Aviation Investigation Final Report

Location:	King Salmon, Alaska	**Accident Number:**	ANC07FA109
Date & Time:	September 30, 2007, 17:20 Local	**Registration:**	N295BA
Aircraft:	Helio H-295	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	4 Fatal
Flight Conducted Under:	Part 91: General aviation - Other work use		

Analysis

The float-equipped airplane was transporting sport-fishing clients returning to a lodge from a remote fishing site. The pilot contacted lodge personnel while en route, and estimated his arrival time in about 3 minutes. When the airplane failed to arrive, an aerial search discovered the wreckage about 10 miles from the lodge, along the anticipated flight route. The NTSB's investigation revealed evidence that the airplane's lower left wing to fuselage attachment cap fitting had failed in flight, which resulted in the airplane's uncontrolled descent. The deformation at the upper forward and aft wing attachment points suggested that the airplane's left wing, in part, had failed in flight, but did not completely separate from the airplane. A subsequent metallurgical examination revealed that the fractured wing to fuselage attachment cap fitting displayed evidence of fatigue cracking, which emanated from areas of corrosion pitting. A Safety Board metallurgist noted that the corrosion pitting was located in the interior portion of the pin/bolt hole, where a large bore pin/bolt resides when the wing is attached to the fuselage, which is not visible when the bolt/pin is installed. The metallurgist also noted that there was corrosion on the forward and aft faces of the fitting that would have been visible. Other than the corrosion pitting on the attachment cap fittings and pins/bolts, no metallurgical anomalies were discovered. On September 9, 2008, the FAA issued a special airworthiness information bulletin (SAIB CE-08-47) recommending a visual inspection for evidence of corrosion, cracking, and other damage on the spar fittings, attachment bolts and related structure, to preclude a structural in-flight failure of the wings.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A corrosion-induced fatigue fracture of the airplane's left wing to fuselage attachment cap fitting, which resulted in a partial separation of the left wing, and an uncontrolled descent.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: CRUISE

Findings
1. (C) WING,WING ATTACHMENT FITTING - CORRODED
2. (C) WING,WING ATTACHMENT FITTING - FRACTURED

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
3. TERRAIN CONDITION - TUNDRA
4. OBJECT - TREE(S)

Factual Information

HISTORY OF FLIGHT

On September 30, 2007, at an estimated time of 1720 Alaska daylight time, a float-equipped Helio H-295 airplane, N295BA, collided with tree and tundra covered terrain, about 40 miles northeast of King Salmon, Alaska. The airplane sustained substantial damage. The airplane was owned and operated by Branham Adventures, Anchorage, Alaska, and was being operated as a visual flight rules 14 Code of Federal Regulations Part 91, other work use flight when the accident occurred. The certificated commercial pilot and the three passengers sustained fatal injuries. Visual meteorological conditions were reported in the area at the time of the accident, and company flight following procedures were in effect. The flight originated at a remote lake, and was en route to the Royal Wolf Lodge when the accident occurred.

During an interview with the National Transportation Safety Board (NTSB) investigator-in-charge (IIC) on October 2, the owners of Royal Wolf Lodge reported that the accident airplane was being used to transport sport-fishing clients, and a lodge guide, to remote areas for fishing. They said that the accident occurred on the last flight of the day, as the airplane was returning to the lodge from Hammersly Lake, about 20 miles southeast of the lodge. The owners also noted that Royal Wolf Lodge and Branham Adventures were jointly owned businesses.

About 1715, the accident pilot radioed lodge personnel that he was en route to the lodge, with an estimated arrival time of about 3 minutes. No further radio communications were received from the accident airplane. When the airplane failed to arrive by 1730, lodge personnel attempted to contact the accident airplane via radio. No emergency locator transmitter (ELT) signal was detected on the lodge's radio equipment, and about 1745, the lodge owner initiated an aerial search along the pilot's anticipated route. He discovered the wreckage about 10 miles from the lodge, along the anticipated flight route, in an area of flat, sparsely tree, tundra-covered terrain.

A search and rescue team was assembled at the lodge consisting of lodge employees. Dark night conditions delayed the search and the discovery of the wreckage until about 2130. The search team confirmed that all of the airplane's occupants had sustained fatal injuries.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with airplane single engine land, airplane single engine sea, instrument airplane, and glider ratings. He also held private pilot privileges with an airplane multiengine land rating. Additionally, he held a flight instructor certificate for gliders. His most recent second-class medical certificate was issued April 6, 2007, and contained the

limitation that he must wear corrective lenses.

