Aviation Investigation Final Report

Location:	Philadelphia, Pennsylvania	**Accident Number:**	NYC06LA089
Date & Time:	April 9, 2006, 10:30 Local	**Registration:**	N901AV
Aircraft:	Piper PA-28RT-201	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

During the takeoff, the pilot heard a loud noise and the engine began to vibrate "severely." The pilot realized that it would not be possible to return to the airport, and elected to land straight ahead. The airplane came to rest approximately 500-700 feet beyond the departure end of the runway. Examination of the airplane revealed that the engine's number 3 cylinder had separated from the engine case. Examination of the number 3 cylinder revealed that it had separated from the engine due to fatigue of the cylinder attachment studs and both through bolts. The fatigue initiated in the lower aft stud and progressed to the other studs and bolts. The engine had accumulated 1,407 total hours of operation since its most recent overhaul.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A fatigue failure of the number 3 cylinder attachment studs, which resulted in a loss of engine power and subsequent forced landing.

Findings

Occurrence #1: LOSS OF ENGINE POWER(PARTIAL) - MECH FAILURE/MALF
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
1. (C) ENGINE ASSEMBLY,CYLINDER - FATIGUE

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

Factual Information

On April 9, 2006, about 1030 eastern daylight time, a Piper PA-28RT-201, N901AV, was substantially damaged during a forced landing after takeoff from Northeast Philadelphia Airport (PNE), Philadelphia, Pennsylvania. The certificated private pilot was not injured. Visual meteorological conditions prevailed, and no flight plan was filed for the 14 CFR Part 91 personal flight.

On the morning of the accident, the pilot completed a preflight inspection, and an engine run-up, both per the checklist, noting no anomalies. He then taxied onto the runway, slowly advanced the throttle, and observed that the engine gauges were "normal." When the airplane reached rotation speed, the pilot initiated a climb, and shortly thereafter retracted the landing gear when no usable runway remained.

As the landing gear retracted, there was a loud noise and the engine began to vibrate "severely." The pilot immediately checked the engine gauges and cycled the landing gear back to the down and locked position. Realizing that it would not be possible to return to the airport, the pilot elected to land straight ahead, and completed an emergency-landing checklist.

The airplane came to rest approximately 500-700 feet beyond the departure end of the runway. During the landing roll, the landing gear collapsed resulting in substantial damage.

A Federal Aviation Administration (FAA) inspector examined the airplane at the scene. Examination of the engine revealed that the number 3 cylinder had separated from the engine case. The piston and connecting rod were found in the forward section of the engine cowling, and the rod end cap was found on the runway near the 6,000-foot distance marker.

The engine was disassembled, and the right engine case half, number 3 cylinder, number 3 cylinder through bolts, connecting rod end, connecting rod end bolts, and connecting rod journal bearings were forwarded to the safety board materials laboratory for further examination.

According to the materials laboratory report, examination of the right engine case half revealed that the area around the number 3 cylinder opening was deformed and gouged consistent with cylinder separation and contact with moving parts after cylinder separation. All of the number 3 cylinder studs were fractured between about .4 and .45 inches from the case surface. The fracture surfaces of each stud, and both through bolts, exhibited features consistent with fatigue.

The fracture surface of the lower, most aft stud, exhibited relatively smooth features on multiple planes across the fracture surfaces, consistent with fatigue under relatively low

stress. The fractures initiated from multiple origins around the circumference of the stud. The two studs on either side of the lower aft stud exhibited relatively smooth features in a flat plane across between about 85 and 90 percent of the fracture surface consistent with fatigue. The fractures of those studs initiated from multiple origins near the cylinder side of the studs. The remaining 3 studs exhibited somewhat rougher features in a flat plane across about 60 to 75 percent of the fracture surface, consistent with fatigue under relatively high stress. The fractures initiated from multiple origins at the cylinder side of the studs, but more toward the aft side of the studs than in the two previously mentioned studs.

Examination of the fracture surfaces of both through bolts revealed that about 10 to 20 percent of the fracture surfaces exhibited relatively smooth features on a flat plane, transitioning to relatively rough features on a slant plane with arrest marks. Features consistent with fatigue and arrested fast fracture under relatively high stress, and multiple fatigue origins were observed.

The accident airplane was a Piper PA-28RT-201, and was manufactured in 1980. Examination of the airplane's maintenance logs revealed that it had accumulated 6,846 total hours of operation at the time of the accident. The engine's most recent overhaul was completed on July 7, 2003. Since that date the engine had accumulated 1,407 total hours of operation.

The pilot held a private pilot certificate with a rating for airplane single engine land. His most recent FAA second-class medical certificate was issued on May 11, 2005. At the time of the accident, the pilot had 308 total hours of flight experience and 29 hours in the make and model of the accident airplane.

The weather reported at Northeast Philadelphia Airport included wind from 010 degrees at 11 knots, visibility 10 statute miles, clear skies, temperature 43 degrees Fahrenheit, dewpoint 25 degrees Fahrenheit, and an altimeter setting of 30.14 inches of mercury.

Pilot Information

Certificate:	Private	**Age:**	40,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	May 1, 2005
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	September 1, 2004
Flight Time:	308 hours (Total, all aircraft), 29 hours (Total, this make and model), 168 hours (Pilot In Command, all aircraft), 20 hours (Last 90 days, all aircraft), 15 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N901AV
Model/Series:	PA-28RT-201	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	28R-8118029
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	Annual	**Certified Max Gross Wt.:**	2750 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	Lycoming
ELT:	Installed, not activated	**Engine Model/Series:**	IO 360-C1C6
Registered Owner:	Northeast Aviation Inc.	**Rated Power:**	200 Horsepower
Operator:	NORTHEAST AVIATION INC	**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	NAHA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PNE,121 ft msl	**Distance from Accident Site:**	
Observation Time:	09:54 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	11 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	10°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.13 inches Hg	**Temperature/Dew Point:**	6°C / -4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Philadelphia, PA (PNE)	**Type of Flight Plan Filed:**	None
Destination:	Robbinsville, NJ (N87)	**Type of Clearance:**	None
Departure Time:	10:30 Local	**Type of Airspace:**	

Airport Information

Airport:	Northeast Philadelphia Airport PNE	**Runway Surface Type:**	
Airport Elevation:	121 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	Unknown
Runway Length/Width:		**VFR Approach/Landing:**	Unknown

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	40.091667,-75.010559

Administrative Information

Investigator In Charge (IIC):	Diaz, Dennis
Additional Participating Persons:	Ernie Scardecchio; Philadelphia FSDO Aaron Spotts; Lycoming Engines; Williamsport, PA Robert Martellotti; Piper; Vero Beach, FL
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Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=63457