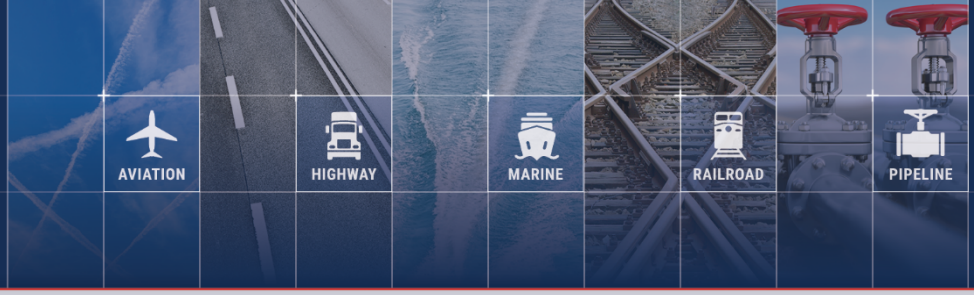

Aviation Investigation Final Report

Location:	Flint, Michigan	**Accident Number:**	CEN12LA066
Date & Time:	November 16, 2011, 09:40 Local	**Registration:**	N168SL
Aircraft:	PIAGGIO AERO INDUSTRIES SPA P180	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control on ground	**Injuries:**	4 Minor
Flight Conducted Under:	Part 91 subpart k: Fractional		

Analysis

During climb to cruise, the captain increased left engine power and the engine power lever became jammed in the full forward position. This condition resulted in an engine overtorque and overtemperture condition, and the captain shut down the left engine. After the engine shutdown, both primary flight display screens went blank. The captain reset the right generator and the flight displays regained power and display. Due to the engine shutdown, the captain diverted to a nearby airport and attempted a single-engine precautionary landing in visual flight rules conditions.

Based on wind conditions at the airport (290 degrees at 18 knots), runway 27 was being used for operations. During the descent, the crew became confused as to their true heading and were only able to identify runway 27 about a minute before touching down due to a 50-degree difference in heading indications displayed to the crew as a result of the instrument gyros having been reset. Accurate heading information would have been available to the crew had they referenced the airplane's compass. Having declared an emergency, the crew was cleared to land on any runway and chose to land on runway 18. After touchdown, the captain applied reverse thrust on the right engine and the airplane veered to the right. The airplane flight manual's single-engine approach and landing checklist indicates that after landing braking and reverse thrust are to be used as required to maintain airplane control. The airplane continued to the right, departed the runway surface, impacted terrain, flipped over, and came to rest inverted. At the point of touchdown, there was about 5,000 feet of runway remaining for the landing roll. The loss of directional control was likely initiated when the captain applied reverse thrust shortly after touchdown, and was likely aggravated by the strong crosswind. Postaccident examination of the airplane showed a clevis pin incorrectly installed by unknown maintenance personnel that resulted in a jammed left engine power lever. No additional

anomalies were noted with the airplane or engines that would have precluded normal operation.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The captain's failure to maintain directional control during landing with one engine inoperative. Contributing to the accident was an improperly installed clevis pin in the left engine power lever, the crew's delay in accurately identifying their heading, and their subsequent selection of a runway with a strong crosswind.

Findings

Personnel issues	Identification/recognition - Pilot
Aircraft	Directional control - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Aircraft	Power lever - Malfunction
Aircraft	Power lever - Incorrect service/maintenance
Environmental issues	Crosswind - Decision related to condition

Factual Information

History of Flight

Enroute-climb to cruise	Loss of engine power (partial)
Landing-flare/touchdown	Loss of control on ground (Defining event)
Landing-flare/touchdown	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On November 16, 2011, approximately 0940 eastern standard time, a Piaggio Aero Industries S.p.A. P180 airplane, N168SL, operated as Avantair, Inc., flight 168, impacted terrain during a runway excursion at the Bishop International Airport (KFNT), Flint, Michigan. The captain, first officer, and two passengers sustained minor injuries. The airplane sustained substantial damage. The flight was being conducted under 14 Code of Federal Regulations Part 91 subpart K. Visual meteorological conditions prevailed and an instrument flight rules flight plan was filed. The airplane departed the Detroit Metropolitan Wayne County Airport (KDTW), Detroit, Michigan, at 0906, and was destined for the West Bend Municipal Airport (KETB), West Bend, Wisconsin.

