NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

STRUCTURES GROUP CHAIRMAN'S FACTUAL REPORT

December 14, 2021

A. ACCIDENT: ANC21FA015

Operator:	Copper Valley Air Service
Location:	Chitina, Alaska
Date:	February 4, 2021
Time:	1051 Alaska Standard Time
Aircraft:	Cessna A185E
Registration:	N9725Z

B. STRUCTURES GROUP

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C. SUMMARY

On February 4, 2021, about 1051 Alaska standard time, a Cessna A185E, N9725Z, sustained substantial damage when it was involved in an accident about 14 miles northeast of Chitina, Alaska. The commercial pilot and the passenger were fatally injured. The airplane was operated as a Title 14 Code of Federal Regulations Part 135 scheduled passenger flight.

D. DETAILS OF THE INVESTIGATION

1.0 Aircraft

The Cessna A185E is an all metal, single reciprocating engine, propeller driven, strut-braced high wing airplane equipped with a conventional tail and fixed conventional landing gear (Figure 1). It was originally configured with two pilot seats and 4 passenger seats. The airplane is 25 feet, 9 inches long, 7 feet, 9 inches high at the tail and has a wingspan of 35 feet, 10 inches. The airplane is powered by a Continental IO-520 6-cylinder engine that drives a McCauley two-blade constant speed propeller.

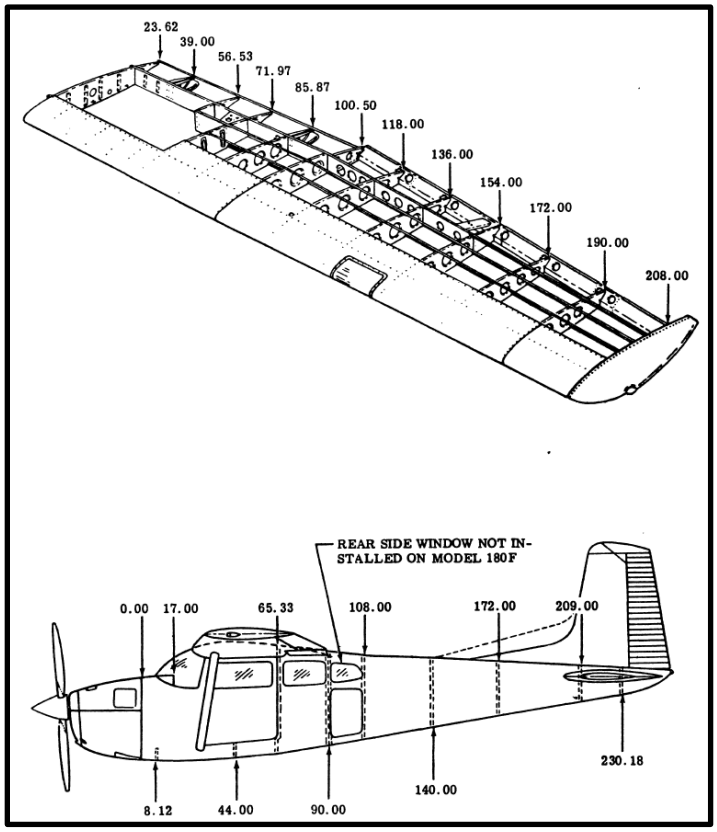

Figure 1-Cessna A185E airplane drawing.

2.0 Accident Site

The airplane broke up in flight over mountainous tree-covered terrain about 12.7 miles east of Chitina Airport. The main wreckage site included the fuselage from the nose to fuselage station (FS) 172, the left wing, the nose landing gear, both main landing gear, the engine, and the propeller. The fuselage was laying on its right side with the left wing attached at the forward and aft attach points. The lower end of the left wing strut was separated from the fuselage allowing the wing to

rest on it upper surface. The left main landing gear mount fitting was fractured from the airplane structure allowing the landing gear to collapse to the right. The propeller was fractured from the engine and found in front of the airplane. The fuselage suffered crushing damage and was fractured in multiple places. The wheel penetration skis remained attached to the main landing gear and all cables and bungees were intact, attached, and undamaged.

