



# Aviation Investigation Final Report

<b>Location:</b>	Beaver Island, Michigan	<b>Accident Number:</b>	CEN22FA031
<b>Date &amp; Time:</b>	November 13, 2021, 13:49 Local	<b>Registration:</b>	N866JA
<b>Aircraft:</b>	BRITTEN-NORMAN BN-2A	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Aerodynamic stall/spin	<b>Injuries:</b>	4 Fatal, 1 Serious
<b>Flight Conducted Under:</b>	Part 135: Air taxi & commuter - Non-scheduled		

## Analysis

A pilot-rated witness observed the airplane during the final approach to the destination airport and stated that the airplane was flying slowly, with a high pitch attitude, and was “wallowing” as if nobody was flying. The airplane stalled and impacted the ground about 300 ft from the runway. GPS and automatic dependent surveillance-broadcast (ADS-B) data captured the accident flight, but the ADS-B data ended about 0.24 miles before the accident. GPS data showed that the airplane’s speed was at or near the published stall speed for the airplane’s given loading condition.

The airplane sustained substantial damage to the fuselage and both wings. Examination of the airplane verified flight and engine control continuity. No preimpact anomalies were found with respect to the airplane, engines, or systems.

The pilot allowed the airspeed to decrease during the approach, increased pitch attitude, and exceeded critical angle of attack, which resulted in an aerodynamic stall and spin into terrain.

## 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 airplane's critical angle of attack during final approach, which resulted in an aerodynamic stall and loss of control at an altitude too low to recover.

## Findings

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<b>Aircraft</b>	Airspeed - Not attained/maintained
<b>Aircraft</b>	Angle of attack - Capability exceeded
<b>Personnel issues</b>	Aircraft control - Pilot

# Factual Information

## History of Flight

<b>Approach-VFR pattern final</b>	Aerodynamic stall/spin (Defining event)
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On November 13, 2021, at 1349 eastern standard time, a Britten Norman BN-2A airplane, N866JA, was substantially damaged when it was involved in an accident near Beaver Island, Michigan. The pilot and three passengers were fatally injured, and one passenger received serious injuries. The airplane was operated as a Title 14 Code of Federal Regulations (CFR) Part 135 air taxi flight.

The ADS-B data showed that the airplane departed Charlevoix Municipal Airport (CVX), Charlevoix, Michigan, at 1332. After departing CVX, the airplane turned north and proceeded directly toward Welke Airport (6Y8), Beaver Island, Michigan. The enroute portion of the flight was conducted about 1,500 ft above mean sea level (msl), and the airplane remained at this altitude until it was about 3 nautical miles (nm) from 6Y8. At this point, the airplane descended and maneuvered toward a straight-in approach to runway 35 at 6Y8. The ADS-B data ended about 0.24 nm south of the accident site.

The track data from a handheld GPS that was used in the airplane coincided with the ADS-B data but recorded additional data that ended at the accident site.

