

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ANC24LA073

ENGINE EXAM

October 8, 2024

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A. ACCIDENT

Location: Lake Hood, Alaska
Date: August 28, 2024
Time: 8:24
17:24
Airplane: DeHavilland DH-2 Beaver

B. ENGINE EXAM

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C. SUMMARY

On August 2, 2024, about 0824 Alaska daylight time, a float-equipped De Havilland DHC-2 airplane, N4444Z sustained substantial damage when it was involved in an accident near Anchorage, Alaska. The pilot and six passengers were uninjured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 135 flight.

The pilot reported that shortly after takeoff, as the airplane climbed to above 200 ft above the water, the engine started to sputter, run rough and began to lose power. The pilot was able to execute a left turn and land on the remaining portion of the lake. The airplane departed the end of the lake onto the bank, the left wing impacted a tree and spun the airplane into some brush. The airplane sustained substantial damage to the left wing and fuselage.

After the accident the operator erroneously thought the airplane had been released to them and they proceeded to start the airplane and subsequently taxied it from the accident site to their hangar. Without federal oversight the operator removed and inspected all spark plugs, checked the timing on the magnetos, did compression checks on all cylinders, inspected all the intake and exhaust valves with a borescope, checked valve clearances, inspected rocker arms and rocker shaft nuts and reported that everything was found to be within normal limits. After accomplishing all the above inspections, the operator ran the engine.

D. DETAILS OF THE EXAMINATION

1.0 Engine Examination

The Pratt and Whitney R985-AN-14B engine SN 210476 was sent to Tulsa Aircraft engines for an engine exam. On October 7, 2024 the engine was removed from the crate and mounted on a stand (Figure 1,2,3). The engine had 1,483 hours since major overhaul (TSMOH) at the time of the accident. The previously installed Stromberg carburetor and No. 3 cylinder were included.



Figure 1 Engine Data Tag



Figure 2 Engine mounted on stand

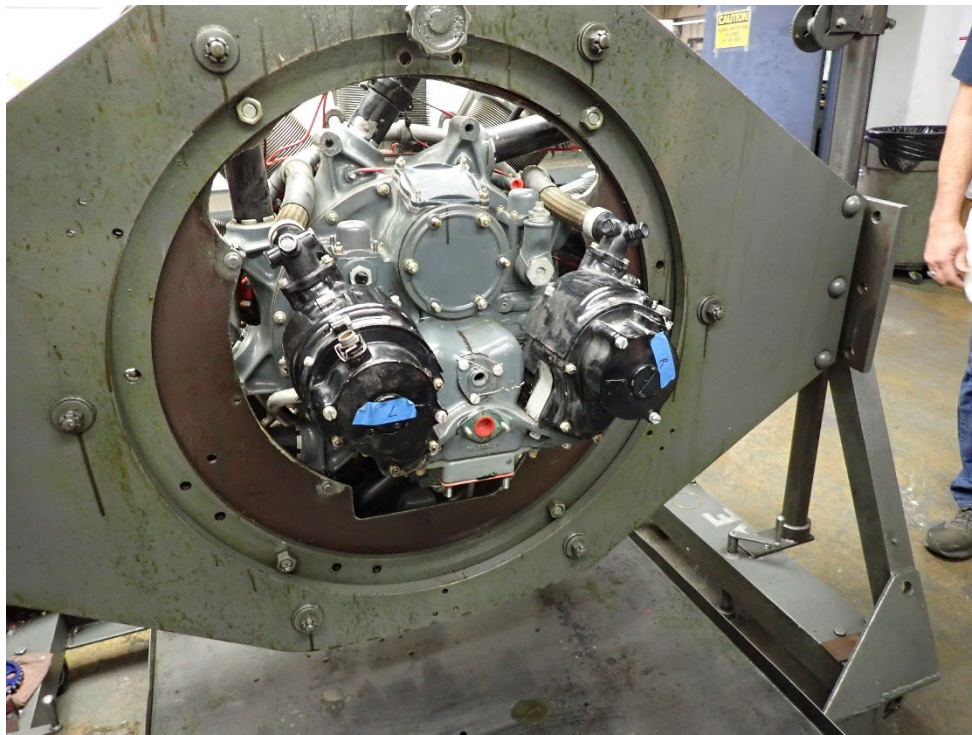


Figure 3 Engine accessory case

The crank shaft rotated smoothly and thumb compressions were observed on all cylinders. Timing was checked on the No. 1 cylinder, the left side was 24° and the right was 25°, within normal limits. Continuity with the magnetos, supercharger, and accessory drives was confirmed. Compression on all 9 cylinders was confirmed.