In the Pilot/Operator Aircraft Accident Report (NTSB Form 6120.1) submitted by Branham Adventures, the pilot's total aeronautical experience was listed as 9,000 hours, with 3,000 hours in the accident airplane make and model. The report noted that in the preceding 90 and 30 days prior to the accident, the pilot accrued a total of 260 hours and 75 hours.

No personal flight records were located for the pilot, and the aeronautical experience listed on page 3 of this report was obtained from a review of the Federal Aviation Administration's (FAA) airmen records on file in the Airman and Medical Records Center in Oklahoma City. On the pilot's application for medical certificate, dated April 6, 2007, he indicated that his total aeronautical experience consisted of 9,200 hours, of which 100 were logged during the previous 6 months.

AIRCRAFT INFORMATION

According to the Pilot/Operator Aircraft Accident Report (NTSB Form 6120.1) submitted by Branham Adventures, the airplane had a total time in service of approximately 8,733.5 flight hours. The last recorded inspection of the engine and airframe was an annual inspection, on May 24, 2007, about 246.6 hours before the accident.

The engine was overhauled on May 31, 2005, by Aero Recip of Alaska, LLC., and at the time of the accident had about 1,172.9 hours since overhaul.

Previous Accident History

A review of the airplane's accident history revealed that on October 6, 2000, it was involved in a previous accident near Port Alsworth, Alaska, following a loss of engine power [ANC01LA003]. As a result of the loss of engine power, the airplane collided with trees during a subsequent forced landing, sustaining substantial damage to the fuselage, wings, and empennage.

According to the owners of Branham Adventures, following the October 6 accident, the airplane was recovered from the accident site, and transported to their Anchorage maintenance facility for repairs. A damage assessment revealed that the airplane's wings were damaged beyond economical repair.

On November 3, 2000, Branham Adventures purchased a replacement set of wings from an aircraft salvage dealer in Fairland, Oklahoma. An airframe logbook entry dated May 10, 2001, noted that when the replacement wings were installed, the wings had 3,032.6 flight hours. The replacement wings were installed 1,794.8 before the accident .

During a telephone conversation with the NTSB IIC on August 27, 2008, the aircraft salvage business owner said that the set of wings that were sold to Branham Adventures were previously removed from N5460E, a 1965 Helio H-250. He said that he purchased the salvage

rights of N5460E from an aviation insurance company following an accident on May 18, 1995, in Clarkson, New York [NYC95LA112]. The salvage dealer said that the wings were not damaged during the accident, and that no repairs were required before he sold the wings to Branham Adventures. The salvage dealer said that he closed his business in 2006, and no records were retained concerning the sale of the wings to Branham Adventures.

METEOROLOGICAL INFORMATION

The closest official weather observation station was King Salmon, 40 miles west-southwest of the accident site. On September 30, at 1736, an Aviation Routine Weather Report (METAR) was reporting, in part: Wind, 260 degrees at 19 knots with gusts to 27 knots; visibility, 8 statute miles; clouds and sky condition, 1,700 feet few, 2,400 feet scattered, 4,100 feet broken; temperature, 46 degrees F; dew point, 42 degrees F; altimeter, 29.34 inHg.

During interviews with the NTSB IIC on October 1, pilots that landed at the lodge about 25 minutes before the accident airplane's proposed arrival, with similar flight routes, characterized the weather conditions as westerly winds at 5 to 10 knots; visibility, 10 statute miles; clouds and sky condition, 5,000 feet overcast. Both pilots' remarked that there were transient and localized rain showers along their flight routes.

WRECKAGE AND IMPACT INFORMATION

On October 1, about 1130, the NTSB IIC, along with three National Park Service rangers, inspected the accident airplane.

All of the airplane's major components were located at the main wreckage site. Prior to ground impact, the airplane collided with trees about 15 feet tall. The initial crash path was marked by broken treetops on a magnetic heading of approximately 240 degrees. The subsequent descent angle to the ground was about 45 degrees. The airplane's initial impact point on the ground was discernible by an area of disturbed tundra, which contained the airplane's left (red) navigation light, and a clear strobe light lens. About 30 feet from the initial impact point was a crater, about 5 feet in diameter and 3 feet deep. The main portion of the airplane's fragmented wreckage was located about 45 feet beyond the initial ground impact.

