Aviation Investigation Final Report

Location:	Ankeny, Iowa	**Accident Number:**	CHI02FA292
Date & Time:	September 24, 2002, 13:13 Local	**Registration:**	N8782P
Aircraft:	Piper PA-24-260	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	1 Fatal, 2 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The airplane was destroyed when it impacted the terrain during takeoff climb from runway 18. Witnesses reported seeing the airplane bank left after raising its landing gear about 100-150 feet agl. One witness reported hearing the engine overspeed after the landing gear were raised, but that the overspeed was momentary. Another witness observed the airplane in a very steep bank, approximately 80 degrees. He reported the angle of bank was reduced to about 30 degrees prior to ground impact. The passenger who was in the right rear seat of the accident airplane reported that during take-off the engine started "missing." He reported the pilot stated, "This isn't right," and reached to adjust something and soon after the engine smoothed out. The pilot made a radio call (which the witness could not hear) and banked the airplane to the left. He reported the nose and left wing dropped and the airplane's left wing impacted the ground with about a 30 degree angle of bank. The nose of the airplane hit the ground and the airplane spun around, but did not cartwheel, before it came to a stop. The witness reported that he thought the airplane's engine was no longer missing, but was operating normally when the airplane impacted the ground. The airplane wreckage was located in a harvested cornfield about 600 feet east of runway 18. The approximately 65 foot wreckage path was on a heading of about 030 degrees magnetic. A propeller slash was unearthed about 30 feet from the initial point of impact along the wreckage path. The propeller slash was about 51 inches in length measured at ground level, and it measured about 18 inches deep from ground level to the bottom of the slash mark. The north side of the ground slash had been polished smooth and exhibited a gray color on the slash's surface similar to the paint found on the propeller blades. Inspection of the flight controls revealed continuity between all flight controls and their respective control surfaces. Inspection of the engine revealed it rotated and had thumb compression and suction on all cylinders. The propeller blades had rotational scoring of the paint on camber side of the blades, but no twisting or deformation of the tips. The propeller governor's pressure relief valve spring was found broken as a result of a fatigue fracture. A functional test of the propeller governor revealed that the pressure relief setting and the pump capacity were well below specified

minimums. Hartzell Propellers reported, "Such deficiency might cause a propeller to operate at reduced blade angle and higher than normal RPM after take-off." Replacement of the pressure relief valve spring at overhaul was required by Service Bulletin 176 dated November 15, 1991, was not performed. The terrain south of runway 18 at IKV was an open field with few obstacles.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot applied an excessive angle of bank and failed to maintain terrain clearance. An additonal factor was the pilot's attention being diverted.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
1. MAINTENANCE,SERVICE BULLETIN/LETTER - NOT COMPLIED WITH - OTHER MAINTENANCE PERSONNEL
2. PROPELLER GOVERNOR CONTROL - FAILURE,PARTIAL
3. PROPELLER GOVERNOR CONTROL - FATIGUE
4. PROPELLER GOVERNOR CONTROL - LOW PRESSURE
5. PROPELLER GOVERNOR CONTROL - OVERSPEED

Factual Information

HISTORY OF FLIGHT

On September 24, 2002, at 1313 central daylight time, a Piper PA-24-260, N8782P, was destroyed when it impacted the terrain during takeoff climb from runway 18 (5,500 feet by 100 feet, concrete) at the Ankeny Regional Airport (IKV), Ankeny, Iowa. The private pilot received fatal injuries and the two passengers received serious injuries. The Title 14 CFR Part 91 personal flight was departing IKV and the intended destination was the Lee C. Fine Airport (AIZ), Kaiser, Missouri. Visual meteorological conditions prevailed. An instrument flight plan was filed but had not been activated.

The pilot had received a weather brief from a Direct User Access Terminal Service (DUATS). He filed an IFR flight plan with the Fort Dodge Automated Flight Service Station (FSS). The airplane received an IFR clearance on the ground from Des Moines Approach control at 1312, but the airplane never contacted Des Moines Approach Control to activate the clearance.

The pilot of a Piper Saratoga that was holding short for takeoff from runway 18, witnessed N8782P departing runway 18. The pilot reported seeing the accident airplane takeoff and raise its landing gear and immediately bank left after it had climbed no more than 300 feet above ground level (agl). He reported the airplane appeared to be entering a left downwind when the airplane's nose went down and impacted a field east of the runway.

