National Transportation Safety Board
Aviation Accident Final Report

Location:	MALVERN, AR	**Accident Number:**	FTW96FA230
Date & Time:	05/29/1996, 1835 CDT	**Registration:**	N333LM
Aircraft:	Piper PA-31T	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	5 Fatal
Flight Conducted Under:	Part 91: General Aviation -		

Analysis

After the completion of scheduled maintenance and a normal ground run up, the airplane departed the airport for a local test flight. Witnesses observed the airplane in a nose high attitude, turn to the left, and then saw the nose drop toward the ground approximately 1 1/2 miles from the departure end of the runway. The airplane impacted hilly terrain and was consumed by a postimpact fire. Detailed examination of the airframe, engines, and propellers revealed no defects or anomalies that would have contributed to the accident.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain control of the airplane after takeoff.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
1. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND

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

Factual Information

HISTORY OF FLIGHT

On May 29, 1996, at approximately 1835 central daylight time, a Piper PA-31T, N333LM, owned and operated by Mid South Engineering Company, Hot Springs, Arkansas, was destroyed after impacting terrain shortly after take off from Malvern Municipal Airport, Malvern, Arkansas. All 5 occupants, the airline transport rated pilot and 4 passengers, were fatally injured. Visual meteorological conditions prevailed for the Title 14 CFR Part 91 flight. A flight plan was not filed.

The aircraft had just completed scheduled maintenance by a facility located at the airport. According to maintenance manager, the pilot invited 4 mechanics (all of the mechanics participated in the scheduled maintenance and were friends of the pilot) from the facility to join him for the routine post maintenance acceptance flight. The manager reported that he observed the aircraft execute a ground run up and taxi onto runway 21. After observing what he described as a normal take off roll, he went inside a hangar (he did not witness the take off or initial climb). Shortly thereafter, the aircraft impacted terrain approximately 1 1/2 miles south of the departure end of the runway.

Two witnesses who heard, but did not see the aircraft, were interviewed and provided statements to the investigator-in-charge. While working in their yard, approximately 3/4 miles from the departure end of the runway, they heard the aircraft's engine noise. One of them described the noise as being "very loud." The other described the engines as being "wound out" and at "full speed." Both witnesses stated that they routinely hear engine noise as airplanes either land or depart from the airport. No other airplanes were reported to be in the vicinity at the time of the accident.

Two eye-witnesses were interviewed and provided statements. One of these witnesses, located approximately 1/2 miles south of the accident site, stated that he "heard the plane coming." After looking up, he observed the aircraft "flying level" toward him, and "then it flew straight up, and the engines got louder." He recalled that he "could see the bottom of the plane", and then "it fell to the left and went behind the trees." After hearing a "noise", he observed "smoke" and then called the police. Another eye-witness, located approximately 1/2 mile southeast of the accident site, stated that she heard a "really strange sounding" airplane (similar to airplanes she heard on "cartoons" when they were "spiraling to the ground"). She then observed the "aircraft heading for the ground" in a nose low attitude. She stated that the aircraft disappeared behind trees during the descent and did not observe the impact.

PERSONNEL INFORMATION

The pilot was employed by Mid South Engineering as the chief corporate pilot since 1991, and held a current airline transport pilot certificate with type ratings in the CE-500, DA-10, and DH-4. He was a certified flight and instrument instructor in single and multi-engine airplanes. His personal flight logs were not recovered. However, as of his last medical examination, performed on July 12, 1995, he had a total of 7,500 hours of flight time. Additionally, the operator reported that he had approximately 5,000 hours of multi-engine flight time (1,700 hours of which were in turbine powered aircraft). The operator also reported that the pilot completed PA-31T initial training on November 19, 1991. He completed PA-31T refresher training on December 13, 1993, and most recently on December 13, 1995 (certificates attached

to this report). According to FAA records, the pilot did not have any flight violations.

Both the company president and the maintenance facility manager stated that they felt that the pilot was "safe and responsible."

AIRCRAFT INFORMATION

Manufactured in 1979, the Piper PA-31T, serial number 31T-7920052, was maintained on a 2 Event, 100 hour cycle maintenance program contracted to D-1 Aviation Inc., Malvern, Arkansas. On the day of the accident, Event 1 of the 100 hour cycle was completed. Log book entries had not been completed, however, the maintenance manager stated that the aircraft was airworthy and had no outstanding discrepancies prior to the flight. According to maintenance records, the last Event 2 inspection was completed on December 28, 1995. The last airframe log book entry (April 1, 1996) prior to the accident was for an inoperative cabin heater. The airframe total time as of this log entry was 4,483.5 hours. The exact total time of the airframe at the time of the accident could not be retrieved due to impact damage to the Hobbs meter and tachometer.

