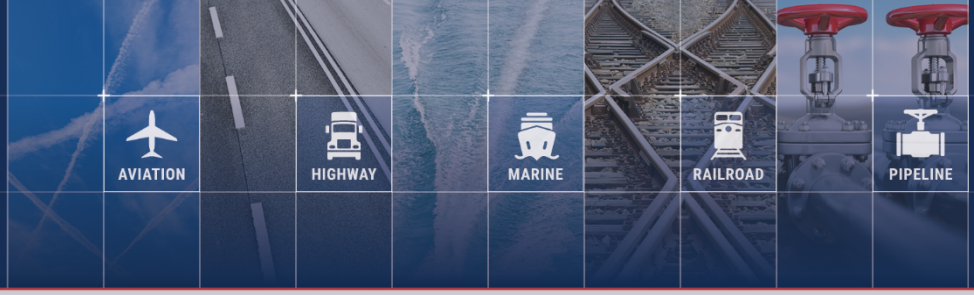

Aviation Investigation Final Report

Location:	Kalispell, Montana	**Accident Number:**	WPR22FA169
Date & Time:	April 30, 2022, 08:04 Local	**Registration:**	N1908A
Aircraft:	Bearhawk LSA	**Aircraft Damage:**	Substantial
Defining Event:	Abrupt maneuver	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The experimental amateur-built airplane was flying in trail behind a group of two other airplanes. The takeoff appeared to be uneventful and the weather unremarkable. Automatic dependent surveillance-broadcast (ADS-B) data indicated that, after climbing to about 1,850 ft above ground level (agl), the airplane leveled off and accelerated to cruise speed. About 1 minute later, the airplane appeared to aggressively pitch down, then up, then down again before the right wing separated from the airplane and the airplane descended to impact the terrain.

Damage signatures indicated that the right wing initially folded downwards almost 90° before breaking away in an upwards direction, likely as the airplane rolled to the right.

The pilot built the airplane from plans, and its primary fuselage structure was made of tubular steel covered in fabric. He used an unapproved welding process to construct the airframe and used thicker walled tubing to compensate. Postaccident examination of the wreckage showed the weld quality was generally poor, and a set of structural bracing components in the main wing spar carry-through section was omitted. Even with the poor build quality, the steel airframe structure appeared to be intact before impact. The omission of the braces alone would not have resulted in the failure of the wing as observed: however, the combined effect of the omission and modifications would have affected the overall structural integrity of the airplane.

ADS-B data showed the airplane was traveling below the never exceed speed (Vne), but well over maneuvering speed (Va) at the time of the breakup; therefore, an aggressive control input would likely have resulted in structural damage. A negative failure of the right wing, as observed, could have been caused by a nose-down control input, and the ADS-B data indicated that the airplane had aggressively pitched down just before the breakup. The resolution of the

ADS-B data did not allow for an accurate assessment of the g-forces encountered during the final oscillations.

The airplane was equipped with dual controls including a center stick. The passenger, who was seated in the rear of the airplane had not flown with the pilot in the airplane before. The passenger's seatbelt was not buckled when examined, and although it had sustained damage it still appeared to operate. The damage observed did not explain why it was unbuckled. If the passenger was unrestrained, inadvertent flight control operation could not be ruled out. Additionally, although friends stated that it was not in the pilot's nature to take risks, his performance of an ostentatious maneuver just before the breakup could not be ruled out.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

An excessive pitch control input for undetermined reasons while the airplane was operating above maneuvering speed, which led to a structural failure of the right wing during cruise flight. Contributing to the accident was the poor construction quality of the airplane and the inadvertent omission by the pilot/builder of a series of structural airframe components.

Findings

Aircraft	(general) - Capability exceeded
Personnel issues	Aircraft control - Unknown/Not determined
Aircraft	Frames (main fuselage) - Not installed/available
Aircraft	Fuselage main structure - Incorrect service/maintenance
Personnel issues	Fabrication - Owner/builder

Factual Information

History of Flight

Enroute-cruise	Abrupt maneuver (Defining event)
Enroute-cruise	Aircraft structural failure

On April 30, 2022, about 0804 mountain daylight time, an experimental amateur-built Bearhawk LSA, N1908A, sustained substantial damaged when it was involved in an accident near Kalispell, Montana. The pilot and passenger were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot planned to fly to Eureka Airport (88M) for breakfast with a group of friends flying in two other airplanes. They departed Kalispell City Airport (S27) about 0759. The accident airplane was the last in trail.

