Aviation Investigation Final Report

Location:	Sandersville, Georgia	**Accident Number:**	ERA23LA320
Date & Time:	August 1, 2023, 09:30 Local	**Registration:**	N106VT
Aircraft:	MESNARD VELOCITY TWIN	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 Fatal, 1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot and the passenger of the twin-engine, amateur-built airplane were departing for on a cross-country flight, and the pilot reported that after completion of all checklists and ground run-ups the takeoff was normal. At 500 ft mean sea level the pilot initiated his “climb” checklist, during which the right engine “failed hard.” The airplane began to roll to the right and the pilot added left rudder to arrest the roll but was unable; he then added full left aileron, but the airplane continued to roll right. The pilot then performed what he described as a “low yo yo” maneuver and he was able to regain control of the airplane. He reduced throttle on both engines to idle before pitching to maintain 85 kts, which was the simulated single engine best rate of climb airspeed determined during flight testing. The pilot reported that he was too low to return to the airport and the airplane was not climbing while maintaining 85 kts. After scanning the immediate area, the pilot located a small clearing in a swamp and decided to make a forced landing. The airplane impacted a swampy area, substantially damaging the fuselage, empennage, and both wings.

Postaccident examination of both engines and the flight controls found no evidence of any preaccident mechanical malfunctions or failures that would have precluded normal operation. The lack of engine cylinder compression found on the right engine was likely due to corrosion, organic debris, and sediment entering the engine during the impact sequence and subsequent soaking in the swamp before recovery. Examination of the airplane’s wiring found the engine control unit (ECU) wiring from the ECU circuit breakers in the cockpit to the ECUs on the aft firewall was chafed and multiple wires were severed in the vicinity of the main landing gear actuator piston track. The wires were not shielded or protected and were clamped to the side of an undamaged covered channel where the landing gear actuator piston ran along with multiple other wires and the aileron control rod. One power wire for the left ECU was severed and both right ECU injector wires were severed. Multiple other wires in the same bundle exhibited cuts and chafing, likely a result of the main landing gear teeter bar rubbing against

the wires when the landing gear was raised and lowered. The ECU manufacturer reported that with both right ECU injector wires severed, there would be no power to the electronic fuel injectors for the right engine and combustion would be lost.

The pilot reported that during the accident flight he never attempted to feather the windmilling propeller of the right engine. Subsequently, the propeller controller would have continued to adjust the propeller blades to a fine pitch attitude in an attempt to maintain the set engine rpm until reaching the fine pitch stop. This adjustment towards fine pitch would greatly increase the drag produced by the propeller and it is likely the unexpected drag the pilot reported experiencing following the loss of engine power.

The pilot stated that during his flight testing of the airplane, he did not shut an engine down in flight nor did he feather a propeller in flight as he thought it was too much of a risk; instead, he simulated single-engine operations by reducing an engine to idle with the propeller set to cruise. All single-engine flight testing was done in this configuration to include Vmc, Vyse, and basic flight with a simulated loss of engine power to one engine. Due to the lack of flight testing with an engine shut down, the investigation was unable to determine why the pilot experienced a loss of control even though the airplane remained above the Vmc and Vyse noted by the pilot in his simulated single-engine testing.

Probable Cause and Findings

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

A total loss of power in the right engine due to the right ECU injector wires being severed by the main landing gear actuator piston teeter bar as a result of a lack of clearance and protection of the wiring bundle.

