Aviation Investigation Final Report

Location:	King George, Virginia	**Accident Number:**	IAD01LA046
Date & Time:	April 22, 2001, 17:30 Local	**Registration:**	N40066
Aircraft:	Piper PA-32R-300	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	4 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The airplane was in cruise flight at 3,500 feet in the vicinity of the Potomac River when the airplane experienced a partial loss of engine power. The pilot said he checked the magnetos and engine controls, and experienced a slight restoration of power when he adjusted the mixture. Within 3 minutes, there was a total loss of engine power. The pilot turned away from the river, and performed a forced landing to a farm pasture. Examination of the airplane at the scene revealed that the # 3 cylinder was loose on the crankcase, and the number 3 intake tube was not installed, and rested in the bottom of the engine compartment. The #3 exhaust riser was found separated at the flange. The flange was found loose, as the two nuts were not tight, with one nut having no washer or lock washer installed. Further examination revealed the 2 case studs and 2 thru studs along the bottom of the # 3 cylinder were broken off. The cylinder was removed and visually examined. The cylinder skirt exhibited chafing and scratching. There was corresponding scratching to the cylinder case pad material. Examination of the fractured cylinder studs revealed fracture surfaces with features consistent with fatigue. The engine was overhauled 14 years and 917 flight hours prior to the accident, and no cylinders had been removed during that time. The engine manufacturer recommended that the engine be overhauled every 2,000 hours or 12 years, whichever occurred first.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The failure of cylinder case and thru studs due to fatigue, which resulted in a loss of engine power over unsuitable terrain.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: CRUISE - NORMAL

Findings
1. (C) ENGINE ASSEMBLY,CYLINDER - LOOSE PART/BOLT/NUT/CLAMP/ETC
2. INDUCTION AIR DUCTING - DISCONNECTED
3. ENGINE ASSEMBLY - SERVICE LIFE EXCEEDED
4. MAINTENANCE,OVERHAUL - NOT COMPLIED WITH
5. (C) MISCELLANEOUS,BOLT/NUT/FASTENER/CLAMP/SPRING - FATIGUE

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

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: EMERGENCY DESCENT/LANDING

Findings
6. (C) TERRAIN CONDITION - NONE SUITABLE

Factual Information

On April 22, 2001, at 1730 eastern daylight time, a Piper PA-32R-300, N40066, was substantially damaged from collision with trees and terrain during a forced landing in King George, Virginia. The certificated commercial pilot and three passengers sustained minor injuries. Visual meteorological conditions prevailed for the flight that originated at Charlottesville, Virginia, destined for Georgetown, Delaware. No flight plan was filed for the personal flight conducted under 14 CFR Part 91.

During a telephone interview, the pilot said the purpose of the flight was to fly his daughter, grandson, and a friend back home from a concert they had attended. He said the airplane was in cruise flight at 3,500 feet in the vicinity of the Potomac River when the airplane experienced a partial loss of engine power. The pilot said he checked the magnetos and engine controls, and experienced a slight restoration of power when he adjusted the mixture. He said that within 3 minutes, there was a total loss of engine power. According to the pilot:

"We left Charlottesville, and got passed off abeam Shannon [Airport], the engine went '[staccato sound]' and lost power. I checked the mags, and pushed the mixture in - and it improved a little - but she was coming down.

"I called Richmond for radar assistance back to Shannon. We were down around 1,200 feet when we lost all power. The only thing I saw was trees and that pasture when we lost all power, so I turned to the pasture.

"When we got close, there was the pasture on the left, the farmhouse, and the ground to the right of the farmhouse kind of sloped away. The pasture was hilly, and the tops and bottoms of the hills were too close together. It didn't look good. I didn't want to land into an upslope, so I turned for the downslope to the right of the farmhouse.

"To the right of the house, the ground fell away, so I turned and pulled to bleed off the airspeed. Then I relaxed the pressure on the wheel and she was on the ground."

During a telephone interview, the pilot's daughter provided a similar description of events. She said:

"We were over the water and he's got this look on his face. So I asked, 'Do we have a problem?' and he said 'yes'. He turned around from over the water back towards land. He kept messing with stuff and nothing worked, and then it just died.

"In about 2 to 3 minutes it stopped running, it just quit. It was deadly silent. Looking at the pasture, it looked straight, but when we got down, it was nothing but bumps. I don't remember

hitting anything on the way down, just one big thump."

During a telephone interview, one witness stated she saw the airplane just prior to touchdown. She said:

"When I saw it, I saw the belly of the plane. The right wing was towards the ground, and the left wing was up. The left wing clipped a tree and the right wing took the top board off of a fence and hit a well casing."

When questioned about the airplane's engine noise, the witness said:

"I didn't hear anything and I didn't see the prop. I was having trouble believing what I was seeing."

The pilot reported that, other than the loss of engine power, the airplane had no performance or handling deficiencies.

Federal Aviation Administration (FAA) safety inspectors examined the wreckage at the site on April 22, 2001. All major components of the airplane were accounted for at the scene.