According to company and maintenance records, the airplane arrived at Toronto Pearson International Airport (CYYZ), Toronto, Canada, on November 14th. After the flight, the flight crew (which included the accident flight first officer) noted in the airplane flight logbook a problem with excessive generator amperage split and the left engine power lever would not go into beta or reverse. At the request of the company, a local maintenance company was contacted to perform corrective action. On November 15th, maintenance personnel performed corrective actions. The corrective actions to the generator were: Left and right generator control units were removed, ground points cleaned, and units were swapped in accordance with the airframe maintenance manual. The corrective actions to the left power lever were: the left power lever system was cleaned, inspected and lubricated and ground runs were performed in accordance with the airframe and engine maintenance manuals. The airplane was then returned to service.

On November 16th, the airplane departed CYYZ and flew for approximately 50 minutes to KDTW. No discrepancies were noted by the flight crew during that flight.

According to the cockpit voice recorder (CVR) transcript and crew statements, at 0925 while climbing through flight level 220 to KETB, the crew noted the left engine torque was 94% and needed to be increased for the climb. The captain attempted to move the left engine power lever; however, he noted resistance. The first officer stated, "that's what it was doing the other day too." The captain applied additional pressure to the lever, a pop sound was heard, and the engine began to over torque and over temp. The captain decided to shut down the engine,

declare an emergency, and divert to KFNT.

Shortly after the left engine was shut down, the crew noted that both primary flight display screens went blank. The captain reset the right generator and the flight displays regained power and display. During the descent, the crew noted a 50 degree difference in the heading indications which they attributed to the instrument gyros resetting themselves. The captain stated he was unable to verify runway direction with the heading indicators. At 0930, the crew contacted KFNT approach control. The first officer explained the emergency and requested the recommended runway. The controller replied, "...we're doing visual approaches to runway two seven today. The current wind is three zero zero at one five [knots]..." The first officer acknowledged runway 27. The first officer then informed the passengers they were landing at KFNT because they shut down the left engine.

At 0932:15, approach control instructed the crew to fly heading 080. The first officer then stated the 080 heading to the captain and asked, "Where are you going?" The captain then turned on the autopilot. At 0933:45, approach control instructed the crew to turn right heading 090. The crew then began the single-engine descent and approach checklists. At 0934:19, the first officer reported the airport in sight and they were going to "make ah circle around for two seven." Approach control cleared the airplane for landing runway 27 and asked the airplane to report turning onto the base leg of the visual approach. The crew then continued with the checklists.

At 0936:26, the captain told the first officer he was descending to 3,000 feet mean sea level (msl) and in a left turn to base. The first officer stated, "we're not turnin' base." Between 0936:33 and 0939:11, there was discussion between the crew regarding to which runway they were tracking towards and discussion between the first officer and KFNT tower to which runway they intended for landing. At 0938:31, the first officer asked the tower controller, "ah yes ma'am ah now we're just noticing our gyros are ah messed too our...are we ah on base for two seven?" The tower controller did not reply to the first officer. At 0939:08, the tower controller cleared the airplane to "land any runway." The first officer responded to the control tower "ah we're takin' this one here. We're turnin' base to final." The tower controller reported the wind was from 290 degrees at 18 knots.

The sound of touchdown was recorded at 0940:21 on runway 18 (7,848 feet by 150 feet). At 0940:30, a sound similar to the propellers transitioning into beta/reverse was recorded. The captain reported he brought the right power lever aft and into beta. He applied left rudder and the airplane veered to the right. The captain stated that he "took out some reverse, then I applied with enough to get us slowed down." The airplane went further right and the captain applied full left rudder and left brake. He reported the engine sounds during reverse were different than usual. The airplane departed the runway surface near the 4,000-feet-remaining runway marker, flipped over, and came to rest inverted. The four occupants exited the airplane with the assistance of airport rescue personnel. The flight crew reported they did not engage the nosewheel steering during the landing.