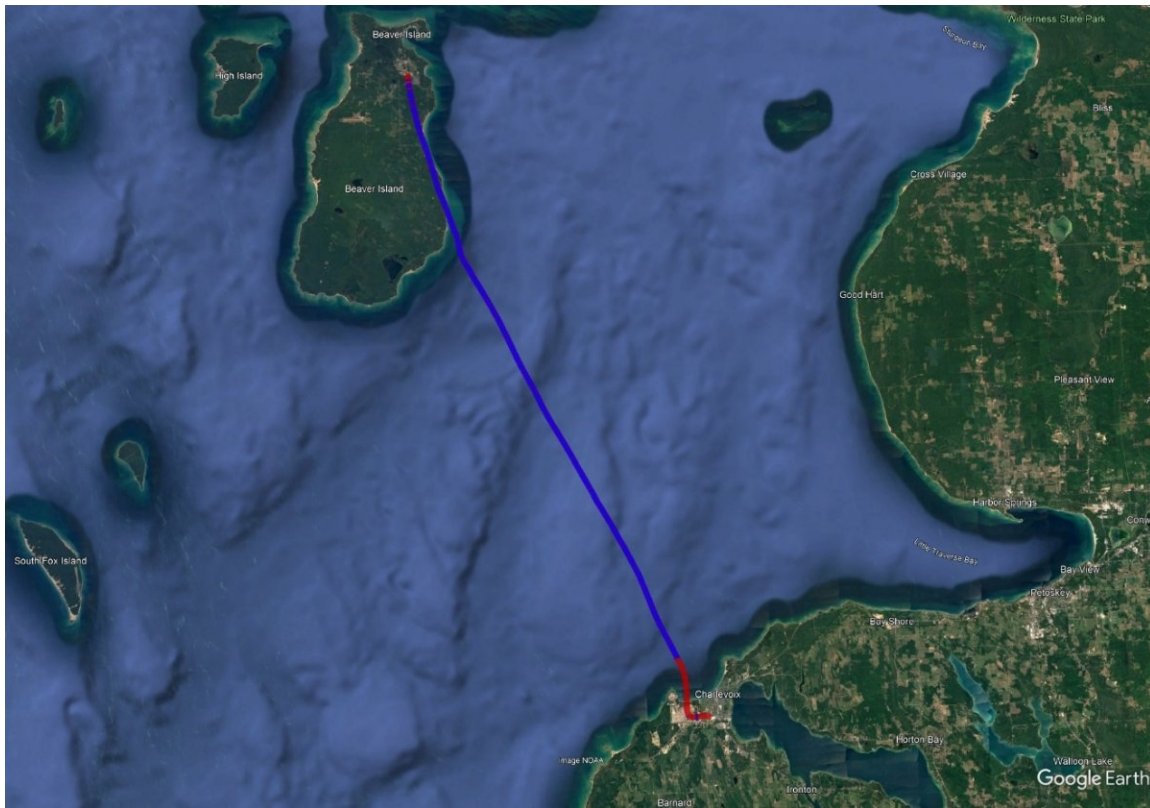
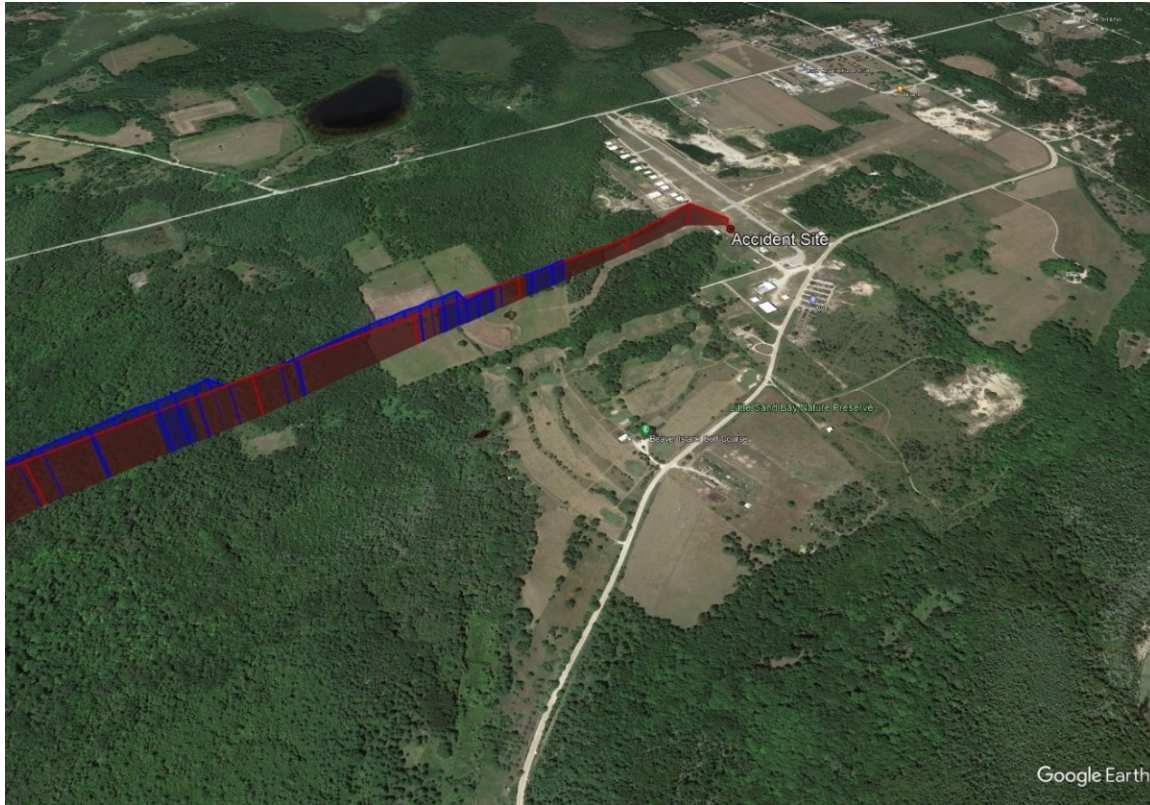


Figure 1: Overview of the accident flight. ADS-B flight track depicted in blue, GPS flight track depicted in red.



*Figure 2: Plot of ADS-B and GPS flight track data for the final portion of the accident flight. ADS-B data depicted in blue. GPS data depicted in red.*

The GPS recorded position, heading, altitude, and ground speed among other data. The airplane's airspeed was calculated from the GPS groundspeed considering the recorded winds at the Beaver Island Airport (SJX), located about 2 nm southwest of the accident site. When the airplane was 1,200 ft from the runway threshold, the calculated airspeed was 58 knots, and when 600 ft from the threshold the airspeed was 54 knots. The final recorded data point coincided with the wreckage location and the recorded airspeed was 33 knots. Figure 3 depicts the plotted airspeed during the final portion of the accident flight.