The other pilots in the group stated that the takeoff was uneventful, with clear skies, good visibility, and no significant weather. They did not see the accident airplane after takeoff but were tracking it on their ADS-B receivers until a few minutes later when the airplane disappeared.

ADS-B data indicated that after departing from runway 31, the accident airplane climbed on the runway heading for about 4 minutes at a groundspeed of about 88 knots. The airplane then leveled off at a barometric (pressure) altitude of 4,900 ft (about 1,850 ft agl) and for the next 60 seconds accelerated to a ground speed of about 115 knots, after which the data ended. Closer examination of the altitude data, which had a resolution of 100 ft, indicated that for the final 3.5 seconds of flight, and while maintaining the same track, the airplane descended to 4,800 ft, then climbed to 5,100 ft before descending again to 5,000 ft as the data ended (figure 1).

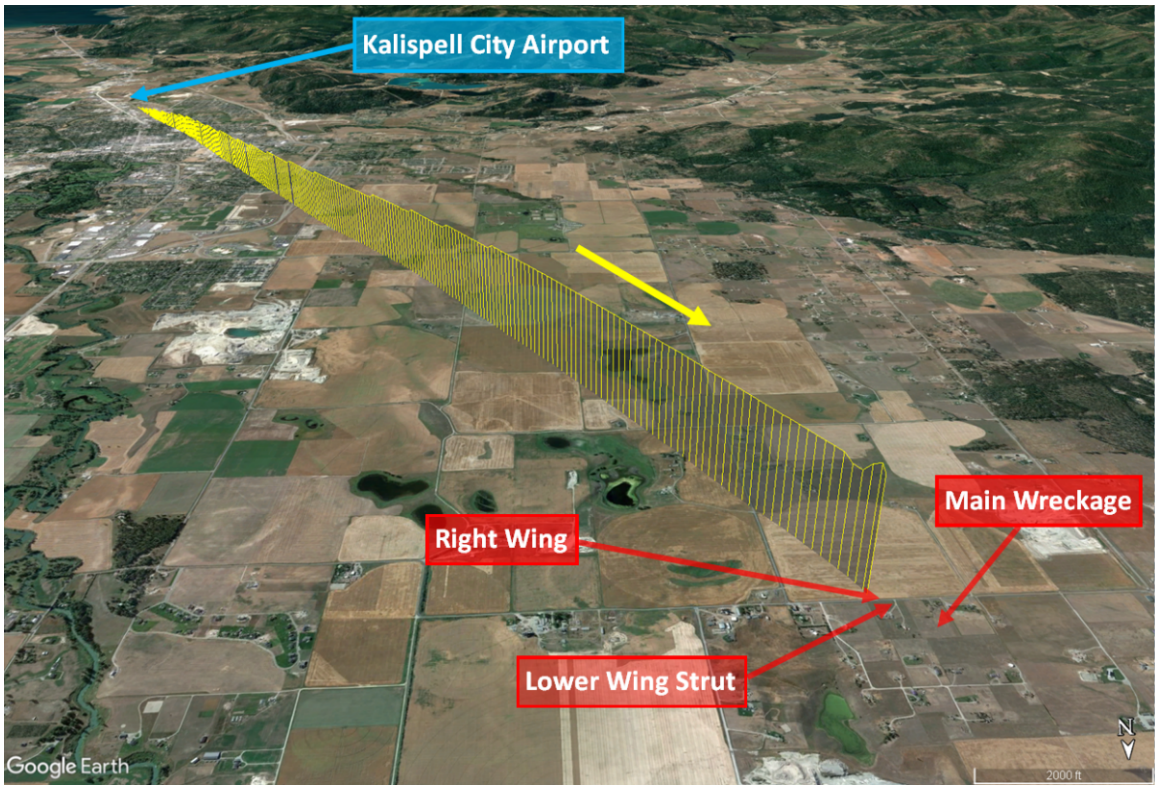

Figure 1 –Flight track and debris field

About that time, a witnesses heard an unusual wind noise followed by a loud bang and observed a wing falling to the ground. No witnesses observed the initial breakup event; however, a north-facing security camera, located on a building about 1,100 ft northwest of the last ADS-B target, captured the airplane about 1 second before ground impact. It was in a direct nose-down attitude and spinning to the right. The right wing was missing, but the left wing and empennage were still attached and intact (figure 2).

Figure 2 – Airplane just before impact

Pilot Information

Certificate:	Flight instructor; Private; Sport Pilot	**Age:**	63,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Front
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	Sport pilot	**Toxicology Performed:**	Yes
Medical Certification:	Sport pilot None	**Last FAA Medical Exam:**	January 1, 1997
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	May 1, 2019
Flight Time:	(Estimated) 996.3 hours (Total, all aircraft), 220 hours (Total, this make and model)		

The pilot's most recent Federal Aviation Administration (FAA) medical occurred in 1997, when he was issued a third-class medical certificate without limitations. At the time of the accident, he had a valid driver's license, and was flying under the provisions for a light sport pilot.

The last entry in the pilot's flight logbook was dated May 1, 2019. There was no evidence that he had undergone a current flight review, as required every 24 months.

The passenger was seated in the rear seat. The accident flight was the first time she had flown in the airplane with him. Friends stated that the pilot was generally risk-averse, and that he typically flew the airplane solo.

Aircraft and Owner/Operator Information

Aircraft Make:	Bearhawk	**Registration:**	N1908A
Model/Series:	LSA	**Aircraft Category:**	Airplane
