

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



WPR21LA271

ENGINE EXAMINATION

March 14, 2022

A. ACCIDENT

Location: Riverside, California
Date: July 15, 2021
Time: 0845 Pacific daylight time
Airplane: Experimental Vans Checca RV6, N468AC

B. PARTY PARTICIPANTS

Air Safety Investigator	Michael Hicks National Transportation Safety Board Federal Way, Washington
Party Coordinator	Derek Bolden Federal Aviation Administration Riverside, California

C. SUMMARY

On July 15, 2021, at 0845 Pacific daylight time, an experimental Vans Checca RV6, N468AC, was substantially damaged when it was involved in an accident near Riverside, California. The two pilots onboard were seriously injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot reported that while on short final approach for runway 27, the engine experienced a total loss of power. The airplane subsequently impacted terrain short of the runway and came to rest inverted.

A Federal Aviation Administration (FAA) inspector responded to the accident site and reported that the airplane was inverted facing toward the north and was 150 yards from the threshold of runway 27. Fuel was observed running out of the lower cowlings near the quick drain. The first identified point of impact was 60 ft east of the airplane's final resting spot.

D. DETAILS OF THE EXAMINATION

1.0 Engine Examination



Figure 1: N468AC at storage facility, secured to a trailer for the engine test run

Examination of the recovered engine revealed no evidence of any preexisting mechanical malfunction or failure that would have precluded normal operation. The engine ran at various power settings for several minutes uneventfully. Due to malfunctioning instrument displays, the maximum engine rpm reached during the engine run was not captured. However, the engine ran consistently when full power was applied.

2.0 Documented Items Prior to the Engine Run

- Engine mounts remained attached to the engine
- All engine accessories remained attached to their respective mounts
- Overall cylinder condition: The rocker box covers were removed from Cylinders No. 1, No. 2, No. 3, and No. 4. The bottom spark plugs were removed, and thumb compression was observed on each of the cylinders when the crankshaft was manually rotated through by turning the propeller by hand and exhibited no restrictions to movement.
- Equal movement of all the rocker arms was observed, with no visual damage and no restrictions to movement, which confirmed that cam lobes were not significantly worn, and accessory gears were not damaged.
- No visual damage was observed on the crankcase.

- The carburetor throttle arm was observed in the idle position. Throttle cable continuity observed from cockpit control lever to carburetor throttle control arm.
- The carburetor mixture control arm position was observed in the lean position. Mixture control continuity observed from cockpit to carburetor.
- Fixed pitch propeller remained attached to the propeller hub and attached to the engine. The propeller blades sustained impact damage and was removed. An exemplar propeller was attached to facilitate the test run.
- Carburetor Heat was observed in the off position.
- All oil and fuel lines were secure, operational. No leakage or seepage were present prior to, during, or after the test run.
- The ignition harness was intact, undamaged, and remained secure to both magnetos and all 8 sparkplugs.
- The engine oil level was about 7 quarts and appeared free of debris and odorless.
- The induction system exhibited no visual impact damage.
- The exhaust system remained attached to all 4 cylinders. The exhaust pipe on lower left and lower right sides, aft of the firewall sustained impact damage and was cut to facilitate air flow for the engine run.
- The engine driven fuel pump was not removed and exhibited no visual impact damage sustained.
- The ignition harness remained connected to each respective magneto and each spark plug. Top spark plugs remained connected with no visual impact damage.
- The bottom spark plugs were disconnected and removed and exhibited normal wear.
- While rotating the engine crankshaft by hand, spark obtained on all ignition harness leads.
- Both magnetos remained attached to their respective mounts and the engine to magneto timing was verified with Right = 27° BTDC and Left = 26° BTDC.
- Slick Magneto "P" leads remained connected.
- Vacuum Pump was not removed and exhibited no visual impact damage sustained.
- The fixed pitch, 2-blade propeller sustained impact damage, with one blade sustaining aft bending, with some chordwise scratches and spanwise scratches.
- An external fuel tank was connected to the fuel selector and the fuel selector was connected to the carburetor bypassing the fuel strainer.
- External battery power was connected to primary electrical bus.
- Sound from the airframe fuel boost pump was observed when the master was turned on.
- Removed the inlet fuel line from the carburetor. The propeller was rotated by hand, and fuel was extracted from the carburetor inlet fuel line.

3.0 Fuel System

The airplane was equipped with two wing fuel tanks (left and right). Recovery personnel reported that during wreckage recovery, about 6-7 gallons of fuel were drained from the left fuel tank, and about 16-17 gallons of fuel was drained from the right fuel tank. at the accident site. The fuel selector had three positions (Off, Left, Right). The left and right, wing fuel tanks were intact, not breached and were subjected to compressed air, to identify potential areas of breach. None observed.

