

National Transportation Safety Board
Office of Aviation Safety
Washington, DC 20594



WPR23FA110

AIRFRAME AND ENGINE EXAMINATION REPORT

March 22, 2023

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A. ACCIDENT

Location: Grass Valley, California
Date: February 19, 2023
Time: 1335
Airplane: Lockwood AirCam / N420PF

B. AIRFRAME AND ENGINE EXAMINATION REPORT

IIC	Fabian Salazar NTSB Federal Way, Washington
Technical Advisor	Jordan Paskevich Rotech Flight Safety Vernon B.C, Canada
Party Coordinator	Phillip Lockwood Lockwood Aircraft Corporation Sebring, Florida
Engineer	Tayler Allcorn Lockwood Aircraft Corporation Sebring, California
FAA	Bryan Combs Sacramento FSDO Sacramento, California

C. SUMMARY

On February 19, 2023, about 1335 Pacific standard time, an experimental amateur built amphibious Lockwood Air-Cam, N420PF, was substantially damaged when it was involved in an accident near Grass Valley, California. The pilot and passenger were fatally injured. The airplane was operated as a Title 14 Code of Federal Regulation Part 91 personal flight.

On February 20, 2023, the IIC and party members for Lockwood Air-Cam travelled to the accident site and conducted a field examination of the wreckage.

On Tuesday, March 22, and 23, 2023. The IIC and the Technical Advisor for Rotax Engines, convened at Plane Parts, Pleasant Grove, California to conduct the engine

examinations for N420PF. The engines had been removed from the wing of the airplane and placed on pallets for the examinations.

Postaccident examinations of the airframe and engines revealed no mechanical malfunctions or failures that would have precluded normal operations.

D. DETAILS OF THE INVESTIGATION

1.0 Accident Site

The airplane impacted terrain in an open field surrounded by pine trees of about 70 to 80 feet tall. The first point of probable impact were three gouges in the terrain about ten feet west of the main wreckage. The gouges were consistent with contact made by the nose of the airplane, and the tips of the two floats. All major components of the airplane remained secured to the airframe. The debris field was contained to an area of no more than 50 feet around the wreckage, with one separated propeller blade outside of that area. The floats remained attached to the undercarriage and the retractable wheels were extended.



Figure 1. Accident site in Grass Valley, California, looking north.

2.0 Airframe Examination

The airframe was examined at the accident site by the IIC and the party members from Lockwood Air-Cam.

2.1 Fuselage

The airplane came to rest on its right side. The fuselage was substantially damaged beginning at the nose to about mid-section. The metal was crumpled in an accordion fashion aft past the rear seating area. The forward-right side exhibited more impact damage than the forward-left side. The front cockpit area was heavily crushed and fragmented. The front windscreen was fragmented and separated from the fuselage. There were two near vertical slash cuts into the aluminum skin located on the left side of the fuselage. One of the slash cuts penetrated the inner wall of the cockpit area.

Crushing and bending was observed throughout the fuselage, the degree of damage lessened as it neared the empennage.



Figure 2. Close up view looking north.



Figure 3. View of the front of the airplane.



Figure 4. Left rear view.

2.2 Empennage

The empennage separated from the aft fuselage but remained partially attached by the control cables. At the area of the separation was a circular row of rivets that had separated from the two halves (empennage and aft fuselage). The horizontal stabilizers and elevators remained installed to the empennage and exhibited bends to the metal structure, and wrinkles to the fabric skin. The elevator trim remained installed on the left elevator and exhibited minor damage. The vertical stabilizer and rudder remained installed on the empennage and exhibited downward crush damage that began at the top of the vertical stabilizer and rudder. All rudder and elevator control cables remained installed on their respective control surfaces and ran through the aft fuselage to their respective flight controls in the cockpit. The flap actuator separated from the airplane and was among the debris.

The elevators remained attached to the horizontal stabilizers. The right-side horizontal stabilizer and elevator exhibited a chordwise downward bend about mid-span. The left

side horizontal stabilizer and elevator exhibited structural bending and wrinkles in the fabric.



