



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Washington, D.C. 20594

AIRWORTHINESS GROUP CHAIRMAN'S FACTUAL REPORT

February 8, 2019

A. ACCIDENT WPR18LA177

Location: Richfield, Utah
Date: June 21, 2018
Time: 1527 Mountain Daylight Time (MDT)
Operator: Private
Aircraft: Schempp-Hirth Arcus M
Registration: N16DN

B. AIRWORTHINESS GROUP

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

Member: Christoph Wannenmacher
Schempp-Hirth
Kircheim, Germany

Member: Josh Cawthra
National Transportation Safety Board
Federal Way, Washington

C. SUMMARY

On June 21, 2018, about 1527 mountain daylight time, a Schempp-Hirth motorized glider, N16DN, was destroyed following an inflight-break up near Richfield, Utah. The commercial pilot and passenger sustained minor injuries. The glider was registered to and operated by the pilot under the provisions of Title 14 *Code of Federal Regulations Part 91* as a personal flight. Visual meteorological conditions prevailed, and no flight plan was filed for the local flight, which originated from Nephi, Utah, about 1300.

D. DETAILS OF THE INVESTIGATION

1.0 Glider

The Schempp-Hirth Arcus M is a high-performance, powered, two-seat, T-tail glider designed primarily for cross country flying and advanced training. The glider is constructed primarily of carbon fiber, Kevlar fiber, and glass fiber reinforced composite materials with a tubular steel fuselage center section truss. The glider is 28 feet, 8 inches long, has a tail height of 5 feet, 3 inches, and a wing span of 65 feet, 7 inches. The glider is equipped with fixed nose skid, fixed tail landing gear, a retractable main landing gear, and a retractable Solo 2625-02i engine. Full-span ailerons are installed along the wing trailing edges that also serve as flaps. The flaps and ailerons are controlled separately in the cockpit. The glider empty weight is 948 pounds and the maximum gross weight is 1,764 pounds. The glider has a maximum speed of 151 knots and a maneuvering speed of 97 knots.

2.0 Wreckage Examination

The group examined the glider wreckage at the Air Transport facility in Phoenix, Arizona, on February 7-8, 2019. The wings separated from the glider during the accident sequence and were found about 1 mile from the main fuselage wreckage. The main wreckage included the fuselage, empennage, and engine. The forward fuselage and cockpit area was extensively crushed, deformed and fractured. The wing main spar caps were manufactured from carbon fiber reinforced plastic (CFRP), the main spar webs were manufactured from glass fiber reinforced plastic (GFRP), and the wing skins were manufactured from foam core CFRP. The forward fuselage structure was manufactured from carbon-Kevlar fiber reinforced plastic (CKFRP) and the aft fuselage was manufactured from CFRP.

Left Wing

The left outboard wing was intact and remained attached to the left inboard wing. The left winglet was fractured from the left outboard wing. The left inboard wing fractured and separated near wing station (WS) 264¹. The main spar lower cap fracture exhibited a broomstraw appearance. The upper cap fracture occurred on a single plane and the fibers remained bonded together. The outrigger wheel on the lower surface of the left inboard wing remained attached. The aft wing closeout and lower skin aft of the main spar was fractured and separated from WS 181 to 264. The left outboard wing aileron was intact and remained attached. The inboard wing outboard aileron remained attached to the wing. The inboard wing inboard aileron was fractured near WS 57. The outer portion remained attached to the wing and the inboard portion was separated. The two outboard aileron inboard aileron hinge pins were intact, however, the bushings were pulled from the aileron. The inboard wing center aileron was separated from the wing and not identified in the recovered wreckage. The two center aileron inboard aileron hinge pins were intact and the others were separated. The air brake remained installed in the wing. The center wing spar was intact and undamaged. The center spar pin was installed and bent down at the aft side of the spar. The forward wing pin and spar end pin were intact and undamaged. The aft wing pin was fractured from the wing and not identified in the wreckage.

Right Wing

The right outboard wing was intact and remained attached to the right inboard wing. The right winglet remained attached to the right outboard wing. The right inboard wing fractured and separated near WS 264. The main spar lower cap fracture exhibited a broomstraw appearance. The upper cap fracture

¹ Wing stations are measured in inches outboard of the glider centerline.

