

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

SUMMARY OF ENGINE EXAMINATION

-- CEN19LA098 --

A. ACCIDENT

Location: Waterloo, Illinois
Date: March 12, 2019
Time: 1442 central daylight time
Aircraft: Piper PA-32R-300 (s/n 32R-7780067), N750R

B. PARTICIPANTS

Timothy Sorensen
Senior Aviation Accident Investigator
National Transportation Safety Board
Denver, Colorado

Mike Childers
Air Safety Investigator
Lycoming Engines
Williamsport, Pennsylvania

C. ACCIDENT SUMMARY

On March 12, 2019, at 1442 central daylight time, a Piper PA32R-300 airplane, N750R, was substantially damaged during a forced landing following a loss of engine power near Waterloo, Illinois. The pilot sustained serious injuries, one passenger sustained minor injuries, and the second passenger, a child restrained in a car seat, was not injured. The airplane was registered to and operated by the pilot under the provisions of Title 14 *Code of Federal Regulations* Part 91 as a personal flight. Visual meteorological conditions prevailed for the flight, which was operated on an instrument flight rules flight plan. The flight originated from the Mobile Downtown Airport (BFM), Mobile, Alabama, at 1118. The intended destination was the St. Louis Downtown Airport (CPS), Cahokia, Illinois.

Summary of Engine Examination

D. DETAILS OF EXAMINATION

After the accident, the airplane was recovered to Feldpouch Aviation facilities at the Vandalia Municipal Airport, Vandalia, Illinois. A post-recovery examination was conducted by the NTSB investigator-in-charge on May 8~9, 2019.¹ Lycoming Engines provided technical support as a party to the investigation. An examination of the airframe was not conducted.

E. SUMMARY OF EXAMINATION²

Engine – Lycoming IO-540-K1G5D (s/n RL-21770-48A)

Propeller – Hartzell HC-C3YR-1RF/F7663R (s/n PA779B)

The engine was separated from the airframe at the time of the exam. The propeller assembly remained secured to the engine crankshaft. The crankcase was fractured above the no. 4 and no. 6 cylinders. The fractured area exposed a hole in the upper surface of the crankcase approximately 20 inches long by 6 inches wide, running from the no. 4 cylinder to the aft push rod for the no. 6 cylinder. The forward portion of the engine mount remained with the engine. The structural tubing had been cut at several locations presumably to facilitate recovery. All four engine attachment fittings were fractured consistent with overstress. The fittings remained secured to the engine at all four attachment points. The mating portion of the fittings were secured to the engine mount at both upper and at the lower, right locations. The lower, left engine mount attachment point and mating portion of the fitting was not observed with the engine.

The interior surface of the crankcase case halves exhibited gouging and scraping damage in the area of the no. 4, no. 5, and no. 6 cylinders consistent with secondary mechanical damage. The main journals and journal bearings appeared undamaged and were oil wetted. The bearings exhibited normal wear signatures. The through-bolts were intact and unremarkable.

The crankshaft was continuous. The propeller flange and accessory section drive gear were intact. The main bearing journals appeared undamaged. The no. 1, no. 2, no. 3, and no. 5 connecting rods remained attached. The no. 4 and no. 6 connecting rods had separated. The no. 4 and no. 6 connecting rod journals exhibited minor scuffing and gouging damage. The remaining rod journals were unremarkable. The counterweights were intact and exhibited mechanical damage consistent with secondary impact damage. The camshaft was continuous, and each cam lobe appeared intact. The shaft exhibited scuffing damage in the area of the nos. 3 and 4, and nos. 5 and 6 cylinders. The shaft was bent in the area of the no. 5 and no. 6 cylinders. The forward and aft gear splines were intact.

The no. 1, no. 2, no. 3, and no. 5 cylinders remained attached to the crankcase. The cylinders, pistons, connecting rods and rod caps appeared intact at the time of the examination; although, the no. 5 cylinder and piston skirt exhibited gouging damage consistent with secondary mechanical damage. The piston faces displayed normal operating signatures. The connecting rod journals and bearings were intact and exhibited normal wear signatures with one exception. The no. 3 bearing and rod journal both

¹ The NTSB did not respond to the site at the time of the accident.