The engine and propeller assembly were discovered within the initial impact crater, with only the aft portion of the engine visible. The engine sustained extensive impact damage to the underside, and front portion of the engine. The exhaust tubes were extensively crushed, bent, and folded, producing sharp creases that were not cracked or broken along the creases.

The propeller hub remained attached to the engine crankshaft spindle. All three propeller blades were loose in the propeller hub, but remained attached to the propeller hub assembly. All three of the propeller blades had multiple leading edge gouges, substantial torsional "S" twisting, and chordwise scratching.

Extensive impact damage was evident to the airplane's firewall, instrument panel, and cabin area. Scattered between the crater and the main wreckage, in a line between the initial impact point, and the final resting point of the main wreckage, were small portions of wreckage debris, paint chips, broken Plexiglas, cockpit instrumentation, and passenger personal effects.

Both of the airplane's severed wings were discovered adjacent to the main wreckage. Responding search and rescue personnel reported that when they initially arrived on scene, both wings were found atop the wreckage. They said that the wings were moved so they could gain access to the wreckage.

An examination of the severed wings disclosed that the airplane's left wing was severed at the wing to fuselage attachment point fittings. The airplane's right wing remained attached to the forward spar carry-through structure. The forward spar carry-through was torn from the airplane's fuselage. Both wings had extensive spanwise leading edge and slat crushing damage.

The empennage was buckled upward at the forward end of the vertical stabilizer attach point, and was displaced slightly to the right. The vertical stabilizer, right horizontal stabilizer, right elevator, and rudder sustained minor denting and bending. The left horizontal stabilizer, and left elevator sustained extensive impact damage.

Due to impact damage, the flight controls could not be moved by their respective control mechanisms. Flight control system cable continuity was established to the point of impact related damage.

MEDICAL AND PATHOLOGICAL INFORMATION

A postmortem examination of the pilot was conducted under the authority of the Alaska State Medical Examiner, 4500 South Boniface Parkway, Anchorage, Alaska, on October 2, 2007. The cause of death for the pilot was attributed to blunt force, traumatic injuries.

On October 31, 2007, toxicological samples taken from the pilot were analyzed by the FAA Civil Aeromedical Institute, Oklahoma City, Oklahoma. According to the toxicology report, 13 mg/dl of ethanol was detected in the liver, and 8 mg/dl of ethanol was detected in muscle tissue, consistent with postmortem production.

TESTS AND RESEARCH

The wreckage was recovered from the accident site and transported to Alaska Claims Services, Inc., in Wasilla, Alaska.

The Helio 295's wing assembly is attached to a fuselage carry-through structure at three points. Two of the attach points are located on the forward portion of the wing, and one at the aft portion of the wing. The airplane's main load bearing capabilities are placed on the two

forward attach points. The forward lower wing attachment cap fitting is formed by interlocking clevises that are held in place by a single, large bore shear pin/bolt. The forward upper wing attach cap fitting is joined to the carry-through by a tension bolt threaded into a barrel nut contained within the wing structure.

On February 5, 2008, a wreckage examination and layout was done under the direction of the NTSB IIC, and a senior NTSB structural engineer assigned to the NTSB's Washington D.C. aviation engineering division. Also present was an air safety investigator from Textron Lycoming.

Examination of the left wing attachment area revealed that the upper forward wing attachment cap and carry through fittings were intact and deformed, and the tension bolt was fractured. The lower forward carry through fitting was intact and had no deformation. The lower forward wing attachment cap fitting was fractured through the bore of each clevis. The shear pin/bolt was intact in the carry through fitting and the inboard portions of the fractured wing clevises were retained in the joint. The NTSB structural engineer discovered fracture surfaces on the airplane's lower forward wing to fuselage cap attachment fitting that were consistent with fatigue fracture. The fracture surfaces on the left upper forward tension bolt exhibited features consistent with overstress. The main wing spar carry-through assembly and the inboard sections of both wings were sent to the NTSB's materials laboratory for examination.

NTSB Materials Laboratory Examination

The accident airplane's main spar carry-through assembly was inspected and disassembled on March 12, 2008, at the NTSB's Washington D.C. materials laboratory. The examination was done at the direction of a Safety Board senior metallurgist, and a senior NTSB structural engineer. Also present at the examination were the NTSB IIC, and a senior aerospace engineer assigned to the FAA's Atlanta, Georgia Aircraft Certification Office (ACO).

