



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety

Washington, D.C. 20594

STRUCTURES GROUP CHAIRMAN'S FACTUAL REPORT

October 3, 2019

A. ACCIDENT: **ERA19FA068**

Operator: Private
Location: Adel, Georgia
Date: December 18, 2018
Time: 1500 EST
Aircraft: Azalea Saberwing
Registration: N203SW

B. STRUCTURES GROUP

Chairman: Clinton R. Crookshanks
 National Transportation Safety Board
 Denver, Colorado

Member: David Poirier
 Azalea Aviation, LLC
 Adel, Georgia

C. SUMMARY

On December 18, 2018, about 1500 eastern standard time, an experimental, amateur-built Saberwing, N203SW, was destroyed during an inflight breakup near Adel, Georgia. The private pilot was fatally injured. Visual meteorological conditions prevailed at the time and no flight plan was filed for the Title 14 Code of Federal Regulations Part 91 personal flight. The flight originated from Cook County Airport (15J), Adel, Georgia at 1100.

D. DETAILS OF THE INVESTIGATION

1.0 Airplane Overview

The Azalea Saberwing is an experimental, amateur-built, single engine, low wing, composite airplane with a conventional tail and fixed conventional landing gear (Figures 1 and 2¹). The airplane is 20 feet long with a wingspan of 26 feet. The airplane has a maximum gross weight of 1500 pounds and a maximum speed of 200 miles per hour. The accident airplane was powered by a Lycoming IO-360 reciprocating 4-cylinder engine with a Sensenich 3-blade tractor propeller.

The airplane is primarily manufactured from fiberglass composite sandwich panels utilizing woven and unidirectional fiberglass cloth with foam core that is infused with resin. Fuselage bulkheads, wing spars and tail spars are constructed of wood. The center portion of the wing, about 7 feet long, is bonded in the lower fuselage during construction and the outboard portions of the wings are attached through bolted fittings on the forward and aft spars. The forward and aft wing spars are a wooden box design with Sitka spruce spar caps and ribs and Birch plywood webs.

2.0 Wreckage Examination

The wreckage was located in a swamp area over an area estimated to be about 6,000 feet long by 1,000 feet wide. The fuselage fractured in two and the left and right outboard wings, vertical stabilizer, rudder, horizontal stabilizer, and elevator separated during the accident sequence. The wreckage was recovered after the accident and examined by the group at the Atlanta Air Recovery facility in Griffin, GA, on June 4, 2019.

Fuselage

The fuselage fractured near the midpoint of the cabin coincident with the location of the wing rear spar during the accident and was recovered in two major pieces. The forward section of fuselage extended from the nose to the rear spar location. The lower forward fuselage section was mostly intact and the engine remained attached to the mount which remained attached to the firewall. There was no deformation of the engine mount identified. The upper and lower engine cowlings were separated. The lower cowling was mostly intact with little damage while the upper cowling was fractured into several pieces with some pieces deformed around the engine. The canopy and forward deck were separated from the forward fuselage and fractured into multiple pieces. The propeller remained attached to the engine, but all 3 blades were fractured. The upper portion of the firewall was fractured about 8 inches below the upper edge and deformed forward slightly. The forward cabin rails, cross members, rudder pedal assembly, and upper portion of the instrument panel were all fractured and deformed downward.

The left and right control columns were intact and remained installed in the forward fuselage. Both columns had a horizontal dent on the forward side coincident with the upper aft edge of the forward spar upper spar cap. The bolt and rod end bearing for the left aileron control tube remained attached to the lower end of the left column, but the left aileron control tube was separated and not identified in the recovered wreckage. The right aileron control tube remained attached to the lower end of the right column and the control tube was fractured about 30 inches outboard of the attach point to

¹ All Figures are presented in Appendix A.

the column. The elevator control tube forward rod end was fractured and disconnected from the control horn on the column interconnect rod. The elevator control tube was fractured about 2 feet aft of the forward end. The elevator trim rod remained attached to the forward end of the elevator control tube. A small section of the elevator control tube between the fracture and the aft control reverser was not identified in the recovered wreckage. The flap torque tube remained installed in the bearing aft of the control columns. The right side of the flap torque tube was intact through the fuselage cutout to the right control horn. The right flap pushrod forward rod end remained attached to the right control horn but the rod end was fractured from the right flap pushrod. The left side of the flap torque tube was intact to the left control horn and the outboard 24 inches of the torque tube was bent aft about 90 degrees. The fuselage cutout on the left side was torn aft. The left flap pushrod forward rod end remained attached to the left control horn but the rod end was fractured from the left flap pushrod. The throttle handle was in the full forward position and jammed in place. The mixture handle was in the full aft position and bent down. The left rudder cable remained attached to the pedal assembly and the cable was fractured about 30 inches aft of the pedal. The right rudder cable remained attached to the pedal assembly and was fractured about 118 inches aft of the pedal. Both fractured cables had a splayed, broomstraw appearance consistent with tension overload. The left and right fuel lines were intact from the fuselage out to their connection with the outboard wings.

