Aviation Investigation Final Report

Location:	Selinsgrove, Pennsylvania	**Accident Number:**	ERA14LA015
Date & Time:	October 4, 2013, 14:20 Local	**Registration:**	N170JH
Aircraft:	Piper PA-22-135	**Aircraft Damage:**	Substantial
Defining Event:	Sys/Comp malf/fail (non-power)	**Injuries:**	2 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot reported that, during takeoff, he applied full throttle and that, when the airplane began to gain airspeed, he pushed the yoke forward to bring the tailwheel off the runway. The tail did not rise, and the airplane subsequently "jumped" off the runway; the pilot pushed the yoke forward again, but the airplane continued to climb. The pilot then decreased the engine power, the airplane's nose lowered, and the pilot pulled back on the yoke to arrest the descent, but the nose did not rise. The airplane continued to descend at a higher rate, and the pilot applied nose-up trim; however, the airplane subsequently impacted the runway.

Examination of the airplane maintenance logbooks revealed that the accident flight was the first flight after an annual inspection had been completed and that the elevator control cables were replaced during the inspection. Examination revealed that the elevator control cables were installed incorrectly and moved the elevators in the direction opposite to that commanded: when the pilot pushed the yoke forward, the airplane climbed, and, when the pilot pulled the yoke aft, the airplane descended. It is likely that the maintenance personnel installed the flight control cables incorrectly and failed to verify that the routing from the elevator cables to the control yoke was correct during the recent annual inspection and postmaintenance check. It is also likely that the pilot failed to perform an adequate preflight check, which required the pilot to verify that all controls were in the proper position.

Probable Cause and Findings

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

The incorrect (reverse) rigging of the elevator cables by maintenance personnel and their subsequent failure to verify that the rigging was correct during postmaintenance checks and the pilot's inadequate preflight check.

Findings

Aircraft	Elevator control system - Incorrect service/maintenance
Personnel issues	Replacement - Maintenance personnel
Personnel issues	Post maintenance inspection - Maintenance personnel
Personnel issues	Lack of action - Pilot
Aircraft	Elevator control system - Inadequate inspection
Personnel issues	Post maintenance inspection - Pilot

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Prior to flight	Aircraft inspection event
Takeoff	Sys/Comp malf/fail (non-power) (Defining event)
Takeoff	Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On October 4, 2013, about 1420 eastern daylight time, a Piper PA-22, N170JH, impacted the runway immediately after takeoff from Penn Valley Airport (SEG), Selinsgrove, Pennsylvania. The private pilot and passenger sustained serious injuries. The airplane was operated under the provisions of Title 14 Code of Federal Regulations Part 91 and no flight plan had been filed. Visual meteorological conditions prevailed for the personal local flight, which was originating at the time of the accident.

According to the pilot, he completed the before takeoff checklist, which included a flight control check of the tailwheel equipped airplane; however, he could not see the elevator from the pilot seat. He taxied the airplane onto the runway, applied full throttle, and when the airplane began to gain airspeed, he pushed the yoke forward in order to bring the tailwheel off the runway. The airplane departed the runway, the pilot pushed the yoke forward again, but the airplane continued to climb at a "low airspeed." The pilot decreased the engine power, the nose of the airplane lowered, and the pilot pulled back on the yoke to arrest the descent. The airplane responded by descending at a higher rate, the pilot applied nose-up trim; however, the airplane impacted the runway. The pilot did not recall any events after the airplane impacted the runway.

According to a witness, he saw the airplane taxiing on the parallel taxiway, then enter the runway without stopping, and begin the takeoff roll. Immediately after the main landing gear departed the runway, the airplane "went into a vertical climb." Then, above the runway, the nose of the airplane dropped, and it descended vertically in a slight left turn. The airplane impacted the runway, which resulted in substantial damage to the wings and fuselage.