Findings

Aircraft	Electrical pwr sys wiring - Damaged/degraded
Aircraft	Recip eng wiring - Damaged/degraded
Aircraft	Recip eng wiring - Design
Personnel issues	Lack of action - Pilot
Personnel issues	Decision making/judgment - Owner/builder
Aircraft	Climb rate - Not attained/maintained
Aircraft	Lateral/bank control - Not attained/maintained

Factual Information

History of Flight

Initial climb	Loss of engine power (partial) (Defining event)
Initial climb	Inflight upset
Initial climb	Collision with terr/obj (non-CFIT)

On August 01, 2023, at 0930 eastern daylight time, an experimental amateur-built Velocity Twin, N106VT, was substantially damaged when it was involved in an accident near Sandersville, Georgia. The airline transport pilot was seriously injured, and the passenger was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

While returning from airshow in Wisconsin, the pilot stopped at Kaolin Field (OKZ), Sandersville, GA, to have the engines' valve clearances checked by an authorized repair facility for the engine manufacturer. Upon completion of the valve clearance adjustments and adjustments to the right propeller brush blocks, a ground run was completed, and the engine operated normally. The pilot reported that after completion of all checklists and ground run-ups the takeoff from OKZ was normal. He reported that at 500 ft he initiated his "climb" checklist, during which the right engine "failed hard." The airplane began to roll to the right and the pilot added left rudder to arrest the roll but was unable; he then added full left aileron, but the airplane continued to roll right. The pilot then performed what he described as a "low yo yo" maneuver and he was able to regain control of the airplane. He reduced throttle on both engines to idle before pitching to maintain 85 kts, which was the simulated single-engine best rate of climb airspeed determined during flight testing. The pilot reported that he was too low to return to the runway and the airplane was not climbing while maintaining 85 knots. After scanning the immediate area, the pilot located a small clearing in a swamp and decided to make a forced landing.

Flight track data recovered from the onboard avionics indicated that the right-engine rpm began to decrease as the airplane reached a GPS altitude of about 600 ft (about 200 ft above ground level). The airplane continued to climb for about 8 seconds, reaching a maximum GPS altitude of about 750 ft. After reaching the maximum altitude the airplane descended for about 7 seconds before leveling around 600 ft GPS altitude for 8 seconds. The airplane then began its final descent until data was lost about 10 seconds later. About 3 seconds after the rpm drop the data showed the airplane begin to bank right about 60° where it remained for about 7 seconds before recovering to near level for about 3 seconds. After leveling, the data shows multiple right banks from between 30° to 60° until the data ends.

The airplane impacted swampy terrain, and the nose of the airplane separated from the impact, resulting in the pilot and passenger being ejected. The airplane was not insured with hull insurance and subsequently was not recovered from the swamp for about one month. Upon examination of the airplane after recovery, it was found that the fuselage, rudder, and both wings were substantially damaged.

Pilot Information

Certificate:	Airline transport; Flight engineer; Flight instructor; Military	**Age:**	67,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Glider	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine; Glider	**Toxicology Performed:**	
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	April 9, 2023
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	June 30, 2023
Flight Time:	(Estimated) 21000 hours (Total, all aircraft), 50 hours (Total, this make and model), 20000 hours (Pilot In Command, all aircraft), 50 hours (Last 90 days, all aircraft), 30 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Passenger Information

Certificate:		**Age:**	69,Male
Airplane Rating(s):		**Seat Occupied:**	Right
Other Aircraft Rating(s):		**Restraint Used:**	4-point
Instrument Rating(s):		**Second Pilot Present:**	No
Instructor Rating(s):		**Toxicology Performed:**	
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	MESNARD	**Registration:**	N106VT
Model/Series:	VELOCITY TWIN	**Aircraft Category:**	Airplane
Year of Manufacture:	2023	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	VT6-777
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	May 23, 2023 Condition	**Certified Max Gross Wt.:**	4500 lbs
Time Since Last Inspection:	50 Hrs	**Engines:**	2 Reciprocating
Airframe Total Time:	50 Hrs at time of accident	**Engine Manufacturer:**	ULPOWER
ELT:	C126 installed, activated, did not aid in locating accident	**Engine Model/Series:**	UL 520 SERIES
Registered Owner:	On file	**Rated Power:**	220 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

According to Federal Aviation Administration airworthiness records, the airplane was manufactured in 2023 and was built by the pilot. It was powered by 2 ULPower 520T series, 220-horsepower engines equipped with Airmaster AP33 propellers. According to the mechanic who had just completed maintenance on the airplane, it had about 32 hours of total time. He also stated that the pilot came to him in order to have the rest of the initial 15-hour maintenance check completed. The accident flight was the first flight after maintenance.

