



Aviation Investigation Final Report

Location:	Janesville, Wisconsin	Accident Number:	CEN21FA130
Date & Time:	February 16, 2021, 09:17 Local	Registration:	N13VT
Aircraft:	Velocity Vtwin	Aircraft Damage:	Substantial
Defining Event:	Powerplant sys/comp malf/fail	Injuries:	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Ferry		

Analysis

The two pilots were conducting a cross-country ferry flight under a special flight permit in the experimental, twin-engine, pusher configuration airplane. The purpose of the flight was to relocate the airplane to have maintenance performed on the landing gear system. The provisions of the special flight permit indicated that the airplane be operated with the retractable landing gear extended and authorized a co-pilot even though the airplane did not require more than one crewmember.

Just after departure on the second leg of the flight, the pilot reported an engine issue to the tower controller and stated that they wanted to return to the airport but did not require any assistance. He was instructed by the controller to report turning final to the runway, an instruction he acknowledged. There was no further communication from the pilot. The controller reported that he saw the airplane just before impact in a turn consistent with maneuvering for landing when its bank angle increased until he lost sight of it behind trees. The airplane impacted trees and came to rest inverted in a river about 1 mile south of the airport, with substantial damage to the fuselage, both wings, and both canards.

Data recovered from onboard avionics and a performance study indicated that, about the same time as the pilot reported the engine problem, the airplane's climb performance decreased similar to flight on a single engine. Indicated airspeed increased to about 16 knots above the maximum airspeed for flight with the landing gear extended (VLE), consistent with a transition from a climb pitch attitude to a level pitch attitude. Data from the onboard avionics indicated a loss of right engine power about 1 minute later, and the airplane entered a descent that continued until impact. Data from the left engine were not recorded.

The right main landing gear door separated from the airplane and was not located. Additionally, all three propeller blades from the right engine separated about 18" outboard from

the propeller hub, and only one was recovered. Both the left and right engine remaining propeller sections appeared in the feathered position at the accident site. The left engine oil pressure sending unit wiring harness contained broken wires that were not consistent with impact damage. The left throttle, propeller, and mixture cockpit controls were found in a further aft position than the right controls, consistent with an intentional engine shutdown.

Based on the available information, it is likely that the damaged wiring harness resulted in the pilots receiving a red “X” on the primary flight display left engine oil pressure indication. This likely prompted the pilot’s initial call to the tower controller of an engine anomaly and the subsequent precautionary shutdown of the left engine.

As the pilots continued back toward the runway and accelerated the airplane past VLE, the right main landing gear door likely departed the airplane and impacted the right propeller, as evidenced by impact damage to the metal leading edge of the recovered propeller blade, consistent with screw or bolt threads. This impact resulted in a total loss of right engine power. With both engines inoperative, the airplane likely did not have the energy available to glide back to the runway.

Recovered onboard data from the previous flight revealed that the airplane had been operated well above VLE, despite the ferry permit limitation. It is possible that the right landing gear door attachment points may have been weakened by the higher air loads associated with airspeeds exceeding VLE on the previous flight and the accident flight, as well as higher-than-normal sideslip angles that would have been required with the left engine shut down.

Toxicology testing of the left seat pilot revealed the presence of potentially impairing medications; however, whether the effects of the medications or underlying medical conditions contributed to the accident could not be determined. Although it is likely that the right seat pilot was acting as pilot-in-command, since he had previously flown the accident airplane; the pilot flying at the time of the accident could not be determined based on the available information.

Probable Cause and Findings

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

The exceedance of the maximum airspeed for flight with the landing gear extended, which resulted in a separation of the right main landing gear door that subsequently impacted the right propeller and resulted in a total loss of right engine power. Contributing to the accident was the damaged wiring harness of the left engine oil pressure sending unit, which gave a false indication of an engine malfunction that resulted in the precautionary shutdown of the left engine.

Findings

Aircraft	Airspeed - Capability exceeded
Aircraft	Engine out control - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Aircraft	Equ/fur sys wiring - Failure
Personnel issues	(general) - Flight crew

Factual Information

History of Flight

Initial climb	Powerplant sys/comp malf/fail (Defining event)
Maneuvering	Loss of control in flight

On February 16, 2021, about 0917 central standard time, an experimental, Velocity Vtwin airplane, N13VT, was substantially damaged when it was involved in an accident near Janesville, Wisconsin. Both pilots sustained fatal injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* (CFR) Part 91 ferry flight.

