

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



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WRECKAGE EXAMINATION SUMMARY

April 23, 2024

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A. ACCIDENT

Location: Emily, Minnesota
Date: August 28, 2022
Time: 1734 CDT
2234 coordinated universal time (UTC)
Airplane: N505DB, Sea & Sky, Inc., Krucker Cygnet Weight-Shift Control Aircraft

B. WRECKAGE EXAMINATION SUMMARY

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C. SUMMARY

On August 28, 2022, about 1734 central daylight time, a Sea & Sky, Inc., Krucker Cygnet amphibious weight-shift control (WSC) aircraft, N505DB, was substantially damaged when it was involved in an accident near Emily, Minnesota. The flight instructor, and a passenger were fatally injured. The aircraft was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The purpose of the flight was for the passenger to aerially distribute cremated remains.

The pilot's wife stated her husband initiated the takeoff to the south and the aircraft did not become airborne at the usual location, rather it became airborne when the flight was abeam a dock that was located near the south end and west edge of the lake. Bordering the southern end of the lake were trees, the tallest of which was estimated to be about 70 ft tall. While flying above the trees, the pilot's wife reported hearing a "pop" sound, but she did not witness nor perceive the aircraft had crashed.

The pilot's wife reported the overdue flight to law enforcement and an initial search conducted by a medivac helicopter failed to locate the wreckage, which was located later that evening by a homeowner who lived near the accident site.

D. DETAILS OF THE INVESTIGATION

1.0 General Aircraft Information

1.1 Weight Shift Control (WSC) Aircraft, Engine, and Propeller Information

The Sea & Sky, Inc., Krucker Cygnet was manufactured in August 2010, as serial number H20056.

It was equipped with floats with retractable wheels allowing land and water usage. It was equipped a North Wing Mustang 3 19 square meter wing. It was also equipped with a Rotax 912UL 80 horsepower engine when operated at 5,800 rpm allowed for takeoff and 5 minutes maximum and a maximum continuous rpm of 5,500. It was also equipped with a ground adjustable Warp Drive 3 bladed solid carbon fiber propeller with aluminum hub.

According to a Weight and Loading document dated August 31, 2010, the empty weight was 626 pounds, and the design gross weight per the Aircraft Operating Instructions was 1,060 pounds, resulting in a useful load of 434 pounds.

According to the Aircraft Operating Instructions, the aircraft was manufactured in accordance with Light Sport Aircraft Airworthiness Standards and as such did not conform to standard category airworthiness requirements.

A WSC aircraft was a powered aircraft with a framed pivoting wing and a fuselage, controllable only in pitch and roll by the pilot's ability to change the aircraft's center of gravity with respect to the wing. Flight control of the aircraft depended on the wing's ability to flexibly deform rather than the use of control surfaces.

