Aviation Investigation Final Report

Location:	Gonzales, Texas	**Accident Number:**	CEN23LA418
Date & Time:	September 23, 2023, 19:14 Local	**Registration:**	N18994
Aircraft:	Beech C23	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

According to the pilot, while on final approach to the runway he experienced wind shear and elected to go around. He applied full throttle and began to climb out when the engine sustained a loss of power, so he made a forced landing to a field off the left side of the runway. The airplane collided with a fence and a tree, which separated the right wing near the wing root.

Postaccident examination of the exhaust system revealed that a portion of the muffler flame tube had failed and blocked at least 95% of the tailpipe exit path. The piece of flame tube was lodged in the tailpipe. A 3-inch crack was noted on the muffler endcap opposite of the separated flame tube. There were no other mechanical malfunctions or failures that would have precluded normal operation.

The muffler had been repaired and reinstalled on the airplane about 23 years before the accident and accumulated 504.84 hours. The most recent 100-hour/annual inspection, which was completed 55.4 hours before the accident, failed to identify the degraded and corroded flame tube.

Probable Cause and Findings

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

The loss of engine power during go-around due to a failed muffler flame tube, which resulted in an exhaust blockage. Contributing to the accident was maintenance personnel's inadequate inspection of the exhaust system during the most recent maintenance.

Findings

Aircraft	(general) - Fatigue/wear/corrosion
Aircraft	(general) - Failure
Aircraft	(general) - Inadequate inspection
Personnel issues	Scheduled/routine inspection - Maintenance personnel

Factual Information

History of Flight

Approach-VFR go-around	Loss of engine power (total) (Defining event)

On September 23, 2023, about 1914 central daylight time, a Beech C23 airplane, N18994, was substantially damaged when it was involved in an accident near Gonzales, Texas. The pilot received minor injuries. The airplane was operated as a Title 14 *Code of Federal Regulations (CFR)* Part 91 personal flight.

According to the pilot, he intended to complete a personal flight to Roger M Dreyer Memorial Airport (T20), Gonzales, Texas. During the final approach to runway 15 he experienced wind shear and elected to go around. He applied full throttle and began to climb out when the engine sustained a loss of power, so he made a forced landing to a field off the left side of the runway. The airplane collided with a fence and a tree, which separated the right wing near the wing root.

Postaccident examination of the airplane revealed substantial damage to the wings and fuselage. The undamaged exhaust system was examined using a flashlight in the tailpipe and a lighted borescope, which revealed a blockage in the tailpipe; the muffler was then removed and cut open. The flame tube was blocking at least 95% of the tailpipe exit path; the piece was lodged in the tailpipe. The fracture area appeared degraded and covered in corrosion. A 3-inch crack was noted on the muffler endcap opposite of the separated flame tube. There were no other mechanical malfunctions or failures that would have precluded normal operation.

The airplane maintenance logbooks revealed that, during a maintenance inspection on December 24, 1997 (3,523.42 hours total time and 1,260.42 hours since major overhaul), the exhaust system was inspected “for leaks and cracks. System found to be satisfactory.”

On January 2, 1999 (3,556.5 hours total time and 1,293.50 hours since major overhaul), another maintenance inspection was conducted by the same mechanic and there was no mention of the exhaust system.

On March 21, 2000, the airplane’s muffler was repaired and inspected by a separate exhaust system repair station. The work order for this muffler repair revealed that the muffler was to be inspected and repaired. The items replaced included: 3 tabs, the outer shell, 2 caps, 2 flame tubes, 2 elbows, 2 beaded ends, 2 end plates, and the tailpipe.

On April 1, 2000 (3,603.36 hours total time and 1,340.36 hours since major overhaul), another maintenance inspection was conducted by the same mechanic from 1997 and 1999, when they reinstalled the repaired muffler.

There were no additional maintenance logbook entries found specifically related to a muffler repair or replacement.

The most recent 100-hour/annual inspection was completed on November 23, 2022, (4,052.8 hours total time and 1,789.8 hours since major overhaul), during which 8 exhaust clamps were replaced and a new exhaust stud was installed on the No. 4 cylinder. There was no specific mention of the muffler; however, 14 *CFR* Part 43 Appendix D—Scope and Detail of Items (as Applicable to the Particular Aircraft) To Be Included in Annual and 100-Hour Inspections, states in part:

(d) Each person performing an annual or 100-hour inspection shall inspect (where applicable) components of the engine and nacelle group as follows:

(8) Exhaust stacks—for cracks, defects, and improper attachment.

