



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	Lawrenceville, GA	<b>Accident Number:</b>	ERA09LA050
<b>Date &amp; Time:</b>	11/01/2008, 1630 EDT	<b>Registration:</b>	N2214N
<b>Aircraft:</b>	PIPER PA-44-180	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Landing gear collapse	<b>Injuries:</b>	2 None
<b>Flight Conducted Under:</b>	Part 91: General Aviation - Instructional		

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## Analysis

During touchdown following a practice ILS approach, the nose gear collapsed, resulting in structural damage to the airplane. Examination of the nose gear assembly revealed that the nose gear drag link bolt failed. The bolt was installed on the airplane approximately 441 flight hours prior to the accident, and Piper Service Bulletin (SB) 1156 requires operators to replace the bolt at 500-hour intervals due to a history of fatigue failures. Examination of the failed bolt revealed that it met design specifications for hardness, surface roughness, and microstructure. Further examination indicated that the bolt failed from reversed bending fatigue. The failure mode was atypical of the failure mode that prompted issuance of the SB.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The failure of the nose gear drag link bolt due to reversed bending fatigue.

## Findings

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<b>Aircraft</b>	Nose/tail landing gear - Fatigue/wear/corrosion (Cause)
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## Factual Information

On November 1, 2008, about 1630 eastern daylight time, a Piper PA-44-180, N2214N, was substantially damaged when the nose landing gear collapsed during landing at the Gwinnett County Airport (LZU), Lawrenceville, Georgia. The instructional flight was conducted under 14 Code of Federal Regulations Part 91. Day visual meteorological conditions prevailed, and no flight plan was filed. The certificated flight instructor and commercial-rated student were not injured. The flight originated from LZU at 1530.

The student was performing a practice ILS approach as part of his multi-engine training program. After confirming "gear down, three green, nose gear in mirror," a normal touchdown was performed with no apparent side drift. As the nose was lowered to the runway, the nose gear collapsed. The airplane came to a stop on the runway and the pilots exited the airplane normally.

An inspector from the Federal Aviation Administration inspected the aircraft and reported that the nose gear drag link bolt, Piper part number 402 940, failed. According to the airplane maintenance logbook, the bolt was installed on June 9, 2007. At the time of the accident, the airplane had accrued approximately 441 hours since the bolt was installed. According to the maintenance records, two new bearings associated with the bolt were also installed.

Piper Service Bulletin (SB) number 1156, dated April 7, 2005, applies to this airplane. The SB provides instructions for replacing the nose gear drag link bolt at 500-hour intervals. SB 1156 states that, "By design, the bolt is free to rotate inside a set of bushings to allow relative movement between the Upper and Lower Drag Links during Landing Gear extension and retraction. Over an extended number of operating hours, this rotation can generate the score marks described, causing stress concentrations to develop in the bolt. Left uncorrected, this condition could eventually result in bolt failure, with subsequent nose gear collapse."

According to a representative from Piper, SB 1156 has not been incorporated into the PA-44-180 Aircraft Maintenance Manual (AMM) for this serial-numbered airplane. The SB has been incorporated for serial numbers 4496001 and higher. Piper expects the SB to be incorporated into the AMM for the older aircraft in early 2010.

Following the accident, the failed bolt was forwarded to the NTSB Materials Laboratory for examination. Examination of the accident bolt, using two exemplar bolts provided by Piper for comparison purposes, revealed that the accident bolt met design specifications for hardness, surface roughness, and microstructure.

Further examination of the accident bolt revealed that the bolt failed due to reversed bending fatigue. This is evidenced by diametrically opposed fatigue cracks that terminate at an area of overload fracture towards the middle of the bolts cross-section. The central overload fracture region roughly corresponds to the neutral axis of the reversed bending force on the bolt. The bolt failed due to the merging of numerous fatigue cracks from many fatigue initiation points around the periphery of the bolt shank.

The 1652 weather observation for LZU included the following: scattered clouds at 1,900 feet, winds calm, visibility 10 statute miles, temperature 19 degrees Celsius, dew point 2 degrees Celsius, and altimeter setting of 30.46 inches of mercury.

## History of Flight

Landing-landing roll	Landing gear collapse (Defining event)
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## Flight Instructor Information

<b>Certificate:</b>	Flight Instructor; Commercial	<b>Age:</b>	23, Male
<b>Airplane Rating(s):</b>	Multi-engine Land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Seatbelt, Shoulder harness
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 Without Waivers/Limitations	<b>Last Medical Exam:</b>	06/21/2008
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	07/26/2008
<b>Flight Time:</b>	846 hours (Total, all aircraft), 71 hours (Total, this make and model)		

## Aircraft and Owner/Operator Information

<b>Aircraft Manufacturer:</b>	PIPER	<b>Registration:</b>	N2214N
<b>Model/Series:</b>	PA-44-180	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	No
<b>Airworthiness Certificate:</b>	Normal; Utility	<b>Serial Number:</b>	44-7995226
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	4
<b>Date/Type of Last Inspection:</b>	08/29/2008, 100 Hour	<b>Certified Max Gross Wt.:</b>	3800 lbs
<b>Time Since Last Inspection:</b>	30 Hours	<b>Engines:</b>	2 Reciprocating
<b>Airframe Total Time:</b>	7802 Hours	<b>Engine Manufacturer:</b>	Lycoming
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	O-360
<b>Registered Owner:</b>	FLIGHT SCHOOL OF GWINNETT INC	<b>Rated Power:</b>	180 hp
<b>Operator:</b>	FLIGHT SCHOOL OF GWINNETT INC	<b>Air Carrier Operating Certificate:</b>	None

## Meteorological Information and Flight Plan

Observation Facility, Elevation:	KLZU, 1061 ft msl	Observation Time:	1652 EDT
Distance from Accident Site:		Condition of Light:	Day
Direction from Accident Site:		Conditions at Accident Site:	Visual Conditions
Lowest Cloud Condition:	Scattered / 1900 ft agl	Temperature/Dew Point:	19° C / 2° C
Lowest Ceiling:	None	Visibility	10 Miles
Wind Speed/Gusts, Direction:	Calm	Visibility (RVR):	
Altimeter Setting:	30.46 inches Hg	Visibility (RVV):	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Lawrenceville, GA (KLZU)	Type of Flight Plan Filed:	None
Destination:	Lawrenceville, GA (KLZU)	Type of Clearance:	None
Departure Time:	1530 EDT	Type of Airspace:	

## Airport Information

Airport:	Gwinnett County Airport (KLZU)	Runway Surface Type:	Asphalt
Airport Elevation:	1061 ft	Runway Surface Condition:	Dry
Runway Used:	25	IFR Approach:	ILS
Runway Length/Width:	6000 ft / 100 ft	VFR Approach/Landing:	Full Stop

## Wreckage and Impact Information

Crew Injuries:	2 None	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 None		

## Administrative Information

Investigator In Charge (IIC):	Ralph E Hicks	Adopted Date:	12/29/2009
Additional Participating Persons:	Mike Pupek; FAA/FSDO; Atlanta, GA		
Publish Date:	08/04/2011		
Investigation Docket:	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> .		

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