



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Aviation Investigation Final Report

Location:	North Plains, Oregon	Accident Number:	WPR23LA255
Date & Time:	July 5, 2023, 11:30 Local	Registration:	N40233
Aircraft:	Avia Stroitel AC-5M	Aircraft Damage:	Substantial
Defining Event:	Loss of control in flight	Injuries:	1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot stated the airspeed may have been too slow when he initiated a 30° - 45° right turn during his first flight in the foreign-manufactured experimental motor glider. The glider immediately entered a clockwise, tight spiraling dive. After several revolutions, he was able to arrest the rotation, but the motor glider's high airspeed produced significant vibrations. He applied gentle aft pressure on the control stick to regain control, but an inflight separation of the right wing ensued. The pilot released the canopy, egressed about 500 ft above ground level (agl), and deployed his parachute. The motor glider impacted the ground, and the pilot's parachute landing resulted in serious injury.

Postaccident examination of the motor glider's wing structure revealed that the right wing's main spar fractured due to overstress from upward bending loads. No evidence of fatigue was observed with the fracture. However, the wing spar was likely weaker than expected due to wrinkles in the composite fiber reinforcement layers in the upper and lower caps at the critical location where the spar intersected the reinforced closeout rib at the inboard section of the wing.

Since the overstress fractures showed no evidence of damage before separation from a progressive failure mechanism or impact, the loads on the right wing during the accident flight were likely higher than any previously applied loads. However, the extent and angle of the wrinkles in the reinforcement layers at the fracture location indicated that the load that produced the right wing failure in this accident was considerably less than the expected failure load for the design and was possibly lower than the expected maximum design operating load. However, without knowing the actual ratio between the design ultimate failure load and the maximum design operating load of the wing for this experimental foreign-made aircraft, it

is uncertain whether the design maximum operating load was exceeded based solely on analysis of the lab findings.

Probable Cause and Findings

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

The pilot’s failure to maintain control of the motor glider, which resulted in an inflight overstress separation of the right wing during a high-speed, high-wing-load spiral dive recovery. Contributing to the accident was the inadequately manufactured wing structure.

Findings

Personnel issues	Knowledge of equipment - Pilot
Personnel issues	Aircraft control - Pilot
Aircraft	Airspeed - Not attained/maintained
Aircraft	Lateral/bank control - Not attained/maintained
Aircraft	Spar (on wing) - Capability exceeded
Organizational issues	(general) - Manufacturer

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Maneuvering	Loss of control in flight (Defining event)
Maneuvering	Aircraft structural failure

On July 5, 2023, about 1150 Pacific daylight time, a foreign-manufactured experimental motor glider, Avia Stroitel AC-5M, N40233, sustained substantial damage when it was involved in an accident near North Plains, Oregon. The private pilot sustained serious injuries. The motor glider was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot reported that after the recent purchase and condition inspection, he intended to perform a series of maneuvers as required by his insurance company. The motor glider was assembled at North Plains Gliderport (1OR4), North Plains, Oregon, followed by a series of towed high-speed taxis. The motor glider was towed for takeoff and released about 3,100 ft msl. To familiarize himself with the motor glider, he performed a climbing clearing turn to the right and trimmed the glider to hold 55 knots indicated airspeed (KIAS) on a southeast heading. Afterward, he performed a series of stalls and recovered from each uneventfully.

While flying straight and level about 2,500 ft msl, the pilot deployed and retracted the motor. While attempting a 30° - 45° right turn to the southeast, the pilot reported that the glider's airspeed may have been too slow, and the glider immediately entered a clockwise, "very tight spiral dive." The pilot neutralized the control stick, and applied left rudder pedal to recover. After several revolutions, he was able to stop the rotation and level the wings. He reported that, "the motor glider was moving at high speed as it was shaking." The pilot reported that he applied gentle back pressure on the control stick, which was followed by an audible "bang" and he observed the right wing separate from the fuselage. He opened the canopy, deployed his parachute below 500 ft agl, and the landing was hard.

Examination of the motor glider logbook revealed that one month before the accident, a condition inspection was completed in accordance with the manufacturer's inspection instructions and found to be in a condition for safe operation. The pilot reported that the weight of the motor glider at the time of the accident was 627 lbs. A review of the manufacturer's flight manual revealed that the stall speed was about 42 KIAS, and the never-exceed speed was 120 KIAS. The pilot reported that the parachute was last packed in 2016. The parachute was required to be repacked every 6 months. He stated the previous owner only used the parachute as additional ballast.