Year of Manufacture:	2018	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	1
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	June 3, 2021 Condition	**Certified Max Gross Wt.:**	1320 lbs
Time Since Last Inspection:	5 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	242 Hrs as of last inspection	**Engine Manufacturer:**	Jabiru
ELT:	Not installed	**Engine Model/Series:**	3300
Registered Owner:	On file	**Rated Power:**	120 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The tandem two-seat airplane was designed for the for light-sport category and built by the pilot from plans. It had a fabric-covered tubular steel airframe and a conventional aluminum wing. It was equipped with dual flight controls, comprised of rudder pedals and a center control stick.

Construction was completed and an airworthiness certificate was issued in June 2018. Maintenance records indicated that the last condition inspection was completed by the pilot on June 3, 2021. The last entry in the logbook, dated February 5, 2022, showed that an engine oil change had been performed. At that time, the Hobbs-hour meter read 242 hours.

Maneuvering speed (Va) is the maximum speed where full, abrupt control movement can be used without overstressing the airframe. According to the airplane's designer, at the airplane's estimated accident weight (about 1,357 pounds) Va would have been about 75 mph, based on a stall speed of 35 mph and 4.5 G limit loading. The airplane had a maximum gross weight of 1,500 pounds when operated in the experimental/utility category, and 1,320 pounds under experimental light sport. The airplanes never exceed speed (Vne) was 140 mph.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KGPI,2963 ft msl	**Distance from Accident Site:**	6 Nautical Miles
Observation Time:	08:00 Local	**Direction from Accident Site:**	79°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	20°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.09 inches Hg	**Temperature/Dew Point:**	2°C / 0°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Kalispell, MT (S27)	**Type of Flight Plan Filed:**	None
Destination:	Eureka, MT (88M)	**Type of Clearance:**	None
Departure Time:	07:59 Local	**Type of Airspace:**	Class E

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	48.285913,-114.40329

The first identified piece of wreckage consisted of the right wing and outboard section of its lift strut, which came to rest on a road about 350 ft northwest of the last ADS-B target. The right wing sustained crush damage and abrasions along the length of its root rib, consistent with ground impact after separation, and the surrounding tarmac area was soaked with fuel. The inboard section of the strut had separated and was located about 100 ft northwest of the wing. The rest of the airplane was located 850 ft northwest of the strut, in a flat grass field, at an elevation of about 3,090 ft.