- The fuel selector valve was connected to the fuel strainer by an unimpeded fuel line. The fuel selector valve was removed, and the valve was rotated through each of the detents without binding or restrictions to movement. All though the fuel selector has three placarded detents identified as Left/Right/Off, rotation of the fuel selector valve indicated that four detents existed, being Both/Left/Right/Off. Compressed air was introduced to the fuel selector valve in each of the detent positions, and no obstructions or impediments were observed. The fuel selector was connected by an unimpeded fuel line to the fuel strainer.
- The airframe was equipped with an electric fuel boost pump and an electrical fuel primer pump. The fuel boost pump appeared operational when power applied. Additionally, the fuel primer pump was operational when turned on.
- The fuel strainer did not sustain visual impact damage. The strainer bowl and the screen were removed and were free of debris.
- The fuel line from the mechanical fuel pump to the carburetor was disconnected from the inlet port of the carburetor. The propeller was manually rotated by hand, and fuel was observed emanating from the fuel line.
- The engine driven fuel pump remained attached to the engine accessory case. Both the inlet and outlet fuel lines remained attached securely.

Fuel Tanks

- A light-affixed borescope was used to examine the left and right fuel tanks; there was no presence of the red or white fuel sloshing substance identified in SB 11-9-13.
- No presence of flaking, blistering or otherwise loose sealer was detected around the fuel cap, or inside of the fuel tanks.
- The left and right fuel tanks appeared clean, with only Proseal visible.
- The fuel caps were not excessively worn, and a tight seal was observed when removed and installed.
- The fuel caps were etched with the airplane's registration number and identified 100LL was the required fuel type.

Oil Filter

- The date on the oil filter was 06/25/2021.
- The filter housing remained connected to the filter housing adapter.
- The oil remaining inside of the oil filter was dark in color.

Carburetor:



Figure 2: Carburetor

- Make: Precision Airmotive Corporation/ Marvel-Schebler
- Model: MA-4-5
- Part No: 10-4164-1
- Serial No: 75308515
- Disassembled carburetor and presence of fuel was noticed in quantity, odor, and the fluid color had a blue-ish hue, confirming the presence of 100LL.
- The float material was royal blue in color, solid epoxy material, and stamped with the numerals 30-862. Floats remained sealed and were not infused with fuel and the float was buoyant while the float bowl remained occupied with fuel.
- The one-piece venturi exhibited mild oxidation and remained intact.
- The mixture metering valve remained intact and exhibited no sign of deformity, discoloration, or presence of debris.

- The needle valve seat did not appear worn or disfigured and exhibited a normal range of motion when manually adjusted.
- The finger screen remained intact and was free of contaminants.
- Excessive wear from the float was not observed on float bowl. However, the bottom, exterior of the float bowl exhibited trace amounts of carbon, where the carburetor attached to the air filter.
- The throttle arm linkage remained connected and operational as experienced by the extraction of fuel from the accelerator pump when the throttle arm linkage was manually adjusted.
- The mixture control arm linkage was intact and functional when manually adjusted throughout the full range of motion, without binding or restriction.
- The accelerator pump was operational when manually manipulating the throttle, exemplified by a strong stream of fuel that exited the carburetor after removal. The accelerator pump fuel screen contained trace contaminants that occupied about 5 percent of the screen.
- The electric boost pump fuel line was disconnected to isolate the electric fuel primer pump. Additionally, the fuel line from the primer was disconnected to confirm fuel flow when the cockpit mounted primer switch was activated. The primer switch was engaged, and fuel was observed emanating from the primer fuel line.



Figure 3: Instrument Panel

4.0 Accessory Documentation

Ignition System

- The left and right Slick magneto housings remained attached to the accessory case mount.
- A "clicking" noise could be heard emanating from the left magneto when the propeller was rotated through and documented as a function of the impulse coupling. The right magneto was a non-impulse magneto.
- Ignition harness did not sustain impact damage, and no signs of impact damage was observed.
- Four spark plugs, one from each cylinder were removed from the bottom of each cylinder and were unremarkable. All four spark plugs were equally gapped without signatures of excessive fouling. Normal dark grey discoloration and normal wear observed.
- The voltage regulator remained attached to the firewall and did not sustain visible impact damage.
- The generator remained attached to the accessory case and did not sustain visual impact damage.
- The alternator remained attached to the accessory case and did not sustain visual impact damage.
- The starter motor remained attached to bottom of the engine case, forward of the sump, and did not sustain visible impact damage.
- The starter ring gear remained attached and to the propeller flange and no visible impact damage was sustained.

Oil Sump and Induction System

- The oil sump remained affixed to the engine case and did not sustain visible impact damage.
- The No. 1, No. 2, No. 3, and No. 4 cylinder intake pipes remained attached, and secure with no visible impact damage.

5.0 Instrument Panel

The digital instruments inside the panel were not operational. Each of the Garmin products and the Dynon, were energized when external battery power was applied. However, a faint error message appeared in the upper left corner of the MFD, that stated "Operating System Not Found." An attempt was made to troubleshoot the instrument panel to document the engine parameters during the test run, to no avail.

Submitted by:

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Air Safety Investigator