud was unthreaded from the hub of the fuel diaphragm. The membrane of the fuel diaphragm was destroyed by fire. The remains of the fuel diaphragm and the separated hub stud were retained for further examination. Visual examination of the fuel injector nozzles from the left engine revealed the nozzle from the No. 1 cylinder was a 2-piece nozzle and the nozzles from the remaining cylinders (2-6) were 1-piece nozzles. All nozzles satisfactory passed the vaporization check. Fluctuation was noted in the spray pattern of nozzles from cylinders 1, 2, and 3. The spray pattern for nozzles from cylinder Nos. 4 and 5 were satisfactory, and the spray pattern from the No. 6 nozzle was noted to be erratic. Testing of all nozzles with respect to flow rate (specification is 31.5 to 33.5 pounds-per-hour (pph)), revealed the Nos. 1, 2, 3, 4, 5, and 6 nozzles tested 33, 22.5, 34, 32, 32.5, and 28.5 pph, respectively. Visual examination of the fuel injector nozzles from the right engine revealed all were a 2-piece nozzle. All nozzles satisfactory passed the vaporization check and nozzle Nos. 1, 2, 4, 5, and 6 exhibited a satisfactory spray pattern. Nozzle No. 3 exhibited a spray pattern to one side. Testing of all nozzles with respect to flow rate (specification is 31.5 to 33.5 pounds-per-hour (pph)), revealed all tested 33 pph with the exception of No. 4, which tested 32.5 pph.

The remains of the fuel diaphragm and separated hub stud from the right servo fuel injector, and a Goode Engineering Corporation fuel diaphragm part number (P/N) GE2541801, were submitted to the NTSB Materials Laboratory located in Washington, D.C. The remains of the accident fuel diaphragm and separated hub stem were submitted in an attempt to determine whether the hub stud was threaded into the fuel diaphragm hub at the time of the post crash fire, or separated during disassembly of the servo fuel injector. The P/N of the fuel diaphragm of the original equipment manufacturer (OEM) is 2541801. The examination of the remains of the fuel diaphragm from the accident servo fuel injector revealed that although unreadable, the markings on the accident hub plate were of the same size, overall length, and in the same position as the provided exemplar fuel diaphragm. The accident submitted components were darkened and slightly sooty which is consistent with high temperature exposure. Examination of the threads of the hub stud that thread into the hub revealed had darker gritty and white powdery deposits in the roots of the threads. Energy dispersive x-ray spectra identified that all the deposits were mostly silicon with different minor constituents. Magnified examination of the internal threads of the hub revealed a shiny brass color contact pattern was observed on the visible flanks of the threads. No deposits were visible on the shiny area. No determination could be made whether the hub stud was or was not threaded into the fuel diaphragm hub at

the time of the post crash fire.

According to the General Manager of the company that has all rights to the FAA Parts Manufacturer Approval (FAA PMA) formerly held by Goode Engineering which is no longer in business but had manufactured fuel and air diaphragms, during manufacture of the fuel diaphragm, the hub stud and hub are prepared for assembly using a primer, and during assembly of the hub stud to the hub, a liquid locking compound is utilized which provides high-strength permanent locking of small diameter components.

Examination of the directional gyro and attitude indicator was performed with NTSB oversight at an FAA certified repair station. Heat damage to both components precluded bench testing of either unit. Examination of the directional gyro revealed the inlet filter was heat damaged but clear of obstructions. Disassembly of the rotor and rotor housing revealed no evidence of rotational scoring on either component. Rotation of the rotor revealed the bearings were not smooth. Examination of the attitude indicator revealed the bezel, mast, and silhouette were missing. A portion of the case was consumed by fire. The rotor was noted to rotate freely inside the rotor housing. No evidence of rotational scoring was noted on either the rotor or rotor housing. Rotation of the rotor revealed the bearings were not smooth.

#### ADDITIONAL INFORMATION

The wreckage minus the retained components was released to Al Sharp, of Aviation Consultant Services on August 24, 2003. All NTSB retained components were released to David Gourgues, insurance adjuster with CTC Services Aviation (LAD, Inc.) on January 24, 2006.

#### Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Piper	<b>Registration:</b>	N93DC
<b>Model/Series:</b>	PA-31	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	No
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	31-7712017
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	6
<b>Date/Type of Last Inspection:</b>	08/01/2002, Annual	<b>Certified Max Gross Wt.:</b>	6500 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	2 Reciprocating
<b>Airframe Total Time:</b>	6019.8 Hours as of last inspection	<b>Engine Manufacturer:</b>	Lycoming
<b>ELT:</b>		<b>Engine Model/Series:</b>	TIO-540-A2C
<b>Registered Owner:</b>	Clearwater Aircraft, Inc.	<b>Rated Power:</b>	310 hp
<b>Operator:</b>	Bruce T. Kendell	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual Conditions	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KPIE, 11 ft msl	<b>Distance from Accident Site:</b>	6 Nautical Miles
<b>Observation Time:</b>	1653 EDT	<b>Direction from Accident Site:</b>	134°
<b>Lowest Cloud Condition:</b>		<b>Visibility</b>	10 Miles
<b>Lowest Ceiling:</b>	Broken / 4300 ft agl	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	16 knots / 23 knots	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	120°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.02 inches Hg	<b>Temperature/Dew Point:</b>	24° C / 23° C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	St. Augustine, FL (KSGJ)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Clearwater, FL (KCLW)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	1547	<b>Type of Airspace:</b>	

## Wreckage and Impact Information

<b>Crew Injuries:</b>	2 Fatal	<b>Aircraft Damage:</b>	Destroyed
<b>Passenger Injuries:</b>	1 Serious	<b>Aircraft Fire:</b>	On-Ground
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	On-Ground
<b>Total Injuries:</b>	2 Fatal, 1 Serious	<b>Latitude, Longitude:</b>	27.986389, -82.761111

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Timothy W Monville	<b>Report Date:</b>	04/25/2006
<b>Additional Participating Persons:</b>	Leslie R Williams; FAA Flight Standards District Office; Tampa, FL Edward Rogalski; Textron Lycoming; Williamsport, PA Robert Martellotti; The New Piper Aircraft, Inc.; Vero Beach, FL Thomas McCreary; Hartzell Propeller, Inc.; Piqua, OH		
<b>Publish Date:</b>			
<b>Investigation Docket:</b>	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at <a href="mailto:pubinq@ntsb.gov">pubinq@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</a> .		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).