The Safety Board senior metallurgist reported that the fractured wing to fuselage attachment cap fitting displayed evidence of fatigue cracking that emanated from areas of corrosion pitting. The metallurgist added that the corrosion pitting was located in the interior portion of the pin/bolt hole, where the large bore shear pin/bolt resides when the wing is attached to the fuselage. The large bore shear pin/bolt had significant corrosion, and was not able to be removed from the carry through fitting clevis. The Safety Board metallurgist noted that the bore area is not visible when the bolt/pin is installed, but there was corrosion present on the forward and aft faces of the fitting that would have been visible. Some of the corrosion was covered with gray paint consistent with the exterior paint on the airplane. Other than the corrosion pitting on the attachment cap fittings and shear pins/bolts, no metallurgical anomalies were discovered.

A complete copy of the NTSB's materials laboratory factual report is included in the public docket for this accident.

Special Airworthiness Information Bulletin

On September 9, 2008, the FAA's ACO, issued a special airworthiness information bulletin (SAIB number CE-08-47), which states, in part:

"Evidence indicates corrosion pitting may lead to fatigue cracks in the forward wing spar lower cap attach fittings, part number, 391-010-462, on Helio Models H-250, H-295, and HT-295 airplanes. Helio Models H-391, H-391B, H-395, H-395A, H-700, and H-800 airplanes incorporate a similar design. If not detected and corrected, these cracks could result in structural failure of the wings with consequent loss of control."

The SAIB recommends, in part:

"To meet your 14 CFR parts 91 and 43 requirements in the forward wing spar lower cap attachment fittings area, do the 100-hour inspections and long-range maintenance recommendations in the Helio Aircraft Operation and Maintenance Manual. The inspections include visual inspections for evidence of corrosion, cracking, and other damage on the spar fittings, attachment bolts, and related structure.

Because corrosion pitting in these areas could lead to structural failure of the wing with consequent loss of control due to metal fatigue, address any evidence of corrosion in the wing attach fittings.

Report any corrosion and other damage to Helio Aircraft and the Atlanta Aircraft Certification Office."

Garmin GPS

While on scene, the NTSB IIC discovered a GARMIN, model 296, hand held GPS unit in the wreckage. The damaged GPS unit was shipped to the NTSB vehicle recorder laboratory in Washington, D.C., in an attempt to recover the accident pilot's preaccident route of flight information. A senior Safety Board electronics engineer reported that impact damage sustained during the accident precluded the recovery of any flight information data.

WRECKAGE RELEASE

The Safety Board released the wreckage to the owner's insurance representative on February 5, 2008. The Safety Board retained the main spar carry-through assembly until July 18, 2008 when it was also released to the owner's insurance representative.

Pilot Information

Certificate:	Commercial	**Age:**	60,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Glider	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	April 1, 2007
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	9000 hours (Total, all aircraft), 3000 hours (Total, this make and model), 100 hours (Last 90 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Helio	**Registration:**	N295BA
Model/Series:	H-295	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	1409
Landing Gear Type:	Float	**Seats:**	4
Date/Type of Last Inspection:	May 1, 2007 Annual	**Certified Max Gross Wt.:**	3800 lbs
Time Since Last Inspection:	246.6 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	8733.5 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Installed, not activated	**Engine Model/Series:**	GO-480-G1D6
Registered Owner:	Branham Adventures	**Rated Power:**	295 Horsepower
Operator:		**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PAPH,73 ft msl	**Distance from Accident Site:**	40 Nautical Miles
Observation Time:	17:36 Local	**Direction from Accident Site:**	240°
Lowest Cloud Condition:	Few / 1700 ft AGL	**Visibility**	8 miles
Lowest Ceiling:	Broken / 4100 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	19 knots / 27 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	260°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.45 inches Hg	**Temperature/Dew Point:**	8°C / 6°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	King Salmon , AK	**Type of Flight Plan Filed:**	Company VFR
Destination:	King Salmon , AK	**Type of Clearance:**	None
Departure Time:	16:00 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	3 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	4 Fatal	**Latitude, Longitude:**	60.660907,-150.899963(est)

Administrative Information

Investigator In Charge (IIC):	Johnson, Clinton
Additional Participating Persons:	Boyd B Waltman; Federal Aviation Administration; Anchorage, AK Troy R Helgeson; Textron Lycoming ; Denver, CO David Maytag; Helio Aircraft Company ; Prescott, AZ Michael Cann; Federal Aviation Administration / ACO; Atlanta, GA Edward Garino; Federal Aviation Administration / ACO; Atlanta, GA
Original Publish Date:	September 26, 2008
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=66825