



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

January 6, 2022

AIRFRAME AND ENGINE EXAMINATION

WPR22LA061

This document contains 32 embedded photos.

A. ACCIDENT

Location: Bermuda Dunes, California

Date: 12/11/2021

Aircraft: Rans RV-3 / N9YY

NTSB IIC: Fabian Salazar

B. EXAMINATION PARTICIPANTS:

Fabian Salazar

IIC

National Transportation Safety Board

Federal Way, WA 98003

Mark Platt

Sr. Air Safety Investigator

Lycoming Engines

Phoenix, AZ.

C. SUMMARY

Examination of the airframe and engine was conducted at Air Transport Recovery, Phoenix, Arizona. Examination of the airframe revealed evidence that the engine was not rotating, and the fuel shutoff valve was set to an intermediate position, consistent with about 50% open. No other mechanical malfunctions or anomalies were found that would have precluded normal operation. Examination of the engine revealed no mechanical malfunctions or anomalies that would have precluded normal operation

D. DETAILS OF THE INVESTIGATION

Airframe Examination. The airframe was sectioned in two. The front half consisted of the airframe from the propeller flange to the pilot's seat, and the main landing gear. The second half consisted of the aft fuselage and empennage including the tail wheel.

Cockpit Documentation

The single seat cockpit was not compromised for living space. The seat consisted of a one-piece cushion with a four-point seat belt and shoulder harness. The seat belt was unlatched but intact. The shoulder harness remained attached to the mounts located on the aft fuselage.

Flight control continuity was established from the control stick to the ailerons, and from the control stick to the recovery cuts in the control cables to the elevators, and from the recovery cuts aft to the elevators. Continuity was established from the rudder pedals to the recovery cut in the control tube. And from the recovery cut in the control tube to the rudder. Control continuity was established from the throttle to the throttle linkage on the carburetor, and from the mixture control to the carburetor. The throttle cable outer sheath, located on the mounting bracket attached to the fire wall, had pulled away from the mounting bracket. Both throttle and mixture levers moved throughout their range. Continuity was established from the flap control handle to the bellcrank to the flaps, located behind the seat, and from the bellcrank to the right flap. The left flap control rod to the bellcrank was fractured consistent with overload. The flap handle would not move due to the distortion in the fuselage.

A fuel shutoff valve was found attached to the bottom of the fuel tank. The fuel shutoff valve handle was found perpendicular to the fuel line. Disassembly and examination of the valve revealed that the handle was manufactured to travel about 90° total. When pulled aft to the stop, towards the tail of the airplane, the passage was completely closed. When pushed fully forward to the stop, toward the nose of the airplane, the passage was completely open. When positioned halfway (90° to the fuel hose) the passage was about 50% open.

The instrument panel remained partially attached to the cockpit but had been pushed over so that the instruments were facing up. All instruments remained secured in their mounts.

Airspeed indicator: 0 knots
Altimeter: 650 feet 30.18
Vertical Speed Indicator: 1,200 feet per minute ascent
Engine Tachometer: 0 RPM
Tach hour meter: 173.73
CHT: 0°F
EGT: 0°F
Ignition: OFF, key found in resting on the seat
Carb Heat: Full in (off)
Amperes: 0
Oil Press: 0 PSI
Oil temp: < 100°F
Master Switch: Broken, Unknown
Field: OFF
COM C/B: IN
XPOND C/B: IN
ALT C/B: IN
ACC C/B: IN
Cabin Heat: IN
Engine Primer: IN
Acceleration: +1, +9, +11

The following items were found in the wreckage and retained for further examination.

1. iFly GPS, Serial number ZZ20080060

2. Dynon D3 Pocket Panel, Serial number: 5072
3. TruTach II, no serial number

The special airworthiness certificate dated October 4, 2011, and a weight and balance, dated 9/26/201, were found with the wreckage, photo documented, and left with the airplane.

WRECKAGE AND IMPACT INFORMATION

AIRFRAME

Fuselage. Beginning on the right side. The fuselage sheet metal on the right side was pulled away from the cockpit area, possibly for recovery purposes. The fuselage skin was damaged with dents and wrinkled skin throughout. The 24-gallon fuel tank remained partially separated and has held in place only by the fuel line at the bottom of the tank. The fuel shutoff valve was found with the lever 90° to the fuel line. This position placed the orifice about 50% open. A fuel gauge, located on the rear of the fuel tank indicated 15 gallons, with the tank empty. There were multiple breaches in the tank. According to the recovery agent, about 8 gallons of fuel drained from the fuel tank after the accident. The one-piece canopy separated from the fuselage, possibly by first responders. The acrylic had shattered and was found withing the wreckage.