The center section forward spar from the left side of the fuselage to the right side of the fuselage remained installed in the lower forward fuselage section with no evidence of damage or disbonding. The left and right sides of the forward spar were fractured at the sides of the fuselage. The upper and lower forward spar cap fractures exhibited areas where there was considerable variability in the plane of individual fiber fracture and areas where there were flatter, more consistent, planes of individual fiber fracture. There was no evidence of dry rot or moisture ingress at the wood forward spar fracture area. The left fuselage longeron was fractured about 54 inches aft of the firewall (Figure 3) and the right fuselage longeron was fractured about 59 inches aft of the firewall (Figure 4). Both longeron fractures were matched with the aft fuselage section. The unidirectional glass layer fibers at the longeron fracture locations were straight and splayed apart with individual fiber fractures at different longitudinal locations. The woven cloth layer, oriented with fibers $\pm 45^\circ$ to the longitudinal axis, fractures had a feathery appearance at the longeron fracture locations. The lower fuselage skin panel was fractured from the left longeron to the right longeron and was matched with the aft fuselage section. There was no evidence of delamination or insufficient resin noted at the longeron fracture locations.

The aft fuselage section extended from the rear spar location to the aft end of the airplane and was mostly undamaged with the exceptions detailed below. The horizontal and vertical stabilizers were fractured from the aft fuselage section. The center wing rear spar was separated from the fuselage and remained attached to a portion of the right outboard wing. The tail cone assembly and upper aft turtle deck section above the horizontal stabilizer were separated from the aft fuselage and not identified in the recovered wreckage. The rudder torque tube was located in the aft fuselage section. The lower half of the vertical stabilizer spar and the canted bulkhead remained attached to the rudder torque tube. The left rudder cable end remained attached to the rudder control horn and the cable was fractured about 88 inches forward of the control horn. The right rudder cable was separated from the control horn and the control horn was fractured at the attach hole. The tailwheel assembly was intact in the aft fuselage, but the bulkhead was fractured from the fuselage.

Both tailwheel springs were stretched and fractured. The rear seat support was intact and attached to both sides of the fuselage. The aft cabin bulkhead and aft fuselage bulkhead were intact and undamaged in the fuselage. The left vertical stabilizer skin was pulled from the fuselage leaving the outer laminate intact. The right vertical stabilizer skin was pulled from the aft fuselage separating and fracturing the outer laminate. The forward and aft horizontal stabilizer bulkheads were fractured at the upper edge of the stabilizer cutout. The elevator control tube remained in the aft fuselage, but the aft rod end was fractured from the tube. There was a fracture, about 12 inches long, in the right side of the aft fuselage skin panel from the horizontal stabilizer cutout running forward along the panel joint line. The data plate was intact on the left side of the aft fuselage.

The aft end of the shoulder harness cable was fractured from the horizontal stabilizer forward spar. The right shoulder harness cable was intact along its length and pulled forward to the aft fuselage bulkhead. The left shoulder harness cable was fractured about 43 inches aft of the shoulder harness and pulled forward to the aft fuselage bulkhead. The fractured cables had a splayed, broomstraw appearance consistent with tension overload.

Empennage

The horizontal stabilizer aft spar, attached elevator, and left side of the horizontal stabilizer were recovered mostly intact as one piece. The elevator was intact and undamaged, and the elevator control tube aft rod end remained installed in the elevator control horn. There was cracking of the paint around the elevator control horn. The horizontal stabilizer mounting bulkheads were firmly attached to the spars, but the bulkheads had fractured from the aft fuselage. The left lower horizontal stabilizer skin had an impact impression running from about 16 inches outboard of the centerline at the leading edge to about 23 inches outboard of the centerline at the trailing edge with corresponding damage to the composite laminate. The left horizontal stabilizer lower skin was mostly separated from the underlying structure. A small portion of the left horizontal stabilizer upper skin about 10 inches long by about 9 inches wide was fractured from the stabilizer and recovered separately. The horizontal stabilizer forward spar was fractured about 7 inches right of the centerline on the upper cap and about 2 inches right of the centerline on the lower cap. The right upper horizontal stabilizer skin was separated and mostly intact. The right lower horizontal stabilizer skin and the internal structure was not identified in the recovered wreckage.