occurred on a single plane and the fibers remained bonded together. The upper wing skin upper face sheet was separated between WS 264 and WS 318. The upper wing skin sandwich and portions of the upper face sheet were separated between the wing root and WS 90. The outrigger wheel on the lower surface of the right inboard wing remained attached. The right outboard wing aileron was intact and remained attached. The outboard 22 inches of the right inboard wing outboard aileron was intact and connected to the entire upper skin and all remained attached to the wing. The remainder of the outboard aileron was separated and not identified in the recovered wreckage. The outboard aileron inboard hinge pin was intact and the center hinge pin was separated. The right inboard wing center aileron remained attached to the wing. The right inboard wing inboard aileron was separated from the wing and recovered in 2 pieces. The inboard section was intact from the wing root to WS 78. The outboard section upper skin was separated between WS 78 and WS 118 and the aileron was intact between WS 118 and WS 145. The inboard aileron inboard hinge pins were intact on the wing, except for the number 3 hinge pin, which was separated. The inboard aileron bushings were all intact except for the number 5 bushing, which was separated from the aileron. The air brake remained installed in the wing. The center wing spar was intact. The center pin bushing was fractured and deformed along its forward side lower edge with corresponding damage to the CFRP. The forward wing pin and root rib leading edge were fractured from the right inboard wing but remained attached by tubing. The forward wing pin was bent slightly forward. The aft wing pin was intact on the wing and bent upwards and forward. The spar end pin was intact and undamaged.

Center Wing/Fuselage

The steel fuselage truss was deformed and fractured in multiple places consistent with the fuselage damage. The truss sections containing the forward and aft wing pin receivers were identified in the wreckage. The forward wing pin receivers were deformed up and forward. About 77 inches of the monocoque CFRP aft fuselage was mostly intact. A section of the aft fuselage about 32 inches long forward of the empennage was fractured into multiple pieces and separated.

Empennage

On-scene photographs showed the empennage was located at the main wreckage site with the remainder of the fuselage. The vertical stabilizer was laying on its right side, the right horizontal stabilizer was folded under the vertical stabilizer, the damaged rudder was partially attached, and the elevators were adjacent to the horizontal stabilizer. The upper 3 inches of the rudder was separated. The elevators were not identified in the recovered wreckage. The empennage was fractured from the fuselage just forward of the vertical stabilizer but remained attached by the control rods and cables. The vertical stabilizer was fractured near the mid span point with corresponding fracture of the rudder. The horizontal stabilizer remained attached to the top of the vertical stabilizer and was engaged with the forward and aft mount points. The right half of the horizontal stabilizer was fractured. The left horizontal stabilizer was mostly intact. The elevator hinges on the horizontal stabilizer were all intact and undamaged.

Flight Controls

All of the fractures in the flight control components had a dull, grainy appearance and deformation consistent with overstress separation.

Elevator

The elevator aft fuselage forward control rod was fractured in 3 places. Otherwise the elevator control

system was intact and connected from the forward control stick to the elevator. There were several areas of damage and deformation of the elevator flight controls adjacent to areas of fuselage damage. The elevator trim locking control rod was near the aft most position.

Aileron

The aileron flight controls were fractured and deformed in multiple places between the forward control stick and the funnels consistent with the extensive forward fuselage damage but all the components were present. The left wing aileron controls were continuous from the wing root to the left center aileron bell crank at WS 204. The left outboard aileron control rod was fractured from the bell crank at WS 204. The outboard 3ft of the outboard rod remained attached to the left outboard aileron bell crank. The left outboard aileron control rod between the fracture and WS 204 was not identified in the recovered wreckage. The three left aileron actuation rods were attached to the bell cranks and ailerons. The right wing aileron controls were continuous from the wing root to the bell crank at WS 204 but the control rod was fractured from the bell crank. The right outboard aileron pushrod fractured from the center and outboard bell cranks and separated. Portions of the right outboard aileron push rod were identified in the recovered wreckage. The three right aileron actuation rods were attached to the bell cranks and ailerons.

Air Brakes

The air brake controls were continuous from the forward pilot position to the aft end of the aft push rod. The bell cranks, vertical control rods, and funnels were located in the fuselage and contained several fractures. The air brake controls were intact from the left and right wing roots to the respective air brakes in the wing.

Rudder

The forward and aft rudder pedal assemblies were deformed and fractured in multiple places. The left and right forward and aft rudder cables remained attached to their respective anchor points but the anchor points were fractured from the fuselage. The right rudder cables were intact from the pedals to the rudder control horn. The left forward pedal rudder cable was fractured near the pedal with a splayed, broomstraw appearance consistent with tension overload. Otherwise the left rudder cables were intact from the pedals to the rudder control horn. The rudder stops at the rudder control horn each had evidence of a single impact. The lower rudder bearing was disassembled and appeared normal.

The upper rudder hinge pin assembly on the vertical stabilizer was fractured and deformed upward. The upper rudder hinge bearing was fractured from its mounting plate on the rudder. There was corresponding damage to the lower portion of the upper ruder hinge cutout. The rudder control horn was intact and attached to the rudder.