



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

March 23, 2021

Airframe and Engine Exam

WPR20LA237

This document contains 18 embedded photos.

A. ACCIDENT

Location: Tehachapi, CA.
Date: July 24, 2020
Aircraft: Rans RV-8 / N138PM
IIC: Samantha Link

B. PARTICIPANTS

Fabian Salazar
ASI, WPR
NTSB

James Bledsoe
ASI, WPR
NTSB

Mark Platt
ASI
Lycoming Motors
Phoenix, AZ.

C. SIGNIFICANT EXAMINATION FINDINGS

- On March 23, 2021, the airplane's airframe and engine were examined at the Air Transport Recovery facility.
- No mechanical malfunctions or anomalies were observed that would have precluded normal operations.
- The three propeller blades were not present.

GENERAL OBSERVATIONS.

1.0 AIRFRAME

The airplane was set up in the covered area at Air Transport, Phoenix, Arizona. The airplane was resting on two stands. There was no landing gear. The wings were held parallel to the fuselage with rope. The loose wreckage was found in the cockpit area, removed, and placed on the floor. All major components except the three propeller blades were located.

FUSELAGE (Front to back)

The right side of the fuselage, from just aft of the engine nacelle to the empennage displayed extensive wrinkling and buckling. A large tear in the sheet metal was evident about mid-way of the tandem cockpit area. The tear in the sheet metal extended from the canopy area down to the belly of the airplane. Aft of the cabin area was extensive sheet metal deformation with wrinkling and bending of the fuselage. Extensive damage was noted to the belly of the fuselage with large tears in the sheet metal, dents, and wrinkling from the nose to the tail.

LEFT SIDE (back to front)

The left side was not as extensively damaged as the right. There is not as much heavy damage on the bottom of the fuselage. There was heavy scratching in the paint about mid-span between the elevator and the wing. The top of the aft fuselage was dented. The rail for the canopy remained attached to the fuselage, but the canopy separated from the top of the fuselage. There were several dents along the top of the fuselage from the aft canopy area toward the empennage. There was a large tear in the sheet metal about 18 inches forward of the trailing edge of the wing. The tear runs from the bottom of the fuselage to the canopy rail.

WINGS

The right wing was extensively damaged, partially separated from the fuselage, and pushed back about 45 degrees. About mid-span there is a deep dent directed aft. The leading edge was crushed aft past the wing spar. The composite wing tip was fractured and crushed inward toward the fuselage. The right aileron had separated at the hinges and displayed damage throughout its span. The right flap had separated from the hinges and displayed damage throughout its span. The entire upper surface of the right wing displayed damage throughout its span. The underside of the right wing displayed extensive damage throughout its span. The right fuel cap remained secured to the wing. The right fuel tank was breached, and no fuel remained.

The left wing remained partially attached to the fuselage by the flap control tube and some wires; it was extensively damaged. The flap had separated from the wing and was damaged along its span. The inboard section was crushed from the trailing edge forward. The aileron remained attached to the wing at both hinges but was extended down beyond the limit and resting under the wing. The composite wing tip separated from the wing and remained in one piece. The leading edge was extensively damaged throughout its span. There was a large dent about mid-span. The left fuel cap remained secured to the wing. The left fuel tank was breached, and no fuel remained. The top and bottom of the wing displayed extensive damage with large tears, dents and wrinkling in the sheet metal.

EMPENNAGE

The right horizontal stabilizer had damage to the leading edge throughout its span, with wrinkling and dents on the sheet metal and scratches running fore to aft. The right elevator

remained attached at the hinges and articulated up and down to full travel. About ten inches of the outboard tip of the right elevator and the counterweight was bent upwards to about a 45° angle. The right side of the vertical stabilizer displayed minor damage. The fiberglass at the base of the vertical stabilizer was damaged, cracked, and some sections were separated. The right side of the rudder displayed minor damage and remained attached to the vertical stabilizer and the tailwheel articulated with the rudder movement.

