

National Transportation Safety Board

Office of Aviation Safety
Central Region



CEN21LA067

WRECKAGE EXAMINATION SUMMARY

ACCIDENT

Location: Telluride, Colorado
Date: November 26, 2020
Time: 1259 mountain standard time
Airplane: Vans RV4, Registration No. N87LW
Latitude: 37.94909 North Latitude
Longitude: 107.88862 West Longitude
Elevation: 8,877 ft msl

PARTICIPANTS

Investigator	David Bowling National Transportation Safety Board Denver, Colorado
Group Member	Troy Helgeson Lycoming Engines Williamsport, Pennsylvania
Group Member	Jaime Ramirez Beegles Aircraft Service, LLC (A&P Mechanic) Greeley, Colorado

ACCIDENT SYNOPSIS

On November 26, 2020, about 1259 mountain standard time, an amateur-built Vans RV4 airplane, N87LW, was substantially damaged when it was involved in an accident near Telluride, Colorado. The pilot and his passenger were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* (CFR) Part 91 personal flight.

WRECKAGE EXAMINATION TIMELINE

The National Transportation Safety Board (NTSB) Investigator-in-Charge (IIC) did not travel to the accident site due to COVID-19 restrictions in place at the time of the accident. The wreckage was recovered by Beegles Aircraft Service. The NTSB wreckage examination was completed on February 18, 2021. The NTSB was assisted by a Lycoming Engines investigator and a Beegles Aircraft Service aviation mechanic.

AIRPLANE DESCRIPTION

The airplane was a 1987 Vans RV4, serial number (s/n) 1115, registration number N87LW. The 150 horsepower, carbureted, normally aspirated, Lycoming O-320-E2B engine, s/n L-26642-27A, provided thrust through a two-blade, ground-adjustable, Sensenich propeller, s/n 2G0M6-E. The low-wing airplane was of conventional aluminum construction with a fixed conventional (tailwheel) landing gear and wing flaps. According to weight-and-balance form found in the wreckage, the airplane's empty and maximum takeoff weights were 888 lbs and 1,483 lbs, respectively.

The airplane was equipped with a 32.6-gallon capacity (32 gallon useable) fuel system, consisting of two 16.3-gallon wing fuel tanks. The fuel selector valve positions include left, right, and off.

According to the airplane kit manufacturer, the airplane's wings-level aerodynamic stall speed at a maximum gross weight of 1,500 lbs was 54 mph (47 knots).

RV-4				Model	RV-4
				Engine	150 - 180 hp
				Top Speed	180 mph
				Stall Speed	48 mph
				Fuel Capacity	32 US gal
				Seats	2
				Weight	888 lbs
				Rate of Climb	2,450 fpm
				Ceiling	28,600 ft
				Range [75% @ 8000 ft]	590 sm
				Range [55% @ 8000 ft]	725 sm
				Gross Weight 1500 lbs	
				Top Speed	212 mph
				Cruise [75% @ 8000 ft]	200 mph
				Cruise [55% @ 8000 ft]	180 mph
				Stall Speed	54 mph
				Takeoff Distance	400 ft
				Landing Distance	425 ft
				Rate of Climb	1,950 fpm
				Ceiling	23,000 ft

Figure 1 - Vans RV4 Specification/Performance Table

MAINTENANCE SUMMARY

Recent Maintenance

The airplane maintenance logbooks were not located during the investigation.

Recent Fueling

According to a fuel purchase receipt, on the morning of the accident, at 1102 mountain standard time, the pilot dispensed 23.87 gallons of 100 low-lead aviation fuel using the self-serve fuel pump at Telluride Regional Airport (TEX), Telluride, Colorado.

WRECKAGE EXAMINATION (FEBRUARY 18, 2021)

The airplane was laid out in a Beegles Aircraft Service's hangar. The left and right wings were separated from the fuselage during recovery. The cockpit forward on the aft fuselage, main landing gear, engine, and propeller hub were attached. The fuselage aft of the cockpit was separated and the empennage was cut from the fuselage forward of the vertical and horizontal stabilizers. The main landing gear struts and wheels were broken aft. The tailwheel was present.



