Aviation Investigation Final Report

Location:	Berlin, Maryland	**Accident Number:**	ERA18LA181
Date & Time:	June 29, 2018, 09:15 Local	**Registration:**	N9745Y
Aircraft:	Beech 35B33	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 Serious, 1 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot stated that, shortly after he retracted the landing gear during the initial climb after takeoff, the airplane began to vibrate and the engine lost power. The pilot initiated a 180° return to the runway, but unable to reach it, performed a forced landing to a golf course.

Postaccident examination of the airplane's engine revealed that the No. 3 cylinder sustained catastrophic damage, including heavy mechanical damage to the piston and separation of the exhaust valve, a portion of which was lodged under the intake valve. Numerous pieces of metal consistent with material from the No. 3 piston head were found in the oil sump. Given this information, it is likely that the loss of engine power was due to the failure of the No. 3 exhaust valve.

The engine manufacturer's maintenance manual recommended that this engine be overhauled at 1,500 hours of operation or every 12 years, whichever occurred first. The maintenance manual also recommended that a borescope be used to inspect the engine's cylinders during every 100-hour/annual inspection in conjunction with a compression test. The engine maintenance records listed the compression test results during previous annual inspections but did not indicate whether the cylinders had been inspected with a borescope. At the previous annual inspection, about 1 month before the accident, the engine total time was 1,769.1 hours. Additionally, the engine was manufactured about 37 years prior to the accident and had not been overhauled. The investigation did not determine if the impending failure of the exhaust valve could have been detected and corrected had the borescope inspections been performed and/or the engine had been overhauled.

Probable Cause and Findings

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

The failure of the No. 3 cylinder exhaust valve, which resulted in the total loss of engine power during takeoff.

Findings

Aircraft	Recip engine power section - Failure
Aircraft	(general) - Not serviced/maintained
Personnel issues	Scheduled/routine inspection - Maintenance personnel

Factual Information

History of Flight

Initial climb	Loss of engine power (total) (Defining event)
Emergency descent	Collision with terr/obj (non-CFIT)

On June 29, 2018, about 0915 eastern daylight time, a Beech 35-B33, N9745Y, was substantially damaged when it was involved in an accident near Berlin, Maryland. The private pilot was seriously injured, and the passenger sustained minor injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot stated that the preflight inspection and the engine runup were normal. After takeoff, he retracted the landing gear, and the airplane began to vibrate. He checked his cockpit gauges, but the "plane was losing power and the vibration increased." The pilot transmitted via radio that he was returning to the airport; however, unable to reach the runway, the pilot performed a forced landing on a golf course. After landing, a small postcrash engine compartment fire ensued.

A Federal Aviation Administration (FAA) inspector examined the airplane where it came to rest about 1/3 mile west of the departure airport. The left wing displayed leading edge damage and was canted upward from midspan to the wingtip. The engine was partially separated from the airframe, and the landing gear and wing flaps were retracted.

Further examination revealed fire damage to the aft section of the engine. The fuel selector valve was in the right tank position. The fuel selector valve screen was removed and inspected; no debris was found. The fuel line from the firewall to the fuel pump inlet was fracture-separated at the inlet fitting. The fuel line from the fuel pump to the fuel metering unit was intact, and the fuel line from the metering unit to the manifold valve was separated at the metering unit. All other B-nuts remained attached to their fittings. Flight control cable continuity was established from the control surfaces to the cockpit controls.

Continuity of the crankshaft and camshaft were confirmed when the propeller was rotated by hand, and thumb compression was obtained on all cylinders except No. 3. Borescope examination of the No. 3 cylinder revealed catastrophic damage, including heavy mechanical damage to the piston and separation of the exhaust valve, a portion of which was lodged under the intake valve. The No. 3 pushrods did not display any visible damage or bending. Numerous pieces of metal consistent with material from the No. 3 piston head were found in the oil sump. No other engine anomalies were observed.

The most recent annual inspection was completed on May 7, 2018, at a tachometer time of 1,162.5 hours and a recorded engine total time of 1,769.1 hours. Additionally, the engine was manufactured during March 1981 and had not been overhauled.

The Continental Motors M-0 Maintenance Manual recommended that IO-470-K engines with serial numbers before 1006000, which included the accident engine, be overhauled at 1,500 hours or every 12

years, whichever occurred first. Additionally, the Maintenance Manual recommends a borescope inspection of the cylinders during every 100-hour/annual inspection in conjunction with a compression test. The engine maintenance records listed the compression test results during the annual inspections but did not indicate whether the borescope inspections were conducted.

Pilot Information

Certificate:	Private	**Age:**	60,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	September 6, 2017
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	May 24, 2018
Flight Time:	1191 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N9745Y
Model/Series:	35B33 NO SERIES	**Aircraft Category:**	Airplane
Year of Manufacture:	1963	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	CD-681
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	May 7, 2018 Annual	**Certified Max Gross Wt.:**	3000 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	3553.8 Hrs as of last inspection	**Engine Manufacturer:**	Continental
ELT:	C126 installed	**Engine Model/Series:**	IO-470
Registered Owner:		**Rated Power:**	225 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:	OXB,12 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	08:53 Local	**Direction from Accident Site:**	126°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	60°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	28°C / 20°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Berlin, MD (OXB)	**Type of Flight Plan Filed:**	IFR
Destination:	Dublin, VA (PSK)	**Type of Clearance:**	IFR
Departure Time:	09:10 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	Ocean City Muni OXB	**Runway Surface Type:**	Grass/turf
Airport Elevation:	11 ft msl	**Runway Surface Condition:**	Dry;Vegetation
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Minor	**Aircraft Fire:**	On-ground
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 1 Minor	**Latitude, Longitude:**	38.311389,-75.129997

Administrative Information

Investigator In Charge (IIC):	Hill, Millicent		
Additional Participating Persons:	David B Garey; FAA/FSDO; Baltimore, MD Nicole Charnon; CMI; Mobile, AL Ricardo Asensio; Textron; Wichita, KS		
Original Publish Date:	December 14, 2021	**Investigation Class:**	3
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=97641		