The right wing remained attached to the fuselage and exhibited substantial damage in the form of aft crushing near the root, and dents and wrinkling of the sheet metal throughout the top of the wing. The leading edge did not exhibit indentations from striking an object. The right-wing tip and inboard to about two feet of the wing exhibited upward bending and scoring of the lower skin of the wing consistent with contacting a hard surface. The aileron remained attached at its mounts and moved with moderate force to the stops. The flap remained attached at its mounts and appeared to be in the full up position. Damage to the right flap was observed at the root. The flap would not move.

The aft fuselage, from the rear of the pilot's seat to the empennage was separated during recovery and exhibited minor damage throughout with some dents and wrinkling of the sheet metal. The right horizontal stabilizer remained attached to the empennage and exhibited no damage. The right elevator remained attached to the horizontal stabilizer and exhibited no damage. The vertical stabilizer remained attached to the empennage and exhibited no damage. Th rudder remained attached to the vertical stabilizer and exhibited no damage. The left horizontal stabilizer remained attached to the empennage and exhibited no damage. The left elevator remained attached to the left horizontal stabilizer and exhibited minor damage with slight upward bending at the outboard tip. The right side of the aft fuselage exhibited minor dents.

The left side of the fuselage exhibited substantial damage in the form of dents and wrinkles to the sheet metal. The left wing remained attached to the fuselage and exhibited substantial damage at the root, outboard to about 4 feet, mostly along the leading edge aft to about mid chord length. The leading edge did not exhibit direct contact with an object. The wing tip was undamaged. The aileron remained attached at its mounts and moved to its limits. The left flap remained attached at its mounts and appeared in the full up position. The flap would not move.

The left main landing gear remained attached to the underside of the engine mount frame and was displaced upwards and aft. The wheel remained attached as did the brake assembly.

The right main landing gear was separated from the underside of the engine mount frame, possibly during recovery. The right wheel remained attached to the right strut as did the brake assembly. The tail wheel remained attached to the empennage and moved freely to the left and right limits.

The engine cowl, constructed from composite materials was partially attached to the forward fuselage. The left and right side of the nacelle was damaged and retained evidence consistent with contact with a palm tree located near the wreckage. The top of the cowl had crushed downward. The oil dip stick access port remained secured. The nacelle was removed, exposing the engine. Remnants of the palm tree were found resting on the top of the engine. The engine remained attached to the firewall. The four cylinders remained attached to the engine case and did not exhibit significant damage.

Propeller. The propeller was removed during recovery. The wooden propeller exhibited a fracture and separation of one blade. The blade was observed near the palm tree but not recovered. The fracture exhibited a front to back break. The opposite propeller blade exhibited very minor damage and did not appear to have struck an object. Minor removal dents were observed on the back side of the blade. The composite spinner was fractured into multiple pieces and mostly separated from its mount.

ELT. An ELT was found in the wreckage. Model ACK Technologies, model: E-01, TSO C91a, serial number: 048655.

Engine. The engine was examined by the party member from Lycoming Engines and the IIC. The top spark plugs were removed and exhibited normal wear. The spark plug leads remained attached to all the spark plugs and exhibited breaks near the magneto, consistent with contact with the firewall. The two magnetos remained attached to their respective pads. The right magneto exhibited a minor defect with a quarter size hole from contact with an object. Spark was observed at all eight leads on the magnetos. E-gap was verified and found to be slightly retarded on both magnetos. The magneto to engine timing was recorded at 20° before top dead center (BTDC) of the number 1 cylinder. The engine data plate indicated 25° BTDC was the correct timing. The ignition switch was examined, and the ground wire was found to be attached but

very loose. The starter ring gear had separated from the engine. The starter separated from the engine and did not exhibit any indication of the ring gear rotating when it contacted the starter.

Thumb force compression was present in all cylinders and in the correct firing order. The carburetor was damaged, and the needle and the filter were not recovered. The brass floats were damaged, one exhibited inward crush damage consistent with fluid being present at the time of impact. The main jet was clear of obstruction, the throttle cable remained attached to the throttle arm, however the outer sheath had separated, allowing the inner control cable to flew when the throttle was advanced to full throttle. It is unknown if this outer sheath separation was a result of the displacement of the engine during impact. The fuel line from the fuel tank to the carburetor was clear but had separated from the carburetor. The intake plenum remained attached to the engine and exhibited minor damage. The gascolator was dry but contained a large amount of metallic rust at the bottom of the bowl. The filter screen was clear.

Valvetrain continuity and cam lobe integrity was established. Similar rocker arm movement was observed at all rocker arms for the intake and exhaust. The Exhaust tubes and intake tubes remained attached to the engine and exhibited minor crush damage upwards. The valve covers were removed and exhibited wet clean oil appearance for all the cylinder heads. The oil screen exhibited no blockage.