According to the airplane maintenance logbooks, the annual inspection was recorded on August 22, 2013, at a total time of 3425.6 hours. The airframe maintenance records indicated that the left hand and right hand elevator cables were replaced at that time.

A postaccident examination of the airplane revealed that the tachometer in the airplane indicated a total time of 3425.9 hours.

In an interview with the mechanics that performed the annual maintenance, they stated that during the annual inspection the mechanics decided to replace the elevator cables since they were frayed. The mechanics routed the new cables in with the part tags attached and a second mechanic confirmed the cable installation. Then, they performed a flight control check utilizing the control column to confirm

the correct installation of the elevator cables. Once checking the airplane, one of the mechanics noticed that a bolt was too short, removed, one cable, replaced the bolt with a longer bolt, and reattached the elevator cable. When asked if they verified the cable rigging, both mechanics stated that they confirmed the correct routing from the elevator cables to the control yoke. In addition, they stated there was no maintenance manual for the airplane and they used the illustrated parts catalog in order to install the cables.

Examination of the airplane by a Federal Aviation Administration inspector revealed that the elevator control cables moved the opposite direction as commanded. When the elevator control cable was operated that corresponded to the yoke being pushed forward, the elevator control surface moved in the upward direction or positioned the airplane in a nose up attitude. When the elevator control cable was operated that corresponded to the yoke being pull aft, the elevator control surface moved downward or positioned the airplane in a nose down attitude.

In the operating instructions for the airplane, under the section labeled "Preflight," it stated that "upon entering the plane, the pilot should ascertain that all controls operate normally and are in proper position and that the door is closed and latched."

In the "Maintenance" section of the PA-22 Owners' Handbook, it stated in the "Leveling and Rigging" section that "In rigging the control system of the Tri-Pacer, this procedure should be followed:
(1) Center the nose wheel, rudder pedals, rudder and ailerons with the interconnecting cables slack at turnbuckles, located behind the baggage compartment.
(2) Check the airplane in flight for proper trim with the interconnecting cables slack.
(3) During the flight check, if ailerons do not line up with the flap trailing edges equally, adjust the aileron tab to obtain proper aileron position."

In addition, the Piper Tri-Pacer Inspection Report, section "D. Fuselage and Empennage Group" task No. 9 of stated to "inspect rudder, elevator and stabilizer trim cables, turnbuckles, guides and pulleys for safety, damage, corrosion and operation."

Pilot Information

Certificate:	Private	**Age:**	34
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	November 5, 2012
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	9999 hours (Total, all aircraft), 9999 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N170JH
Model/Series:	PA-22-135	**Aircraft Category:**	Airplane
Year of Manufacture:	1953	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	22-1645
Landing Gear Type:	Tailwheel	**Seats:**	
Date/Type of Last Inspection:	August 22, 2013 Annual	**Certified Max Gross Wt.:**	2000 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	3426 Hrs as of last inspection	**Engine Manufacturer:**	LYCOMING
ELT:	Installed	**Engine Model/Series:**	O-290 SERIES
Registered Owner:	On file	**Rated Power:**	0 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	SEG,463 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	18:53 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 3800 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.02 inches Hg	**Temperature/Dew Point:**	27°C / 19°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Selinsgrove, PA (SEG)	**Type of Flight Plan Filed:**	None
Destination:	Selinsgrove, PA (SEG)	**Type of Clearance:**	None
Departure Time:	14:20 Local	**Type of Airspace:**	

Airport Information

Airport:	Penn Valley Airport SEG	**Runway Surface Type:**	Asphalt
Airport Elevation:	465 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	17	**IFR Approach:**	None
Runway Length/Width:	4760 ft / 75 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Serious	**Latitude, Longitude:**	40.820835,-76.863891(est)

Administrative Information

Investigator In Charge (IIC):	Moats, Heidi
Additional Participating Persons:	John Sibole; FAA/FSDO; Harrisburg, PA
Original Publish Date:	October 27, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=88271