Aviation Investigation Final Report

Location:	ARECIBO, Puerto Rico	**Accident Number:**	ERA18LA165
Date & Time:	June 10, 2018, 12:34 Local	**Registration:**	N3889D
Aircraft:	Cessna 182	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 Serious, 4 Minor
Flight Conducted Under:	Part 91: General aviation - Skydiving		

Analysis

The pilot stated that shortly after takeoff on the skydiving flight, the airplane's engine made a "clicking" sound and lost power. The pilot subsequently performed a forced landing to a field, during which the airplane flipped over and sustained substantial damage to the fuselage, right wing, and tail. Examination of the engine revealed the crankcase web mating surfaces at the Nos. 2, 3, and 4 bearing saddles exhibited pitting consistent with fretting, which was indicative of improper preloading (torque) of the through bolts. Additionally, the No. 2 main bearing was displaced from its saddle and severely worn, and the crankshaft fractured due to fatigue. A review of maintenance records revealed the engine's camshaft and lifters were replaced about 280 hours before the accident; this was the last documented time during which the applicable through bolts and associated nuts would have been assembled. Given this information, it is likely that maintenance personnel failed to properly apply torque to these through bolts during this maintenance, which ultimately resulted in the crankshaft failure and the subsequent loss of engine power.

Probable Cause and Findings

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

Maintenance personnel's failure to properly apply torque to the engine through bolts, which ultimately resulted in the crankshaft failure and the total loss of engine power.

Findings

Personnel issues	Installation - Maintenance personnel
Aircraft	Recip engine power section - Failure

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Initial climb	Loss of engine power (total) (Defining event)
Emergency descent	Off-field or emergency landing
Landing-landing roll	Collision with terr/obj (non-CFIT)

On June 10, 2018, about 1234 Atlantic Standard time, a Cessna 182, N3889D, was substantially damaged during a forced landing after it experienced a total loss of engine power shortly after takeoff from the Antonio (Nery) Juarbe Pol Airport (ABO), Arecibo, Puerto Rico. The pilot was seriously injured, and the four passengers sustained minor injuries. The airplane was privately owned and operated by Skydive Puerto Rico as a Title 14 *Code of Federal Regulations* Part 91 skydiving flight. Visual meteorological conditions prevailed, and no flight plan was filed for the local flight that had just departed ABO.

The pilot stated that shortly after takeoff from runway 8, about 275 ft above the ground, he made a left turn to avoid descending jumpers. While in the turn, the airplane started to vibrate, and the engine made a "clicking" sound while losing power. The pilot was unable to maintain altitude and made a forced landing to a field. The airplane flipped over, which resulted in substantial damage to the firewall, fuselage, right wing strut, and vertical stabilizer/rudder. The propeller was also damaged.

A postaccident examination of the engine by a Federal Aviation Administration (FAA) inspector revealed the crankshaft was fractured. Preparation was made to have the engine removed from the airframe and shipped to the manufacturer. Due to the limited availability of resources in Puerto Rico after Hurricane Maria, there was a delay in having the engine shipped. During this time, and unbeknownst to the National Transportation Safety Board (NTSB), the engine was sold while the investigation was still on-going. The FAA was able to locate the engine in Puerto Rico and the new owner assisted in having the engine shipped to the manufacture in Mobile, Alabama, where the engine was disassembled and examined under the supervision of the NTSB.

The examination revealed the crankshaft was fractured at the No. 3 cheek just forward of the No. 2 connecting rod and aft of the No. 2 main crankshaft journal. The No. 2 main bearing was displaced from its saddle and was severely worn. The head of the No. 2 cylinder's connecting rod bolt was fractured and not recovered. The crankcase web mating surfaces at the Nos. 2, 3, and No. 4 bearing saddles exhibited pitting consistent with fretting. The fractured ends of the crankshaft were examined at the NTSB Materials Laboratory. The examination revealed the fracture surfaces were consistent with fatigue cracking.

A review of the engine logbook revealed the engine was last overhauled on October 2, 1997, about 21 years prior to the accident. According to the Continental Standard Practice Maintenance Manual, the recommended time between overhauls for this model engine was 1,500 hours or 12 years. At the time of the accident, the engine had accrued a total of 2,821.2 hours and 1,111.2 hours since major overhaul.

Further review of the engine logbook revealed the engine was removed from the airplane on September 15, 2017, "due to excessive camshaft and lifter wear." A work order associated with this repair stated that the engine's camshaft and lifters were replaced at a tachometer time of 2,541 hours and 831 hours since overhaul (280 hours prior to the accident.). On January 5, 2018, at 965 hours since overhaul (146.2 hours prior to the accident), the No. 4 cylinder was removed and reinstalled after the piston rings were staggered. The engine underwent two additional 100-hour inspections, with the last being completed on June 5, 2018, at an engine time of 1,087 hours since overhaul.

The pilot held a commercial pilot certificate with ratings for airplane single and multiengine land, and instrument airplane. His last FAA first-class medical certificate was issued on December 12, 2017. The pilot reported a total of 2,285 flight hours, of which, 1,187 hours were in the same make/model as the accident airplane.

Pilot Information

Certificate:	Commercial	**Age:**	50,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
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:**	December 12, 2017
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	March 2, 2018
Flight Time:	2285 hours (Total, all aircraft), 1187 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N3889D
Model/Series:	182 A	**Aircraft Category:**	Airplane
Year of Manufacture:	1957	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	34589
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	June 5, 2018 100 hour	**Certified Max Gross Wt.:**	2650 lbs
Time Since Last Inspection:	24 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	3931.2 Hrs at time of accident	**Engine Manufacturer:**	CONT MOTOR
ELT:	C91A installed, activated, did not aid in locating accident	**Engine Model/Series:**	O-470-L
Registered Owner:	On file	**Rated Power:**	220 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:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	3975 ft
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:		**Temperature/Dew Point:**	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	ARECIBO, PR (ABO)	**Type of Flight Plan Filed:**	VFR
Destination:	ARECIBO, PR (ABO)	**Type of Clearance:**	None
Departure Time:	12:34 Local	**Type of Airspace:**	Unknown

Airport Information

Airport:	Antonio (Nery) Juarbe Pol Airp ABO	**Runway Surface Type:**	
Airport Elevation:	20 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing;Full stop

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	4 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 4 Minor	**Latitude, Longitude:**	18.221651,-66.590759(est)

Administrative Information

Investigator In Charge (IIC):	Read, Leah
Additional Participating Persons:	Rafael Gonzalez; FAA/FSDO; San Juan, PR Nicole Charnon; Continental Motors Inc; Washington DC
Original Publish Date:	June 8, 2020
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=97433