PHOTO EXHIBIT



Figure 1. N9YY at the accident site. The top of a palm tree is to the left of the airplane. Photo courtesy of the Riverside Sheriff's department.



Figure 2. N9YY at accident site, showing sand spread out to absorb fuel, and a palm tree without a top, with palm tree debris around the accident site. Photo courtesy of the Riverside Sheriff's department.



Figure 3. N9YY at accident site. Photo courtesy of the Riverside Sheriff's department.



Figure 4. N9YY at the recovery facility. Right-side view.



Figure 5. Front view.



Figure 6. Front-left view.



Figure 7. Left-side view.



Figure 8. Left-rear view.



Figure 9. Left-rear view.



Figure 10. Right-rear view.



Figure 11. Rear view.



Figure 12. Cockpit view.



Figure 13. Instrument panel.



Figure 14. One-piece canopy.



Figure 15. Fuel shutoff valve in intermediate position, as found.

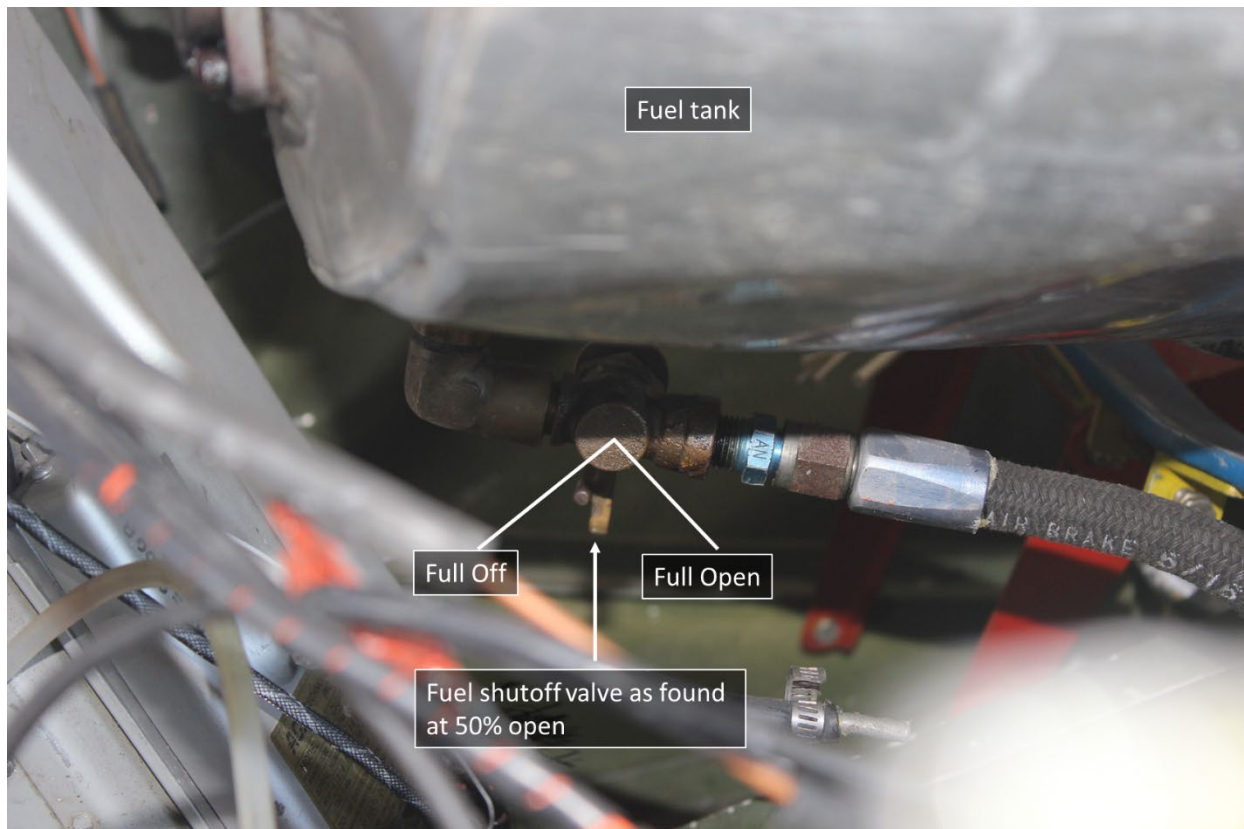


Figure 16. View of fuel shutoff valve handle travel.



Figure 17. Fuel shutoff valve showing the valve handle position when the opening is at 100% open.



Figure 18. Fuel shut off valve showing the valve at 100% open and the fuel handle at 45° forward.