The two PT6A-28 model engines (S/N's 51985 and 51983) were original equipment, and were last overhauled in May, 1991. Both engines had total times of 4,453 hours each, as of their last recorded maintenance performed on March 21, 1996. According to maintenance records, the engines were in service for 1,066 hours since overhaul to March 21, 1996. According to company records, both engines were independently subject to scheduled Spectrographic Oil Analysis Programs (SOAP). These data, provided by the company, did not show any abnormal trends.

The two Hartzell model HC-B3TN-3B propeller assemblies (Hub S/N's BU9706 and BU9701) were original equipment. According to maintenance records, S/N BU9706 hub assembly was last overhauled on January 13, 1993. S/N BU9701 hub assembly was last overhauled on July 7, 1992.

Inspection of the airframe, engine and propeller maintenance records revealed no discrepancies of uncorrected maintenance defects. According to the records, the aircraft was in compliance with all applicable Airworthiness Directives.

COMMUNICATIONS

There were no reported communications with the aircraft. The departure airport did not have a tower facility.

WRECKAGE AND IMPACT INFORMATION

The accident site was located approximately 1 1/2 miles southeast of the departure end of runway 21. The terrain was sloping upward away from the airport, and heavily wooded with small pine trees and brush. The entire wreckage area, including ground impressions and debris, encompassed a linear area approximately 80 feet long and 30 feet wide. The center line axis along the energy path was oriented approximately 082 degrees magnetic. The initial impact point was discovered to be a 2 foot deep ground impression, measuring approximately 5 feet wide, and 7 feet long. Evidence at the site (damaged bushes) showed that, after the initial impact, the aircraft slid forward along the energy path for about 80 feet and was consumed by a post impact fire. The main wreckage consisted of the fuselage, both wings, and both engines with nacelles (the empennage was found completely separated from the fuselage and was located between the initial ground impression and the main wreckage). A summary of

the on site findings are presented below and are listed as they were found in-situ along the energy path.

The left propeller cylinder and piston assembly were found separated (fractured) from the propeller hub spider assembly, approximately 10 feet forward of the initial ground impression and 10 feet to the left of the energy path center line. The hub and all three propeller blades (attached to the hub) were found adjacent to the main wreckage near the engine reduction gearbox. One of the blades exhibited bending aft (approximately 30 degrees) and was twisted toward low pitch from mid span to the blade tip. The second blade exhibited bending aft from the inboard portion of the de-ice boot and was twisted toward low pitch. Approximately 1/4 of the blade span (outboard to the tip) was not recovered and appeared to have been consumed by the post impact fire. The third blade was bent slightly aft. Approximately 2/3 of the outer portion of the span was not recovered and appeared to have been consumed by the post impact fire. All three of the left propeller blade faces exhibited chordwise scoring.

The right propeller assembly was found embedded in the ground, approximately 15 feet forward of the initial ground impression and 15 feet to the right of the energy path center line. The piston was found extended and the pitch change links were fractured. One of the propeller blades was found separated from the hub (fractured). The blade was exhibited bending slightly aft and was twisted toward low pitch from approximately 1/3 span outboard toward the tip. The two other blades were found attached to the hub. One of the attached blades was free to rotate by hand within the blade clamp. This blade exhibited bending forward from approximately 1/4 span and was twisted toward low pitch. The second attached blade was found turned approximately 180 degrees within the blade clamp, and was twisted toward low pitch from approximately 1/3 span outboard to the tip. All three of the right propeller blades exhibited chordwise scoring.

The empennage, including elevators and vertical stabilizer, was found approximately 30 feet forward of the initial ground impression along the energy path. As previously stated, it was completely separated from the fuselage. The break occurred at about Flight Station 317, with a portion of the bulkhead and outer skin remaining with the fuselage. Control cables to the elevators and rudder showed evidence of tension overload near the structural separation area. Cable continuity was established from the cable breaks rearward to the rudder and elevator control surfaces. Flight control stops for the rudder and elevator were intact. Both elevator trim tabs were aligned with the elevator surface in the "neutral" position. The rudder trim drum shaft was observed to have a forward extension of 1.25 inches with 8 jackscrew threads visible. This trim reading indicates a near "neutral" setting.