According to the engine logbook the No. 3 cylinder was removed on July 31, 2024 for an intake valve issue. The Cylinder at time of removal had 1,477 hours since overhaul. Cylinder No. 3 was disassembled, and the valve stem/valve guide clearance was measured and found to be within normal limits (Figure 4).

The valve gap clearances were checked all on cylinders and they were found to be within normal limits. All cylinders were removed, no abnormalities were noted. All the cylinders were disassembled the valve guide/valve stem clearances were measured. The No. 2 cylinder valve guide/valve stem clearance was tight beyond normal limits. All other cylinder valve guide clearances were within normal limits (Figure 4). No longitudinal scoring or excessive carbon build up was observed on the valve stems or valve guides.

Cylinder No.	Exhaust Valve guide inside diameter measurement Top-Middle-Bottom	Exhaust Valve stem measurement	Intake Valve guide inside diameter measurement Top-Middle-Bottom
1	59-57-59	0.554	37-37-39
2	54-53-53	0.552	39-39-39
3-A*	53-52-57	0.546	37-38-37
3-B*	55-53-58	0.546	37-37-38
4	54-52-53	0.546	36-37-37
5	52-51-55	0.546	37-37-37
6	54-52-55	0.546	37-36-36
7	54-52-59	0.546	37-37-38
8	55-53-58	0.550	37-37-36
9	52-51-60	0.546	37-38-38

Cylinder No.	Intake Valve Stem Measurement	Exhaust Valve Stem/Valve Guide Clearance	Intake Valve Stem/Valve Guide Clearance
1	0.4345	0.003-0.005	0.002-0.0045
2	0.434	0.001-0.002	0.005
3-A*	0.434	0.006-0.011	0.003-0.004
3-B*	0.434	0.007-0.012	0.003-0.004
4	0.4335	0.006-0.008	0.0025-0.0035
5	0.4345	0.005-0.009	0.0025
6	0.434	0.006-0.009	0.002-0.003
7	0.434	0.006-0.013	0.003-0.004
8	0.434	0.003-0.008	0.002-0.003
9	0.434	0.005-0.014	0.003-0.004

*3-A was the cylinder installed on the engine during the exam

*3-B was the cylinder that had been replaced 5.5 hours prior to the accident.

According to the Pratt & Whitney Aircraft Engine Overhaul Manual for the 985 Engine dated October 1979 the Intake and Exhaust Valve Guide/Valve Stem clearances are:

Inlet Valve Guide/Valve Stem clearances are set to **.0015 to .004**

Exhaust Valve Guide/Valve Stem clearances are set to **.003 to .0055**

Figure 4 Valve Guide/Valve Stem Clearances

The condition of cylinders No. 1, 2, 4 through 9 were found in a condition consistent with the number of hours, 1483.9 Since Major Overhaul (TSMO) (Figure 5).



Figure 5 Cylinder No. 1

All cylinders were found in serviceable condition. Cylinder No. 3 was found in a condition consistent with the number of operational hours, 5.5 hours in service.

The valves and rocker arms all moved smoothly, the pushrods were straight and pressed ends attached firmly.

Pistons and piston pins were inspected and found in a condition consistent with the number of operational hours (Figure 6). Pistons and piston pins were found in serviceable condition. The valves and valve rocker arms moved freely and were found in serviceable condition.



Figure 6 Pistons and piston pins

The nose case was removed exposing the cam ring and gears (Figure 7). Run out of the camshaft was done to measure lobe height, the cam lobes were within normal limits. The engine case was not disassembled at this time as continuity and smooth operation was confirmed. Visual inspection of the master rod, articulating rods and accessory section showed no abnormalities. Engine case was found to be in serviceable condition. The crankshaft was not removed from the crankcase as freedom of movement and continuity was confirmed.

A dial indicator was installed to check the cam ring runout and cam lobe lift. Cam ring was found in serviceable limits. Continuity was confirmed with crankshaft. The cam roller tappets located in the nose case were found in good condition. All rollers and tappets moved smoothly and freely (Figure 8).