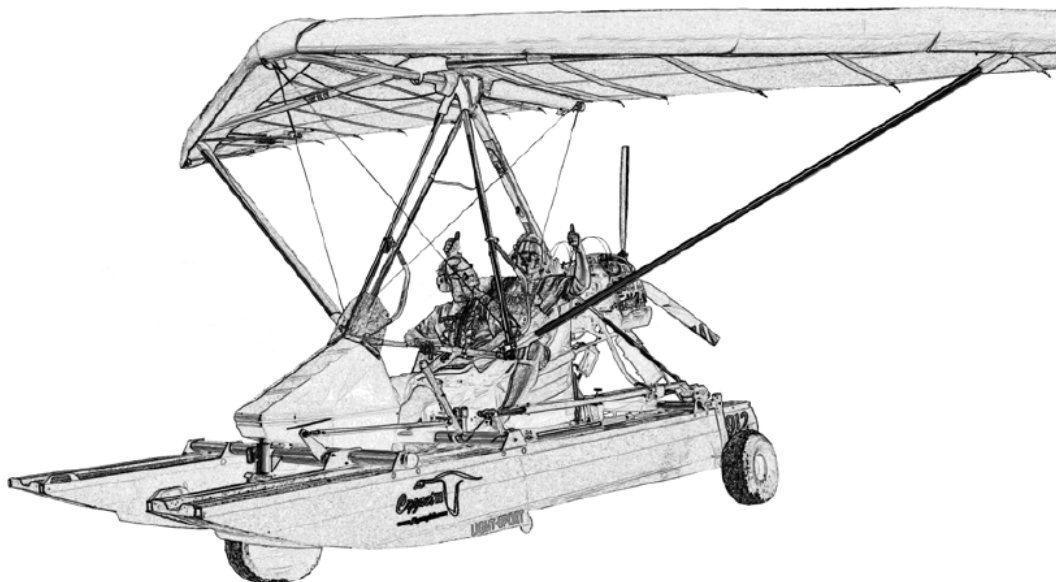


Figure 1: Front Quartering View of the WSC Aircraft.

2.0 Accident Site General

The WSC aircraft crashed in a densely wooded area coming to rest upright on a magnetic heading of about 270°, listing about 45° to the right at 46.770733° north and -94.01418° west (Figure 2). The wreckage remained secured by law enforcement until NTSB arrival and completion of the on-scene investigation.



Figure 2: Right Side View of the Wreckage at the Accident Site.

2.1 Accident Site Details and Tree Contact Information

Further examination of the accident site area which contained small diameter trees revealed no evidence of a shallow descent. Rather, the damage to trees was consistent with a steep descent. There was no evidence of bird remains found at the wreckage site or among the wreckage, and there also was no pre or postimpact fire. A slight smell of fuel was noted at the accident site¹. The following tree trunks were noted to have the following damage consistent with propeller blade contact:

- 1.625 inches diameter tree trunk with 2 parallel cuts at 45° angle. 1 cut was completely through the trunk and the second cut about 5.375 inches later was thru about 1/2 the diameter (Figure 3).
- 2 inches diameter tree trunk has 1 cut at 45° angle completely thru.
- 2.25 inches diameter tree trunk has 1 cut diagonal measuring 14 inches long thru the diameter.
- 2.5 inches diameter tree trunk with 1 cut at 45° angle completely thru.

¹ This was attributed to the fuel tank which was damaged and leaking on the forward end.



Figure 3: View of the 1.625 inches diameter tree trunk with parallel slash marks and black color consistent with propeller blade contact.

2.2 Flight Deck Examination

Examination of the Flight Deck revealed the front seat remained connected on the right front side and the aft upper side. The rear seat was structurally separated at the front attachment but remained connected at the upper aft attachment.

Examination of the instrument panel revealed the following:

Airspeed Indicator - 19 miles-per-hour. Green arc 40 to 50 mph. Yellow arc 50-60 mph. Upper Red line radial marked at 60 mph.

Water temperature - Off scale low

Oil Temperature - Off scale low

Altimeter - -400 ft at 28.23 inHg.

Oil Pressure - Off scale low

Compass - 250°

Hour Meter - 422.15

Volts - Off scale low

Left and Right Engine Kill Switches - Both On

Panel Power Switch - Up (On)

Throttle - Full Aft

Windscreen - Fully in-place no evidence of bird remains but there was some scuffing noted on the right side of the window moving outboard from the bottom moving up.

Ignition Switch - Key in and on Both position

Front Seat Lapbelt - Remained connected but webbing cut

Rear Seat Lapbelt - Remained connected but webbing cut

Position Lights Circuit Breaker - In

Tachometer - Off scale. Upper red line radial marked at 5,800 rpm.

2.3 Floats

Examination of the left and right floats revealed the right exhibited more extensive damage on the front portion than the left (Figure 4).



Figure 4: Views of the Front Portions of Both Floats.

2.4 Wing Examination

Examination of the left portion of the wing revealed the leading-edge tube was overload fractured about 40.5 inches outboard of the wing strut-braced attach point location. The wing strut remained attached at both ends.

Examination of the right portion of the wing revealed the leading-edge tube was overload fractured 11 ft 3 inches from the center point of the wing. The flying wire or control cable from the right lower control bar attach point to the center forward attach was fractured 32 inches from the wing leading edge tube and 43 inches from the control bar; the cable measured about 5/32's inch in diameter. The remaining sections of cables remained attached at both ends. Examination of the fractured cable ends revealed several strands exhibited permanent bending deformation with fractures at a 45° angle (slant fracture) consistent with overstress. The cable damage was consistent with contact by one propeller blade (Figure 5).