The left side of the vertical stabilizer displayed minor damage with dents near the leading edge. The left horizontal stabilizer had minor damage on the top and bottom. The left elevator remained attached to the empennage, articulated up and down to full travel and had a large fracture and crack about mid-span on the top surface. The trim tab on the left elevator separated but remained partially attached by the trim control cable.

ENGINE COWLING

The two-part composite engine cowlings were extensively damaged. The lower cowlings separated and fragmented. The top cowlings remained partially attached and were damaged.

LANDING GEAR

The right main landing gear was separated from the fuselage. The mounting hardware was absent and the mounting holes on the strut were not distorted, consistent with removal of the landing gear for recovery. The tire had a large tear and was deflated. The brake caliper remained attached to the rotor, and the hydraulic line fractured and separated from the caliper. The wheel skirt or pants were separated.

The left main landing gear was separated from the fuselage. The mounting hardware was absent and the mounting holes on the strut were not elongated, consistent with removal of the landing gear for recovery. The tire was not damaged. The brake caliper remained attached to the rotor and the hydraulic hose remained attached to the caliper.

PROPELLER

The three-blade propeller hub remained attached to the engine. The propeller blades had fracture separated from the hub at their roots. The hub retained about 8 inches of the A blade, 6 inches of the B blade and about 7 inches of the C blade. The separated section/fragments of the propeller blades were not present. The composite spinner remained attached to the hub.

COCKPIT

The cockpit area retained its original shape and was not extensively damaged. The tandem seats were not secured to the cockpit and were easily removed from the fuselage. The front seat area had a control stick, rudder pedals, and a throttle quadrant. Continuity for the throttle and mixture were established from the throttle quadrant to their respective control arms on the fuel servo. The aft seat contained a control stick only. Both seats used a five-point restraint system. Both restraint systems were intact and remained attached at all mounting points.

The instrument panel contained an Advanced Flight Systems AF-5500, which includes two multi-function displays. Both MFD's remained attached to the instrument panel. The MFD's were removed and sent to the NTSB Recorders Laboratory for download.

FLIGHT CONTROL CONTINUITY

Flight control continuity was confirmed from the front control stick to aft control stick and from the control sticks to the left and right aileron control tubes. The aileron control tube for the left wing and right-wing aileron bell cranks were confirmed. Bell crank to aileron was unable to be confirmed due to damage from the accident.

Rudder control continuity was confirmed from the rudder pedals to the rudder control surface. Elevator control continuity was confirmed from the control sticks to the elevator control surfaces.