The main wreckage came to rest in a nose-down attitude in a grass field. The airframe sustained extensive crush damage and fragmentation to the leading edge of the vertical stabilizer. The left wing remained partially attached to the airframe by its lift strut and the forward spar end cap.

The bolts that connected both the main and aft wing spar end caps of the detached right wing remained in place and attached at their respective steel fittings and weldments on the airframe. The corresponding wing fittings at the spar caps exhibited pull-through damage in an upwards direction.

The lift strut had fractured near the midspan point. The upper section remained connected to the wing attach fitting, and the lower section had detached from the lower fitting on the landing gear assembly. The corresponding lower strut bolt remained in place at the landing gear weldment, along with the tip of one of the lower strut bracket clevises. The corresponding clevis fitting on the strut exhibited downward deformation and failure. Concave buckling damage was noted on the upper (wing side) of the strut, and on the outer side (lower section) material appeared to have torn out and bent back against the strut structure.

There was a one-inch-wide impression in the lower section of the lift strut, and a rectangular puncture in the lower wing skin adjacent to that area. This damage appeared to match the dimensions of the right cabin step, and the skin exhibited scrape signatures to its surface that matched the step's anti-slip coating. A 20-inch-wide impact impression in the lower leading edge of the wing was present adjacent to the strut attach point; the dent matched the approximate diameter of the main landing gear tire consistent with the wing folding downward and against the right side of the airplane structure.

The tail section remained largely intact; The vertical stabilizer and rudder, along with horizontal stabilizer and elevators, sustained minimal damage and remained firmly in place.

The rudder control cables were continuous from the control surface through to their respective foot pedals. The elevator control tubes were breached and buckled in multiple locations, and all exhibited bending damage consistent with impact. Both ailerons remained attached to their respective wings; the control cables for the right aileron were intact to the wing separation point, and the drive cable for the left wing was continuous from the control surface to the control stick assembly.

The elevator pitch trim control arm was mounted just above the pilot and to the left. The trim system was intact except for the right trim tab push-pull tube, which had broken away from the fitting on the control surface. The break appeared clean and granular in appearance; there was no evidence of corrosion and no damage to the skin in that area.

There was no evidence of a bird strike.

The engine sustained significant impact damage, partially detaching the starter motor and alternator assembly, along with the ignition wires and all ancillary cables and fuel lines. The induction system was crushed, and the carburetor had detached but appeared largely undamaged. There was no evidence of a catastrophic engine failure and all six cylinders

remained attached to the crankcase. The fuel strainer had broken open exposing the screen, which was free of debris.

The engine was fitted with a composite 2-blade propeller. Both blades had separated at their root and were found in the impact crater next to the forward section of the engine and the propeller hub.

Medical and Pathological Information

An autopsy of the pilot was performed by the State of Montana Forensic Science Division. The cause of death was reported as multiple blunt force injuries. Due to the condition of the remains, autopsy was unable to determine whether medical conditions were present. Toxicology testing was performed by the FAA Forensic Sciences Laboratory; the results were positive for Rosuvaststin (Crestor) which is a prescription cholesterol medication and is acceptable for FAA medical certification.

Tests and Research

Airframe Structure

The tube widths of all the steel airframe members met the diameters specified in the plans; however, most tube walls were about 30% thicker. The steel tube members appeared to have been welded using the metal inert gas (MIG) arc welding process, contrary to both the kit manufacturer's recommendations and FAA best practices. According to friends of the pilot, he had elected to use thicker gauge tube because he was using a MIG welder and was aware of the increased weight penalty that using the thicker tube would incur.

The weld quality was generally poor throughout, with multiple areas of incomplete fusion, porosity, and burn-through. Of note, the left fore-aft lower wing box longeron exhibited an incomplete weld to the left aft vertical support, with no penetration, and had detached (figure 3). However, the remaining airframe welds in all other locations were correctly oriented, and appeared intact, with any separation failures occurring in overload just beyond the weld fillets.