² Directions related to accident site placement and component damage/deformation are with respect to an intact airframe unless otherwise noted.

Summary of Engine Examination

E. SUMMARY OF EXAMINATION *(continued)*

displayed three corresponding localized areas of discoloration. Each was irregular in shape but neither exceeded an overall diameter of 0.250 inch. They were also oriented linearly across the width of the journal/bearing.

The no. 4 and no. 6 cylinders remained attached to the crankcase. The exterior of the cylinders appeared to be undamaged at the time of the exam.³ The valve covers were securely installed and intact. The rocker arms appeared intact and were oil wetted. The connecting rods had separated from the crankshaft; the rods remained attached to the pistons. The pistons were wedged within the cylinders. The pistons, lower cylinder flanges and connecting rods exhibited secondary mechanical damage. Both arms of the no. 4 connecting rod and one arm of the no. 6 connecting rod common to the cap attachment bolt holes were separated.

A connecting rod cap was recovered from the engine; it was deformed and exhibited gouges consistent with secondary mechanical damage. One cap attachment bolt was retained; it had fractured near the base of the cap. The second bolt was not retained. In addition, a portion of a connecting rod cap common to an attachment bolt hole, a second rod cap fragment, two attachment bolt fragments, and two nuts were recovered loose within the engine. All exhibited various degrees of deformation and gouging.

The accessory section housing appeared intact and the accessory gears appeared undamaged. The interior housing surface and the gears were oil wetted. The oil pump housing and impellers were intact and rotated freely. The housing cavity exhibited circumferential scoring consistent with hard particle passage during operation. The oil screen was intact and contained a significant amount of metallic debris. The filter was secured to the engine. The oil filter housing was partially crushed consistent with impact damage. The filter media was not examined.

The dual magneto unit remained securely attached to the engine. The ignition harness exhibited minor abrasion damage consistent with impact. The spark plugs were securely installed. Each plug was intact and displayed normal combustion signatures. The magneto produced a spark across all leads when rotated.

The fuel distribution valve was unremarkable; the diaphragms were intact. The fuel lines were secured to the valve and to the fuel injectors. The fuel injectors were free of debris and appeared to be unobstructed.

The fuel servo and engine-driven fuel pump remained securely attached to the engine. Both components appeared intact. The throttle control arm and butterfly valve rotated smoothly. The servo diaphragm was undamaged. The fuel screen was intact and free of sediment or debris. The fuel pump was operated manually. Fuel was expelled from the outlet consistent with normal operation.

The engine control cables were cut near the rear of the engine presumably to facilitate recovery. The throttle control cable was continuous to the fuel servo; however, the end

³ The no. 4 and no. 6 cylinders sustained additional mechanical damage due to efforts to remove the cylinders from the crankcase. Secondary mechanical damage at the base of the cylinders prevented direct removal.

Summary of Engine Examination

E. SUMMARY OF EXAMINATION *(concluded)*

fitting was fractured at the rod end. The mating portion of the rod end remained attached to the fuel servo lever. The mixture was continuous to the fuel servo and remained attached to the mixture control lever. The propeller control cable remained attached to the governor.

The propeller governor remained secured to the engine and appeared to be undamaged. The input drive was free to rotate, and the splines were intact. The control arm was intact and operated smoothly under hand pressure. The gasket and gasket screen were intact; the screen was free of debris.

The propeller spinner remained attached and was crushed, partially conforming to the hub. The hub appeared intact and undamaged. All three blades remained attached to the hub. One blade was bent aft approximately 60° at the root. The blade exhibited predominantly longitudinal scraping, with limited chordwise scraping along the outboard one-third of the leading edge. The second blade was bent aft about 30° near mid-span. The blade exhibited a small gouge at the leading edge near the blade tip, with minor, localized chordwise scuffing near the root and over the outboard one-third of the blade span. The third blade appeared to be undamaged.