Figure 5. Empennage

2.3 Wings

The wings and engines separated from the fuselage as a single unit but remained partially attached by various cables and some attachment brackets. The right wing exhibited substantial damage with bent metal framework. The right aileron remained installed on the right wing. The control tube from the aileron to the bellcrank remained installed and was bent. The spanwise control tube fractured at the bellcrank, mid-wing, but remained installed at the center/common bellcrank. The right aileron control cable remained installed from the center/common bellcrank to the front and rear control stick. The right flap remained installed on the right wing and was damage.

The left wing exhibited substantial damage with bent metal framework, The left aileron remained installed on the left wing. The aileron control cable from the aileron to the bellcrank and from the bellcrank to the center/common bellcrank remained installed. The aileron control cable from the center/common bellcrank to the front and back flight

controls remained installed. The left flap remained installed on the left wing but was separated at the root end nearest the fuselage.



Figure 6, Left Wing



Figure 7. Right wing

2.4 Landing Gear

The landing gear consisted of floats with one wheel mounted forward and one wheel mounted on the rear of each float. The retractable wheels were extended. The floats were mounted to struts that were then mounted to the fuselage.

The right pontoon remained installed on the struts. The tip to the forward strut was crushed upward, aft and displaced to the left. The front right wheel separated from the pontoon mount and was found in a gouge in the ground. The rear wheel remained installed and was extended. The right float rudder was absent. According to the manufacturer, the float rudders were not necessary for this airplane due to the efficiency of the airplane's rudder.

The left float remained installed on the airplane. Both the front and rear wheel remained installed on the float and were extended. The tip of the float, aft to the front strut was heavily damaged, crushed upward, aft, and bent to the left. The left float rudder was absent. According to the manufacturer, the float rudders were not necessary for this airplane due to the efficiency of the airplane's rudder.



Figure 8. Landing gear, underside view

2.5 Cockpit

The front seat area was destroyed. Most of the instruments were fracture separated from the fractured instrument panel. The front seat separated from the floor at the rivets. All flight controls remained installed in the front seat area. The rudder pedals fractured and partially separated front their mounts. The rudder control cables remained installed to the pedals. The front control stick remained installed to the floor. All control cables remained attached to the control stick. The throttle quadrant remained installed to the fuselage. The throttles were not evenly matched.

The rear seat area was substantially damaged but not to the extent of the front seat area damage. The rear seat remained installed. The flight controls remained installed. The control cables remained installed to the controls. The throttles remained installed and were evenly matched to the idle position.

The cockpit instruments were found strewn about the wreckage.
Airspeed indicator: 80 KIAS

Altimeter: 2,480 ft @ 30.09
Vertical Speed Indicator: lodged at -2,000 ft per minute
A Cylinder Head Temp: 100°F
B Cylinder Head Temp: 160°F
Volts: Damaged, unreadable
Oil Pressure: Damaged unreadable
Fuel Quantity, Left and Right: Less than ¼ tank
Flaps Switch: Toggle centered
Trim: Toggle centered
AUX Fuel Pumps: On
MAGS Left and Right: Undetermined
Starters: Left
ELT: Not armed
Both Tachometers: Damaged Undetermined



Figure 9. Cockpit view

2.6 Survivability

As mentioned in the previous paragraphs, the cockpit area was substantially damaged with the most severe damage occurring at the front of the tandem seat cockpit. There was no postaccident fire.

2.7 Fuel/Fuel System

The airplane was equipped with a 28-gallon fuel tank. According to the fuel receipt, the pilot put 18.6 gallons of 100 low lead aviation gasoline into the tank prior to departing on the 30-minute flight. A witness account reported the pilot had topped off the tank before departing on the flight. Postaccident examination of the fuel tank revealed the tank sustained breaches and released the fuel at the accident site. One first responder stated that when they first arrived, there was a strong odor of fuel in the air. After a period, the odor of fuel dissipated and could not be detected.

2.8 Other Systems. N/A

3.0 Engine Examination

The airplane was equipped with two Rotax 912ULS engines. Both engines were modified with non-OEM or after-market "big-bore" kits. The engines were examined by a technical advisor for the manufacturer, under the oversight of the NTSB.