Examination of the wreckage site revealed that the motor glider's engine and propeller assembly remained attached to the fuselage and constituted the main wreckage. The left wing came to rest about 130 ft northeast of the main wreckage and the empennage came to rest about 398 ft northeast of the main wreckage. The right wing was the furthest point from the main wreckage and came to rest about 446 ft northeast. The left wing's aileron sustained impact damage to the inboard and outboard attachment hinges, but remained connected to the aileron bellcrank. The right wing's aileron was not damaged and remained connected to the wing at the respective hinge point and the bellcrank.

The motor glider's wing root and composite spars were tapered to fit into corresponding carry-through boxes that connected in the aft fuselage. The left- and right-wing spar carry-throughs connected to the root rib of the opposite wing. The 70-pound wing panels were anchored by the carry-through with a single cam-actuated spar pin that cinched the wing assembly together. Aileron and divebrake controls mated automatically when the wings were installed.

Photographic evidence revealed that the right wing's inboard spar was fracture separated. The left- and right-wing carry-through spar beams remained attached within the carry-through box and connected by the spar pin (see figure 1).



Figure 1. Accident site image of right-wing spar fracture separation.

Postaccident examination of the right-wing spar separation revealed that the fracture occurred in the spar at the outboard side of the reinforced area of the closeout rib, as seen in figures 2 and 3. The spar caps were constructed of a fiber-reinforced composite material separated by a web constructed of wood laminate.

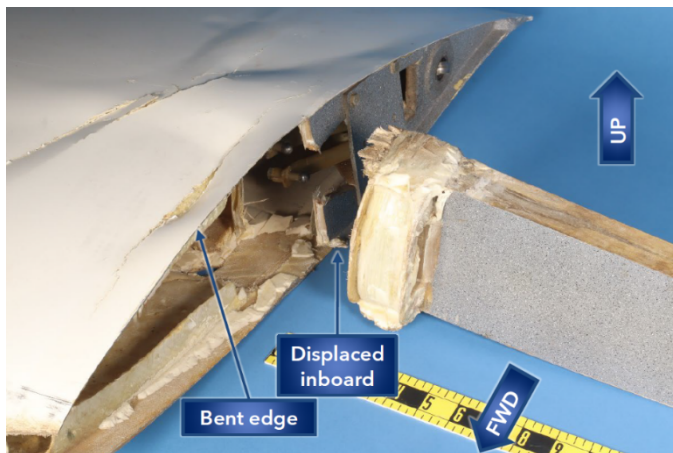


Figure 2. Inboard end of the right wing with separated carry-through beam.

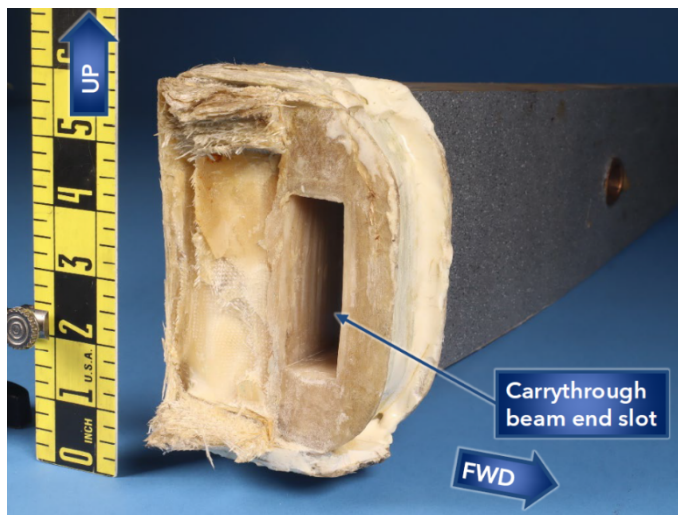


Figure 3. Inboard side of the right-wing spar fracture at the outboard end of the carry-through beam.

A materials lab examination revealed a cream-colored filler between the skin layers, and the fracture path varied between interfaces at either side of the filler. No evidence of preexisting or progressive fracture, such as arrest lines or rubbing damage from mating surfaces, was observed. (See figure 4.)