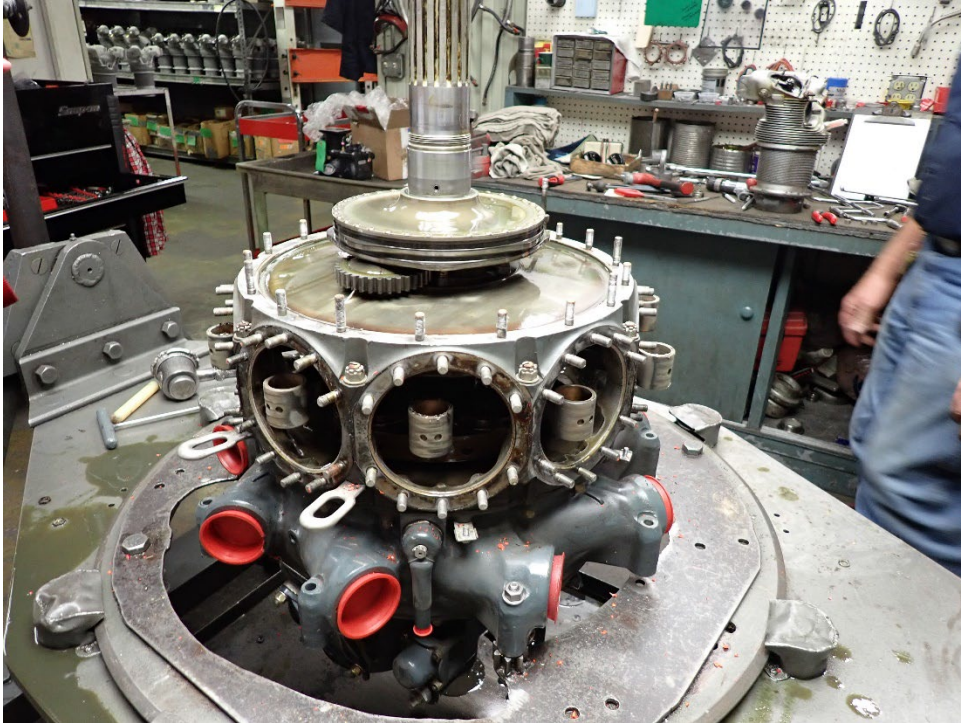


Figure 7 Cam ring, gears, and cam lobes



Figure 8 Nose case and roller tappets

The engine exhibited no indications that the lubrication system was not functioning normally. No heat signatures or thermal damage was found that would indicate oil starvation of any lubricated moving parts. The smooth operation of all the components and visual appearance of the engine internals deemed removing the complete accessory case or splitting the crankshaft case halves unnecessary. The oil screen was removed and found to be clean (Figure 9).