The left and right vertical stabilizer skins were separated from each other and recovered in the debris field mostly intact. The left vertical stabilizer skin was mostly undamaged. The right vertical stabilizer skin had the upper and lower ribs attached. There were two fold lines in the right vertical stabilizer skin between the ribs with corresponding paint and laminate damage. The left and right rudder skins were separated from each other and recovered in the debris field mostly intact. The left rudder skin was mostly undamaged. The right rudder skin had the rudder spar, 4 ribs, and the upper half of the vertical stabilizer spar attached with 2 hinges.

Wings

The right outboard wing separated from the airplane during the accident sequence and was recovered mostly intact. The right wingtip remained attached but was split along the outer edge. The right aileron was intact and remained attached to the right outboard wing. The upper skin of the right aileron was disbonded from the outboard half of the aileron spar. The right flap was intact and remained attached to the right outboard wing. The right flap pushrod was installed on the

inboard end of the flap and the forward rod end was fractured from the pushrod. The right outboard wing upper skin was disbonded from the internal structure in the fuel tank area. The right fuel line was fractured at the inboard rib. The right aileron pushrod was fractured at the inboard rib and deformed downward. There was an area of black rubber transfer marks on the right outboard wing lower skin.

A portion of the right center section forward spar outboard of the fuselage remained attached to the right outboard wing by the lower attach bolt on scene. The bolt was removed to separate the forward spar prior to the examination. The right outboard wing forward spar upper fittings were intact and undamaged. The forward spar right upper bolt remained installed in the outboard wing fittings and portions of the center section fittings were captured beneath the bolt head and nut. The right outboard wing forward spar lower fittings were intact and slightly deformed counterclockwise as viewed looking outboard. The right center section forward spar upper fitting lugs were both fractured in shear tear out. The right center section forward spar lower fittings were intact and undamaged. The right center section forward spar was cut between the wing and landing gear fittings during recovery (Figure 5). The right landing gear fitting remained attached to the center section forward spar. The right landing gear remained attached to the fitting by the two upper AN5 bolts. The threads on one of the two lower AN4 bolts were stripped and the other AN4 bolt was fractured. The landing gear was rotated about 95° inboard from its original position deforming the fitting.

A portion of the center section rear spar, about 60 inches long, remained attached to the right outboard wing by the lower attach bolt. The right rear spar lower attach bolt and fittings were intact and undamaged. The rear spar section spanned from about the left side of the fuselage to the right wing fitting. The right outboard wing rear spar upper fittings and the center section upper forward fitting were intact and undamaged. The right center section rear spar upper aft fitting was deformed aft about 90°. The right rear spar upper attach bolt was separated and not identified in the recovered wreckage.

The left outboard wing separated from the airplane during the accident sequence and was recovered mostly intact. The left wingtip was separated and only the lower half was identified in the recovered wreckage. The left aileron was intact and remained installed. The left flap was separated from the wing and recovered mostly intact with little damage. The left flap hinge was pulled from the flap and remained installed on the left wing. The left flap pushrod was installed on the inboard end of the flap and the forward rod end was fractured from the pushrod. The left outboard wing upper skin was disbonded from the root rib in the fuel tank area. The left fuel line was fractured at the inboard rib. There were two areas of leading edge impact damage, one about 12 inches inboard of the wing end rib and one about 42 inches outboard of the root rib.

The center section forward spar between the left side of the fuselage and the left outboard wing attach point was not identified in the recovered wreckage. The left wing forward spar upper attach bolt remained intact and installed in the left outboard wing forward spar upper aft fitting (Figure 6). The left outboard wing forward spar upper forward wing fitting lug was fractured in shear tear out and the upper aft fitting was deformed aft. The left wing forward spar lower attach bolt remained intact and installed in the outboard wing lower fittings. The left outboard wing forward spar lower fittings were intact and deformed slightly clockwise as viewed looking outboard. The

left center section forward spar lower fittings were both fractured through the cross section inboard of the attach hole and the fractured portion of the lugs remained installed in the joint.

A portion of the left center section rear spar, about 24 inches long, remained attached to the left outboard wing by the lower attach bolt. The left rear spar lower attach bolt and the lower center section fittings were intact and undamaged. The left outboard wing rear spar lower attach fittings were deformed counterclockwise about 20° as viewed looking outboard. The left wing rear spar upper attach bolt was separated and not identified in the recovered wreckage. The left outboard wing rear spar upper attach fittings were both deformed aft about 15°. The left center section rear spar upper forward fitting was deformed forward about 45° and the upper aft fitting was undamaged.

The wing center section skins and ribs on both the left and right sides between the fuselage and outboard wings were fractured into multiple pieces. Many portions of this structure were not conclusively identified in the recovered wreckage.