



# Aviation Investigation Final Report

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<b>Location:</b>	Morrisville, Vermont	<b>Accident Number:</b>	ERA18FA238
<b>Date &amp; Time:</b>	August 29, 2018, 12:00 Local	<b>Registration:</b>	N17970
<b>Aircraft:</b>	Schweizer SGS 2 32	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Aerodynamic stall/spin	<b>Injuries:</b>	3 Fatal
<b>Flight Conducted Under:</b>	Part 91: General aviation - Aerial observation		

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## Analysis

The commercial pilot of the glider departed on a 30-minute local sightseeing flight with two passengers seated in the rear seat. The pilot of the tow plane reported that during the tow to the glider's 4,500-ft mean sea level (msl) release altitude, he had to "weave around the clouds" and stated that the mountaintops were obscured by clouds. A witness who saw the glider release from tow stated that, following release, the glider flew away and "disappeared" into clouds. When the glider did not return as expected, the tow pilot initiated an aerial search; the glider was subsequently located in trees at an elevation of 3,673 ft msl about 7 miles west of the departure airport. The glider impacted terrain in a near-vertical, nose-down attitude; the forward cockpit was crushed, but the rear cockpit was largely intact. Examination of the glider revealed no evidence of preimpact mechanical malfunctions or anomalies that would have precluded normal operation.

The relatively low-energy, vertical impact attitude of the glider was consistent with an aerodynamic stall/spin. Weight and balance calculations revealed that the glider was likely about 50 lbs over its maximum gross weight at the time of the accident, but remained within its published center of gravity limits. The glider's increased gross weight would have resulted in an increased stall speed. Given the low clouds in the area, it is possible that the pilot inadvertently entered an area of reduced visibility and subsequently exceeded the glider's critical angle of attack, resulting in an aerodynamic stall and spin. It is also likely that the glider's increased gross weight and stall speed increased the glider's susceptibility to a stall/spin situation.

Although lap belts and shoulder harnesses were required for each occupant of the glider, the accident glider was equipped with only a single lap restraint for the front pilot's seat, and a single lap restraint for both rear seat occupants. The combined weight of the rear seat occupants likely resulted in the failure of the single lap belt's mounting hardware in overload.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's exceedance of the glider's critical angle of attack while maneuvering, which resulted in an aerodynamic stall/spin and impact with terrain. Contributing to the accident was the pilot's decision to operate the glider outside of its published weight limitations.

## Findings

<b>Personnel issues</b>	Aircraft control - Pilot
<b>Aircraft</b>	Angle of attack - Capability exceeded
<b>Aircraft</b>	Airspeed - Not attained/maintained
<b>Personnel issues</b>	Decision making/judgment - Pilot
<b>Personnel issues</b>	Weight/balance calculations - Pilot
<b>Aircraft</b>	Maximum weight - Capability exceeded

## Factual Information

### History of Flight

<b>Maneuvering</b>	Aerodynamic stall/spin (Defining event)
<b>Uncontrolled descent</b>	Collision with terr/obj (non-CFIT)

On August 29, 2018, about 1200 eastern daylight time, a Schweizer SGS 2-32 glider, N17970, was substantially damaged when it was involved in an accident near Morristown, Vermont. The pilot and two passengers were fatally injured. The glider was operated as a Title 14 *Code of Federal Regulations* Part 91 local sightseeing flight.

According to the tow pilot, the purpose of the flight was to provide a 30-minute sightseeing tour to two passengers in the 3-place glider. After takeoff, he climbed the airplane to 4,500 ft mean sea level (msl), where the glider pilot released from the tow. The glider turned westbound toward Spruce Creek and Sterling Pond, Morristown, Vermont. The tow pilot returned to the airport and did not visually monitor the flight of the glider.

A witness who was hiking near Sterling Pond saw the tow plane and glider in flight and photographed the aircraft while the glider was on tow and after its release. The witness reported to local police that the tow plane made a "slingshot" turn and the glider released from the tow. He watched the glider fly away and "disappear" into the clouds.