3.1 Left Engine

Left engine serial number: 6781367.

The engine remained attached to the engine mount. The engine mount was cut and removed from the wing during recovery.

The top and bottom spark plugs were removed. The spark plugs appeared to be gapped in accordance with the manufacturer's recommendation and exhibited yellow staining on the electrodes.

The engine was set up for a test run. This included re-installing the carburetors, which had separated from the intake manifold due to the impact. The fuel line was cut and placed into a container of gasoline. The fuel return line was also placed into the container holding gas. One half quart of oil was placed into the oil tank. An electrical source was attached to the starter. The engine started easily and ran at idle without effort. The throttles were manually advanced, and the engine responded. There were no backfires or unusual engine noises. The engine was shut down after about two to three minutes run time.



Figure 10. Left engine

3.2 Right Engine

Right engine serial number: 6781366

The engine remained attached to the engine mount. The engine mount was cut and removed from the wing during the recovery. Upon examination the engine would not rotate. Upon removal of the number 1 cylinder head, there was an oil build up that prevented the engine from rotating. After the number one head was removed, the engine rotated with no resistance. The remaining heads and all cylinders were removed. The rocker boxes were all oil wetted and appeared normal. All cylinder walls were smooth with no signs of scoring. All pistons and wrist pins were smooth and appeared normal. The cylinder head inner chambers all exhibited a yellowish colored deposit, consistent with lead from low lead gasoline. The camshaft and lobes were normal with no wear on the cam lobes. Valve train continuity was confirmed normal.

There was evidence that the pickup trigger coils were impact damaged.

The engine driven fuel pump was removed. Examination of the pump revealed that the ports for the fuel lines were fractured. The diaphragm operated normally. All spark plugs exhibited a yellowish stain on the electrodes, consistent with lead deposits from low lead gasoline.



Figure 11. Right engine

4.0 Propeller Examination

The airplane was equipped with two, three-bladed, composite, fixed pitch propellers, manufactured by Warp Drive, model number: T13845.

4.1 Left Propeller

The left propeller exhibited fracture separation of one blade (L1) The blade fractured and separated about 7 inches from the root end. The L1 blade was located 120 feet east of the wreckage. The tip of the L1 blade exhibited red color transfer on the leading edge. The root of the blade remained installed on the hub and rotated about 80°. The next blade, L2, remained installed on the hub and exhibited no damage. The L2 blade

also exhibited red color transfer on the leading edge. The third blade, L3, remained installed on the hub and exhibited no damage. The red color transfer on the two left blades was consistent with the red paint of the fuselage.



Figure 12. Left propeller

4.2 Right Propeller

The right propeller exhibited fracture separations on two of the three blades. The R1 blade was nearly whole and remained installed on the hub. The R1 blade exhibited damage at the tip where about three inches of the tip was fragmented, and damage to the trailing edge about 9.5 inches from the root. The following blade, R2, fractured in a straight chordwise crack and separated about 7 inches from the hub. The following blade, R3, exhibited the same chordwise fracture and separation about 7 inches from the hub.

5.0 Pilot Information

According to the family, the pilot had owned the airplane since October 2022, and had been flying airplanes since he was a teenager. He was in good health, both mentally and physically. He had no stressors. On the day of the accident, he gave his brother-in-law a ride in the airplane that lasted about 25 minutes. He then dropped the family member off at the pilot's house, picked up the accident passenger, refueled the airplane and then departed the Nevada County Airport (GOO), Grass Valley, California for a local flight.

6.0 Aircraft Information

The Lockwood Aircraft Corporation AirCam was manufactured in 2022 and was equipped with two Rotax 912UL engines. The airplane was equipped with float landing gear and did not have a stall warning device installed. According to the manufacturer, the airplane's serial number of 001 did not conform to the serial number system used for AirCam airplanes.



Figure 13. Preaccident photo of N420PF

7.0 Meteorological Information

Weather information for GOO recorded about the time of the accident was reported as, wind west at 8 knots, 10 miles visibility, clear, 61°F, dew point 28°F, barometric pressure 30.05 inches of mercury.

Submitted by:

Fabian Salazar
IIC