Figure 2 - Airplane Layout

Left Wing

The airplane's left wing had been cut at the root. The wing was crushed aft along the leading edge to the spar, from the wing tip to the root. The wing tip was broken aft. The fuel tank cap was secure. Examination showed the cap intact and the seal in good condition. The cap depicted the tank quantity as 16.3 US gallons and the type of aviation fuel as 100 low lead. The fuel tank was broken open and no fuel was present.

The left aileron push tubes and linkages were located. The push-pull tube into the wing was compressed and cut. The aileron was separated and broken at the hinges and actuator horn. The aileron surface itself was dent and buckled. Manipulation of the aileron horn showed the mechanism was intact and moved freely. The corresponding push-pull tube was in the fuselage, left front cockpit area. Manipulation of the forward and aft cockpit control sticks laterally moved the tube at the fuselage.

The left flap was connected to the wing, intact, and broken forward. The actuator arm was separated at the wing root. The inboard flap surface was bent inward along the length of the hinge and buckled at midspan. The electric flap switch was in the front cockpit along the left wall forward of the throttle and mixture control. The flap switch was broken in its housing.



Figure 3 - Left Wing (Bottom Facing)

Right Wing

The airplane's right wing had been cut at the root. The wing was crushed aft along the leading edge to the spar, from the wing tip to the root. The wing tip was broken aft. The fuel tank cap was secure. Examination showed the cap intact and the seal in good condition. The cap depicted the tank quantity as 16.3 US gallons and the type of aviation fuel as 100 low lead. The fuel tank was broken open and no fuel was present.

The right aileron push tubes and linkages were located. The push-pull tube into the wing was cut. Manipulation of the aileron showed the mechanism was intact and moved freely. The aileron itself was buckled slightly. The corresponding push-pull tube was in the fuselage, front cockpit area. Manipulation of the forward and aft cockpit control sticks laterally moved the tube at the fuselage.

The right flap was connected, intact, and slightly extended. The actuator arm was separated at the wing root. The inboard flap surface was bent up and aft.



Figure 4 - Right Wing (Bottom Facing)

Empennage

The empennage was intact. The horizontal stabilizers and showed minor damage. The left elevator was buckled at midspan outboard. The trailing edge toward the tip was torn in several places and the trailing edge corner was bent upward. The right elevator trailing edge corner was also bent upward and the right elevator tip was separated along the seam. The push-pull tube to the elevator was cut forward of the

vertical stabilizer. Manipulation of the tube freely moved the elevator. The elevator trim tab was in a nose up position. The trim cable was broken at the empennage separation. Manipulation of the cable moved the trim tab. The remainder of the trim cable was traced to the cockpit through to the trip actuator lever. The trim lever was at mid-range. The vertical stabilizer showed no damage. The rudder was crushed upward slightly at the base. The rudder cables were found separated and frayed. Pulling on the cables moved the rudder and tailwheel through their entire range. The cable separations were in the floor of the aft cockpit just under the rear pilot seat and corresponded with the separations found at the empennage. The cables were traced through the floor to the rudder pedals showing continuity through the rear and front cockpits.



Figure 5 – Empennage

Aft Fuselage

The fuselage, aft of the rear cockpit, was bent inward on the right side, broken upward, and separated. The elevator push-pull tube was cut at the aft portion of the

fuselage separation where the empennage had been cut. It was traced to the balance weight just behind the baggage bulkhead. The bottom of the fuselage in that area was crushed upward.



Figure 6 - Aft fuselage

Cockpit and Instrument Panel

The instrument panel was broken forward and fragmented. The radios, flight, and navigation instruments were broken out. The front and rear seats were also broken forward and the cockpit floor was crushed upward. The cockpit walls were bent, buckled, and broken forward. The canopy was separated and most of the front plexiglass was broken out.

