Aviation Investigation Final Report

Location:	Mesquite, Texas	**Accident Number:**	CEN20LA159
Date & Time:	April 23, 2020, 16:00 Local	**Registration:**	N477SS
Aircraft:	Pilatus PC12	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 Serious
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

Shortly after takeoff the pilot reported to the air traffic controller that he was losing engine power. The pilot then said he was going to divert to a nearby airport and accepted headings to the airport. The pilot then reported the loss of engine power had stabilized, so he wanted to return to his departure airfield. A few moments later the pilot reported that he was losing engine power again and he needed to go back to his diversion airport. The controller reported that another airport was at the pilot's 11 o'clock position and about 3 miles. The pilot elected to divert to that airport.

The airplane was at 4,500 ft and too close to the airport, so the pilot flew a 360° turn to set up for a left base. During the turn outbound, the engine lost all power, and the pilot was not able to reach the runway.

The airplane impacted a field, short of the airport. The airplane's wings separated in the accident and a small postcrash fire developed.

A review of the airplane's maintenance records revealed maintenance was performed on the day of the accident flight to correct reported difficulty moving the Power Control Lever (PCL) into reverse position. The control cables were inspected from the pilot's control quadrant to the engine, engine controls, and propeller governor. A static rigging check of the PCL was performed with no anomalies noted. Severe binding was observed on the beta control cable (propeller reversing cable). The cable assembly was removed from the engine, cleaned, reinstalled, and rigged in accordance with manufacturer guidance.

During a post-accident examination of the engine and propeller assembly, the beta control cable was found mis-rigged and the propeller blades were found in the feathered position. The beta valve plunger was extended beyond the chamfer face of the propeller governor, consistent with a position that would shut off oil flow from the governor oil pump to the constant speed unit (CSU). A wire could be inserted through both the forward and aft beta control cable clevis inspection holes that function as check points for proper thread engagement. The forward beta control cable clevis adjustment nut was rotated full aft.

The swaging ball end on the forward end of the beta control cable was not properly secured between the clevis rod end and the push-pull control terminal and was free to rotate within the assembly.

Before takeoff, the beta valve was in an operational position that allowed oil flow to the CSU, resulting in normal propeller control. Vibration due to engine operation and beta valve return spring force most likely caused the improperly secured swaging ball to rotate (i.e. “unthread”) forward on the beta control cable. The resulting lengthening of the reversing cable assembly allowed the beta valve to stroke forward and shut off oil flow to the propeller CSU. Without propeller servo oil flow to maintain propeller control, the propeller faded to the high pitch/feather position due to normal leakage in the transfer bearing. The reported loss of power is consistent with a loss of thrust due to the beta control cable being mis-rigged during the most recent maintenance work.

Probable Cause and Findings

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

The loss of engine power due to a mis-rigged beta control cable (propeller reversing cable), which resulted in a loss of thrust inflight.

Findings

Personnel issues	Repair - Maintenance personnel
Personnel issues	(general) - Pilot

Factual Information

History of Flight

Enroute-climb to cruise	Loss of engine power (partial) (Defining event)
Emergency descent	Off-field or emergency landing

On April 23, 2020, about 1600 central daylight time, a Pilatus PC-12 airplane, N477SS, was substantially damaged when it was involved in an accident near Mesquite, Texas. The pilot was seriously injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 positioning flight.

Shortly after takeoff, the pilot reported to the air traffic controller that he was losing engine power. The pilot decided to divert to Rockwall Municipal Airport, and then accepted vectors to the airport. The pilot then reported the loss of engine power had stabilized, so he wanted to return to DFW (Dallas-Fort Worth International Airport). A few moments later the pilot reported that he was losing engine power again and he needed to go back to Rockwall. The controller reported that the Mesquite Airport (HQZ) was at the pilot's 11 o'clock position and about 3 miles. The pilot then elected to divert to HQZ.

The pilot reported that the airplane was at 4,500 ft and too close to the airport, so to lose altitude he planned a 360° turn to set up for a left base at HQZ. During the turn outbound, the engine lost power and the pilot was not able to reach the runway.

The airplane impacted terrain in a muddy field, short of the airport. The airplane's wings separated in the accident and a small post-crash fire ensued.

