

Summary of Aircraft Examination

NATIONAL TRANSPORTATION SAFETY BOARD Office of Aviation Safety Washington, DC 20594

SUMMARY OF AIRCRAFT EXAMINATIONS

-- CEN21FA238 --

A. OVERVIEW

On May 28, 2021, about 1048 eastern daylight time, a Lancair Evolution airplane, N515DL, was destroyed when it was involved in an accident near McDermott, Ohio. The private pilot and passenger were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

B. PARTICIPANTS

On the day after the accident, representatives from the NTSB, FAA, Evolution Aircraft, Lancair Owners and Builders Organization (LOBO), Pratt & Whitney Canada, and Hartzell Propeller participated in exams at the accident site and a nearby airport hangar. On July 16, 2021, the NTSB investigator and NTSB aircraft structures specialist performed an airframe examination at the recovery location (AMF Aviation LLC).

C. SUMMARY OF ON SITE EXAMINATION

The airplane descended at a nearly vertical angle and impacted into a forested area. The wreckage was significantly fire damaged (reference Photo 1).



Photo 1 – Accident Site

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The rocket from the ballistic recovery system was expended during the fire. The parachute was not deployed.

Both set of flight controls (sticks and rudder pedals) were found in the cabin area. The elevator pushrod exhibited signs of an overload. No pre-accident anomalies were observed with the flight control system.

The cabin door was closed and locked at impact. The forward latches were in the latched position and the aft latches were missing. Examination indicated a stress overload of the steel base.

Several tree branch cuts consistent with propeller impact were found at the accident site (reference Photo 2).



Photo 2 - Cut tree branches

The tree branch segments ranged in length from 2 ft to 2.5 ft long. Based on 1,900 engine rpm, the segment lengths were consistent with an airplane descent rate of about 15,000 to 19,000 feet per minute.

The engine was partially submerged in the terrain and covered with burnt airframe debris.

The propeller hydraulic unit (cylinder, piston, feathering spring, pitch change rod) was fractured from the propeller assembly and was near the impact point.

The right wing separated outboard of the landing gear well and was located about ½ mile north of the main wreckage. The majority of the horizontal stabilizer and a 3 ft section of the left elevator were recovered about ¾ mile northeast of the main wreckage.

The upper portion of the vertical stabilizer and rudder were not located. The rudder capstan, yaw damper servo and lower sternpost were at the accident site.

D. SUMMARY OF ENGINE EXAMINATION AT AIRPORT HANGAR

The engine was separated adjacent to the gas generator and the exhaust duct mating flange to access the hot section components. The downstream side of the compressor turbine disc and blades exhibited circumferential scoring from contact with the upstream side of the power turbine vane and baffle.

The power turbine vane baffle was impact separated from the vane. The upstream side of

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the baffle exhibited rotational scoring marks from contact with the downstream side of the compressor turbine. The downstream side of the baffle exhibited rotational scoring marks from contact with the upstream side of the power turbine.

The compressor section No. 1 bearing was in place but was not capable of manual rotation. The 1st stage compressor blades exhibited impact damage and several blades exhibited tip curl opposite the direction of rotation. The visible regions of the 1st stage stator airfoil were discolored and the stator tips exhibited some rolled over material from contact with the spacer.

The reversing lever guide pin mounting bracket was bent and the Beta valve was compressed and impact damaged from contact with the rear face of the propeller.

The chip detector was in place and secure, with no debris attached to the magnetic poles.

E. SUMMARY OF PROPELLER EXAMINATION AT AIRPORT HANGAR

The powerplant was hoisted from behind the spinner bulkhead. The propeller was not disassembled further and no attempt was made to remove and examine the internal pitch change mechanisms or blade preload plates.

The propeller blades were numbered #1 through #4 counter-clockwise as viewed from the aft side (reference Photo 3).

