NATIONAL TRANSPORTATIONS SAFETY BOARD
Office of Aviation Safety
Washington, DC 20594

SUMMARY OF ENGINE EXAMINATION

-- CEN19FA210 --

A. ACCIDENT

Location: Chebanse, Illinois
Date: July 5, 2019
Time: 1358 central daylight time
Aircraft: Beech A36 (s/n E-1875), N1809S

B. PARTICIPANTS

Timothy Sorensen
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C. ACCIDENT SUMMARY

On July 5, 2091, about 1358 central daylight time, a Beech A36 airplane, N1809S, was substantially damaged during a forced landing following a loss of engine power near Chebanse, Illinois. The pilot sustained serious injuries, one passenger sustained minor injuries, and one passenger was fatally injured. The airplane was registered to and operated by private individuals as a Title 14 *Code of Federal Regulations* Part 91 as a personal flight. Visual meteorological conditions prevailed at the time of the accident, and the flight was not operated on a flight plan. The flight originated from Smyrna Airport (MQY), Smyrna, Tennessee, about 1135 and was destined for Bolingbrook's Clow International Airport (1C5), Bolingbrook, Illinois.

E. DETAILS OF ENGINE EXAMINATION

The engine was shipped to Continental Aerospace Technologies facilities in Mobile, Alabama from AMF Aircraft Recovery, Springfield, Tennessee. The engine was received in a shipping crate which was opened immediately prior to the examination in the presence of the NTSB investigator-in-charge (IIC). The examination and test run were conducted on October 16 and 17, 2019. At the conclusion of the examination, the engine was crated in the presence of the NTSB IIC for return shipment to AMF.

F. SUMMARY OF ENGINE EXAMINATION[1]

Continental IO-520-BB (17) [s/n 274766]

Visual examination revealed that induction riser manifold (rear wye)[2], no. 6 induction elbow, left and right exhaust collectors, and the left, front and right, rear engine mounts were damaged consistent with impact forces. The propeller flange was bent, and the crankshaft-to-propeller flange radius exhibited cracking consistent with impact.[3] The crankshaft end-play measured 0.007" and the run-out was 0.075". The propeller flange deflection was measured as 0.150". The throttle body/mixture control exhibited minor impact damage including a broken fitting. The fuel screen was intact and free of debris.

Magneto timing was checked and determined to be 25° BTDC and 28° BTDC for the left and right magnetos, respectively. The required magneto-to-engine timing is 22° BTDC.

A cylinder leakage (compression) test was completed prior to the test run with the engine at room temperature. The readings and leak path were as follows:

Cylinder #1 – 38/80 psi (exhaust valve)	Cylinder #2 – 39/80 psi (piston rings)
Cylinder #3 – 19/80 psi (piston rings)	Cylinder #4 – 6/80 psi (exhaust valve)
Cylinder #5 – 23/80 psi (exhaust valve)	Cylinder #6 – 19/80 psi (exhaust valve)

In preparation for an engine test run, the induction riser manifold (rear wye) assembly and the no. 6 induction elbow were replaced with airworthy components. The throttle body/mixture control assembly from the accident airplane was reinstalled. A broken fitting on the throttle body/mixture control was replaced. In addition, the propeller flange deflection was determined to be excessive for an engine test run. The damaged propeller flange was removed, and a slave flange was welded in place.

The engine was placed into an engine test cell and fitted with test club propeller. The initial start attempt was not successful and fuel leaks were observed at the engine driven fuel pump and the throttle body/mixture control. The components were removed and bench tested to identify the source of the leaks. The fuel pump exhibited a leak at the lower-left corner of the housing, at the mating line between two sections of the housing. Although a slight offset was visible between the housing sections, no damage was observed. The throttle body/mixture control exhibited leaks at both ends of the housing. O-rings from both components were removed and found to be hardened, worn, and brittle. The o-rings were replaced, and the components retested with no anomalies noted.

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[1] Directions related to accident site placement and component damage/deformation are with respect to an intact airframe unless otherwise noted.

[2] The rear wye assembly, including the throttle body/mixture control, was removed on-scene to prevent further damage. It was shipped loose in the crate with the engine.

[3] The propeller assembly remained secured to the engine after the accident. It was removed during the on-scene examination.

F. SUMMARY OF ENGINE EXAMINATION *(concluded)*

They were reinstalled on the accident engine. No fuel leaks were observed during the subsequent start attempts and engine run.

The subsequent start attempts were not successful, and the starter motor was allowed to cool for 3 minutes. On the next attempt, the engine started with slight hesitation consistent with over-priming. The engine speed was advanced in steps for warm-up before attempting full power operation. The engine was run at 1,200 rpm, 1,600 rpm, 2,450 rpm and then at full throttle in 2-minute intervals at each power setting in order to allow the engine operation to stabilize. The throttle was then rapidly advanced from idle to full throttle five times. The engine performed normally and without any hesitation, stumbling or interruption in power.

A magneto check was conducted during the run. The engine speed drop was less then 100 rpm on each magneto consistent with normal magneto function.

A cylinder leakage (compression) test was completed after the engine test run. The readings and leak path were as follows:

Cylinder #1 – 62/80 psi (exhaust valve)	Cylinder #2 – 58/80 psi (piston rings)
Cylinder #3 – 61/80 psi (exhaust valve)	Cylinder #4 – 60/80 psi (piston rings)
Cylinder #5 – 53/80 psi (piston rings)	Cylinder #6 – 55/80 psi (exhaust valve)

Noting that repairs were made to the engine driven fuel pump and the throttle body/ mixture control assembly to address fuel leaks, the engine performed normally and demonstrated the ability to produce rated horsepower on demand. No anomalies consistent with a pre-impact failure or malfunction were observed.