The tow pilot stated that, when the glider had not returned after 45 minutes, an attempt was made to reach the pilot by radio, without success. After numerous attempts over multiple radios and by cell phone, airport personnel notified the local 911 operator of the missing glider, and a Federal Aviation Administration (FAA) Alert Notice was subsequently issued. The tow pilot and another local pilot began an aerial search, and at 1756, the glider was identified from the air near the summit of Sterling Mountain. At 2135, search and rescue crews reached the accident site, which was located about 40 ft below the summit at an elevation of 3,673 ft msl. The accident site was 7 miles from the departure airport on a 297° ground track.

## Pilot Information

<b>Certificate:</b>	Commercial; Private	<b>Age:</b>	70, Male
<b>Airplane Rating(s):</b>	Single-engine land; Single-engine sea	<b>Seat Occupied:</b>	Front
<b>Other Aircraft Rating(s):</b>	Glider	<b>Restraint Used:</b>	Lap only
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 3 With waivers/limitations	<b>Last FAA Medical Exam:</b>	June 1, 2018
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	June 18, 2018
<b>Flight Time:</b>	3103 hours (Total, all aircraft), 406 hours (Total, this make and model), 128 hours (Last 90 days, all aircraft), 28 hours (Last 30 days, all aircraft)		

The pilot was the owner of the sightseeing company. A review of the pilot's logbooks revealed that he had accrued 1,214 hours of flight experience in gliders, including 406 hours of which were in the accident glider make and model.

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Schweizer	<b>Registration:</b>	N17970
<b>Model/Series:</b>	SGS 2 32 No Series	<b>Aircraft Category:</b>	Glider
<b>Year of Manufacture:</b>	1973	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Utility	<b>Serial Number:</b>	80
<b>Landing Gear Type:</b>	Hull	<b>Seats:</b>	3
<b>Date/Type of Last Inspection:</b>	July 3, 2018 Annual	<b>Certified Max Gross Wt.:</b>	1430 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	0
<b>Airframe Total Time:</b>	3589 Hrs as of last inspection	<b>Engine Manufacturer:</b>	
<b>ELT:</b>	Not installed	<b>Engine Model/Series:</b>	
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

The maximum allowable gross weight for the glider in the utility category was 1,430 lbs. The center of gravity (CG) range was 101.08 to 105.18 inches aft of datum.

The computed weight and balance for the accident flight revealed that the glider weighed 1,480 lbs and the CG approached the forward limit, at 101.63 inches aft of datum.

According to the glider type certificate holder, the glider was certified and delivered with lap belts and shoulder harnesses at the pilot and passenger seating positions. In May 2018, the pilot brought an identical Schweizer SGS 2-32 to the type certificate holder's facility for an annual inspection. The pilot was advised that proper seat belts and shoulder harnesses were required in the glider before they would endorse the airframe logbook at the completion of the inspection, as the installed seat belts were not original equipment and were not approved as equivalent replacements.

The pilot agreed to the installation and purchased an additional set of seat belts and shoulder harnesses for the accident glider. He picked up the additional seat belt set, along with the other glider, on June 27, 2018.

### Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KMVL, 732 ft msl	<b>Distance from Accident Site:</b>	7 Nautical Miles
<b>Observation Time:</b>	15:54 Local	<b>Direction from Accident Site:</b>	122°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	9 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	190°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	29.89 inches Hg	<b>Temperature/Dew Point:</b>	29°C / 22°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Morrisville, VT (MVL)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Morrisville, VT (MVL)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	11:40 Local	<b>Type of Airspace:</b>	Class G

The tow pilot reported that he had checked the winds on two different commercial websites before the flight. The winds aloft at Plattsburg, New York, about 40 miles from Morristown, were reported at 37 knots out of the southwest on one weather reporting site. Another weather reporting site indicated that the winds aloft were 16 knots at 1,000 ft above ground level over Morristown. He thought the discrepancy was unusual, as the wind speeds reported in each place were typically within a few knots of each other.

During the climb and before and after the glider release, he said that, "the air was really smooth," but that he had to "weave around the clouds." There was "plenty of room" between the clouds. According to the tow pilot, "Some of the mountaintops were partially obscured."

According to the tow pilot, the glider pilot "liked to run the ridge on the Burlington (west) side, and the clouds were hard to see."

He stated that the glider pilot typically checked the weather before a flight.