The flight was destined for Sebastian, Florida, for maintenance to be performed on the landing gear system and was operated in accordance with a Federal Aviation Administration (FAA) Special Flight Permit. While standard limitations of the permit stipulated that occupancy was “limited to the pilot, essential crew required to operate the aircraft and its equipment and personal baggage,” additional limitations were added which stated, “gear to remain down during flight, co-pilot authorized,” even though the airplane only required one flight crewmember.

The pilots departed Appleton International Airport (ATW), Appleton, Wisconsin, about 0634, destined for Southern Wisconsin Regional Airport (JVL), Janesville, Wisconsin, where they landed about 0715. Fuel records obtained from the fixed base operator at JVL indicated that the airplane was to be topped off with 100 low lead (100LL) aviation fuel; the receipt reflected that the airplane was serviced with 53.5 gallons of 100LL. The airplane subsequently departed JVL about 0912.

According to archived air traffic control recordings, shortly after takeoff, the right seat pilot stated that they would like to circle back and land runway 32 and “work through some engine issues.” The controller acknowledged the request, asked the pilot to report turning onto final for runway 32, and asked if any assistance was required. The pilot replied “no sir, we should be fine.” No further radio communications were recorded from the accident airplane.

The airplane was equipped with two Garmin G3X displays that were capable of recording data on internal nonvolatile memory chips. According to the airplane manufacturer, the primary flight display (PFD) would record left engine data and the multifunction display (MFD) would record right engine data. Engine data was recovered from the MFD, however, the only recoverable data from the PFD was GPS data.

Around 0912:15, data showed right engine rpm decrease from around 2,600 to 2,100 rpm. Around this time, airspeed began to increase to a maximum of around 156 knots and altitude

to a maximum of around 2,850 ft. (Figure 1) During this interval, right engine rpm fluctuated above 2,100. The airplane appeared to stop its climb shortly thereafter, around 0913:25. The airplane continued around 2,800 ft until about 0914:00, when the rpm began to show a decrease. By 0914:10, the rpm had reached zero. The airplane continued to descend until the end of the recorded data. Indicated airspeed began fluctuating, but showed a decreasing trend for the remainder of the recording.

The tower controller on duty saw the airplane south of the airport in a turn consistent with a modified base-to-final just before impact. He stated that when the airplane was just beyond the trees, he saw it begin to circle left. About halfway through the circle, the bank angle increased and he then lost sight of the airplane behind trees.

