Aviation Investigation Final Report

Location:	Crossville, Tennessee	**Accident Number:**	ERA21FA232
Date & Time:	May 25, 2021, 07:30 Local	**Registration:**	N26889
Aircraft:	GULFSTREAM AMERICAN CORP AA-5A	**Aircraft Damage:**	Destroyed
Defining Event:	Fuel related	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The student pilot was on a multi-leg, solo cross-country flight in atmospheric conditions conducive to serious carburetor icing at descent power. Track data and interviews with the pilot's instructor revealed that the airplane entered a gradual descent over a 5-minute span that included a 450° descending right turn. Shortly thereafter, the pilot called his instructor via cell phone and reported that the airplane's engine was producing only partial power. The instructor stated that the pilot's demeanor was calm, and as such, the discussion felt conversational and that there was time to discuss fuel state, engine control positions, landing at the nearest airport, or selecting a forced landing site.

When asked, the pilot reported he was "40 to 50 miles" from his departure airport; however, track data revealed that the airplane was about 8 miles south of the departure airport. The instructor suggested the pilot make an "emergency landing in a field," but the pilot reported that there were trees and mountains ahead of him before the sounds of impact were heard.

The airplane was consumed by postcrash fire. Control continuity to all flight control surfaces was confirmed; examination of the engine revealed the accessories were destroyed by fire and that the core exhibited no preimpact anomalies. The fracture surfaces on a separated carburetor heat control revealed signatures consistent with overstress due to impact and high temperatures.

Based on the lack of mechanical anomalies and the partial loss of engine power as reported by the pilot, it is likely that the engine lost partial power as the result of carburetor ice accumulation, which resulted in descent into terrain. It is likely that the pilot's prompt application and use of carburetor heat in accordance with the airplane's operating handbook would have restored engine power.

Probable Cause and Findings

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

A partial loss of engine power due to carburetor icing, which resulted in a descent and impact with terrain. Contributing to the accident was the pilot's failure to apply carburetor heat following the initial loss of engine power.

Findings

Personnel issues	Lack of action - Pilot
Aircraft	Intake anti-ice, deice - Not used/operated
Environmental issues	Conducive to carburetor icing - Effect on equipment

Factual Information

History of Flight

Enroute	Fuel related (Defining event)
Enroute	Loss of engine power (partial)
Emergency descent	Collision with terr/obj (non-CFIT)

On May 25, 2021, about 0730 central daylight time, a Gulfstream American AA-5A, N26889, was destroyed when it was involved in an accident near Crossville, Tennessee. The student pilot was fatally injured. The airplane was operated as a Title *Code of Federal Regulations* Part 91 instructional flight.

Track data obtained from the Federal Aviation Administration (FAA), an interview with the pilot's flight instructor, and telephone records revealed that the airplane departed Crossville Memorial Airport (CSV), Crossville, Tennessee, on the second leg of a cross-country flight about 0715. The next planned stop was Cleveland Regional Jetport (RZR), Cleveland, Tennessee, about 50 miles south of CSV. The airplane climbed on a southerly track to 3,700 ft mean sea level (msl) before beginning a gradual descent about 0718. The airplane continued its descent on its southerly track until about 0723 and 3,000 ft msl, when the airplane entered a 450° descending right turn.

Figure 1. – Overview of Accident Flight

At 0726, about 2,300 ft msl, the pilot placed a phone call to his flight instructor. The instructor stated that the pilot reported that the engine was not making full power, producing about 1,700 rpm versus the normal cruise power setting of about 2,400 rpm. The instructor stated that the pilot remained calm during the conversation, and he assisted with troubleshooting, including asking about the fuel state, magneto switch position, and carburetor heat position. The pilot thought he was “40 to 50” miles from CSV. The instructor told him to land at the nearest airport, but the pilot reported that the airplane had slowed to 70 knots. The instructor then advised the pilot to perform an emergency landing to a field. The pilot reported that there were “trees and mountains.” Shortly thereafter, the instructor heard the sound of an impact and the connection was lost.

Figure 2. Profile View of Accident Flight

The airplane completed its course reversal about 8 miles south of CSV and traversed a large cultivated field before impacting rising terrain on a heavily wooded ridgeline.