Figure 4. Sectioned right wing lower skin (upper image) and upper skin (lower image) after the upper skin was separated from the spar. The lower skin shows mating fracture surfaces at the inboard end of the leading-edge bond line.

Mating sides of the fracture through the right-wing spar upper cap are shown in figures 5 and 6. Fiber reinforcement layers were visible at the forward side of the upper spar cap, and the longitudinal reinforcement layers appeared to deviate from the spanwise direction outboard of the fracture surface. Dashed lines in figure 5 trace several of the reinforcement layers visible on the forward face of the upper cap showing observed variations in fiber alignment.

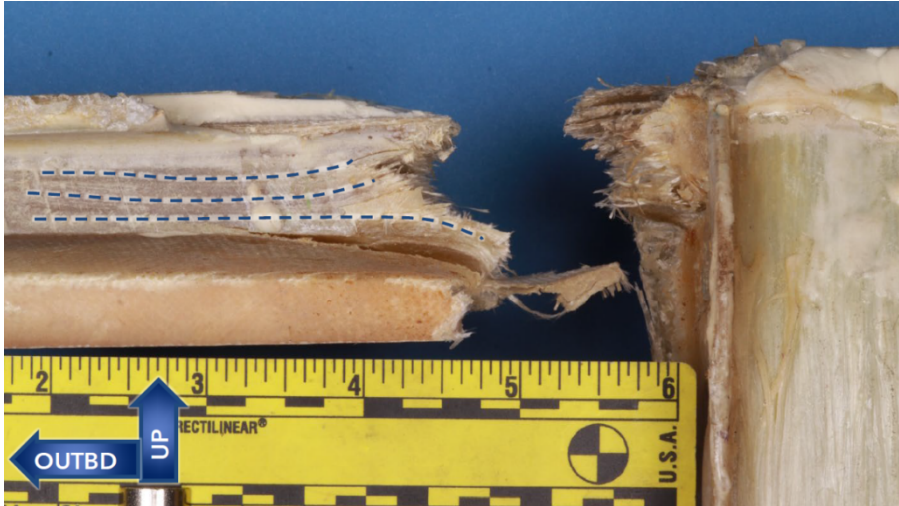


Figure 5. Mating sides of the right-wing spar upper cap fracture after the outboard side was separated from the upper skin. Dashed lines indicate the orientation of reinforcement layers visible on the surface.

As viewed on the outboard side (figure 6), the fracture surface mostly had a rough fibrous appearance consistent with tensile overstress fracture. A small portion of the surface at the upper side of the fracture had a whiter flattened appearance consistent with compression failure. At the lower quarter of the fracture, the exposed longitudinal fibers were angled downward relative to the spanwise direction.



Figure 6. Inboard side (upper image) and outboard side (lower image) of the right-wing spar upper cap fracture.

Mating sides of the right-wing spar fracture through the lower cap are shown in figure 7. The fracture surfaces had a rough fibrous appearance consistent with tensile overstress fracture. A relatively large pocket of fractured resin was observed at the lower aft side of the fracture, and that portion of the fracture was the furthest outboard. A wrinkle was observed in the fibers at the lower surface forward of the resin pocket. Additionally, brackets in figure 7 indicate fibers in the upper half of the fracture that were angled significantly downward relative to the spanwise direction.