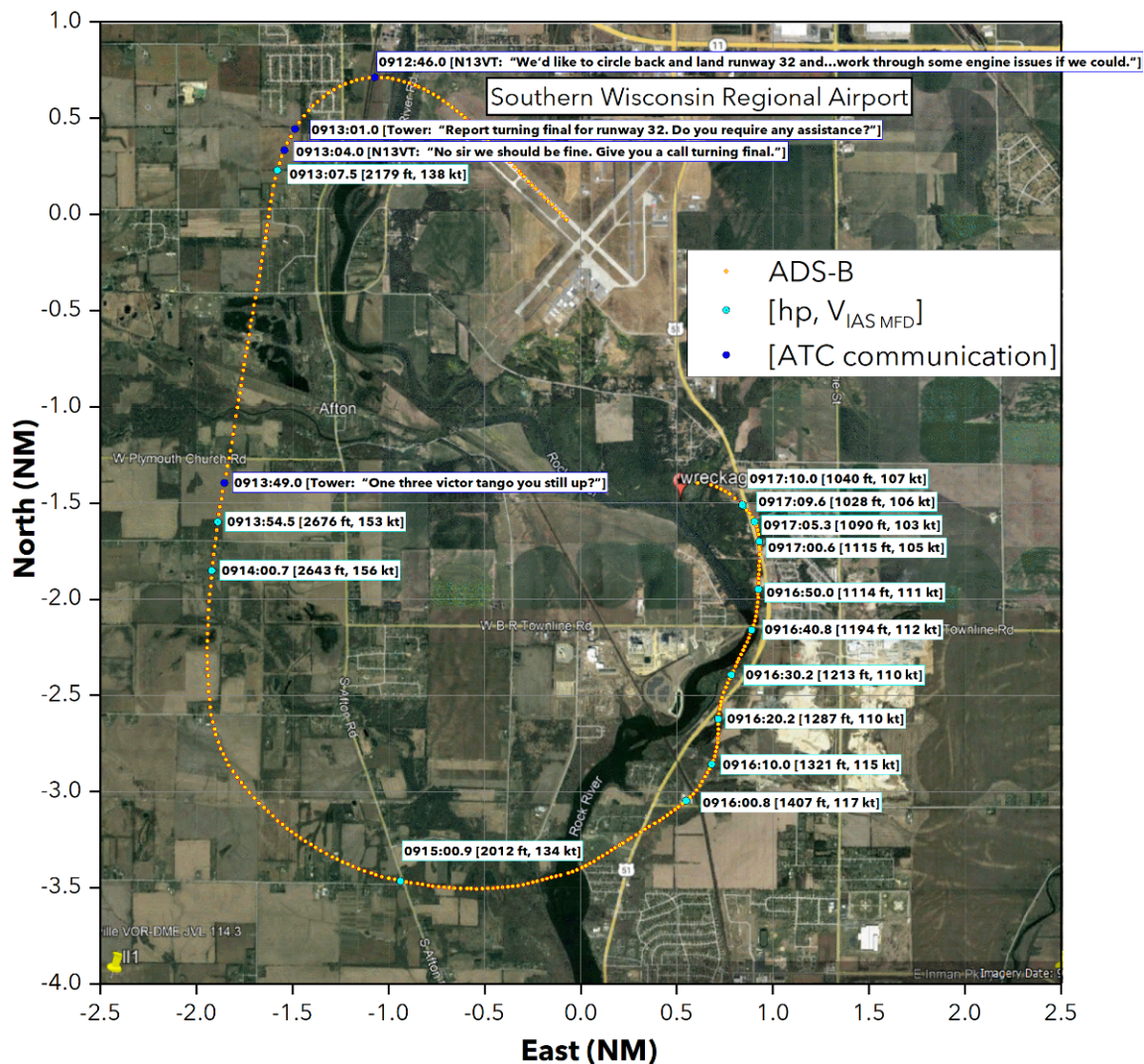


Figure 1: Position, Altitude and Airspeed for the Accident Flight

Pilot Information

Certificate:	Airline transport	Age:	25, Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	Toxicology Performed:	Yes
Medical Certification:	Class 1 None	Last FAA Medical Exam:	May 12, 2020
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	1821 hours (Total, all aircraft), 32 hours (Last 30 days, all aircraft)		

Co-pilot Information

Certificate:	Commercial	Age:	26, Female
Airplane Rating(s):	Single-engine land; Single-engine sea	Seat Occupied:	Left
Other Aircraft Rating(s):	Unmanned (sUAS)	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane single-engine; Instrument airplane	Toxicology Performed:	Yes
Medical Certification:	Class 1 None	Last FAA Medical Exam:	October 14, 2020
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	840 hours (Total, all aircraft)		

A review of the right seat pilot's logbook revealed that he had received training in the accident airplane in September 2020. Along with the flight instructor's signature was the comment, "Very nice job! Velocity Twin proficient."

Aircraft and Owner/Operator Information

Aircraft Make:	Velocity	Registration:	N13VT
Model/Series:	Vtwin NO SERIES	Aircraft Category:	Airplane
Year of Manufacture:	2020	Amateur Built:	
Airworthiness Certificate:	Experimental (Special)	Serial Number:	VT-020
Landing Gear Type:	Retractable - Tricycle	Seats:	4
Date/Type of Last Inspection:		Certified Max Gross Wt.:	
Time Since Last Inspection:		Engines:	2 Reciprocating
Airframe Total Time:		Engine Manufacturer:	Continental
ELT:	Installed	Engine Model/Series:	Titan IOX-370
Registered Owner:		Rated Power:	
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:	KJVL, 808 ft msl	Distance from Accident Site:	1 Nautical Miles
Observation Time:	08:45 Local	Direction from Accident Site:	355°
Lowest Cloud Condition:		Visibility	10 miles
Lowest Ceiling:	Broken / 5000 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	9 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	340°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.1 inches Hg	Temperature/Dew Point:	-14°C / -18°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Janesville, WI (KJVL)	Type of Flight Plan Filed:	
Destination:	Sebastian, FL (X26)	Type of Clearance:	VFR
Departure Time:	09:11 Local	Type of Airspace:	Class D

Wreckage and Impact Information

Crew Injuries:	2 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:		Aircraft Explosion:	None
Total Injuries:	2 Fatal	Latitude, Longitude:	42.595377,-89.030245

The airplane impacted trees and came to rest inverted in a 3-ft-deep tributary of the Rock River about 1 mile south of JVL and sustained substantial damage to both wings, both canards, and the fuselage. Both fuel tanks were breached and a strong odor consistent with 100LL aviation fuel was present at the accident site.