A witness, who was walking north in front of one of the airport's hangars, reported observing the accident airplane takeoff from runway 18. He reported that the airplane looked and sounded normal. He reported that when the landing gear was raised approximately 150 feet agl, he heard the engine overspeed. He reported the overspeed lasted a few seconds and then the engine sound returned to normal. He reported seeing the airplane enter a left turn, which to him appeared normal. He did not continue to observe the airplane and did not see it impact the ground.

A witness, who was walking south in front of one of the airport's hangars, reported that he saw the airplane turn left after takeoff. He reported the airplane entered a steep left bank, approximately 80 degrees angle of bank. He reported the nose dropped and the airplane lost altitude. He reported that as the airplane approached the ground the bank angle was reduced to about 30 degrees. He did not see the airplane impact the ground due to trees obstructing his view.

The father-in-law of the pilot reported that he and his wife were passengers on board the accident airplane. He reported the pilot preflighted the airplane while they waited at Exec 1 Aviation, a local fixed base operator. When they boarded the airplane, he sat in the right rear

seat while his wife was in the right front seat. The pilot and front seat passenger wore their seatbelts and shoulder harnesses, while he wore only the seatbelt since a shoulder harness was not available. He reported that the airplane taxied for takeoff and while they were number two for departure, the pilot conducted a "run-up" and everything appeared normal.

The passenger reported that during takeoff about 100 - 150 feet agl, the engine sounded like it was "missing." He reported that the pilot said, "This isn't right," and reached to adjust something and momentarily the engine smoothed out. The pilot made a radio call (which the witness could not hear) and banked the airplane to the left. He reported the nose and left wing dropped and the airplane's left wing impacted the ground with about a 30 degree angle of bank. The nose of the airplane hit the ground and the airplane spun around, but did not cartwheel, before it came to a stop. The witness reported that he thought the airplane's engine was no longer missing, but was operating normally when the airplane impacted the ground. The witness reported that he remained conscious, but the pilot and front seat passenger were both knocked unconscious. The witness crawled through the broken front windshield, and was then able to assist the right seat passenger out of the airplane. He reported that fire had started to engulf the airplane and he was not able to extricate the pilot.

Emergency responders arrived at the scene and had the two survivors transported to a local hospital. The fire prevented them from rescuing the pilot.

PERSONNEL INFORMATION

The 49-year-old private pilot held single engine land and airplane instrument ratings. He held a Third Class medical certificate that was issued on November 8, 2000. He had a total of about 570 flight hours with 187 in the same make and model as the accident airplane. He had flown about 60 hours in the last 90 days.

AIRCRAFT INFORMATION

The airplane was a single engine Piper PA-24-260, Comanche, serial number 24-4235. The airplane seated four and had a maximum gross weight of 2,900 pounds. The engine was a 260 horsepower Lycoming IO-540-D4A5 engine. The airplane was equipped with LoPresti engine cowl, propeller, and gap seal modifications.

The last annual inspection was conducted on June 21, 2002. The airplane had flown 80 hours since the last inspection and had a total time of 3,654 hours. The last maintenance performed on the airplane at 3,645 hours was on September 13, 2002, when a fuel totalizer was installed.

The engine had 1,623 hours since overhaul, and the propeller had 1,219 hours since new at the time of the accident. The maintenance records indicated the airplane was in an airworthy condition.

METEOROLOGICAL INFORMATION

At 1325, the recorded weather at IKV was: wind 130 degrees at 8 knots, sky clear, visibility 10 statute miles, temperature 18 degrees C, dew point 5 degrees C, altimeter 30.29.

WRECKAGE AND IMPACT INFORMATION

The airplane wreckage was located in a harvested cornfield about 600 feet east of runway 18 at coordinates 41 degrees 41 minutes 40 seconds North latitude, and 093 degrees 33 minutes 12 seconds West longitude. The wreckage path was on a heading of about 030 degrees magnetic. The pitot tube was found at the initial point of impact. A ground scar that proceeded from the initial point of impact to the main wreckage was about 65 feet in length. The airplane's longitudinal heading after the airplane came to rest was about 140 degrees.

A ground impact crater was located about 30 feet from the initial point of impact along the wreckage path. Pieces of the engine cowling were found near the crater. A ground slash was found at the impact crater. It was about 51 inches in length measured at ground level, and it measured about 18 inches deep from ground level to the bottom of the slash mark. The north side of the ground slash had been polished smooth and exhibited a gray color on the slash's surface similar to the paint found on the propeller blades.