The main wreckage, as previously stated, was found approximately 80 feet forward of the initial ground impression. The fuselage structure was consumed by fire with only the floor boards and wing box beam remaining in a state that could be identified. Flight control cables from the cockpit rearward to the wing box beam were embedded in molten aluminum resultant from the post crash fire but appeared to be intact. Control cable continuity was verified from the wing box beam area outboard to both left and right aileron control wheel chains and rearward to the aforementioned separation point of the empennage. Both firewall fuel shutoff valves were "open" and the crossfeed valve was found "off." The power and propeller condition control quadrant was fire damaged with all levers found in the "full forward" position. The cockpit and cabin were totally consumed by fire. No instrument readings or switch positions could be validated.

The right wing was mostly consumed by the post impact fire. Remaining portions of the leading edge that were not consumed showed impact damage and crushing aft along the span. The aileron bellcrank, control rod, and control cables were found connected. The ailerons and flaps were destroyed by fire. The flap actuator was found fully retracted with no threads visible. Aileron trim showed a forward extension of approximately 1/2 inches with 3.5 threads visible on the jackscrew.

The left wing was partially consumed by the post impact fire. Portions of the leading edge exhibited impact damage and crushing aft along the span. The tip tank was separated from the wing tip and was found laying adjacent to the wing tip. The aileron was intact and the control rod and cables were attached. The flap was mostly destroyed by fire with the exception of a small outboard portion, and the flap actuator was found fully retracted with no threads visible.

The right engine was moderately fire damaged and found upright in the fire consumed airframe nacelle, with engine mounts and firewall attached. The reduction gearbox housing was intact with the propeller and overspeed governors and tachometer generator attached. The propeller shaft was fractured in torsion overload and separated from the propeller mounting flange. The exhaust duct case displayed compression and torsion deformation. The gas generator case displayed compression and torsion deformation aft of the fuel nozzle attach points and forward of the engine mount, and all case mounted controls were found in place with impact and fire damage. The compressor inlet support struts were fractured. The rear housing of the accessory gearbox was completely consumed by fire, and all external gearbox mounted controls were impact fire damaged and held in place by external lines and linkages. Power control and propeller reversing linkages were in continuity from the propeller to the control cam box and control unit input lever. Compressor Discharge Air (P3), and Power Turbine Control (Py) pneumatic lines were found in place with fire and impact damage. All lines were continuous and connections were found safety wired in place. In order to view the power turbine disc, the investigator-in-charge removed the right exhaust stack. The power turbine disc was displaced upwards and aft, and the majority of turbine blades were found fractured adjacent to the blade roots (blade fragments were found laying in the exhaust stack). The power turbine shroud exhibited circumferential machining corresponding to contact with the fractured turbine blade tips. Also inspected was the power turbine guide vane ring and interstage baffle. The vane airfoils were fractured around the upper circumference, and the inner drum and interstage baffle displayed circumferential machining corresponding to axial contact with the displaced power turbine disc.

The left engine was found upright in the fire consumed airframe nacelle with engine mounts and firewall attached. The reduction gearbox was intact with the propeller and overspeed governors, and tachometer generator attached. The exhaust duct case displayed indentations (outward) corresponding to fractured turbine disc blades. The gas generator case exhibited deformations similar to the right engine. The accessory gearbox housing was intact with the high pressure fuel pump and fuel heater units fractured and separated from their respective mounting pads. Power control and propeller reversing linkages were in continuity from the propeller to the control cam box and fuel control unit input lever. Pneumatic lines (P3 and Py) exhibited impact and fire damaged. All lines were continuous and safety wired with the exception of the propeller governor fitting safety wire, which was found impact damaged and fractured in overload. After removal of the left exhaust stack, the power turbine disc was observed to be displaced upwards and aft (similar to the right engine). The majority of the power turbine blades were found fractured adjacent to the blade roots. Some of the blades

were displaced forward in their fir tree slots. The power turbine shroud exhibited circumferential machining corresponding to contact with the turbine blade tips. The vane airfoils of the power turbine guide vane ring were fractured around the upper circumference. The inner drum and interstage baffle showed circumferential machining corresponding to axial contact with the power turbine disc.

Both left and right propeller governors were found attached to their respective reduction gearbox housings and both governor control arms were found in the "low pitch" range (same position on both engines).