PERSONNEL INFORMATION

The captain held airline transport pilot and commercial pilot certificates. On the airline transport pilot certificate he had an airplane multi-engine land rating, and on the commercial certificate he had an airplane single-engine land rating. He was issued a first class medical certificate on November 10, 2010. On the NTSB Pilot/Operator Aircraft Accident/Incident report, the company indicated the captain had 3,851 total flight hours, and 2,023 flight hours in the accident make and model airplane, with 113 listed as pilot-in-command. The captain's last flight review was completed on June 8, 2011.

The first officer held airline transport pilot and private pilot certificates. On the airline transport pilot certificate he had an airplane multi-engine land rating, and on the commercial certificate he had an airplane single-engine land rating. He was issued a second class medical certificate on February 14, 2011. On the NTSB Pilot/Operator Aircraft Accident/Incident report, the company indicated the first officer had 3,957 total flight hours, and 259 flight hours in the accident make and model airplane, with 0 hours as pilot-in-command. The first officer's last flight review was completed on July 17, 2011.

AIRCRAFT INFORMATION

The airplane was manufactured in 2007 by Piaggio Aero Industries S.p.A. as model P180, and designated serial number 1139. It was powered by two 850-shaft-horsepower Pratt & Whitney PT6A-66B engines and equipped with two Hartzell HC-E5N five-bladed propellers.

The airplane was maintained in accordance with an approved continued airworthiness inspection program. On November 9, 2011, a "C" check was completed at a total airframe time of 4,422 hours. During the "C" check, an inspection of the engine controls, levers, cables, and power level switch was performed in accordance with the airframe maintenance manual, which did not require the disconnection of any linkage or cables.

The left engine was installed on the airframe on August 20, 2011.

METEOROLOGICAL INFORMATION

At 0953, the KFNT automated surface observing system reported the wind from 280 degrees at 16 knots, visibility 10 miles, sky clear, temperature 4 degrees Celsius, dew point minus 3 degrees Celsius, and an altimeter setting of 29.91 inches of Mercury.

FLIGHT RECORDERS

The airplane was equipped with a L-3 Communications CVR, model FA 2100-1010, serial number 000330603, which recorded and retained the most recent 30 minutes of CVR operation. The four channels of audio are stored in solid-state memory modules. Of the four channels of audio information, one is for each flight crew member, and one channel is for the

cockpit area microphone (CAM); the fourth channel is not used.

Inspection of the CVR revealed no damage, and the audio information was extracted from the recorder normally without difficulty. The recordings from each flight crew member audio panels were excellent quality, while the audio channel from the CAM was fair quality.

Timing on the CVR transcript was established by correlating the air traffic control recording transmission time to the corresponding CVR event.

The CVR group meeting convened on November 23, 2011, and a partial transcript was prepared for the last 24 minutes, 2 seconds of the 31-minute, 4-second digital recording.

WRECKAGE AND IMPACT INFORMATION

Postaccident examination by Federal Aviation Administration inspectors of the accident site and airplane showed tire skids marks beginning near the runway centerline approximately 3,250 from the approach end of the runway. The tire skid marks continued in a right arc pattern until the airplane departed the runway surface, approximately 4,100 feet from the departure end of the runway. Tire skids marks, consistent with the nosewheel, led to the impact of the 4,000-foot runway-remaining sign for runway 18. Approximately 65 feet from the sign, a ground scar, consistent with the left wing, was observed. The airplane came to rest inverted 83 feet from the ground scar.

The left wing was partially separated outboard of the engine. The forward fuselage, including the left and right canards, was fragmented. The empennage, aft of the rear bulkhead, was partially separated from the fuselage. The left propeller was found in the feathered position.