The installed Dynon Avionics revealed that the airplane total time was 4,108.2 hours at the time of the accident. Therefore, the muffler had been installed on the airplane for 504.84 hours.

Beech maintenance and overhaul documents revealed that the exhaust system should be overhauled or replaced every 800 hours or when the condition warrants replacement. The exhaust muffler and shroud should be inspected every 100 hours. The documentation states, "It is recommended that at each 100 hour and/or annual inspection, all exhaust muffler shrouds be removed and the muffler thoroughly inspected for cracks, leaks and (if applicable) deterioration of the internal tubes which could cause a decrease in engine power due to blockage of the exhaust.

According to the Federal Aviation Administration (FAA) FAA-H-8083-32B, Aviation Maintenance Technician Handbook – Powerplant:

Internal Muffler Failures

Internal failures (baffles, diffusers, etc.) can cause partial or complete engine power loss by restricting the flow of the exhaust gases. If pieces of the internal baffling breaks loose and partially or totally blocks the flow of exhaust gases, engine failure can occur. As opposed to other failures, erosion and carburization caused by the extreme thermal conditions are the primary causes of internal failures. Engine backfiring and combustion of unburned fuel within the exhaust system are probable contributing factors. In addition, local hot-spot areas caused by uneven exhaust gas flow can result in burning, bulging, or rupture of the outer muffler wall.

Exhaust System Repairs

It is generally recommended that exhaust stacks, mufflers, tailpipes, etc., be replaced with new or reconditioned components rather than repaired. Welded repairs to exhaust systems are complicated by the difficulty of accurately identifying the base metal so that the proper repair materials can be selected. Changes in composition and grain structure of the original base metal further complicate the repair. However, when welded repairs are necessary, the original contours should be retained; the exhaust system alignment must not be warped or otherwise affected. Repairs or sloppy weld beads that protrude internally are not acceptable as they cause local hot spots and may restrict exhaust gas flow.

FAA Advisory Circular (AC) 91-59A, "Inspection and Care of General Aviation Aircraft Exhaust Systems," emphasizes "the safety hazards of poorly maintained aircraft exhaust systems (reciprocating powerplants) and highlights points at which exhaust system failures occur. Further, it provides information on the kinds of problems to be expected and recommends pilots perform ongoing preventive maintenance and mechanics perform maintenance." The AC also notes that potential failures can include partial or full engine power loss caused by loose baffles, cones, or diffusers on mufflers and heat exchangers that partially or completely block the exhaust gas outlet flow.

Pilot Information

Certificate:	Private	**Age:**	43,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	January 20, 2023
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	October 29, 2022
Flight Time:	210.9 hours (Total, all aircraft), 162.7 hours (Total, this make and model), 125 hours (Pilot In Command, all aircraft), 28 hours (Last 90 days, all aircraft), 14 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N18994
Model/Series:	C23	**Aircraft Category:**	Airplane
Year of Manufacture:	1977	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	M-1998
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	November 23, 2022 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	55 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	4052.8 Hrs as of last inspection	**Engine Manufacturer:**	Lycoming
ELT:	C126 installed, activated, aided in locating accident	**Engine Model/Series:**	O-360-A4K
Registered Owner:	On file	**Rated Power:**	180 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:	KBAZ,648 ft msl	**Distance from Accident Site:**	33 Nautical Miles
Observation Time:	18:51 Local	**Direction from Accident Site:**	290°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots / 17 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.81 inches Hg	**Temperature/Dew Point:**	36°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	San Marcos, TX (KHYI)	**Type of Flight Plan Filed:**	None
Destination:	Gonzales, TX	**Type of Clearance:**	VFR
Departure Time:	18:39 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	ROGER M DREYER MEML T20	**Runway Surface Type:**	Asphalt
Airport Elevation:	354 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	15	**IFR Approach:**	None
Runway Length/Width:	3200 ft / 50 ft	**VFR Approach/Landing:**	Forced landing;Go around

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Minor	**Latitude, Longitude:**	29.525311,-97.457816

Administrative Information

Investigator In Charge (IIC):	Lindberg, Joshua
Additional Participating Persons:	Fred McMillan; Federal Aviation Administration; San Antonio, TX Dave Harsanyi; Lycoming; Williamsport, PA Casey Love; Textron Aviation; Wichita, KS
Original Publish Date:	May 14, 2024
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=193123