Post-impact fire consumed a majority of the fuselage between the engine firewall and the empennage. The mixture, throttle, and propeller controls were found in the full forward position. All flight controls and aircraft components were found at the accident site. The landing gear were found in the up position. The flap jackscrew was measured at 4 inches which indicated 20 degrees of flaps. The flap cables were attached to the flap mechanism. The flap position indicator was destroyed by fire.

The left wing was broken in two where the lower spar cap ends approximately 9 feet 6 inches from the wing root. The inboard section of wing remained attached to the fuselage. The broken outboard section of wing remained attached to the rest of the wing only by the aileron cables, and was found lying under the left horizontal stabilizer. Fire had consumed the dry bay area of the main inboard fuel tank. The left inboard fuel tank had burned through and was not intact. The left wing spars were bent up and aft where the wing was broken in two. The left wing flap had broken off and was found lying in front of the right wing. The left aileron cable was attached to the bellcrank assembly and was traced forward to the control column. The aileron follow up cable between the ailerons was intact. The left main landing gear was in the up position.

The right wing remained attached to the fuselage and was continuous from the wing root to the wingtip. There was a chordwise split at the production splice at the same point that the left wing broke in two. The fire consumed the dry bay area aft of the main right inboard fuel tank in the wing. The top of the right wing inboard fuel tank had been burned off exposing the fuel cell. The right flap was detached and consumed by fire. The wing area past the flap exhibited some burn damage, but a majority of the remaining wing was intact. Except for the

wingtip, there was no leading edge crush damage. The outboard section of the wing exhibited crush damage on the bottom of the wing just aft of the leading edge. The right aileron remained attached. The right aileron cable was attached to the bellcrank assembly. The aileron would move when the cable was pulled. The right main landing gear was in the up position.

The empennage had separated from the fuselage but remained attached by the rudder and stabilator cables. The majority of the vertical stabilizer and left stabilator were intact and received little burn damage. The right horizontal stabilator and right anti-servo tab received impact damage and the leading edge was consumed by fire. The stabilator trim measured 0.120 inches which indicated a nose down trim. The stabilator cables were attached at the control horn and at the control column.

The rudder counterweight and the right stabilator weight were detached from their respective surfaces, but were found at the accident site. The right rudder cable was detached at the horn and found broomstrawed. The cockpit end was traced to the rudder pedals where it was burnt away from the pedal. The left rudder cable was intact and connected to both ends.

The outboard wing fuel tanks in both wings were found intact and containing fuel. Fuel samples were examined for color, odor and clarity. There were no indications of fuel contamination. The fuel selector was functional and found to be on the left main fuel tank.

The examination of the engine revealed that the crankshaft could be rotated, and valve train and the accessory gears exhibited continuity. All cylinders exhibited compression and suction. The magnetos were fire damaged and could not be tested. The inspection of the spark plugs revealed no anomalies. The fuel servo inlet screen, oil filter element, and oil suction screen were found free of debris.

The National Transportation Safety Board's (NTSB) investigator-in-charge (IIC) retained the propeller, propeller governor, and fuel servo for further testing.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot at the Iowa State Medical Examiner's Office on September 26, 2002, in Des Moines, Iowa.

A Forensic Toxicology Fatal Accident Report was prepared by the FAA Civil Aeromedical Institute. The report indicate the following results:

15 (%) Carbon monoxide detected in blood.

0.94 (ug/ml) Cyanide detected in blood.

No ethanol detected in blood.

0.119 Sertraline detected in blood.

Sertraline detected in liver.

0.142 (ug/mL, ug/g) Desmethylsertraline detected in blood.

Desmethylsertraline detected in liver.

Sertraline is a prescription antidepressant. Desmethylsertraline is a metabolite of sertraline.

TESTS AND RESEARCH

The fuel servo, RSA 5AD1, p/n 2524A054, was inspected at RLB Accessory Service in Addison, Illinois. The inspection revealed the fuel servo had received fire damage that prevented functional testing of the unit. No pre-existing anomalies were found.

The three bladed Hartzell propeller, model HC-C3YR-1RF with F7590 blades, was inspected at Hartzell Propeller Inc., in Piqua, Ohio. The inspection revealed the following information:

1. The A blade had rotational scoring in the paint on the camber side. There was no twisting or deformation at the tip. The pitch knob was gouged and bent.

2. The B blade had a large radius bend, bent aft about 20 degrees at 1/4 radius. It also had a slight forward bend on the outer 1/3 of the blade. It had rotational scoring in the paint on the leading edge of the camber side. There was no twisting or deformation at the tip. The pitch change knob was fractured.