The right wing was separated from the fuselage, fractured into 5 pieces, and recovered in the debris field. The empennage was separated from the fuselage at FS 172 and recovered mostly intact in the debris field. Some small pieces of the windshield were also recovered in the debris field. The outboard portion of the right wing and a section of the right aileron were located about 200 yards north of the main wreckage. The empennage and the inboard right wing section were located about 140 yards northwest of the main wreckage.

3.0 Wreckage Examination

The wreckage was examined by the group at the Alaska Claims Services facility in Wasilla, AK, June 22-23, 2021. All of the fracture surfaces examined had a dull, grainy appearance consistent with overstress separation. There was no evidence of corrosion or fatigue noted on any of the areas examined.

3.1 Fuselage

The fuselage was mostly intact but damaged from the nose to FS 172 on scene. There was significant lateral crushing of the structure along its length. The fuselage was separated at the pilot compartment for recovery. The two pilot compartment doors were separated during recovery. The left wing forward attach point was intact on scene with the bolt installed. The forward bolt was removed to disconnect the wing for recovery and reinstalled in the fuselage clevis fitting. The left wing aft attach point was intact on scene with the bolt installed. The left wing aft spar was cut about 3 inches outboard of the attach point for recovery. The left strut fuselage attach lug was fractured through the bolt hole. The right wing forward attach clevis fitting and surrounding structure was fractured from the fuselage and remained attached to the right wing. The right wing aft attach point was intact with the bolt installed. The right wing aft spar was fractured about 3 inches outboard of the attach point. The aft spar lug remnants captured in the clevis fitting were rotated upward more than 90º and impacted a fastener installed through the fitting. There were semi-circular impact impressions on the top of the aft spar lug remnants. The right strut fuselage attach lug was fractured through the bolt hole.

The aft fuselage was mostly intact to the FS 172 bulkhead location. The left cargo door remained installed. There was a cable tear through in the left side lower fuselage skin from FS 172 forward to the aft end of the cargo door. The extended baggage floor was mostly intact in the aft fuselage. The aft flange of the extended baggage floor was fractured from the right side of the fuselage and fractured downward about 8.5 inches from the right side where there was a crease in the floor and a cut out in the flange. There was no evidence of cable contact on the aft flange. The extended baggage compartment aft wall was not attached to the lower flange as installed. The aft baggage wall was pillowed aft. The floor was removed and the cable pulleys beneath it were intact. The flight control cables did not remain installed in the pulleys.

3.2 Left Wing

The left wing was mostly intact and partially attached to the fuselage at the main wreckage site as described earlier. The left aileron and flap were intact and remained attached to the left wing (Figure 2). The left wing strut was intact and remained attached to the wing at the upper attach point with no obvious damage. The lower end of the left wing strut was separated from the fuselage. The lower strut bolt was intact and installed in the strut clevis fitting. The paint around the rivets attaching the upper and lower strut fittings to the strut was cracked and flaked (Figure 3). There was a rectangular impact impression in the lower surface of the left strut at the upper end consistent with the shape of the lower spar cap outboard of the strut. The wing outboard of wing station (WS) 100 was mostly undamaged and had no obvious deformation. There were two small downward deformations of the aileron trailing edge. The inboard wing area was buckled and compressed with the upper and lower skins closer together. The flap was deformed coincident with the buckling damage. The fuel bladder was breached at the inboard side. The forward spar lower cap and strut fitting on the spar had upward buckling and damage at the strut attach point.

Figure 2-Left wing, lower surface.

Figure 3-Left wing strut, lower surface, upper (left) and lower (right) strut fitting rivets.

3.3 Right Wing

The right wing fractured into 5 pieces during the accident. One piece was further separated into 2 pieces for recovery yielding 6 separate pieces that were laid out (Figure 4).

Figure 4-Right wing wreckage layout (strut not shown).