Examination of the airplane's engine by the FAA inspectors revealed that the number 3 cylinder was loose on the crankcase, and the number 3 intake tube was not installed, and rested in the bottom of the engine compartment. According to the FAA Airworthiness inspector's written statement:

"Initial view of the engine found the #3 cylinder had a loose cylinder hold down thru stud nut at the 10 o'clock position, with sheared studs at the 7 and 5 o'clock positions. A smaller nut at the 11 o'clock position was loose. The sheared thru stud at the 5 o'clock position had the corresponding nut on the #2 cylinder very loose. The #3 intake tube was found disconnected from the cylinder, with the #2 flange attach bolts and seal not located. The threaded holes for these bolts in the cylinder remained intact. The #3 exhaust riser was found separated at the flange. The flange was found loose, as the two nuts were not tight, with one nut having no washer or lock washer installed."

On May 22, 2001, the engine was examined at an aircraft recovery facility in Clayton, Delaware. A Safety Board investigator supervised the examination.

According to the investigator, examination of the engine case for the #3 cylinder revealed that a portion of the lower aft, half-inch case stud and hold down nut was not installed, but found laying in the engine cowling. In addition a portion of the lower forward, half-inch case thru stud and a portion of the two three-eighths case studs were also not installed. The thru stud and hold down nut were also found in the cowling.

The cylinder was removed and visually examined. The cylinder skirt exhibited chafing and

scratching. There was corresponding scratching to the cylinder case pad material.

There were no additional indications of broken studs. However, the lower aft half-inch case stud for the number one cylinder could be turned by a cylinder base wrench using only a slight exertion. Both propeller blades exhibited forward blade face scratching and leading edge nicks.

A Safety Board Materials engineer examined the fracture surfaces of the #3 case and thru studs. According to the engineer's report:

"The macroscopic fracture features of the four lower studs from the number 3 cylinder were examined from photographs including those shown in figures 1 and 2. In the figures, the studs are numbered from aft to forward. Stud number 1, shown in figure 1, had relatively smooth fracture surfaces in offset planes that had a macroscopically faceted appearance, features consistent with fatigue in cylinder studs.

"Stud numbers 2 to 4 had relatively smooth fracture features on the side of the stud closest to the center of the cylinder, features also consistent with fatigue. The fatigue region was in the circumferential plane and covered approximately 80 percent or more of each stud fracture surface. At the opposite side of the stud, the fracture plane changed to an offset angle consistent with overstress fracture. A smooth boundary separated the fatigue and overstress fracture regions."

The airframe and the engine had both accrued 2,780 hours of total time. The airplane's most recent annual inspection was performed January 2, 2001, at 2,772 aircraft hours.

An examination of engine logbook excerpts indicated that the engine was overhauled June 12, 1987 and had accrued 917 hours since that date. No cylinders had been removed from the time of the overhaul, to the date of the accident.

The recommended schedule for engine overhaul was 2,000 hours or 12 years. According to the Textron Lycoming Service Instruction #1009AQ:

"...all engines that do not accumulate the hourly period of time between overhauls specified in this publication are recommended to be overhauled in the twelfth year."

The pilot held a commercial pilot's certificate with ratings for airplane single-engine land, multi-engine land, and instrument airplane. He was a certified flight instructor with ratings for airplane single-engine land and instrument airplane.

The pilot reported 2,800 hours of total flight experience. He said that he had owned N40066 for 19 years, and had approximately 1,000 hours of experience in the PA-32R-300.

At 1701, the weather reported at the Shannon Airport, about 10 miles west of the accident site,

included clear skies with winds from 180 degrees at 6 knots.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	67,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	October 30, 2000
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	November 18, 2000
Flight Time:	2800 hours (Total, all aircraft), 1000 hours (Total, this make and model), 2600 hours (Pilot In Command, all aircraft), 6 hours (Last 90 days, all aircraft), 6 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N40066
Model/Series:	PA-32R-300	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	7780514
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	January 2, 2001 Annual	**Certified Max Gross Wt.:**	3600 lbs
Time Since Last Inspection:	8 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	2780 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-540-K1G50
Registered Owner:	Arthur L. Harris	**Rated Power:**	300 Horsepower
Operator:		**Operating Certificate(s) Held:**	None
Operator Does Business As:	Weonna Leasing Corporation	**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	EZF,85 ft msl	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	17:01 Local	**Direction from Accident Site:**	236°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	180°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.2 inches Hg	**Temperature/Dew Point:**	31°C / 15°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Charlottesville, VA (CHO)	**Type of Flight Plan Filed:**	None
Destination:	GEORGETOWN, DE (GED)	**Type of Clearance:**	None
Departure Time:	17:00 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	3 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	4 Minor	**Latitude, Longitude:**	38.302776,-77.336944

Administrative Information

Investigator In Charge (IIC):	Rayner, Brian
Additional Participating Persons:	Dave Moore; Textron Lycoming; Philadelphia , PA George Bush; FAA; Richmond, VA
Original Publish Date:	May 13, 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=52113