Figure 19. Engine right-side view.



Figure 20. Engine front view.



Figure 21. Engine left-side view.

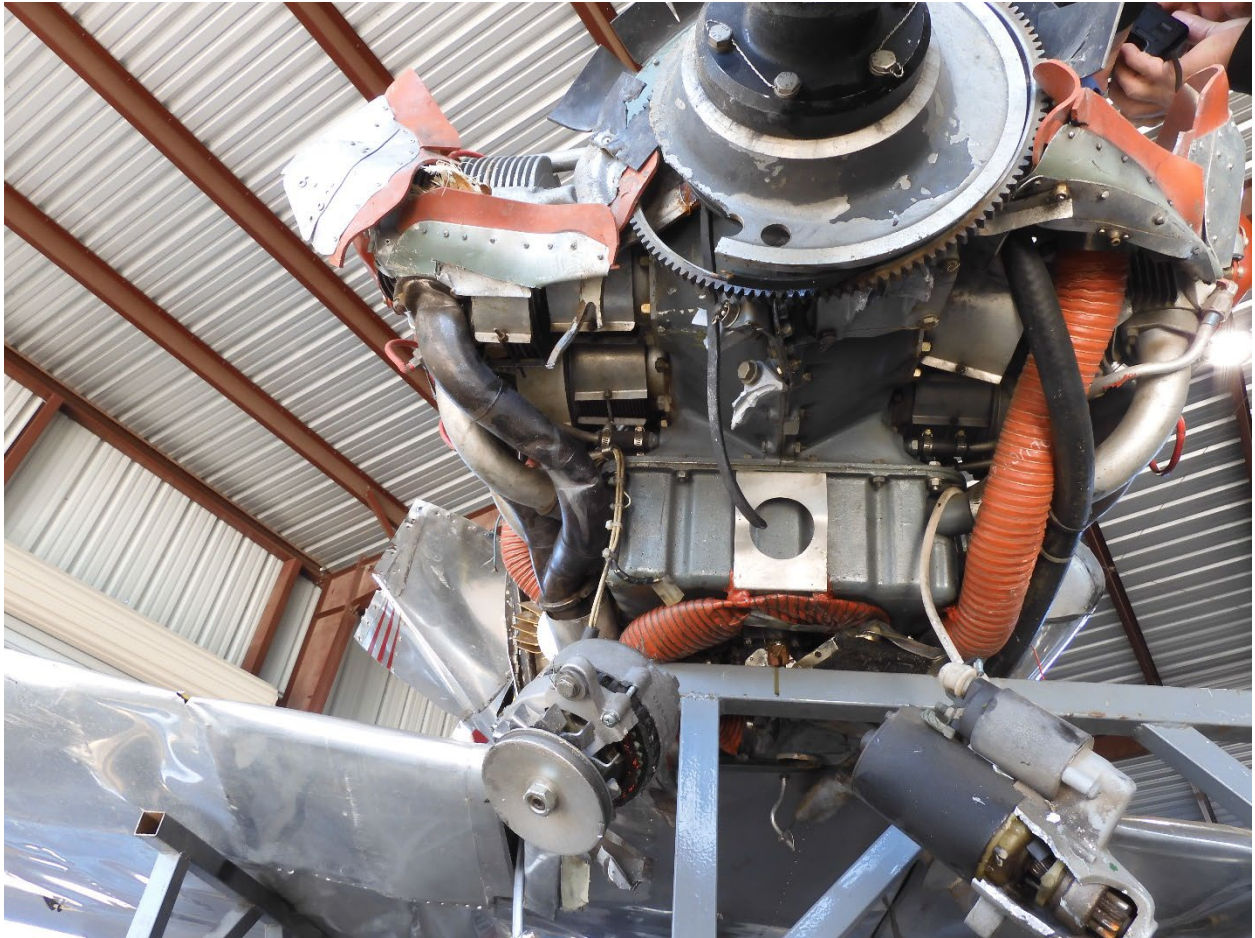


Figure 22. Engine front view showing the displaced starter, alternator, and ring gear.



Figure 23. Engine rear view.



Figure 24. Engine oil screen.



Figure 25. Top spark plugs.



Figure 26. Throttle cable and throttle arm linkage.



Figure 27. Carburetor bowl with floats.



Figure 28. Gascolator bowl and screen, showing metallic rust debris found at the bottom of the bowl.



Figure 29. Starter and ring gear, showing no rotational damage to the starter from the ring gear.



Figure 30. Wooden propeller and fragment of the spinner.



Figure 31. Back-side view of the propeller.



Figure 32. Back-side view of the separated propeller at the accident site, near the palm tree.