The right inboard wing was mostly intact but damaged from the wing root at WS 23.6 to about WS 86 at the forward spar and WS 100 at the aft spar. There was a large semi-circular impact impression in the leading edge and upper skin with vertical scratching and gouging centered near WS 44. The upper and lower wing skins were pillowed outward in the fuel tank area. The forward wing spar was fractured near WS 86 and the upper cap, lower cap, and web were deformed and twisted consistent with the outboard portion of the forward spar rotating leading edge down with respect to the inboard portion. The aft spar was deformed upward with buckling damage between about WS 86 and WS 100 and the spar was fractured near WS 100. The three lower stringers between the spars had splices installed between about WS 91 and WS 99. The forward spar wing attach bolt remained installed through the wing lug fitting and fuselage clevis fitting but the fuselage clevis fitting was pulled from the fuselage. The fuselage fitting was jammed in a position about 45º up. The aft spar wing attach bolt was intact and installed in the fuselage clevis fitting. The aft spar upper cap wing lugs were fractured from the wing and remained installed in the fuselage fitting. The aft spar web was fractured through the attach point hole. The right flap remained attached to the inboard wing section. There was a tear in the upper skin aft of the aft spar from the outboard end to inboard end consistent with a cable pull through.

The right wing strut was separated from the airplane and remained attached to a small section of forward spar. The spar section spanned from about WS 86 to WS 100. The upper spar cap near WS 100 had spanwise buckling deformation adjacent to the fracture. The lower spar cap near WS 100 was deformed upward. The upper strut attach bolt remained intact and installed through the strut clevis and forward spar. The right strut wing spar fitting was fractured through the lower bolt hole. The lower portion remained with the strut and the upper portion remained attached to the forward spar outboard of WS 100. The strut was unbolted from the spar during the examination. The lower strut fitting was separated from the strut and recovered at the main wreckage site. The lower strut attach bolt was intact and installed in the clevis and there was a

piece of the fuselage lug retained. The rivets on the lower side of the strut fitting and 3 rivets on the upper side of the strut fitting were all deformed and sheared upward (Figure 5). The corresponding holes in the strut were ovalized. There was buckling damage to the upper strut skin and a small portion of the strut skin remained attached to the fitting on the upper side. There was a dent in the upper surface of the right strut about 39 inches from the upper end. The strut appeared straight. There was a rectangular impact impression in the lower surface of the right strut at the upper end consistent with the shape of the lower spar cap outboard of the strut.

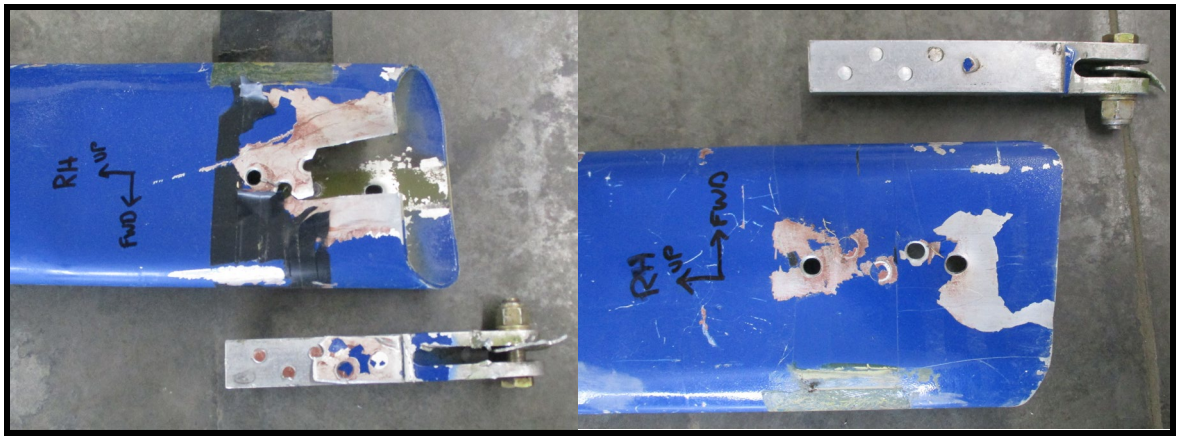

Figure 5-Right wing strut and lower fitting, upper surface (left) and lower surface (right).