According to the propeller controller manufacturer, in a scenario where an engine lost combustion, the propeller was windmilling below the set speed, and no change was made to the propeller controller, then the propeller would adjust in the fine direction in an attempt to increase engine speed.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	MLJ,384 ft msl	**Distance from Accident Site:**	23 Nautical Miles
Observation Time:	09:15 Local	**Direction from Accident Site:**	300°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots / None	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	50°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.05 inches Hg	**Temperature/Dew Point:**	26°C / 24°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Sandersville, GA	**Type of Flight Plan Filed:**	VFR/IFR
Destination:	Sebastian, FL (X26)	**Type of Clearance:**	Unknown
Departure Time:		**Type of Airspace:**	Class G

Airport Information

Airport:	KAOLIN FLD OKZ	**Runway Surface Type:**	
Airport Elevation:	438 ft msl	**Runway Surface Condition:**	Rough;Soft;Vegetation;Wet
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 1 Serious	**Latitude, Longitude:**	32.96143,-82.839437(est)

The fuselage roof was partially separated from the main fuselage and was cut at the rear attachment to facilitate recovery. The floor was fractured in multiple places. The keel of the fuselage body was fractured just aft of the front seats, forward of the second row of seats. The nose cone was fractured in multiple places. The right canard on the nose was impact-separated, and the left canard was cut to facilitate recovery. The elevators were impact-

separated from their respective portions of the canard. The empennage remained attached to the fuselage. The vertical stabilizer remained intact. The rudder was impact-separated from the vertical stabilizer and the rudder control bellcrank was folded forward. The right wing was impact-separated outboard of the engine. The right aileron remained attached to the wing at all attachment points. The left wing was impact-separated outboard of the engine. The left aileron remained attached to the wing at all attachment points. Continuity was confirmed from all flight control surfaces to the flight controls in the cockpit.

The second and third row seating were not occupied during the accident flight and remained attached and in place. The pilot seat was separated from the seat track. The inboard pilot seat track remained attached to the floor at all attachment points; the outboard track remained attached to the floor at the rear attachment point and was separated at the forward attachment point. The four-point pilot seat harness remained attached to the floor at the inboard and rear attachment points; the outboard attachment point was separated. The harness was separated from the pilot's seat. The front passenger seat's outboard seat track remained attached to the seat and was separated from the floor. The inboard front passenger seat's track remained attached to the floor at all attachment points and was separated from the seat. The four-point front passenger seat harness remained attached to the floor at the inboard and rear attachment points; the outboard attachment point was separated. The harness was separated from the front passenger seat.

Both fuel caps remained seated in place. The left-wing fuel tank finger filter remained installed on the stub from the fuselage into the wing fuel tank. Continuity was confirmed from the left and right wing fuel tanks to the header tank installed in the aft fuselage. Both fuel shutoff valves were found in the open position and continuity was established from the header tank through the fuel pumps. The right engine fuel system pre-filters for both the manual and automatic electronic fuel pumps were removed, disassembled, and examined, and exhibited a minor amount of organic debris. The right manual fuel pump was tested by applying power and operated normally. The neutral wire on the right automatic fuel pump was loose in the crimping and was easily pulled free when slightly pulled on. Examination of the disassembled right automatic fuel pump revealed no anomalies. The left-engine automatic and manual fuel pumps were tested by applying power and operated as expected.

