Aviation Investigation Final Report

Location:	Tallahassee, Florida	**Incident Number:**	ERA13IA267
Date & Time:	June 3, 2013, 15:20 Local	**Registration:**	N633TC
Aircraft:	Piper PA-34-200T	**Aircraft Damage:**	None
Defining Event:	Flight control sys malf/fail	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

According to the flight instructor, during the initial climb, the student pilot noticed a problem with the elevator trim wheel. The flight instructor moved the trim wheel and noted no resistance. He then looked down at the wheel and observed the trim cable protruding from its side. The flight instructor assumed control of the airplane, advised the tower air traffic controller of the emergency, and landed the airplane without incident.

Examination of the elevator trim cable assembly revealed that the trim cable failed due to fatigue cracking of the individual wires. The wire breaks were so numerous and over such a sizable length that they should have been detectable by a visual inspection. However, a review of the aircraft logbooks revealed that maintenance personnel did not detect the fatigue cracking of the wires during the most recent 100-hour and annual inspections nor during compliance with an airworthiness directive (AD) that required, in part, that all control cables be inspected for broken wires strands and that any broken wire strands be replaced; the inspections and AD were accomplished less than 2 months before the incident.

Probable Cause and Findings

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

The failure of the elevator trim cable due to fatigue cracking, which resulted from maintenance personnel's repeated inadequate inspection of the cable.

Findings

Aircraft	Elevator tab control system - Failure
Personnel issues	Scheduled/routine inspection - Maintenance personnel
Aircraft	Scheduled maint checks - Inadequate inspection

Factual Information

History of Flight

Initial climb	Flight control sys malf/fail (Defining event)
Emergency descent	Flight control sys malf/fail

On June 3, 2013, about 1520 eastern daylight time, a Piper PA-34-200T, N633TC, experienced a trim cable failure during climbout from Tallahassee Regional Airport (TLH), Tallahassee, Florida. The flight instructor (CFI) and student pilot were not injured, and the airplane was not damaged. Visual meteorological conditions prevailed and no flight plan was filed. The airplane was registered to and operated by Florida Flight Training Center under the provisions of Title 14 Code of Federal Regulations Part 91 as an instructional flight. The flight was originating at the time of the incident.

The CFI stated they departed from TLH uneventfully and were climbing through 300 feet when the student pilot noticed a problem with the elevator trim wheel. The CFI moved the trim wheel and noted no resistance when the wheel was turned. Upon looking down at the wheel, he observed the trim cable protruding out from the side of the wheel. The student pilot advised that he was having difficulty controlling the airplane and the CFI subsequently assumed control of the airplane. The CFI advised the tower controller of the emergency and landed the airplane without incident. Examination of the airplane revealed that the elevator trim cable had broken and was protruding from the trim wheel housing.

The elevator trim cable assembly was sent to the NTSB material laboratory for examination. An examination of the trim cable revealed that it was composed of a 1/16 inch diameter wire rope with a swaged-on ball at one end and a swaged-on turnbuckle fitting at the other end. Visual inspection revealed trim cable lubrication along the entire length with no indication of external corrosion. The wire rope section had separated about 5 feet 6 inches from the turnbuckle end and 14 feet 6 inches from the ball end of the cable. The separation was made up of individual wire breaks spread along an approximate 2-inch length of the wire rope. A magnified visual inspection of the cleaned cable established that all but a few wires were fractured directly across the wires with no apparent yielding or deformation. Further, only a few wires (broken or intact) showed either internal or external wear. A scanning electron microscope examination of several of the broken wires revealed features consistent with fatigue progression through the individual wires.

A review of the aircraft logbooks revealed that the failure of the trim cable was not detected on April 25, 2013, -during the 100 hour and annual inspections. Nor was it noted on April 13, 2013, during the compliance of AD 2013-02-13; which states in section 7-149 a) "At each annual or 100 hour inspection, all control cables must be inspected for broken wires strands. Any cable assembly that has one broken wire strand located in a critical fatigue area must be replaced." The inspection was completed 3 months prior to this event.

Flight instructor Information

Certificate:	Flight instructor	**Age:**	27
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	July 21, 2011
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	April 12, 2012
Flight Time:	1500 hours (Total, all aircraft), 500 hours (Total, this make and model), 1200 hours (Pilot In Command, all aircraft), 100 hours (Last 90 days, all aircraft), 40 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N633TC
Model/Series:	PA-34-200T	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	34-7870328
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	April 25, 2013 100 hour	**Certified Max Gross Wt.:**	4570 lbs
Time Since Last Inspection:	117 Hrs	**Engines:**	2 Reciprocating
Airframe Total Time:	7424 Hrs as of last inspection	**Engine Manufacturer:**	CONT MOTOR
ELT:	C91 installed, not activated	**Engine Model/Series:**	TSIO-360 SER
Registered Owner:	HAWKINS ALAN	**Rated Power:**	225 Horsepower
Operator:	Florida Flight Training Center	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	TLH,83 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	14:53 Local	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Scattered / 4700 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 6000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots / 14 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	160°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.88 inches Hg	**Temperature/Dew Point:**	32°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Tallahassee, FL (TLH)	**Type of Flight Plan Filed:**	None
Destination:	Venice, FL (VNC)	**Type of Clearance:**	None
Departure Time:	15:20 Local	**Type of Airspace:**	

Airport Information

Airport:	Tallahassee TLH	**Runway Surface Type:**	Asphalt
Airport Elevation:	83 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	09	**IFR Approach:**	None
Runway Length/Width:	8003 ft / 150 ft	**VFR Approach/Landing:**	Precautionary landing

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	None
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	30.396944,-84.35083(est)

Administrative Information

Investigator In Charge (IIC):	Alleyne, Eric
Additional Participating Persons:	Robert J Nutt; FAA/FSDO; Tampa, FL
Original Publish Date:	April 27, 2015
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=87084