The throttle and mixture control handles were found full forward. The fuel selector was on the left tank. The fuel gauges on each side of the fuel selector switch were broken and the needles indicated the left and right fuel tanks were full. The ignition switch was in the both position. The key was broken at the switch.

A JPI 830 digital engine monitor was removed and successfully downloaded using the manufacturer's software utility. The downloaded data was retained by the NTSB IIC for additional analysis.

The front and aft cockpits were equipped with lap belts. The right front seat lap belt had been cut. The left side of the belt was undamaged. An examination of the

bayonet on the left side belt showed witness marks consistent with the belt being fastened when the crash occurred. The right rear seat lap belt had also been cut. The left side belt was not located.



Figure 7 - Cockpit

Airframe Summary

The airframe examination did not reveal any evidence of a preexisting mechanical malfunction or failure that would have prevented normal operation. Flight control continuity could not be established due to damage; however, all flight control system separations were consistent with impact-related damage or were separated to facilitate recovery of the wreckage. All structural damage to the airplane was consistent with ground impact.

ENGINE EXAMINATION

Lycoming O-320-E2B, s/n L-26642-27A

Throttle, mixture, and carb heat cables attached to respected control arms. The engine was lifted and removed from the airframe. The exterior of the engine was photographed. The remaining firewall and baffling were removed from the engine. The fuel pump, oil filter, and magneto were removed.

The wiring harness was removed from the top four spark plugs. The top spark plugs were removed and examined. They electrodes showed minimal wear and were light gray with no combustion deposits.

The rocker box covers were removed, and the crankshaft was manually turned. Intake and exhaust valves on all four cylinders moved normally. The crankshaft and camshaft rotated smoothly and the camshaft gear drove the accessory drive gears. Push rods to the lifters and rocker arms moved smoothly.

Internal engine and valve train continuity were confirmed while the engine crankshaft was rotated. Cylinder compression was confirmed by placing a finger over the open spark plug holes and feeling suction and expelled air from each cylinder while the crankshaft was rotated. A borescope examination of each cylinder confirmed no anomalies with the cylinders, pistons, valves, or valve seats.



Figure 8 - Engine Valves and Rockers, Left Side View



Figure 9 - Engine Valves and Rockers, Right Side View

Magneto Teledyne Continental Motors Model S4LN-21, Serial No. 712044

The magneto was in good condition. The wires from the distributor cover were cut and the magneto coupling was turned. The magneto coupling rotated normally. When rotated, spark was observed at all four wires.



Figure 10 - Engine Driven Magneto

Electronic Magneto

The engine was equipped with an electronic magneto. The magneto was not tested during the examination.

Engine-Driven Fuel Pump

The engine-driven fuel pump was removed. Fuel dripped from the line connectors. When the drive lever was depressed, air was pushed through the fuel line connectors out of the pump.



Figure 11 - Engine-Driven Fuel Pump

Carburetor

The carburetor was broken aft and separated from the engine. The carburetor floats were not present during the examination. The control arms moved freely. The fuel screen was removed and examined. The screen was clean and showed no debris.

Oil Filter

The oil filter housing was broken aft from the accessories case. The filter screen was removed from the housing. The screen was clean and showed no debris.



Figure 12 - Oil Screen

Engine Examination Summary

The engine examination did not reveal any evidence of a preexisting mechanical malfunction or failure that would have prevented normal operation. All physical damage to the engine was consistent with ground impact.

PROPELLER EXAMINATION

Sensenich Two-Blade Composite Propeller, serial number 2G0M6-E

The two-bladed Sensenich composite propeller hub was still attached to the engine flange and crankshaft. The hub showed gouges and scoring marks. One propeller blade was broken laterally and aft at the hub. The other blade was broken aft approximately 5 inches outboard of the hub. That blade showed aft and lateral splintering at the fracture and chordwise scrapes and scratches on the front face.



Figure 13 - Propeller Hub



Figure 14 - Propeller Blade

Propeller Examination Summary

The propeller examination did not reveal any evidence of a preexisting mechanical malfunction or failure that would have prevented normal operation. All physical damage to the propeller was consistent with it turning at ground impact.