Figure 5: View Showing the Flying Wire or Control Cable from the right lower control bar attach point to the center forward attach in Proximity to the Damage on One Propeller Blade Leading Edge.

2.5 Landing Gear

The front and rear wheels were in the retracted or water landing position (Figure 6).



Figure 6: View of the Front and Both Rear Wheels.

2.6 Fuel/Fuel System

The fuel tank was impacted damaged on the forward end and was noted to be leaking fuel. About 6.5 gallons of automotive fuel were drained from the fuel tank. The fuel cap was in-place. Residual fuel was noted in the clear fuel line from the shutoff valve to the engine-driven fuel pump; no water was present. It was estimated to be about 1 ounce. The fuel vent was clear. The fuel shutoff valve was in the open position and was free into fuel tank. Fuel was also noted in the clear fuel filter; no water was noted.

3.0 Engine Examination

Examination of the Rotax 912UL engine, serial number 4409896² revealed it remained attached to the structure at all 4 attach points but the fore/aft longitudinal structural member that provided support for the engine was overload fractured near a weld for the 45° brace for the vertical post; thus, the engine was canted slightly to the right (Figure 7). Following removal of the propeller, rotation of the propeller shaft from the reduction gearbox through 360° revealed crankshaft, camshaft and valve train continuity to all cylinders and to the rear of the engine. Thumb suction and compression was noted in all cylinders. Both carburetors remained attached to the engine and both air filters remained attached to both carburetors. No fuel leakage was noted at either carburetor. The flex coupling of the left carburetor was cracked about 90° circumference at the outboard mounting bolt. Both cables remained attached to both carburetors. The Nos. 1/3 and 2/4 carburetor slides both were 3/4 closed³. About 1 ounce of automotive fuel without water contamination was found in the #2/4 carburetor⁴ and #1/3 carburetor. Slight specs were noted in the #1/3 carburetor bowl. All ignition leads remained attached to all spark plugs, which were all installed in each cylinder. Examination of the left and right exhaust outlets revealed both exhibited black sooty deposits. The throttle control from the hand/foot controls were continuous from each control to both carburetors. The oil level in the oil tank was at the full level.

² It was equipped with a 2.27:1 reduction gearbox.

³ As depicted in NTSB Photographs IMG_1136 and 1137, respectively.

⁴ NTSB photographs IMG_1108-1109.



Figure 7: View of the Engine and Propeller Assemblies.

4.0 Propeller Examination

Examination of the Warp Drive composite propeller, model 68L-NX-HPL3, serial number N20745⁵ which remained attached to the engine revealed all blades remained secured in the hub. One blade (marked 3⁶) that was missing 4 inches of the tip was resting against the float. The separated section of propeller blade was not located, but the associated nickel leading edge with manufactured ends on both ends was found among the main wreckage. The second blade (marked 2) was full span but partially fractured 12 inches from the outboard end of the hub. The final blade was fractured about 8 inches from the outboard end of the propeller hub (Figure 8). The separated blade piece which was located at the accident site was inspected and exhibited a semi-circular gouge on the leading edge of the blade about 3 inches inboard from the tip. Blue paint transfer was noted on the cambered side of the separated blade piece from the tip to the area of the semi-circular gouge. Close examination of the gouge on the leading edge revealed it measured about 8/32 inch in diameter and parallel striations were noted in the gouge. The gouge was consistent with being made by the right wing cable that went from the control bar to the center forward attach point of the wing.

⁵ This was a sticker on one of the propeller blades and was associated with propeller blade replacement on July 1, 2021. The maintenance records reflect the propeller serial number to be N1604 or N17397.

⁶ Marked for the investigation



Figure 8: View of the Reconstructed Propeller.

5.0 Parts Retention

The engine was retained for examination and operational testing at an independent Master Repair Center (iMRC), which was also a training center for the Rotax aircraft engine⁷.

Submitted by:

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Sr. Air Safety Investigator

⁷ Refer to NTSB Memorandum For Record - Propeller Blade Angle Check and Engine Run Results contained in the NTSB public docket for the investigation.