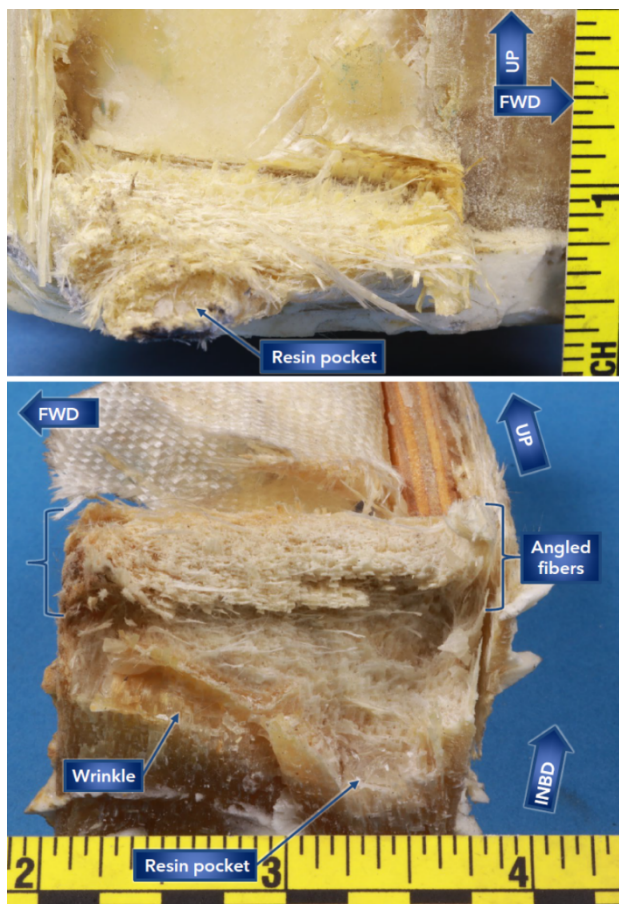


Figure 7. Inboard side (upper image) and oblique view of the outboard side (lower image) of the right-wing main spar lower cap fracture.

According to the Federal Aviation Administration's Glider Flying Handbook, an excessive low-nose attitude during a steep turn may result in a significant increase in airspeed and loss in altitude, which indicates a spiral dive. If the pilot attempts to recover from this situation by applying back elevator pressure only, the limiting load factor may be exceeded, causing structural failure. To recover from a spiral dive, the pilot should first reduce the angle of bank with coordinated use of the rudder and aileron, and then smoothly increase pitch to the proper attitude.

Common errors during spiral dives include:

- Failure to recognize when a spiral dive develops.
- Rough, abrupt, or uncoordinated control application during recovery.
- Improper sequence of control applications.

Commented [1]:

Pilot Information

Certificate:	Private	Age:	72, Male
Airplane Rating(s):	Single-engine land	Seat Occupied:	Single
Other Aircraft Rating(s):	Glider	Restraint Used:	4-point
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	
Medical Certification:	Class 2 Without waivers/limitations	Last FAA Medical Exam:	June 13, 2023
Occupational Pilot:	No	Last Flight Review or Equivalent:	May 16, 2023
Flight Time:	(Estimated) 240 hours (Total, all aircraft), 0 hours (Total, this make and model), 206 hours (Pilot In Command, all aircraft), 21 hours (Last 90 days, all aircraft), 3 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Avia Stroitel	Registration:	N40233
Model/Series:	AC-5M	Aircraft Category:	Glider
Year of Manufacture:	2000	Amateur Built:	Yes
Airworthiness Certificate:	Experimental (Special)	Serial Number:	004
Landing Gear Type:	Tandem; Other launch/recovery system	Seats:	1
Date/Type of Last Inspection:	June 7, 2023 Condition	Certified Max Gross Wt.:	660 lbs
Time Since Last Inspection:	4 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	96.5 Hrs as of last inspection	Engine Manufacturer:	Zanzolterra
ELT:	Not installed	Engine Model/Series:	MZ34/5
Registered Owner:	On file	Rated Power:	25 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KH10,196 ft msl	Distance from Accident Site:	5 Nautical Miles
Observation Time:	10:53 Local	Direction from Accident Site:	111°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	/	Turbulence Type Forecast/Actual:	/
Wind Direction:		Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.9 inches Hg	Temperature/Dew Point:	29°C / 10°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	North Plains, OR (10R4)	Type of Flight Plan Filed:	None
Destination:	North Plains, OR	Type of Clearance:	None
Departure Time:	11:19 Local	Type of Airspace:	Class G

Airport Information

Airport:	North Plains Glider Port 10R4	Runway Surface Type:	
Airport Elevation:	174 ft msl	Runway Surface Condition:	Dry
Runway Used:		IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Serious	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:		Aircraft Explosion:	None
Total Injuries:	1 Serious	Latitude, Longitude:	45.576414,-123.06036(est)

Administrative Information

Investigator In Charge (IIC):	Hicks, Michael
Additional Participating Persons:	Keith Ruconich; Federal Aviation Administration; Portland, OR
Original Publish Date:	May 8, 2025
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=192533

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