The outboard wing section spanned from about WS 100 to the wing tip. The section included the wingtip, the lower skin and stringers, the outboard upper forward skin panel, the leading edge skin, the forward spar from WS 100 to WS 208, the auxiliary spar from WS 156 to WS 208, and the wing ribs at WS 154, WS 172, WS 190, and WS 208. The forward spar upper cap had buckling deformation at the fracture near WS 100 and also near WS 132. There was a piece of upper aileron skin and hinge attached to the auxiliary spar between WS 188 and WS 198.

The outboard aft wing section spanned from about WS 100 to WS 154 and included the aft lower skin, the auxiliary spar, the inboard half of the aileron, the aileron bell crank, and a 14-inch by 14-inch section of the upper wing skin at the inboard end. The aileron control and balance cables remained attached to the bell crank. The control cable measured about 14 feet long, and the balance cable measured about 15.5 feet long. The cable ends had a splayed, broomstraw appearance consistent with tension overload. This piece was attached to the upper skin piece on scene but separated during recovery.

A section of right wing upper skin was separated that spanned from about WS 100 to WS 208. The skin was folded in half lengthwise near the mid span point as recovered and straightened during the exam. There were several V-shaped dents in the trailing edge gap seal between WS 156 and WS 185 consistent with the aileron skin stiffening corrugations. The outboard upper skin panel was attached and had paint and markings consistent with being replaced. The upper wing stringers remained attached to the skin and the WS 100 rib remained attached. A section of the aft spar remained attached between WS 108 and WS 141. There was a splice in the second upper stringer aft of the forward spar between WS 101 and WS 109. This piece was attached to the outboard aft wing piece on scene but separated during recovery.

The outboard half of the right aileron from WS 154 to WS 208 separated from the airplane and was found in the debris field. The balance weights remained attached. There was a section of the aileron upper skin missing between WS 188 and 198 that was attached to the outboard aft wing piece.

3.4 Empennage

The empennage separated from the airplane at the FS 172 bulkhead location and was mostly intact. The horizontal stabilizer, elevators, vertical stabilizer, and rudder remained attached to the empennage. There was a cable tear through on the right side of the empennage from FS 172 aft to about FS 204. There was no obvious deformation of the horizontal stabilizer or stabilizer shelf. The vertical stabilizer and rudder were deformed to the left. The vertical stabilizer attach bolts were all intact and installed. The right forward, right aft and left aft attach holes in the vertical stabilizer forward and aft spars were fractured consistent with the left deformation of the vertical stabilizer. The left aft attach hole in the empennage bulkhead was fractured consistent with the left deformation of the vertical stabilizer. The right and left trim actuators were separated from the lower surface of the horizontal stabilizer. The attach bolts were intact and installed in the trim actuators and the brackets were deformed and fractured consistent with upward movement of the leading edge of the horizontal stabilizer relative to the actuators. The trim chain was pulled through the actuator gears such that the left cable to chain junction was jammed in the left actuator gear. The horizontal stabilizer aft attach point bolts were intact and installed. The aft left attach point on the stabilizer shelf was fractured and deformed up. The left and right elevators remained intact and installed on the horizontal stabilizer. The right elevator was jammed in a trailing edge up position and the left elevator was jammed in a trailing edge down position which was consistent with on scene photos. The right elevator torque tube flange was fractured and separated from the center bell crank with torsional deformation consistent with the right elevator deflected trailing edge up with respect to the left elevator. The right elevator center hinge was pulled from the elevator spar. There was damage to the upper and lower right elevator skins consistent with over travel up and down.

Figure 6-Separated empennage.