A review of the airplane's maintenance records revealed maintenance was performed on the day of the accident flight to correct reported difficulty moving the Power Control Lever (PCL) into reverse position. The control cables were inspected from the pilot's control quadrant to the engine, engine controls, and propeller governor. A static rigging check of the PCL was performed with no anomalies noted. Severe binding was observed on the beta control cable (propeller reversing cable). The cable assembly was removed from the engine, cleaned, reinstalled, and rigged in accordance with the Pilatus Aircraft Maintenance Manual (AMM) and Pratt & Whitney Engine Maintenance Manual (EMM).

In a post-accident interview, the pilot reported that several days before the accident, on previous flights, the PCL was difficult to move from the idle detent into reverse (beta mode). He brought the issue up to the mechanics and other pilots, who reported the discrepancy. The maintenance records reflected that there were no issues with the PCL cable, the binding was caused by binding inbeta control cable assembly.

The pilot stated that the accident flight was the first flight since maintenance work on the PCL, and that before departure, he cycled the propeller 3-4 times during taxi and the PCL operated "smoothly".

The engine and propeller were separated from the airframe and shipped to a Pratt & Whitney Canada facility in Bridgeport, West Virginia, for a detailed examination.

A 1st stage compressor blade had impact damage on the leading edge and four blades had minor leading-edge damage. A borescope was used to inspect the centrifugal impeller and a small amount dirt/debris accumulation was visible, but the impeller vanes were all in good condition and unremarkable.

The power turbine (PT) module was separated from the engine. The trailing edge of all compressor turbine blades were in good condition. The combustion liner was intact and there was no evidence of burn through or fuel nozzle streaking. The leading edge of the 1st stage PT blades and trailing edge of the 2nd stage PT blades visible through the exhaust were unremarkable.

The beta control cable was found mis-rigged and the propeller blades were found in the feathered position. The beta valve plunger was extended beyond the chamfer face of the propeller governor, consistent with a position that would shut off oil flow from the governor oil pump to the constant speed unit (CSU). A wire could be inserted through both the forward and aft beta control cable clevis inspection holes that function as check points for proper thread engagement. The forward beta control cable clevis adjustment nut was rotated full aft. The swaging ball end on the forward end of the beta control cable was not properly secured between the clevis rod end and the push-pull control terminal and was free to rotate within the assembly.

Pilot Information

Certificate:	Commercial	**Age:**	55
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	February 25, 2020
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	January 8, 2020
Flight Time:	2283 hours (Total, all aircraft), 1137 hours (Total, this make and model), 2081 hours (Pilot In Command, all aircraft), 87 hours (Last 90 days, all aircraft), 59 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Pilatus	**Registration:**	N477SS
Model/Series:	PC12 47	**Aircraft Category:**	Airplane
Year of Manufacture:	2007	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	813
Landing Gear Type:	Retractable - Tricycle	**Seats:**	
Date/Type of Last Inspection:	March 21, 2020 AAIP	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Turbo prop
Airframe Total Time:	7018.7 Hrs as of last inspection	**Engine Manufacturer:**	Pratt & Whitney Canada
ELT:	C126 installed	**Engine Model/Series:**	PT6A-67B
Registered Owner:	Tvpx Aircraft Solutions Inc Trustee	**Rated Power:**	1200 Horsepower
Operator:	Boutique Air	**Operating Certificate(s) Held:**	Commuter air carrier (135)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KHQZ	**Distance from Accident Site:**	
Observation Time:	15:54 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots / 12 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	20°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.76 inches Hg	**Temperature/Dew Point:**	27°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Dallas, TX (DFW)	**Type of Flight Plan Filed:**	IFR
Destination:	Muscle Shoals, AL (MSL)	**Type of Clearance:**	IFR
Departure Time:	15:15 Local	**Type of Airspace:**	

Airport Information

Airport:	Mesquite Metro HQZ	**Runway Surface Type:**	Concrete
Airport Elevation:	445 ft msl	**Runway Surface Condition:**	Soft;Vegetation
Runway Used:	18	**IFR Approach:**	None
Runway Length/Width:	6000 ft / 100 ft	**VFR Approach/Landing:**	Forced landing;Straight-in

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	1 Serious	**Latitude, Longitude:**	32.761665,-96.531944(est)

Administrative Information

Investigator In Charge (IIC):	Hatch, Craig
Additional Participating Persons:	Gavin Hill; FAA FSDO; Dallas, TX Les Doud; Hartzell Propeller, Inc; Piqua, OH Florian Reitz; Swiss Transportation Safety Investigation Board Bob Renshaw; Pilatus Aircraft; Broomfield, CO Beverley Harvey; Transportation Safety Board Jeff Davis; P&W ; Bridgeport, WV
Original Publish Date:	May 19, 2022
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=101199