The wiring from the engine control unit (ECU) circuit breakers to the aft fuselage were contained inside an undamaged covered channel with multiple other wiring bundles, the main landing gear actuator and teeter bar, and the aileron control tube. The wiring bundles for the right and left ECU were not shielded and were connected with an Adel clamp, along with multiple other wiring bundles, to the inside of the channel. The crimp connection where the wiring loom provided by the engine manufacturer connected to a wiring bundle installed by the pilot/builder, from the left ECU circuit breaker to the left ECU, was found to be loose and the wires were easily pulled out of the crimp connection by hand. One of the left ECU power wires (positive/+ve) was severed in the path of the main landing gear actuator piston; multiple other wires in the left ECU wiring bundle exhibited cuts to the insulation. Both right ECU injector wires (positive/+ve) were severed in the same vicinity as the left ECU wires. Multiple other wires were severed in the same vicinity as those of the right and left ECU wires. The

manufacturer reported that with both right ECU injector wires severed, there would be no power to the electronic fuel injectors for the right engine and combustion would stop.

Right Engine

The right-engine crankcase was examined and was intact. Crankshaft continuity was confirmed by rotating the propeller through 720° of rotation. Water and oil were expelled from the engine spark plug holes when the crankshaft was rotated by hand using the propeller. Compression and suction were confirmed on cylinder Nos. 1, 5, and 6 by rotating the propeller. Compression and suction were not observed on cylinder Nos. 2, 3, and 4. The rocker covers were removed from the cylinders and valvetrain continuity was confirmed by rotating the propeller. The Nos. 1, 3, and 6 exhaust valve clearances were not within the range specified by the manufacturer. The Nos. 1, 2, 3, and 4 cylinder heads were removed and the Nos. 2, 3, and 4 exhaust valves were observed to not be seated when compressed air was applied. The turbocharger compressor rotated freely when rotated by hand using a socket wrench. The spark plug wire to ignition coil cap connection was found to be loose on all 12 spark plug leads. Only the top two attachment bolts were installed on both ignition coils. The throttle body sensor was tested and was found to be working correctly through the entire movement of the throttle control mechanism. All six injectors from the right engine were tested by applying power and an audible click was heard, indicative of normal operation.

The right ECU was tested for functionality at the manufacturer's facility under the supervision of an investigator of the Belgian Air Accident Investigation Unit and was found to function properly with no anomalies. The data recovered from the right ECU showed that takeoff commenced 5 minutes and 50 seconds after the ECU began recording data (initiated when the engine RPM exceeded 48 rpm). Forty-two seconds after takeoff the rpm dropped from 2,500 to 1,500 in 2 seconds. Forty-four seconds after takeoff the throttle was increased with no increase in rpm and the turbo pressure and exhaust gas temperatures began to drop. Fifty seconds after takeoff the throttle was decreased and not advanced again during the recording. The final data point was collected 72 seconds after takeoff.

The right propeller remained attached to the engine crankshaft flange at all attachment points. The propeller hub remained intact. The four propeller blades remained seated in the hub and were impact fractured. The right propeller controller was found in the cruise position and the pilot reported that he did not attempt to feather the propeller. The controller was removed and sent to the National Transportation Safety Board (NTSB) vehicle recorders laboratory for data download. The right propeller controller data showed that from the time the right rpm dropped until the data was lost the right propeller was being driven towards fine pitch.

Left Engine

The left-engine crankcase was examined and was intact. Crankshaft continuity was confirmed by rotating the propeller by hand through 720° of rotation. Compression and suction were confirmed on all cylinders by rotating the propeller. The rocker covers were removed from the cylinders and valvetrain continuity was confirmed by rotating the propeller. The Nos. 1, 3, and 4

exhaust valve clearances were not within the range specified by the manufacturer. The No. 4 intake valve clearance was not within the range specified by the manufacturer. The turbocharger compressor rotated freely when rotated by hand using a socket wrench. The engine was equipped with an electronic ignition system, which was not tested. The ignition harness was undamaged. The spark plugs were a three-prong automotive style and exhibited corrosion. The oil filter was removed and cut open and was free of any debris. The oil pump pumped out water when the propeller was rotated by hand.

The left ECU was tested at the manufacturer facility with the right ECU. The data showed that takeoff occurred 5 minutes and 34 seconds after the ECU began recording data. Forty-four seconds after takeoff the throttle is increased, and the rpm remained constant. Fifty seconds after takeoff the throttle was decreased with a subsequent decrease in rpm. Fifty-seven seconds after takeoff the throttle was increased for 4 seconds with a subsequent increase in rpm before being reduced again. The final data point was collected 70 seconds after takeoff.