2.0 AIRFRAME PHOTOS



Figure 1: Front Left Side of Airplane



Figure 2: Left Side of Airplane



Figure 3: Empennage



Figure 4: Aft Right Side of Airplane



Figure 5: Front Right Side of Airplane



Figure 6: Propeller Assembly



Figure 7: Instrument Panel

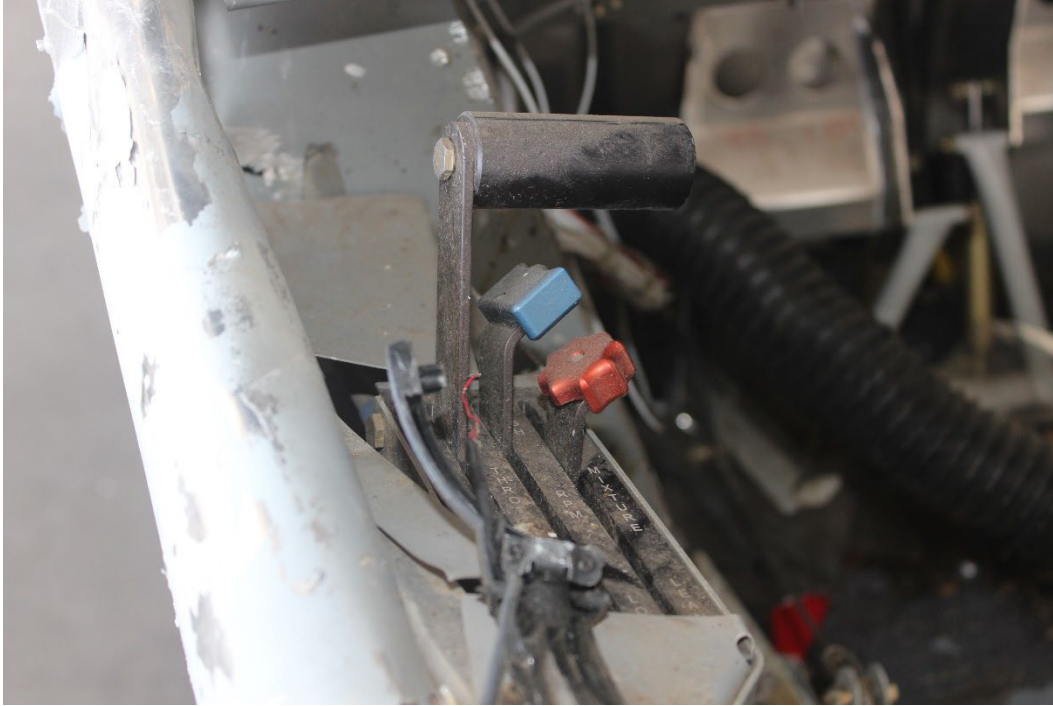


Figure 8: Engine Controls

3.0 ENGINE

OVERVIEW

The engine remained secured to the firewall; the number two cylinder sustained damage consistent with impact. Visual examination of the engine did not reveal any catastrophic pre impact failures or malfunctions.

FUEL SYSTEM

The fuel divider remained secured on the top of the engine. It was disassembled and no anomalies were noted. The diaphragm remained intact, pliable, and undamaged. Each line remained secured to each nozzle/cylinder. Each nozzle was removed and were free of debris the fuel pump remained attached to the engine and the fuel lines remain secure at their respective fittings the fuel pump was removed and disassembled no anomalies were noted with the internal components.

The fuel servo remained attached to the engine. The throttle and mixture controls were securely attached at their respective control arms and continuity was established to the cockpit controls. The inlet screen was removed, and no debris was noted. All fuel lines within the engine compartment remained secured.

IGNITION SYSTEM

The upper spark plugs were removed and were consistent with normal operations. Both magnetos remained secured to their mounting pads and the ignition harness was secured to each spark plug/cylinder.

ENGINE ROTATION

The engine was borescoped; the valves, cylinder walls, and piston heads were all consistent with normal operation. The lower spark plugs were also consistent with normal operations.

The engine was rotated by hand at the propeller hub. The valves moved accordingly, and drivetrain continuity was established to the accessory section of the engine. In addition, thumb compression was established on all cylinders, and spark was obtained on each ignition lead.