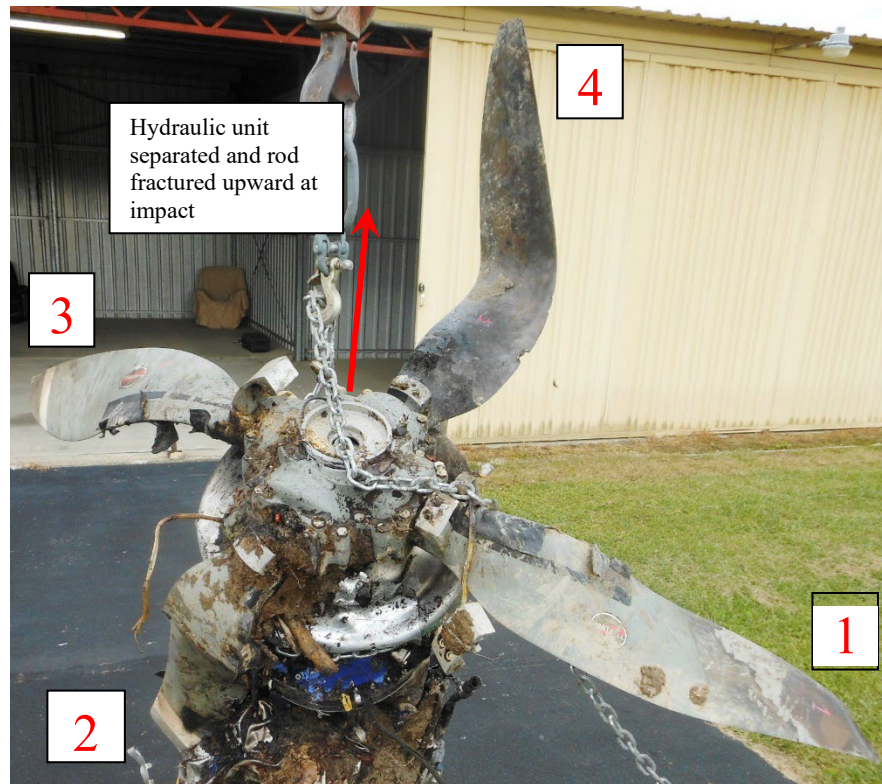


Photo 3 – Propeller at airport hangar

Blades #1 through #3 had chordwise/rotational scoring, and blades #1 and #3 were bent aft and twisted toward low pitch. Blade #1 had S-bend characteristics and blade #3 was bent opposite rotation. Blade #1, #2, and #4 counterweights fractured from the blade.

Blades #1, #3 and #4 could be partially rotated by hand force, consistent with the pitch change mechanism (knob and/or fork) being fractured. All four blades were in an

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operational or low pitch blade angle range (not feathered).

The spinner dome was torn from the spinner bulkhead mounting screws and crushed towards the left side of the engine, with spiral pattern scoring on the forward end.

The pitch change rod was displaced about 1.2" forward of the feathered position, which corresponded to a blade angle of about 33.3°.

Propeller damage was consistent with impact into terrain while turning under power in a normal blade angle range of operation, with the propeller not feathered.

F. SUMMARY OF AIRFRAME EXAMINATION AT RECOVERY LOCATION

The outboard section (11 ft) of the right wing (see Photo 4) was separated outboard of the landing gear well. The upper surface of the right wing contained impact marks near the fuel cap from the leading to trailing edge.



Photo 4 – Right wing that separated inflight

Visual examination of the wing revealed areas exhibiting fracture features consistent with overstress failure, as well as evidence of areas consistent with possible bond line abnormalities.

Most of the horizontal stabilizer and a 3 ft section of the left elevator (see Photo 5) were recovered by law enforcement in a corn field about ¾ mile northeast of the main wreckage. The outboard 3 ft of horizontal stabilizer separated and was not yet recovered.

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Photo 5 – Horizontal stabilizer and left elevator that separated inflight

The upper surface of the horizontal stabilizer exhibited evidence fracture features consistent with overstress failure, as well as possible bond line anomalies between the vertical stabilizer and horizontal stabilizer mating structures.

The lower surface of the horizontal stabilizer to empennage exhibited fracture features consistent with overstress failure, as well as evidence of possible bond line abnormalities.

A review of the build documents and visual examination of the horizontal stabilizer upper surface revealed the omission of additional structural reinforcement angles common to the outboard surfaces of the vertical stabilizer and the upper surface of the horizontal stabilizer.

The left side elevator was separated from the horizontal stabilizer, with the left-hand elevator center hinge fitting twisted counterclockwise when viewed from the aft position. The examined fractures exhibited features consistent with an overstress failure.

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