Figure 3 – Incomplete weld of left lower wing box longeron

The airplane's plans called for diagonal bracing of the main wing spar carry-through area in the upper cabin. Examination of the airframe revealed that the carry-through structure bracing was missing. Review of the pilot's build logs and airframe remnants indicated that the bracing had never been installed; nothing in the build logs indicated this omission was intentional.

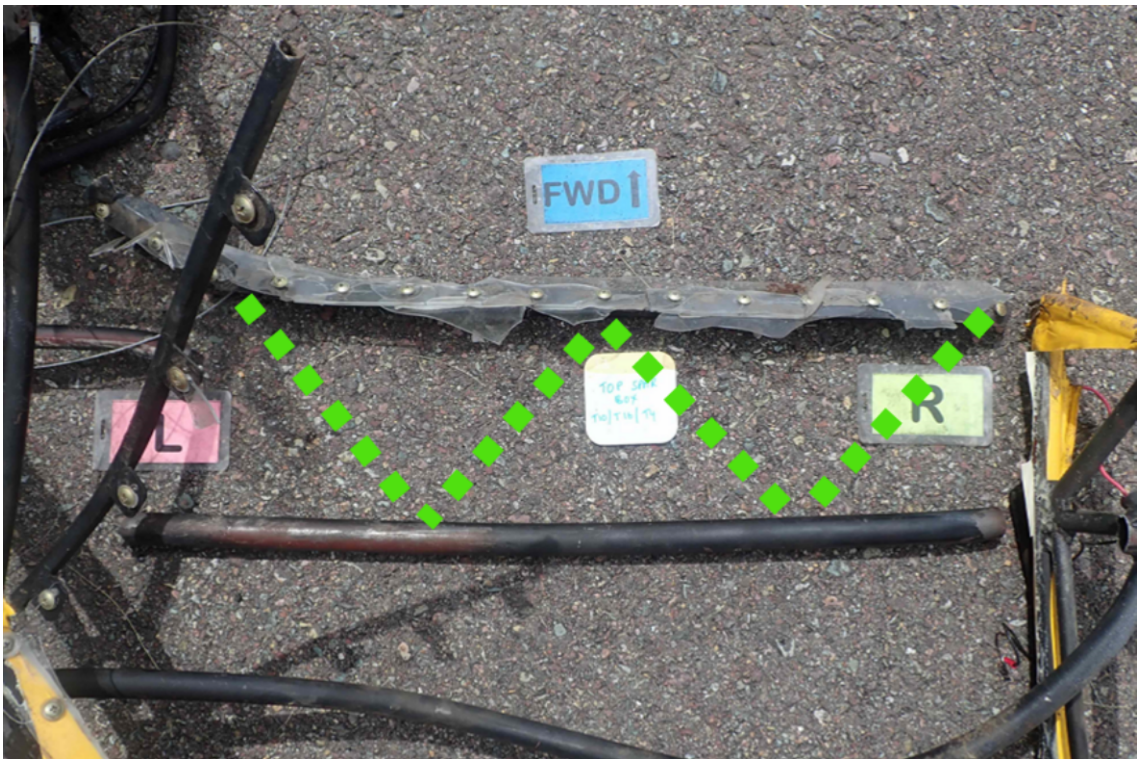

Figure 4 – Omitted wing spar carry-through bracing (in green)

The designer of the airplane performed a structural analysis to calculate how the omission of the bracing would affect the airframe integrity. The results indicated that the carry-through would lose about 20% of its compressive strength, with little change to tensile strength.

Seat Belts

The airplane was equipped with two-place lap seat belts. The front (pilot's) belt was still latched and remained attached to its anchor fittings at the seat base. The rear seat had detached from the airframe and its seatbelt was found unlatched, with the buckle in a position that would have been in the center of the passenger's lap. The pull tab of the buckle exhibited downward deformation, but the latch mechanism was still functional.

Administrative Information

Investigator In Charge (IIC):	Simpson, Eliott
Additional Participating Persons:	Troy A. Meskimen; Federal Aviation Administration FSDO ; Helena, MT
Original Publish Date:	April 10, 2024
Last Revision Date:	
Investigation Class:	Class 3
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=105021