Examination of the left engine revealed that the Beta clevis pin was installed in reverse, which caused an interference with a fuel control unit interconnect rod. Due to the interference, the power lever control linkage was jammed in the full power position.

Inspection of the generators and the electrical system revealed no anomalies.

Due to airframe and system damage, the nose landing gear assembly could not be tested and was removed for further examination.

TEST AND RESEARCH

Nose Landing Gear Assembly

From January 31 to February 1, 2012, the nose landing gear assembly and nosewheel steering system were examined at the facilities of Aero Precision Repair and Overhaul under the supervision of the NTSB investigator-in-charge. The nose landing gear assembly was installed on a test fixture and testing in accordance with the manufacturer's component maintenance

manual was completed. During the test, an uncommanded right turn of the nose landing gear occurred. Examination of the steering actuator revealed the follow-up potentiometer was damaged. A replacement steering actuator was installed and no anomalies were noted with the remainder of the nose landing gear assembly test.

The steering actuator was disassembled. Water was found within the actuator piston dry area, which also contained the follow-up potentiometer. The feedback potentiometer was inspected and damage on the wire harness, consistent with the impact and/or airplane recovery, was noted. One wire was found broken within the wire insulation, and two additional wires were found crimped.

No anomalies were noted with the nose landing gear assembly that would have precluded normal operation prior to the impact with terrain.

Airplane Flight Manual

The following excerpt is from the airplane flight manual single-engine approach and landing procedure, after touchdown:

9. Brakes and reverse - AS REQUIRED
10. Landing distance - INCREASE the flaps DN landing distance approximately:

30% if reverse thrust is not applied, or
25% if reverse thrust is applied

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	33,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	November 10, 2010
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	June 8, 2011
Flight Time:	3851 hours (Total, all aircraft), 2023 hours (Total, this make and model), 1113 hours (Pilot In Command, all aircraft), 159 hours (Last 90 days, all aircraft), 56 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Co-pilot Information

Certificate:	Airline transport; Private	**Age:**	50,Male
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):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	February 14, 2011
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	July 17, 2011
Flight Time:	3957 hours (Total, all aircraft), 259 hours (Total, this make and model), 2925 hours (Pilot In Command, all aircraft), 168 hours (Last 90 days, all aircraft), 76 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	PIAGGIO AERO INDUSTRIES SPA	**Registration:**	N168SL
Model/Series:	P180	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	1139
Landing Gear Type:	Retractable - Tricycle	**Seats:**	10
Date/Type of Last Inspection:	November 9, 2011 Continuous airworthiness	**Certified Max Gross Wt.:**	12100 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo prop
Airframe Total Time:	4422 Hrs at time of accident	**Engine Manufacturer:**	P&W CANADA
ELT:	Installed, not activated	**Engine Model/Series:**	PT6A-66B
Registered Owner:	AVANTAIR INC	**Rated Power:**	850 Horsepower
Operator:	AVANTAIR INC	**Operating Certificate(s) Held:**	Fractional ownership

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	FNT,782 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	09:53 Local	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	18 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	290°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.9 inches Hg	**Temperature/Dew Point:**	4°C / -3°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Detroit, MI (DTW)	**Type of Flight Plan Filed:**	IFR
Destination:	West Bend, WI (ETB)	**Type of Clearance:**	IFR
Departure Time:	09:06 Local	**Type of Airspace:**	

Airport Information

Airport:	Bishop International Airport FNT	**Runway Surface Type:**	Asphalt
Airport Elevation:	782 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	18	**IFR Approach:**	Visual
Runway Length/Width:	7848 ft / 150 ft	**VFR Approach/Landing:**	Precautionary landing

Wreckage and Impact Information

Crew Injuries:	2 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	2 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	4 Minor	**Latitude, Longitude:**	42.965278,-83.743614(est)

Administrative Information

Investigator In Charge (IIC):	Sauer, Aaron
Additional Participating Persons:	Bartholemew Angle; Federal Aviation Administration; Detroit, MI
Original Publish Date:	February 12, 2013
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=82320