3. The C blade was bent aft about 45 degrees at 1/4 radius. It had rotational scoring in the paint on the camber side. There was no twisting or deformation at the tip. The pitch change knob was fractured.

The Hartzell report stated that the damage to the propeller blades "suggested that the engine was developing little or no power at the time of impact." The report stated, "There were no propeller discrepancies noted that would have precluded normal operation. All damage was consistent with impact damage." (See Hartzell Propeller Inc., Aircraft Incident/Accident Report No. 020924)

The propeller governor, F4-4, serial number 823U, manufacture date October 26, 1964, was inspected at Hartzell Propeller Inc., in Piqua, Ohio. The inspection revealed that the propeller governor's component parts were originally manufactured by Hamilton Standard, and Hartzell remanufactured the propeller governor in 1964 for use in its PA-24-260 application.

The inspection revealed that the pressure relief valve was the same type originally used by

Hamilton Standard, but which Hartzell had stopped using in 1967. There was no indication the propeller governor had ever been overhauled. The Hartzell report stated, "Since 1967 Hartzell has specified different, Hartzell manufactured, pressure relief valve components. Replacement with the later components at overhaul has been long standing common practice and is further required by Service Bulletin 176 dated November 15, 1991."

The propeller governor was run on a governor test stand with the following results:

	Specification	Actual
Pressure relief valve	275-300 psi	180 psi
RPM	2420 +/- 10 RPM	2428 RPM
Pump capacity @ 1750 RPM	8 to 12 qt/min.	2.2 qt/min.
Internal leakage	8 oz/min. maximum	6 oz/min.

The pressure relief setting and the pump capacity were below specified minimums. An inspection of the pressure relief valve spring revealed it was fractured. The fractured pressure relief valve spring was sent to the NTSB Materials Laboratory for further examination.

The Hartzell report stated, "Deficient pressure and pumping capacity was noted during governor testing and was attributed to a broken pressure relief valve spring. Such deficiency might cause a propeller to operate at reduced blade angle and higher than normal RPM after take-off." (See Hartzell Propeller Inc., Aircraft Incident/Accident Report No. 020924)

The NTSB Materials Laboratory report stated that scanning electron microscope (SEM) examination of the spring coil fracture surface revealed "the presence of a thumbnail pattern with flat features propagating normal to the surface indicative of fatigue." (See NTSB Materials Factual Report No. 03-011)

ADDITIONAL INFORMATION

The Piper Comanche, PA-24-260, Owner's Handbook stated that the flap setting for a minimum takeoff run was 15 degrees of flaps. There was no requirement for using 20 degrees of flaps. The flap system installed on the PA-24-260 is electrical and the flaps can be lowered and stopped in any desired position.

The terrain south of runway 18 at IKV was a open field with few obstacles.

Parties to the investigation included the Federal Aviation Administration, the New Piper Aircraft Company, Textron-Lycoming, and Hartzell Propeller Inc.

Pilot Information

Certificate:	Private	**Age:**	49,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 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	November 8, 2000
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	June 21, 2001
Flight Time:	570 hours (Total, all aircraft), 187 hours (Total, this make and model), 60 hours (Last 90 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N8782P
Model/Series:	PA-24-260	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	24-4235
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	June 12, 2002 Annual	**Certified Max Gross Wt.:**	2900 lbs
Time Since Last Inspection:	80 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	3654 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-540-D4A5
Registered Owner:	Foxtrot Yankee Inc.	**Rated Power:**	260 Horsepower
Operator:		**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	IKV,910 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	13:25 Local	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	130°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.29 inches Hg	**Temperature/Dew Point:**	18°C / 5°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Ankeny, IA (IKV)	**Type of Flight Plan Filed:**	IFR
Destination:	KAISER/LAKE OZA, MO (AIZ)	**Type of Clearance:**	IFR
Departure Time:	13:25 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	Ankeny Regional Airport IKV	**Runway Surface Type:**	Concrete
Airport Elevation:	910 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	18	**IFR Approach:**	None
Runway Length/Width:	5500 ft / 100 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	2 Serious	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-ground
Total Injuries:	1 Fatal, 2 Serious	**Latitude, Longitude:**	41.694442,-93.553337

Administrative Information

Investigator In Charge (IIC):	Silliman, James
Additional Participating Persons:	Terry Warren; FAA-Des Moines FSDO; Ankeny, IA Aaron Spotts; Textron/Lycoming; Williamsport, PA George Hollingsworth; The New Piper Aircraft Company; Reston, VA Tom McCreary; Hartzell Propellers; Piqua, OH
Original Publish Date:	December 30, 2003
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=55789