The chief pilot for the operator witnessed the accident. He stated that he heard the pilot announce that he was at "Sand Bay", a location that the operator's pilots use as a reporting point about 5 minutes from the airport. He stated that he left his house, which is adjacent to the airport, to meet the airplane and he could see the airplane was flying very slowly, in a near stall position. He stated that it appeared to be flying nose-up with no power. He realized that the pilot only had a few seconds to lower the nose and add power before the airplane stalled. His first reaction was that the airplane was "wallowing" and no one was flying the airplane. He stated that the airplane did not recover from the nose-high attitude, then stalled and impacted the ground about 100 ft from the runway.



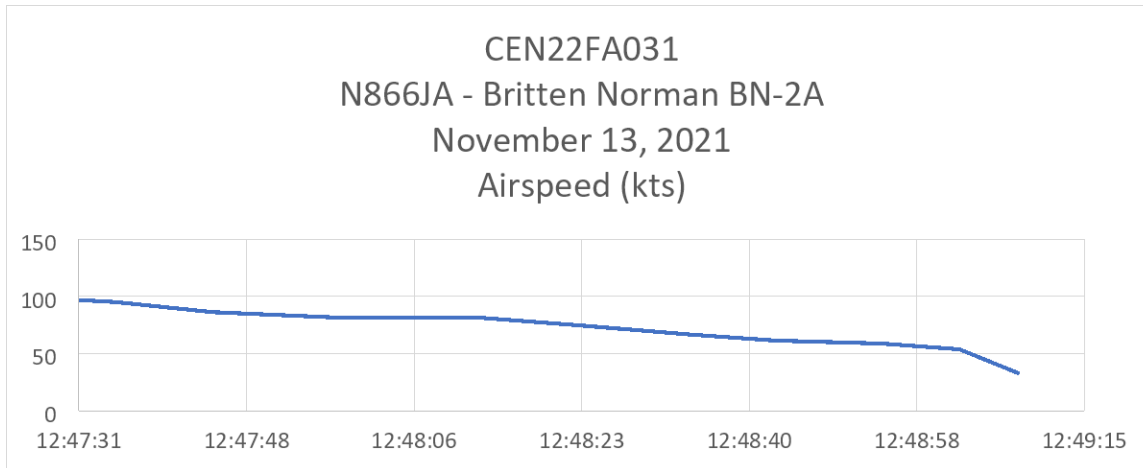


Figure 3. Airspeed during the final portion of the flight.

### Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	55, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Lap only
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	Airplane single-engine	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 1 With waivers/limitations	<b>Last FAA Medical Exam:</b>	January 8, 2021
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	July 21, 2021
<b>Flight Time:</b>	2949 hours (Total, all aircraft), 136 hours (Total, this make and model), 2606 hours (Pilot In Command, all aircraft)		

According to the operator's report, the pilot had accumulated 2,949 hours of total flight experience with 136 hours in the accident airplane make and model.

The pilot was hired by the operator on March 20, 2021, and the operator's training records indicated that the pilot completed the company indoctrination, aircraft ground training, emergency training, crew resource management training, special subjects training, flight training, and differences training between March 21 and July 13, 2021. He passed the airman competency/proficiency check in accordance with 14 CFR Parts 135.293, 135.297, and 135.299 on July 21, 2021.

The pilot's flight duty summary indicated that his last duty day before the day of the accident was on November 1, 2021, 12 days before the accident. On that day the pilot was on duty for about 9.3 hours, logged 5.5 hours of flight time, and completed 17 landings.

### Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	BRITTEN-NORMAN	<b>Registration:</b>	N866JA
<b>Model/Series:</b>	BN-2A	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1970	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	185
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	10
<b>Date/Type of Last Inspection:</b>	October 28, 2021 Annual	<b>Certified Max Gross Wt.:</b>	6200 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	2 Reciprocating
<b>Airframe Total Time:</b>	20784 Hrs as of last inspection	<b>Engine Manufacturer:</b>	Lycoming
<b>ELT:</b>	C91 installed, activated, aided in locating accident	<b>Engine Model/Series:</b>	O-540-E4C5
<b>Registered Owner:</b>	MCPHILLIPS FLYING SERVICE INC	<b>Rated Power:</b>	260 Horsepower
<b>Operator:</b>	MCPHILLIPS FLYING SERVICE INC	<b>Operating Certificate(s) Held:</b>	Commuter air carrier (135)
<b>Operator Does Business As:</b>	Island Airways	<b>Operator Designator Code:</b>	ECLA