The left propeller remained attached to the engine crankshaft flange at all attachment points. The propeller hub remained intact. The four propeller blades remained seated in the hub and were impact fractured. The left propeller controller was found in the cruise position. The controller was removed and sent to the NTSB vehicle recorders laboratory for data download. The data showed that the propeller was operating as expected for the duration of the flight.

Additional Information

The pilot reported that he completed phase 1 of flight testing for the experimental amateur-built airplane using the task-based flight testing allowable by the airworthiness certificate. When asked how long the flight testing took, the pilot stated that it took about 26 hours. The pilot stated that during the testing he did not shut down an engine in flight nor did he feather a propeller in flight, as he felt it was too much of a risk; instead, he simulated single-engine operations by reducing an engine to idle with the propeller set to cruise. All single-engine flight testing was done in this configuration to include Vmc, Vyse, and basic flight with a simulated loss of engine power to one engine. The pilot reported that the Vmc for the airplane was about 68 knots and the Vyse was 85 knots. When asked what resources he used for reference to design the flight testing, he stated that he used the Experimental Aircraft Association (EAA) Flight Test Manual and test cards. Review of the manual and test cards showed that there was no mention of single-engine flight testing in either the EAA Flight Test Manual or in Advisory Circular (AC) AC 90-89C, Amateur-Built Aircraft and Ultralight Flight Test Handbook. The pilot

also noted that there was little guidance on multi-engine flight testing from any publicly available source.

Preventing Similar Accidents

Maintain Airplane Control with One Engine Inoperative (SA-081)

The Problem

An unexpected loss of power in one engine while flying a multiengine airplane during critical phases of flight such as during takeoff and landing has resulted in fatal accidents when the pilots did not maintain the airplane's minimum controllable airspeed (Vmc). Pilot experience in the accidents has ranged from a private pilot with 765 hours total flight time and only a single-engine rating to a multiengine-rated pilot with 18,000 hours total flight time. These accidents demonstrate that having a multiengine rating alone may not be enough to avoid the risk of loss of aircraft control with one engine inoperative (OEI), especially if engine failure occurs during a critical phase of flight.

What can you do?

- Be honest about your knowledge of OEI operations and your ability to recognize and handle an OEI situation in your airplane, especially during takeoff and other critical phases of flight.
- Be thoroughly familiar with the recommended procedures and checklists for OEI operations—particularly the memory checklist items—in the airplane flight manual and pilot operating handbook.
- Ensure that you have a multiengine rating and establish multiengine proficiency.
- Seek training in any new multiengine airplane model you fly to ensure that you fully understand the relationship between OEI and Vmc for each phase of flight and the proper recovery techniques for that airplane.
- Do not allow perceived operational pressures (for example, from air traffic controllers, passengers, etc.), continuation bias, or last-minute runway changes to influence your decisions to safely fly and land the airplane.
- Avoid distractions (for example, conversations with passengers or setting radio frequencies) and stay mentally focused when maneuvering at low altitude.

- Remember that a loss of one engine is a 50% loss of power, which can reduce climb performance by at least 80% to 90% and creates asymmetrical thrust. Attention and proper response to these factors are crucial to maintaining airplane control during OEI.

See https://www.ntsb.gov/Advocacy/safety-alerts/Documents/SA-081.pdf for additional resources.

The NTSB presents this information to prevent recurrence of similar accidents. Note that this should not be considered guidance from the regulator, nor does this supersede existing FAA Regulations (FARs).

Administrative Information

Investigator In Charge (IIC):	Young, Joshua
Additional Participating Persons:	Chuck Thompson; FAA/FSDO; Atlanta, GA Pieter Dumont; Belgian Air Accident Investigation Unit; Brussels, OF Scott Swing; Velocity Inc; Sebastian, FL
Original Publish Date:	December 19, 2024
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=192773