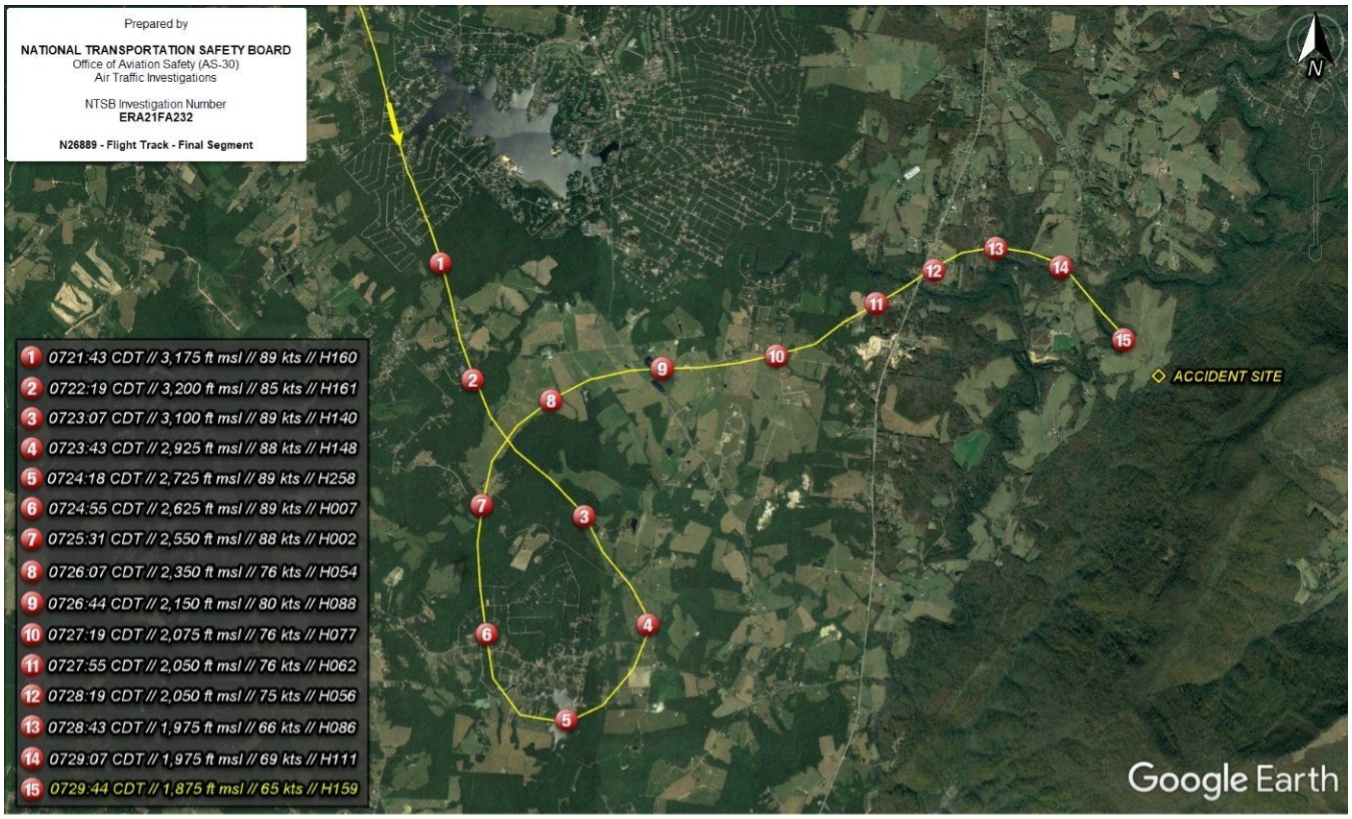

Figure 3. View of Flight Track Final Segment

The pilot had begun flight lessons about 1 month before the accident. According to his instructor, the pilot had accrued 44 total hours of flight experience, all of which was in the accident airplane. The pilot was a conscientious student who flew an average of three times per week. The instructor stated that the pilot was enrolled in an online ground school and that they would discuss the lessons before each flight. The accident flight was the pilot's first solo cross-country flight.

The airplane's most recent annual inspection was completed on December 11, 2020, at 5,221.84 total aircraft hours.

Examination of the airplane at the accident site revealed that the wreckage path was about 1,800 ft elevation, oriented about 030° magnetic and was about 75 ft long. The initial impact point was in a tree about 50 ft tall, and pieces of angularly-cut wood were found along the wreckage path.

The airplane was consumed by postcrash fire. Remnants of each wing and the main wing spars were found adjacent to main fuselage area. The tail section was impact damaged but remained largely intact. Control cable continuity was established from the control column and rudder pedals to the rudder and elevators. Continuity was established from the control column through breaks at each wing root to the ailerons. The cable breaks displayed features consistent with overload failure. The instrument panel and its contents were consumed by fire.

The engine displayed significant fire damage, and the accessories, along with their associated wires, hoses, and fittings, were consumed by fire.

Examination of the throttle control at the carburetor revealed that the ball-joint end of the throttle control cable was fractured at the carburetor arm. The carburetor end of the throttle control cable assembly with attached support bracket, carburetor arm with attached ball screw piece, and carburetor arm attachment nut and cotter pin were retained and forwarded to the NTSB Materials Laboratory in Washington, DC. Examination of the fracture surfaces revealed fracture features consistent with high temperature overstress fracture and ductile overstress fracture.

The weather reported at Crossville Memorial Airport, Crossville, Tennessee, about 20 minutes after the accident included clear skies and calm wind. The temperature was 22°C and the dewpoint was 17°C.

Review of the icing probability chart contained withing the FAA Special Airworthiness Information Bulletin CE-09-35 revealed the atmospheric conditions at the time of the accident were "conducive to serious icing at glide power."