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KSJX,666 ft msl	<b>Distance from Accident Site:</b>	3 Nautical Miles
<b>Observation Time:</b>	13:55 Local	<b>Direction from Accident Site:</b>	227°
<b>Lowest Cloud Condition:</b>	Scattered / 2000 ft AGL	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>		<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	11 knots / 20 knots	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	320°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	29.73 inches Hg	<b>Temperature/Dew Point:</b>	4°C / 0°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Charlevoix, MI (CVX)	<b>Type of Flight Plan Filed:</b>	Company VFR
<b>Destination:</b>	Beaver Island, MI (6Y8)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	13:32 Local	<b>Type of Airspace:</b>	Class E

## Airport Information

<b>Airport:</b>	WELKE 6Y8	<b>Runway Surface Type:</b>	Grass/turf
<b>Airport Elevation:</b>	664 ft msl	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>	17/35	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>	3500 ft / 140 ft	<b>VFR Approach/Landing:</b>	Full stop

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	3 Fatal, 1 Serious	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>		<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	4 Fatal, 1 Serious	<b>Latitude, Longitude:</b>	45.719909,-85.517729

The airplane impacted the ground about 110 ft east of the extended centerline of runway 35, and 320 ft south of the runway threshold. The turf runway was 3,500 ft long and had a displaced threshold just beyond its intersection with paved runway 9/27. Impact signatures indicated that the airplane struck the ground in a left-wing-low, nose-low attitude. The front of the fuselage was crushed upward and aft.





*Figure 4. Overall view of the airplane wreckage at the accident site.*

All major components of the airplane were located at the accident scene. Flight control continuity was established from the cockpit controls to each respective control surface except for cuts made by first responders for occupant extraction. Engine control continuity was established from the cockpit to each engine except for cuts made by first responders for occupant extraction. The wing flaps were found in an extended position.

Examination of the airframe, engines, and propellers did not reveal any preimpact mechanical malfunction or failures that would have precluded normal operation.

### **Additional Information**

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The airplane was a twin-engine, high-wing, strut-braced monoplane with a fixed tricycle landing gear arrangement. It was configured to accommodate 10 people, including the flight crew, with additional baggage capacity behind the passenger seats.

The airplane load manifest indicated that the airplane was operating at a weight of 5,903 lbs., and the center of gravity was at 25.3 inches aft of the datum, within the manufacturer's prescribed weight and center of gravity limits. According to the operator, all passengers and baggage were weighed on a scale before flight.

According to the airplane flight manual, for a weight of 6,000 lbs. with flaps down, the stall speed was listed as 42 knots (48 mph).

## Preventing Similar Accidents

### Prevent Aerodynamic Stalls at Low Altitude

While maneuvering an airplane at low altitude in visual meteorological conditions, many pilots fail to avoid conditions that lead to an aerodynamic stall, recognize the warning signs of a stall onset, and apply appropriate recovery techniques. Many stall accidents result when a pilot is momentarily distracted from the primary task of flying, such as while maneuvering in the airport traffic pattern, during an emergency, or when fixating on ground objects.

An aerodynamic stall can happen at any airspeed, at any altitude, and with any engine power setting. Pilots need to be honest with themselves about their knowledge of stalls and preparedness to recognize and handle a stall situation. Training can help pilots fully understand the stall phenomenon, including angle-of-attack concepts and how weight, center of gravity, turbulence, maneuvering loads and other factors can affect an airplane's stall characteristics. The stall characteristics may be different in each type of plane, so learn them before you fly.

The stall airspeeds marked on the airspeed indicator (for example, the bottom of the green arc and the bottom of the white arc) typically represent steady flight speeds at 1G at the airplane's maximum gross weight in the specified configuration. Maneuvering loads and other factors can increase the airspeed at which the airplane will stall. For example, increasing bank angle can increase stall speed exponentially.

Reducing angle of attack by lowering the airplane's nose at the first indication of a stall is the most important immediate response for stall avoidance and stall recovery. This may seem counterintuitive at low altitudes, but is a necessary first step.

See [http://www.nts.gov/safety/safety-alerts/documents/SA\\_019.pdf](http://www.nts.gov/safety/safety-alerts/documents/SA_019.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):** Brannen, John

**Additional Participating Persons:** Thomas Kozura; FAA/Federal Aviation; Grand Rapids, MI  
Troy Helgeson; Lycoming Engines; Williamsport, PA  
Justin Doxey; Air Accidents Investigation Branch  
Les Doud; Hartzell Propeller; Piqua, OH

**Original Publish Date:** October 5, 2023

**Investigation Class:** 3

**Note:**

**Investigation Docket:** <https://data.nts.gov/Docket?ProjectID=104239>

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).