The atmospheric conditions at the time of the accident were conducive to instrument meteorological

conditions.

A weather research and forecasting model was run to simulate wind and cloud conditions. The results showed that cloudy conditions were possible with bases around 3,700 ft msl with downdrafts of 100 to 300 ft per minute and horizontal wind magnitudes of 25 knots or slightly greater possible amongst the terrain.

### Airport Information

<b>Airport:</b>	Morrisville-Stowe State MVL	<b>Runway Surface Type:</b>	
<b>Airport Elevation:</b>	732 ft msl	<b>Runway Surface Condition:</b>	
<b>Runway Used:</b>		<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>		<b>VFR Approach/Landing:</b>	None

### Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	2 Fatal	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	3 Fatal	<b>Latitude, Longitude:</b>	44.592777,-72.745834(est)

All major components of the glider were accounted for at the accident site. The glider came to rest in a near-vertical, nose-down attitude. The nose and leading edge of the left wing rested on the ground. The left wing was torn about 9 ft inboard of the tip but remained attached by sheet metal and control tubes. The right wing was attached and bowed slightly between the aileron attach points.

The empennage was wrinkled on the left side just aft of the wing; the vertical stabilizer, rudder, horizontal stabilizer, and elevator were intact.

Flight control continuity was confirmed from the cockpit to all flight control surfaces.

The nose enclosure, rudder controls, instrument panel, and front cockpit were destroyed by impact. The passenger compartment appeared largely intact. The front seatbelt, a single lap restraint, was released by rescue personnel. The rear seatbelt, a single lap belt, was secured at the buckle, but the right side seat belt mounting bracket was fractured. The bracket section attached at the belt was not recovered. The fracture surfaces on the bracket section attached to the airframe exhibited features consistent with overstress.

An FAA aviation safety inspector conducted an examination of the seat belts installed in the accident glider after recovery. He confirmed that there were no shoulder harnesses installed in the glider and that

only a single lap belt was installed to restrain the two rear seat passengers.

## Medical and Pathological Information

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The Office of the Chief Medical Examiner, Burlington, Vermont, performed an autopsy of the pilot and determined the cause of death as "blunt impacts."

The FAA Forensic Sciences Laboratory performed toxicological testing on the pilot. Test results were negative for the presence of drugs and alcohol.

## Survival Aspects

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According to the glider manufacturer, when properly equipped, the glider should have had 4 shoulder harnesses installed; 1 in the front seat for the pilot, and 3 in the rear seat. When two passengers were seated in the rear seat, each would use their respective outboard shoulder harness. When only one passenger was seated in the rear seat, that passenger would use the center-mounted shoulder harness.

A survivability assessment of the accident glider was requested from the FAA Office of Accident Investigation and Prevention and the Biodynamics Research Team. The biomedical research engineer who completed the assessment was provided with photos and narrative descriptions of the restraints installed, as well as the manufacturer's restraint requirements for each occupant.

According to her assessment, the Schweizer SGS 2-32 aircraft Type Certificate Data Sheet (TCDS) requires "Approved safety belt and shoulder harnesses required for each occupant." In this case, there were two rear seat occupants, weighing 195 lbs and 185 lbs, using a single lap belt. The combined weight of the occupants in a single lap belt would have failed the hardware at a much lower deceleration level than what it was designed for, allowing the occupants to impact the surrounding structure. The weight of the occupants should have been distributed amongst six hard points; instead, only two were utilized, contradictory to the TCDS, which significantly diminished the rear seat occupants' survivability.

## Additional Information

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According to the FAA Glider Flying Handbook, Chapter 5, Glider Performance, a glider's stall airspeed, minimum controllable airspeed, minimum sink airspeed, and best L/D airspeed are increased by a factor equal to the square root of the increase in weight.

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Rayner, Brian
<b>Additional Participating Persons:</b>	William Moore; FAA/FSDO; Portland, ME Kyle Schweizer; K&L Soaring LLC; Cayuta, NY
<b>Original Publish Date:</b>	May 19, 2020
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class</a>
<b>Note:</b>	The NTSB traveled to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.ntsb.gov/Docket?ProjectID=98199">https://data.ntsb.gov/Docket?ProjectID=98199</a>

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