4.0 ENGINE PHOTOS



Figure 9: Top of Engine



Figure 10: Right Side of Engine



Figure 11: Left Side of Engine



Figure 12:Accessory Section



Figure 13: Left Side Valve Assemblies

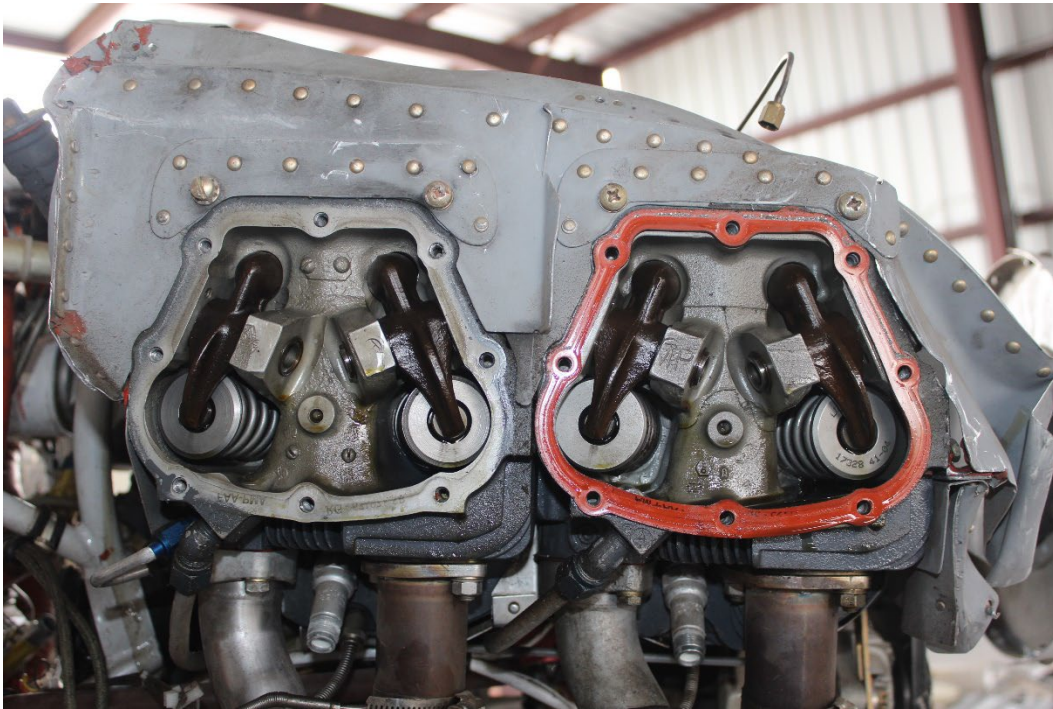


Figure 14: Right Side Valve Assemblies



Figure 15: Fuel Pump

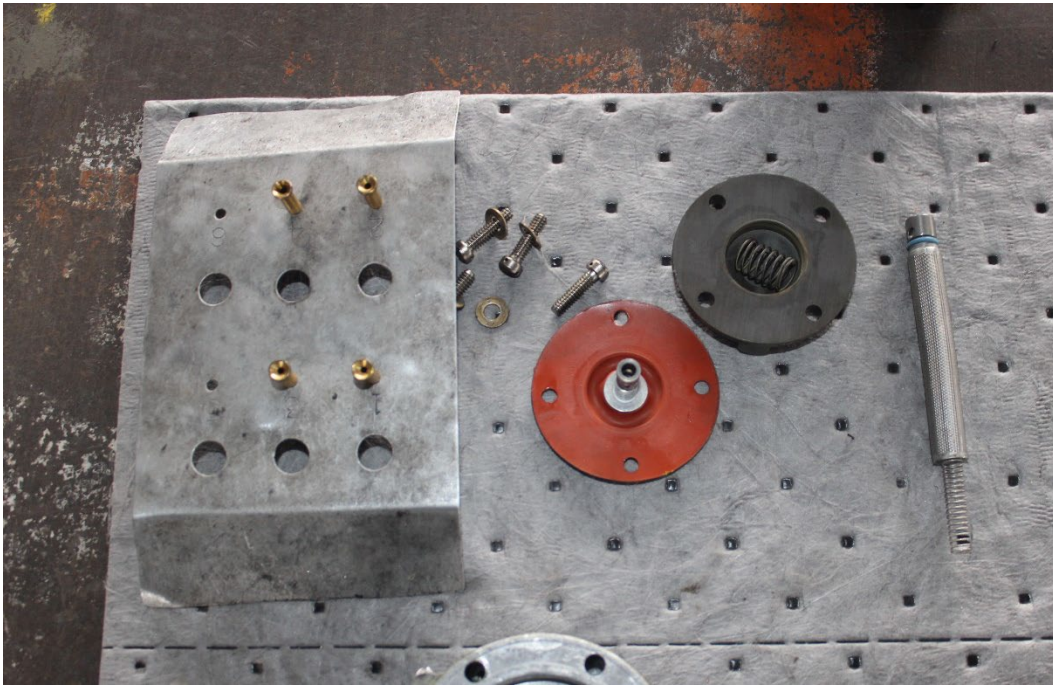


Figure 16: Fuel Divider and Nozzles



Figure 17: Magnetos



Figure 18: Upper Spark Plugs

END.

Submitted by Fabian Salazar