According to the Gulfstream American Model AA-5A Cheetah Pilot's Operating Handbook, Normal Procedures:

Page 4-11, DESCENT, (3) Carburetor Heat – As required by engine power setting and weather conditions

page 4-19, NOTE – If engine runs rough during cruise with carburetor heat on, it may be due to an over-rich condition. To correct for engine roughness in such a situation, lean mixture to smooth engine operation."

Section 3, Emergency Procedures, page 3-16:

ROUGH ENGINE OPERATION OR LOSS OF POWER - Carburetor Icing –

An unexplained drop in RPM and engine roughness may result from the formation of carburetor ice. To clear the ice, apply full throttle (do not exceed red line) and pull the carburetor heat knob full out until the engine runs smoothly. Then remove carburetor heat and readjust the throttle. If conditions require the continued use of carburetor heat in cruise flight use the minimum amount of heat necessary to prevent ice from forming and lean the mixture for smooth engine operation.

FAA Special Airworthiness Information Bulletin (SAIB) CE-09-35, Carburetor Icing Prevention

Pilots should be aware that carburetor icing doesn't just occur in freezing conditions, it can occur at temperatures well above freezing temperatures when there is visible moisture or high

humidity. Icing can occur in the carburetor at temperatures above freezing because vaporization of fuel, combined with the expansion of air as it flows through the carburetor, (Venturi Effect) causes sudden cooling, sometimes by a significant amount within a fraction of a second.

To recognize carburetor icing, the warning signs are: A drop in rpm in fixed pitch propeller airplanes. … The pilot should respond to carburetor icing by applying full carburetor heat immediately. The engine may run rough initially for short time while ice melts.

Pilot Information

Certificate:	Student	**Age:**	34,Male
Airplane Rating(s):	None	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	April 21, 2021
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 44 hours (Total, all aircraft), 44 hours (Total, this make and model), 44 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	GULFSTREAM AMERICAN CORP	**Registration:**	N26889
Model/Series:	AA-5A	**Aircraft Category:**	Airplane
Year of Manufacture:	1979	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	AA5A0792
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	May 19, 2021 100 hour	**Certified Max Gross Wt.:**	2400 lbs
Time Since Last Inspection:		**Engines:**	1
Airframe Total Time:	5419.08 Hrs as of last inspection	**Engine Manufacturer:**	
ELT:	Installed, not activated	**Engine Model/Series:**	
Registered Owner:	On file	**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:	CSV,1870 ft msl	**Distance from Accident Site:**	8 Nautical Miles
Observation Time:	07:53 Local	**Direction from Accident Site:**	321°
Lowest Cloud Condition:	Clear	**Visibility**	9 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.26 inches Hg	**Temperature/Dew Point:**	22°C / 17°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Crossville, TN (CSV)	**Type of Flight Plan Filed:**	None
Destination:	Cleveland, TN (RZR)	**Type of Clearance:**	None
Departure Time:	07:15 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	N/A	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	35.8455,-84.97611(est)

Preventing Similar Accidents

Preventing Carburetor Icing (SA-029)

The Problem

According to NTSB aircraft accident data, from 2000 to 2011, carburetor icing was a cause or factor in about 250 accidents. On average, carburetor icing causes or contributes to two fatal accidents per year. Accident evidence shows that some pilots do not recognize weather conditions favorable to carburetor icing and inaccurately believe that carburetor icing is only a cold- or wet-weather problem. Pilots may also have not used the carburetor heat according to the aircraft's approved procedures to prevent carburetor ice formation. In addition, some pilots may not recognize and promptly act upon the signs of carburetor icing.

What can you do?

- Check the temperature and dew point for your flight to determine whether the conditions are favorable for carburetor icing. Remember, serious carburetor icing can occur in ambient temperatures as high as 90° F or in relative humidity conditions as low as 35 percent at glide power.
- Refer to your approved aircraft flight manual or operating handbook to ensure that you are using carburetor heat according to the approved procedures and properly perform the following actions:
    - Check the functionality of the carburetor heat before your flight.

    - Use carburetor heat to prevent the formation of carburetor ice when operating in conditions and at power settings in which carburetor icing is probable. Remember, ground idling or taxiing time can allow carburetor ice to accumulate before takeoff.
    - Immediately apply carburetor heat at the first sign of carburetor icing, which typically includes a drop in rpm or manifold pressure (depending upon how your airplane is equipped). Engine roughness may follow.
- Consider installing a carburetor temperature gauge, if available.
- Remember that aircraft engines that run on automotive gas may be more susceptible to carburetor icing than engines that run on Avgas.

See https://www.ntsb.gov/Advocacy/safety-alerts/Documents/SA-029.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):	Rayner, Brian
Additional Participating Persons:	Joseph Patterson; FAA; Nashville, TN Mike Childers; Lycoming Engines; Williamsport, PA
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Last Revision Date:	
Investigation Class:	Class 3
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=103145