Aviation Investigation Final Report

Location:	Tallahassee, Florida	**Incident Number:**	ERA14IA019
Date & Time:	October 8, 2013, 12:10 Local	**Registration:**	N640BD
Aircraft:	Piper PA 46 350P	**Aircraft Damage:**	Minor
Defining Event:	Landing gear collapse	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation		

Analysis

After a normal takeoff for the business flight, the airline transport pilot retracted the landing gear; however, the red landing gear warning annunciator light remained illuminated. The pilot chose to divert the airplane to its base airport for landing. During the precautionary landing, the nose landing gear (NLG) collapsed, and the airplane sustained minor damage.

Postincident examination of the NLG components revealed that the aft NLG actuator bolt had fractured at the upper attachment fitting from reverse-bending fatigue, which led to the subsequent collapse of the NLG. The head of the bolt was missing, which precluded verification of the bolt part number. However, the bolt had a drilled shank, which was inconsistent with the specified part number bolt. Although the bolt was not the correct part number, the bolt diameter in the grip and the hardness and material composition conformed to the required specifications; therefore, use of the incorrect part number bolt likely did not cause the fatigue cracking. The fracture and wear patterns on the bolt were consistent with some level of torque having been applied during installation; however, the preincident level of applied torque could not be determined; therefore, it could also not be determined whether inadequate torque on the bolt resulted in the fatigue initiation. Lastly, a tug was frequently used to move the airplane during ground operations, which would have placed additional stress on the NLG attachment; however, the effect of tug usage on the incident bolt could not be determined.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be:

The failure of the nose landing gear (NLG) actuator attachment bolt due to fatigue for reasons that could not be determined during postincident examination, which resulted in the NLG collapsing during landing.

Findings

Aircraft	Nose/tail gear attach section - Fatigue/wear/corrosion
Aircraft	Nose/tail gear attach section - Failure

Factual Information

History of Flight

Initial climb	Sys/Comp malf/fail (non-power)
Landing-flare/touchdown	Landing gear collapse (Defining event)

On October 8, 2013, about 1210 eastern daylight time, a Piper PA46-350P JetProp, N640BD, operated by Municipal Code Corporation, sustained minor damage when its nose landing gear collapsed while landing at the Tallahassee Regional Airport (TLH), Tallahassee, Florida. The airline transport pilot was not injured. Visual meteorological conditions prevailed and an instrument flight rules flight plan had been filed for the flight that departed Sarasota-Bradenton International Airport (SRQ), Sarasota, Florida, destined for Gulfport, Mississippi. The business flight was conducted under the provisions of Title 14 Code of Federal Regulations Part 91.

The pilot reported that the takeoff from SRQ was normal; however, after he retracted the landing gear, the red landing gear warning annunciator light remained illuminated. He cycled the landing gear and observed three corresponding green annunciator lights when the gear handle was selected to the extended position, but he continued to observe the red landing gear annunciator warning light after the landing gear was selected to the retracted position. The pilot elected to divert to TLH, which was where the airplane was based. He again received cockpit annunciator light indications that the all three landing gear were down and locked prior to landing; however, during touchdown, the nose of the airplane continued to slowly drop until the propeller contacted the runway.

Subsequent inspection of the airplane revealed that the aft nose landing gear actuator bolt was fractured. The bolt was installed through mounts on either side of the actuator fitting and through a spherical bearing in the upper fitting for the actuator. The bolt head with about 1-inch of the shank was not recovered. The remaining portion of the bolt, which included the locknut and a washer was retained and forwarded to the NTSB Materials Laboratory, Washington, DC, for examination.

Review of maintenance records revealed that the airplane had been operated for about 2,850 hours since it was modified under a Supplemental Type Certificate (STC) by Rocket Engineering Corporation, Spokane, Washington, on August 13, 2001. The STC called for replacing the original factory installed Lycoming TIO-540 series engine with a Pratt & Whitney Canada PT6A-34 series engine, and included associated airframe alterations.

Examination of the retained components by an NTSB metallurgist revealed that the nose landing gear actuator attachment separated due to the fracture of the bolt at the upper attachment fitting from reverse-bending fatigue. The head of the bolt was missing, which precluded verification of the bolt part number. The installed bolt contained a drilled shank, which was inconsistent with the specified part number of a NAS6607-38 bolt; however, the bolt diameter in the grip, hardness, and material composition conformed to the required specification. The fracture and wear patterns on the bolt were consistent with some level of clamping force applied during installation; however, the level of applied torque was unknown and could not be determined.

An evaluation of the loading spectrum for the nose landing gear attachment and a conversation with a representative from the STC holder revealed that tug loads could be a significant contribution to the overall load profile. In response to an inquiry regarding the frequency that a tug was used to move the incident airplane, a representative of the owner indicated that the airplane took 180 to 270 trips per year, and a tug was utilized approximately 75 percent of the time. [Additional information can be found in the NTSB Materials Laboratory Factual Report No. 14-017 located in the public docket.]

After the airplane was repaired and returned to service, maintenance personnel stated that the bolt required a washer to be installed to occupy a gap between the actuator and the engine mounts. The washer was installed prior to the incident, and when properly torqued, there were no gaps present.

Pilot Information

Certificate:	Airline transport	**Age:**	64,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	August 9, 2013
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	January 12, 2013
Flight Time:	17103 hours (Total, all aircraft), 6256 hours (Total, this make and model), 16000 hours (Pilot In Command, all aircraft), 60 hours (Last 90 days, all aircraft), 25 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N640BD
Model/Series:	PA 46 350P JetProp	**Aircraft Category:**	Airplane
Year of Manufacture:	1990	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	4622095
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	January 20, 2013 Annual	**Certified Max Gross Wt.:**	4299 lbs
Time Since Last Inspection:	55 Hrs	**Engines:**	1 Turbo prop
Airframe Total Time:	4576 Hrs at time of accident	**Engine Manufacturer:**	Pratt & Whitney Canada
ELT:	C126 installed, not activated	**Engine Model/Series:**	PT6A-34
Registered Owner:	MUNICIPAL CODE CORP	**Rated Power:**	565 Horsepower
Operator:	MUNICIPAL CODE CORP	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	TLH,55 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	11:53 Local	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Clear	**Visibility**	
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	40°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	29.95 inches Hg	**Temperature/Dew Point:**	26°C / 19°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	SARASOTA, FL (SRQ)	**Type of Flight Plan Filed:**	IFR
Destination:	GULFPORT, MS (GPT)	**Type of Clearance:**	IFR
Departure Time:	10:50 Local	**Type of Airspace:**	Class C

Airport Information

Airport:	TALLAHASSEE RGNL TLH	**Runway Surface Type:**	Asphalt
Airport Elevation:	83 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	36	**IFR Approach:**	None
Runway Length/Width:	6076 ft / 150 ft	**VFR Approach/Landing:**	Full stop;Precautionary landing;Straight-in

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Minor
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	30.396667,-84.351387(est)

Administrative Information

Investigator In Charge (IIC):	Schiada, Luke
Additional Participating Persons:	Frank Crawford; FAA/FSDO; Tampa, FL
Original Publish Date:	March 2, 2016
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this incident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=88287