

WPRNational Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR21LA287

ENGINE EXAMINATION

November 16, 2021

TABLE OF CONTENTS

A. ACCIDENT

Location: Chandler, Arizona
Date: July 10, 2021
Time: 07:21 MST
Airplane: Beech, A36TC, N222HC

B. ENGINE EXAMINATION

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C. SUMMARY

On July 10, 2021, about 0721 mountain standard time, a Beech A36TC, N222HC, was substantially damaged when it was involved in an accident at the Chandler Municipal Airport (CHD), Chandler, Arizona. The pilot and two passengers sustained minor injuries and one passenger sustained serious injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* 91 personal flight.

The pilot reported the takeoff rotation was normal, however acceleration was slightly slower than normal. The pilot reported that after the gear was raised the aircraft did not accelerate or climb so he decided to land near the end of the runway. The airplane impacted wings level and slid along the dirt beyond the runway. The pilot reported the airplane struck an airport fence which resulted in significant damage and postcrash fire.

D. DETAILS OF THE EXAMINATION

1.0 Engine Examination

Engine: Continental Motors

Engine Model Number: TSIO-520-UB6B

Serial Number: 24898-R

Visual examination of the engine revealed extensive thermal damage throughout the engine. All engine accessories and propeller remained attached to the engine.

All of the engine accessories were removed along with the upper spark plugs and rocker box covers. The crankshaft was rotated by hand using the propeller. Thumb compression and suction was obtained on all 6 cylinders. The intake and exhaust valve rocker arms on all 6 cylinders exhibited equal movement when the crankshaft was rotated.



Figure 1: View of Engine Right Side, Photo Courtesy NTSB

The oil filter was intact with minor crush damage. The oil line extending from the oil pump was thermally damaged.

The starter was intact and remained attached to the starter adapter. The starter was removed, and the drive shaft rotated by hand. The starter adapter was removed and rotated freely by hand.

The fuel manifold valve remained attached to the engine and exhibited some thermal damage. All 6 fuel injector lines remained attached to the fuel manifold valve. The manifold valve was removed and subsequently disassembled. The internal spring was found intact and undamaged. The internal diaphragm was thermally damaged and remained fused to the fuel manifold valve cavity and screen. The fuel injector lines were removed. Air pressure was applied to all 6 fuel injector lines. The cylinder no. 2, 4, and 6 fuel injector lines were free of debris. Cylinder no. 1, 3, and 5 fuel injector lines were restricted and had thermal damage. All fuel injector nozzles were free of debris with the exception of the no. 1 cylinder, which had a small amount of debris.

The throttle cable was cut, however, the control rod end remained attached to the throttle arm. The throttle body was intact and fire damaged. The throttle arm moved slightly by hand. The throttle body to turbo controller linkages were intact. The turbo controller was partially disassembled. All internal components exhibited normal operating signatures.

The oil pump was removed and visually inspected. The gears were lightly coated with oil and free of damage. The internal oil pump cavity was free of scoring.

The alternator remained attached to the crankcase. Once removed, the drive shaft rotated freely by hand. Internal examination of the crankcase through the alternator drive mount revealed normal operational signatures.



Figure 2: View of Alternator Port, Photo Courtesy NTSB

The intake and exhaust rocker covers on cylinders no. 1, 3, and 5 were thermally damaged. The remaining portions of the rocker covers were removed. The intake and exhaust valve springs on the no. 1, 3, and 5 cylinders were exhibited thermal damage and corrosion. Intake tubes on the same side were thermally damaged. rocker covers on 2-4-6 showed light thermal damage. Cylinder 4 and 6 EGT wire leads were missing. Top spark plugs for 2, 4, and 6 cylinders were intact with thermal damage.

All upper and lower spark plugs were removed and examined. The upper cylinder no. 1, 3, and 6, and bottom cylinder no. 1 spark plugs were corroded. The upper cylinder no. 2 spark plug was dark gray within the electrode area. The upper 4, 5, and lower 2, 3, 4, 5, and 6 spark plugs were gray in color within the electrode area. The gap between ground electrodes and center electrode appeared normal. All upper and lower spark plugs exhibited normal wear signatures.

The left and right magneto were removed. The left magneto was thermally damaged. The drive shaft rotated by hand; however, no spark was produced on any of the leads. The magneto was disassembled, and all internal components were thermally damaged. The points opened and closed when the drive shaft was rotated. The right magneto sustained thermal damage. The drive shaft was not able to be rotated. The magneto was disassembled, and all internal components were thermally damaged.

The fuel pump was intact and exhibited thermal damage. The fuel pump drive shaft coupling was intact and undamaged. The fuel pump drive shaft would not rotate by hand. The fuel pump was disassembled and inspected. Corrosion was observed throughout the internal areas of the fuel pump. The internal rotor and vanes were intact.

The exhaust was cut. Inspection of the turbo waste gate showed the control cables to be intact. Inspection of the turbo revealed it to be in normal condition with all pieces intact. The last 14 inches of the exhaust was bent and crushed upward. The waste gate oil line was severed two inches from the waste gate. The intercooler showed thermal damage to about 10% of the box.

Inspection of the exhaust showed the dark grey residue with no oil. Exhaust was free of blockage or debris. No evidence of metal particles found in the exhaust.

The exhaust remained attached to all 6 cylinders and exhibited thermal and impact damage. The cylinder no. 1, 3, 5 side was cut off and the cylinder no. 2, 4, 6 side was able to be unbolted.

The turbo charge waste gate remained attached in its respective position. The butterfly valve was in the "open" position. The control arm was actuated by hand using a hand tool and movement of the butterfly valve was observed, and opened once pressure was released.

The turbine and compressor impellers spun freely by hand with no binding noted. The compressor and turbine impellers were intact with slight lateral play in the shaft between the compressor and turbine impellers was noted, with some slight rub marks on the housing.



Figure 3: View of Turbocharger Axial Impeller, Photo Courtesy NTSB



Figure 4: View of Turbo Charger, Photo Courtesy NTSB

2.0 Propeller Examination

The engine was equipped with a 3 bladed Hartzell propeller, model PHC-C3YF-1RF/F8068K. The propeller sustained thermal and impact damage to all 3 blades. All 3 blades remained attached to the propeller hub. Each blade was labeled for identification purposes. Blade A was curled 18 inches outboard of the hub, opposite direction of rotation and had chordwise striations on the camber side of the blade. The tip of the blade separated and was not found with the recovered wreckage. Propeller blade B was bent 12 inches from the hub in opposite direction of rotation. There was a one-inch-wide gouge on the leading edge near the blade tip. Chordwise striations on the cambered side of the blade were observed. The blade tip was separated, and the trailing edge contained a large gouge. Propeller blade C was also missing a material at the tip.

The spinner remained intact, however, was thermally damaged, with an approximate 12 inch section melted, which exposed the propeller hub.

The propeller governor was intact. The propeller governor was removed, and the screen was free of debris. The control arm moved freely from stop to stop. The propeller governor drive shaft rotated freely by hand.

Submitted by:

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