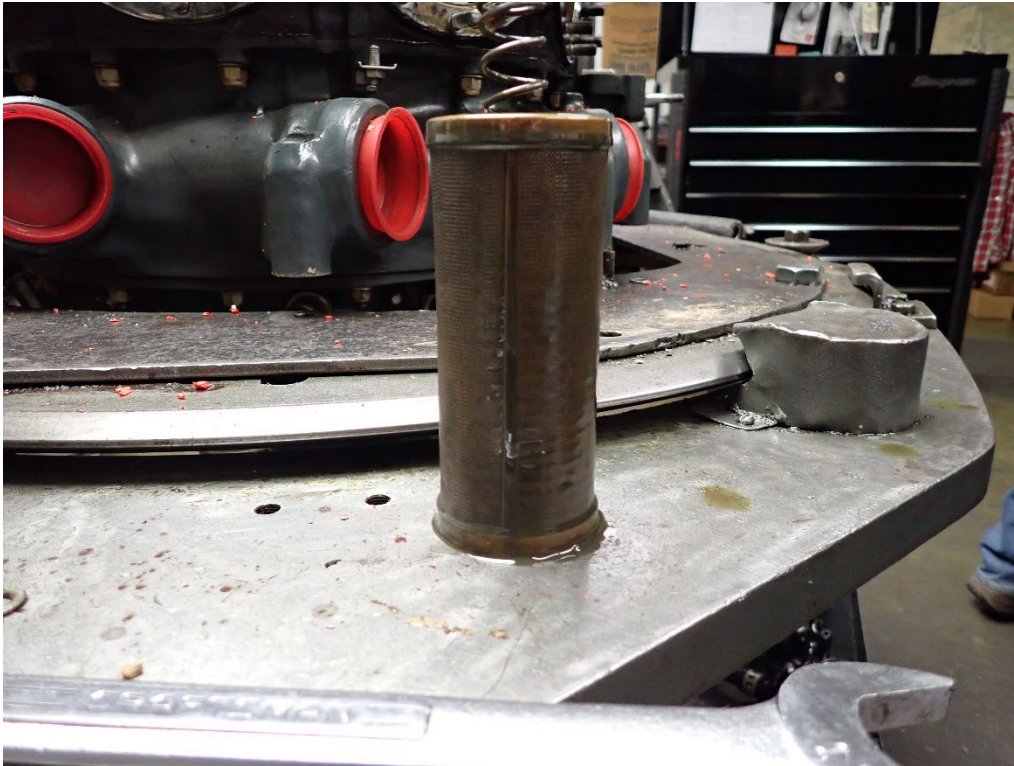


Figure 9 Engine oil screen

The super charger was inspected and found to be in serviceable condition and continuity with the engine was confirmed. The intake tubes were removed and found in serviceable condition along with the seals (Figure 10).



Figure 10 Intake tubes

The Stromberg Model NAR 9B carburetor SN 5778971 was disassembled, it was observed to be excessively dry (Figure 11). The accelerator pump and float moved normally (Figure 12). Fine metal and non-metal particles were found in the carburetor bowl (Figure 13). The Carburetor fuel screen was inspected and found to have minor debris which appeared to be silicone sealant on the screen (Figure 14). Small non-metal particles were observed past the carburetor screen in the economizer. The impeller was intact and rotated smoothly. The fuel pump drive gears turned in sync with the magneto drive gears and impeller when the crank shaft was rotated.

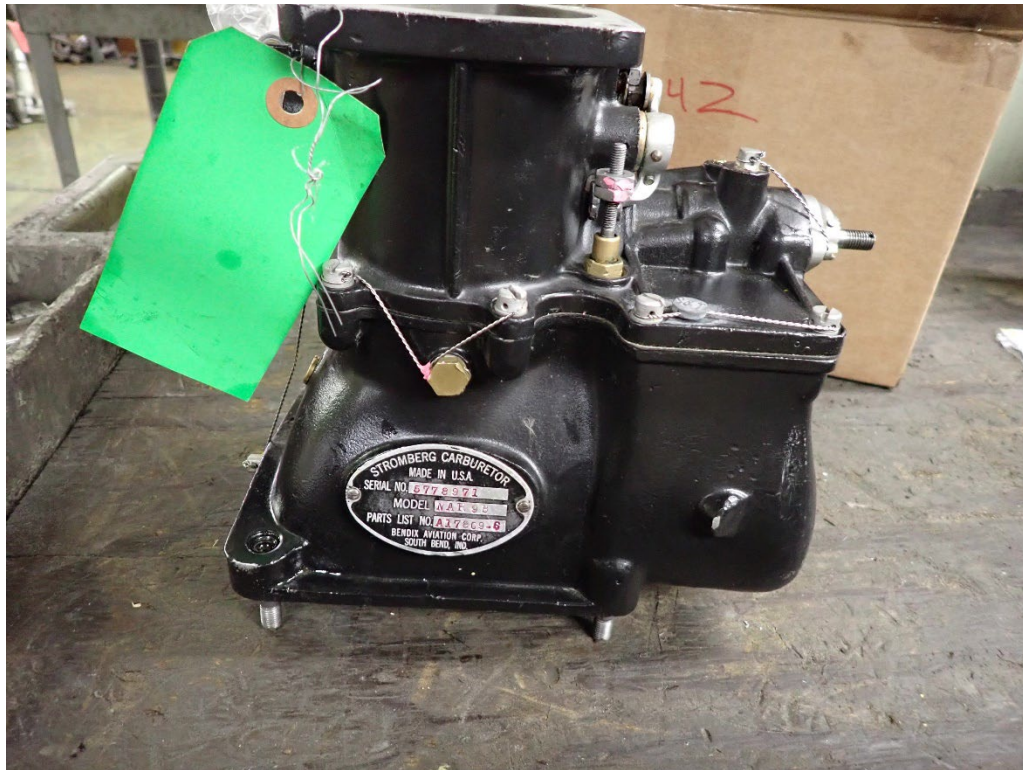


Figure 11 Stromberg carburetor



Figure 12 Carburetor with float



Figure 13 Debris found in carburetor



Figure 14 Carburetor fuel screen

Submitted by:

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