The elevators were removed from the horizontal stabilizer so that the balance could be checked. The Cessna balance tool was not available, so the group utilized fabricated knife edges and beam. The left elevator was underbalanced at 22.0 in lb and the right elevator was underbalanced at 22.3 in lb. The Cessna 185 Service Manual, Section 17, Figure 17-3 states that the elevators should be underbalanced between 0 and 22.00 in lb.

3.5 Pitch Trim

The pitch trim wheel was intact in the forward fuselage but was partially fractured from its mounting point. The trim wheel was removed from the wreckage and examined. There were wear marks in the center of the teeth on the trim wheel coincident with the location of the locking balls. There were impact impressions in the trim wheel teeth at the locations of the locking ball mounting points. The trim wheel installed was an STC unit that had the aluminum wheel and sprocket riveted together.

4.0 Previous Damage

On May 26, 2014, the parked and tied down accident airplane was impacted by another airplane that lost control during landing. The collision damaged the right wing, right horizontal stabilizer and elevator, and the vertical stabilizer and rudder. Photos supplied to the NTSB showed the damage to the accident airplane after the collision (Figure 6).

Figure 7-Airplane N9725Z after the collision.

5.0 Maintenance Records[1]

The airplane had accrued 6,564.2 hours total time at the time of the accident. The most recent inspection of the airplane was a 100-hour inspection completed on November 6, 2020, at a time of 6,500.4 hours.

[1] See Appendix A for the pertinent maintenance records.

The first maintenance logbook entry after the collision was dated February 20, 2016, with a total aircraft time of 5,473.6 hours. The entry stated that the "aircraft was repaired by replacing cabin roof skin, replacing front spar and top skin on vertical stabilizer, applying patch to horizontal stabilizer, and repairing tip of replacement right hand wing". The FAA Form 337 associated with the wing repair indicated that the WS 208 center rib, top skin, bottom skin, and outboard auxiliary spar were replaced on the right wing. The Form 337 for the horizontal stabilizer repair indicated a patch was installed on the right horizontal stabilizer outboard top skin. There was no Form 337 for the vertical stabilizer repair. A new tachometer was installed at this time with a reading of 0. The airplane was also repainted white and blue, and a weight and balance was performed.

According to the mechanic that repaired the airplane, the right wing installed on the accident airplane was removed from a 1969 Cessna 180H, N91399, SN 18052069, repaired and installed. Textron provided detailed information on the differences between the Cessna 180 and Cessna 185 wing as built. The Cessna 180 wing installed had different shaped holes in the aft spar web at two locations with a thicker doubler installed at one of the locations, an updated fitting, and several updated parts.

In August 2017, the rudder cables were replaced including all new hardware. There were broken roll pins on the elevator trim wheel repaired on July 18, 2020, and August 18, 2020. A tail reinforcement kit (STC SA2522AK) and a new trim wheel (STC SA02528AK) were installed on October 25, 2020.

The table below summarizes the required inspections performed on the accident airplane from the time it was repaired after the collision to the accident. The airplane was owned and maintained by Copper Valley Air Service during this time. The inspection signoff dated August 18, 2018, had the mechanics printed name with no license number or signature.

Date	Insp. Type	TT	Tach	Signoff
11/9/16	100 Hr/Annual	5571.2	97.6	IA
6/16/17	100 Hr	2403.0*	198.7	A&P
11/26/17	Annual	5762.3	288.7	IA
5/10/18	Annual	5859.6	386.0	IA
8/2/18	100 Hr/Annual	**	486.3	None
12/30/18	Annual	6052.3	578.7	IA
6/12/19	100 Hr	6150.1	676.5	A&P
9/14/19	100 Hr/Annual	6246.3	772.7	IA
6/14/20	Annual	6333.4	859.8	IA
8/18/20	100 Hr/Annual	**	957.6	A&P
11/6/20	100 Hr/Annual	6500.4	1026.8	A&P

Table 1 – Inspection Summary

*Incorrect total time entered in logbook, Tach appears correct
**No total time in logbook entry