No mechanical or structural anomalies were discovered at the accident site that could have contributed to the accident.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy on the pilot was performed by the Arkansas State Crime Laboratory, Medical Examiner Division, Little Rock, Arkansas. Toxicology tests were negative for drugs. Testing for carbon monoxide could not be accomplished due to a lack of suitable specimen. Small amounts of Ethanol and Acetaldehyde were detected in blood and muscle tissue samples. However, the FAA Regional Flight Surgeon stated that these findings are most likely attributed to postmortem production since the specimens received were putrefied.

FIRE

There was no evidence of an in flight fire. In addition to the aforementioned post impact fire that consumed most of the fuselage and wings, there was fire damage to surrounding trees and brush extending for about 1 acre around the main wreckage. Much of the area was still smoldering during the investigation team's on-site documentation and recovery process. Local emergency personnel utilized a bulldozer to cut a road to the accident site and establish a fire break around the area.

SURVIVAL FACTORS

According to rescue personnel, all of the occupants were found in their seats with seat belts locked and there was no evidence of an egress. People who arrived at the scene shortly after the crash, stated that they observed the fuselage tube through the flames and that it was intact and not flattened. The fire was too intense for them to get close.

TESTS AND RESEARCH

Detailed examination and teardowns of the engines and accessories were accomplished under the supervision of the NTSB at the Pratt & Whitney Canada Service Investigation Facilities, Quebec, Canada, on 9-11 July, 1996. During the engine teardowns, it was discovered that both left and right engines showed consistent evidence of powered engine operation at the time of impact. Aside from fire and impact damage, no anomalies were discovered that would have precluded normal engine operation prior to the impact.

Fire and impact damage precluded functional testing of the fuel control units. However, aside from fire and impact damage, disassembly of the units revealed no anomalies that would have affected normal operation.

The propeller and overspeed governors from both engines could not be tested for functionality due to fire and impact damage. However, disassembly of the units revealed no anomalies that would have affected normal operation.

Detailed examination and teardowns of the propeller assemblies were accomplished under the supervision of the NTSB at Hartzell Propeller Inc., Piqua, Ohio, on 2 July, 1996. During the propeller teardowns, both propeller assemblies displayed evidence that they were rotating and absorbing power at impact. The specific amount of power could not be determined. Other than impact and fire damage, no discrepancies were found that would have precluded normal propeller operation. According to the propeller manufacturer, all damage was consistent with ground contact.

Detailed technical descriptions of the engine, accessory, and propeller component and sub-component teardown examinations are attached to this report.

ADDITIONAL DATA

The wreckage was released to the owner's representative.

Pilot Information

Certificate:	Airline Transport; Flight Instructor; Commercial	**Age:**	51, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim.	**Last FAA Medical Exam:**	07/12/1995
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	7500 hours (Total, all aircraft), 700 hours (Total, this make and model), 7500 hours (Pilot In Command, all aircraft), 60 hours (Last 90 days, all aircraft), 30 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N333LM
Model/Series:	PA-31T PA-31T	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	31T-7920052
Landing Gear Type:	Retractable - Tricycle	**Seats:**	0
Date/Type of Last Inspection:	05/29/1996, 100 Hour	**Certified Max Gross Wt.:**	6500 lbs
Time Since Last Inspection:	0 Hours	**Engines:**	2 Turbo Prop
Airframe Total Time:	4483 Hours	**Engine Manufacturer:**	P&W
ELT:	Installed, not activated	**Engine Model/Series:**	PT6A-28
Registered Owner:	MID SOUTH ENGINEERING CO	**Rated Power:**	675 hp
Operator:	MID SOUTH ENGINEERING CO	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	HOT, 0 ft msl	**Distance from Accident Site:**	15 Nautical Miles
Observation Time:	2250 CDT	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Clear / 0 ft agl	**Visibility**	25 Miles
Lowest Ceiling:	None / 0 ft agl	**Visibility (RVR):**	0 ft
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	100°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	29°C / 16°C
Precipitation and Obscuration:			
Departure Point:	(M78)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	1834 CDT	**Type of Airspace:**	Class D

Airport Information

Airport:	MALVERN MUNICIPAL (M78)	**Runway Surface Type:**	
Airport Elevation:	536 ft	**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	4 Fatal	**Aircraft Fire:**	On-Ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	5 Fatal	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	ALEXANDER LEMISHKO	**Report Date:**	10/14/1997
Additional Participating Persons:	DAVID F HALL; LITTLE ROCK, AR THOMAS A BERTHE; QUEBEC, CANADA, MICHAEL MCCLURE; ARLINGTON, TX ROGER STALLKAMP; PIQUA, OH		
Publish Date:			
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