When the airplane was removed from the water, both propellers appeared in the “feathered” position. The throttle, propeller, and mixture controls for the left engine were found in a further aft position than the right engine controls. The left main landing gear door was attached to the airplane and the right main landing gear door was not located. One propeller blade from the right engine, found at the base of a tree that was the initial point of impact, contained impact damage to the metal leading edge consistent with screw or bolt threads. The remaining two propeller blades from the right engine were not located.

Examination of the engines revealed no evidence of preaccident mechanical malfunctions or anomalies that would have precluded normal operation. The oil pressure sending units were removed from the airframe and examined. The right oil pressure sending unit and wiring harness appeared unremarkable. The left oil pressure sending unit wiring harness exhibited damage to the red wire, which had separated the wire into two pieces. Visible cuts had penetrated the insulation of the green and black wires. This damage was not consistent with impact damage.

Testing of the left and right oil pressure sending units was accomplished on an exemplar Velocity Vtwin utilizing the left engine’s oil system.

The left oil pressure sensor was tested first by attaching a surrogate wiring harness to it in place of the damaged one. The sensor was then installed in the mounting position on the left engine firewall. After starting the engine, the sensor was able to detect the left engine’s oil pressure. The right oil pressure sensor was tested using its original (as-found) wiring harness. It was then installed in the mounting position on the left engine firewall. After starting the engine, the sensor was able to detect the left engine’s oil pressure.

According to Velocity, if the Garmin G3X failed to receive data from the sender unit, a red “X” would appear over the oil pressure indication on the display.

Medical and Pathological Information

Toxicology testing of specimens from the left seat pilot performed by the FAA's Forensic Sciences Laboratory identified bupropion (741 ng/ml) and its metabolite, hydroxybupropion, as well as amphetamine (58 ng/ml) in femoral blood. These three substances were also identified in urine.

Bupropion is an antidepressant used to treat depression and help patients quit smoking, often marketed with the names Wellbutrin and Zyban. It carries two warnings: 1) a dose-dependent risk of seizures; and 2) may impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery).

Amphetamine is a Schedule II controlled substance that stimulates the central nervous system available by prescription for the treatment of attention deficit disorder and narcolepsy. It carries a boxed warning about its potential for abuse and has warnings about an increased risk of sudden death and the potential for mental health and behavioral changes. After a single 30 mg oral dose, early blood levels averaged 111 ng/ml and average blood levels in adults using the long acting prescription orally for a week were about 65 ng/ml. Amphetamine is also a drug of abuse. Those abusing amphetamine typically have levels greater than 200 ng/ml and may have levels above 2000 ng/ml.

Tests and Research

A vehicle performance study was completed by the National Transportation Safety Board based largely on data from two Garmin G3X displays that were recovered in the wreckage, one configured as a PFD and one as an MFD, in addition to ADS-B data.

Rate-of-climb data from the MFD showed a significant decrease in climb rate shortly after the right seat pilot reported an engine concern. The rate-of-climb then increased about the time the MFD recorded a decrease in indicated airspeed, before decreasing to about zero climb rate. When the rate-of-climb decreased, the indicated airspeed increased to about 156 knots (kts), which was 16 kts above the maximum landing gear extended (VLE) speed.

Right engine data was recovered from the Garmin G3X MFD unit. The data were consistent with an engine shutdown as determined by a decrease in fuel flow and exhaust gas temperature. At that time, a descent began than continued until impact. No data were stored for the left engine.

MFD data indicated that the previous flight was operated well above the VLE of 140 kts calibrated airspeed (KCAS) and the landing gear operation speed, VLo, of 120 KCAS, despite the ferry permit limitation. In addition, the recorded fuel flow was close to that for an engine at 75% cruise power as per the Pilot's Operating Handbook (POH).

Administrative Information

Investigator In Charge (IIC):	Williams, David		
Additional Participating Persons:	Todd Davis; FAA; Milwaukee, WI Scott Swing; Velocity Aircraft; Sebastian, FL		
Original Publish Date:	February 24, 2023	Investigation Class:	3
Note:			
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=102636		

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