Aviation Investigation Final Report

Location:	Clearwater, Florida	**Incident Number:**	CEN13IA270
Date & Time:	April 24, 2013, 17:20 Local	**Registration:**	N139SL
Aircraft:	Piaggio P180	**Aircraft Damage:**	Minor
Defining Event:	Sys/Comp malf/fail (non-power)	**Injuries:**	6 None
Flight Conducted Under:	Part 91: General aviation		

Analysis

During landing, the nosewheel touched down, and the pilot heard the tire "squeal" and then felt the airplane gradually veer right. The pilot attempted to correct the turn by applying left rudder, left braking, and left-engine reverse thrust. The airplane came to a stop with the nose pointed more than 90 degrees right of the runway centerline. Examination of the nose landing gear steering manifold revealed that it had recently been overhauled but that the overhaul was not conducted in accordance with the manufacturer's component maintenance manual (CMM); the overhaul facility used unapproved alternative tooling because it did not have the required tooling to conduct the overhaul as specified in the CMM. The nose landing gear steering manifold exhibited internal damage consistent with metal tooling marks that resulted from the use of improper tooling during the overhaul and led to the failure of the nose landing gear steering manifold during landing.

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 steering manifold during landing, which resulted in an uncommanded and uncontrollable right turn, and the overhaul facility's improper overhaul of the nose landing gear steering manifold.

Findings

Aircraft	Nose/tail landing gear - Malfunction
Personnel issues	(general) - Maintenance personnel
Personnel issues	Knowledge of procedures - Maintenance personnel

Factual Information

History of Flight

Landing-landing roll	Runway excursion
Landing-landing roll	Sys/Comp malf/fail (non-power) (Defining event)

On April 24, 2013, about 1720 eastern daylight time, a Piaggio P180 airplane, N139SL, received minor damage during a runway excursion at the St. Petersburg-Clearwater International Airport (KPIE), Clearwater, Florida. The air transport pilot and 5 passengers were not injured. The airplane received minor damage to the nose landing gear and wheel. The airplane was registered to Anoil Co. and operated by Avantiar under the provisions of 14 Code of Federal Regulations Part 91 as a business flight. Visual meteorological conditions prevailed for the flight and no flight plan was filed. The local flight originated from KPIE about 1550.

During landing, when the nose wheel touched down, the pilot heard the sound of a tire squeal and then felt the airplane gradually veer to the right. The pilot attempted to correct the turn by applying left rudder, left braking, and left engine reverse thrust. The airplane came to a stop with the nose pointed more than 90 degrees to the right of the runway centerline. Only the nose landing gear exited the runway.

The operator examined the nose landing gear after the event and performed multiple tests in attempt to determine the cause of the malfunction. When the hydraulics were turned on and the electric steering turned off, the steering actuator actuated the wheels 50 degrees to the right. When the electric steering was turned on, the steering actuator actuated the wheels back to the center position or 0 degrees. The steering manifold, serial number M/DAG74/04; part number 114180003, was removed from the nose landing gear and retained for further examination.

The nose landing gear and steering manifold were overhauled by Advantage Aviation Technologies II, LLC (AAT) on March 15, 2013. According to the AAT work order, the steering manifold was overhauled in accordance with Component Maintenance Manual (CMM) 32-50-50, Revision 6.

A post incident examination was conducted on the steering manifold. The purpose of this examination was to reveal any mechanical malfunctions or failures of the component. It was also to discover and evaluate the overhaul procedures used by AAT.

The testing procedures used by the group were the manufacturer's Component Maintenance Manuals (CMMs) which are the correct manuals to use when overhauling the landing gear and its components.

The feedback and control readings were all completed on an analog scale as provided by AAT, not a digital scale as specified in the CMM. The Test Box DRT66770, as specified in the CMM, was not available during testing and was never used by AAT during the overhaul because they do not possess one. A 1985 era Dowty-Rotol Ltd. wiring diagram, 460006820 - sheet 2 of 5, was located at AAT and was used to engineer a replacement test box which was used in all tests performed by AAT and by the

group. None of the other required tooling and test boxes, as specified by the CMM, were available at AAT.

The steering manifold was first connected to an exemplar Piaggio P180 landing gear. With the system electrically de-energized and hydraulic pressure available the actuator steered left without any commands or inputs. The bias steering check was accomplished and the actuator always actuated to the left. The test was performed twice and the actuator arm moved 6 degrees the first time and about 14 degrees the second time. The tests did not replicate the uncommanded right turn as experienced during the runway excursion.

The steering manifold was then connected to a hydraulic test rig and tested per CMM 32-50-50, Revision 8, which was the most current revision at the time of the examination. The group decided that the tests were invalid because ATT did not possess the specified test box. The manifold did not pass any of the other CMM functional tests because the solenoid valve inside the manifold would not close properly.

The manifold was then disassembled and examined in order to reveal any anomalies inside the unit that would not allow normal operation.

The examination revealed multiple scratches and damage noted to the armature plate and retainer ring. One wave washer and two shims, which measured 0.003 inches in thickness, were located inside the sleeve assembly. The wire connected to the electrical connector was damaged and had a white insulation sleeve placed over it, which ATT had installed during the overhaul. The installation of the insulation sleeve was not a specified procedure in the CMM.

A review of the original overhaul paperwork revealed multiple discrepancies. ATT omitted procedures during the overhaul. AAT used alternative tooling which was not approved by the CMM and not referenced in the overhaul paperwork. AAT did not possess any written procedures to which they worked from to validate that the work was completed properly.

The manifold was not able to be tested as required in the CMM, as the overhaul facility did not possess the required equipment and tooling and testing equipment.

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	48
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	March 4, 2013
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	January 30, 2013
Flight Time:	6553 hours (Total, all aircraft), 1115 hours (Total, this make and model), 9 hours (Last 90 days, all aircraft), 3 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piaggio	**Registration:**	N139SL
Model/Series:	P180	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	1104
Landing Gear Type:	Tricycle	**Seats:**	10
Date/Type of Last Inspection:	April 23, 2013 Continuous airworthiness	**Certified Max Gross Wt.:**	12100 lbs
Time Since Last Inspection:	2 Hrs	**Engines:**	2 Turbo prop
Airframe Total Time:	7989 Hrs at time of accident	**Engine Manufacturer:**	Pratt & Whitney
ELT:	Installed, not activated	**Engine Model/Series:**	PT6A-66
Registered Owner:	Anoil Co	**Rated Power:**	850 Horsepower
Operator:	AVANTAIR INC	**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:		**Operator Designator Code:**	V2JA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KPIE,11 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	16:53 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	320°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.09 inches Hg	**Temperature/Dew Point:**	28°C / 16°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Clearwater, FL (KPIE)	**Type of Flight Plan Filed:**	None
Destination:	Clearwater, FL (KPIE)	**Type of Clearance:**	VFR
Departure Time:	15:53 Local	**Type of Airspace:**	

Airport Information

Airport:	St Petersburg-Clearwater Inter KPIE	**Runway Surface Type:**	Asphalt
Airport Elevation:	11 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	36R	**IFR Approach:**	None
Runway Length/Width:	9730 ft / 150 ft	**VFR Approach/Landing:**	Full stop;Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Minor
Passenger Injuries:	5 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	6 None	**Latitude, Longitude:**	27.905,-82.687225(est)

Administrative Information

Investigator In Charge (IIC):	Lindberg, Joshua
Additional Participating Persons:	Tony Baumgard; FAA; Dallas, TX Bob Haynes; FAA; Orlando, FL
Original Publish Date:	March 24, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=86858