Aviation Investigation Final Report

Location:	College Park, Maryland	**Accident Number:**	ERA20FA060
Date & Time:	December 29, 2019, 14:48 Local	**Registration:**	N26455
Aircraft:	American Aviation AA5	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

Prior to departure, the pilot received a standard weather briefing that included pertinent weather information along the route and his instrument departure clearance. Cloud ceilings were reported to be 500 ft above ground level and cloud tops were reported to be 21,000 ft mean sea level (msl). After departing, radar data showed the airplane maintained a heading of about 140° for about one minute airplane climbed to 1,200 ft msl and the pilot contacted air traffic control. He was instructed to turn to heading 310° once above 1,700 ft. The airplane initiated a right turn and climbed to about 1,900 ft before entering a right spiraling descent and impacting the ground.

Toxicology testing of the pilot's tissue indicated the presence of diphenhydramine in liver and urine. Diphenhydramine is a sedating antihistamine that carries the following warning: may impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery). However, the samples tested were unsuitable for determining whether the levels identified could have caused impairment. As a result, it could not be determined if the pilot's use of a potentially impairing substance contributed to the accident.

Examination of the wreckage revealed no evidence of any preimpact mechanical malfunctions or failures of the airplane prior to the accident. Analyses of the weather conditions, radar track data, and wreckage distribution are consistent with the pilot becoming spatially disoriented and entering a graveyard spiral while making a climbing turn in instrument meteorological conditions.

Probable Cause and Findings

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

The pilot's loss of airplane control due to spatial disorientation after entering a climbing turn in instrument meteorological conditions.

Findings

Personnel issues	Spatial disorientation - Pilot
Aircraft	Pitch control - Not attained/maintained

Factual Information

History of Flight

Initial climb	Loss of control in flight (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On December 29, 2019, at 1448 eastern standard time, a Grumman American Aviation AA-5A, N26455, was destroyed when it was involved in an accident near College Park Airport (CGS), College Park, Maryland. The pilot was fatally injured. The airplane operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot had filed an instrument flight rules (IFR) flight plan, departed CGS at 1445, and was destined for Westchester County Airport (HPN), White Plains, New York. Prior to departure the pilot contacted Leidos flight service and received a standard weather briefing that included pertinent weather information along the route. The pilot received his instrument departure clearance while on the ground prior to takeoff and was instructed to maintain runway heading until reaching controlled airspace (750 ft mean sea level), then turn to 050° and climb to 2,000 ft.

The airplane departed runway 15, maintained an approximate heading of between 140° and 150°, and climbed for about 1 mile as it tracked slightly right of the extended runway centerline. When the airplane reached an altitude of about 1,200 ft the pilot established communication with air traffic control and was instructed to climb to 5,000 ft and turn to a 310° heading once the airplane climbed above 1,700 ft. The airplane then entered a right turn and climbed to about 1,900 ft before entering a right spiraling descent. The controller issued a low-altitude alert as the airplane descended through 700 ft before radar and voice communications were lost. At 1447, the final radar target was near the accident site at an

altitude of 525 ft and 153 knots groundspeed. Figure 1 shows the airplane's radar-derived track plotted in red.

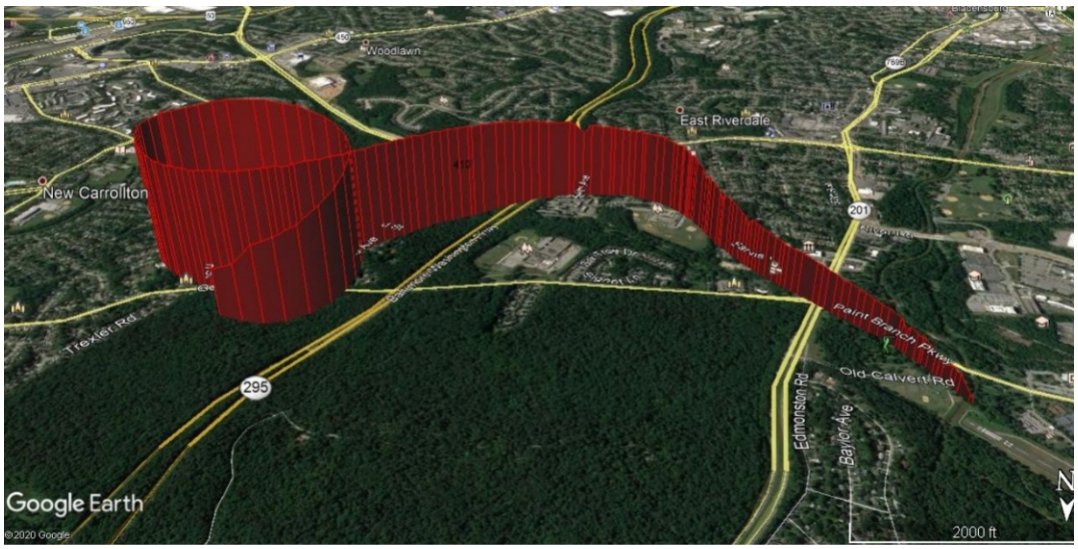

Figure 1. Map showing the airplane's radar track.

Multiple witnesses near the accident site described hearing the airplane's engine noise, but they did not witness the accident. One witness said the sound of the engine was "loud" prior to impact. Another witness said he heard the airplane travel "directly over the house." He further stated that the airplane was not visible due to weather conditions at the time, which were "serious IFR." He said the sound of the airplane's engine was continuous until it "suddenly cut off." Two witnesses reported hearing the engine "sputter."

PERSONNEL INFORMATION

No pilot logbooks were recovered. In May 2019 the pilot reported to his insurance company he had 865 total flight hours. The pilot reported on the application for his second class medical in August 2019 he had 2,100 total flight hours.

METEOROLOGICAL INFORMATION

At the time of the accident, instrument meteorological conditions (IMC) prevailed. The ceiling was overcast at 500 ft above ground level (agl); the cloud tops were about 21,000 ft.

WRECKAGE INFORMATION

The initial impact point was in trees, where multiple branches displayed angular cuts. Several pieces of angularly cut branches were found along the wreckage patch. The main wreckage was scattered about 50 ft along the wreckage path, where the fuselage and the empennage were largely consumed by fire. Flight control continuity was confirmed, through several breaks, from all flight control surfaces to the cockpit controls. All breaks displayed features consistent with overload failure.

The main spar was separated from the airframe and fractured into several pieces. The left wing was partially consumed by fire, the left flap and aileron were separated and located along the debris path. The right wing, aileron, and flap were found separated along the debris path. The rudder remained attached to the empennage structure, the vertical stabilizer was separated. The right horizontal stabilizer remained attached, the left horizontal stabilizer was separated. Both elevators were separated from the empennage.

The fuel selector was found in the "RIGHT" position. The electric fuel pump was separated from its mount and punctured. The engine driven fuel pump was separated from the engine and not located in the wreckage. Both magnetos were impact separated from the engine. The left magneto produced spark when rotated by hand. The right magneto distributor block was fractured and could not be rotated by hand.

The engine was impact separated and located at the end of the debris path. The crankcase appeared intact. The cylinders were examined with a borescope. No anomalies were observed on the visible portions of the pistons, cylinder walls, or valves. The No. 1 cylinder was displaced aft but remained attached to the crankcase, the crankshaft flange was bowed. The Nos. 1 and 2 cylinders had bent pushrods. When actuated by hand through and accessory drive pad, the engine would not rotate.

The rocker box covers were removed; the valve springs and rocker assemblies were all intact with no anomalies observed. The top spark plugs were removed from the engine for inspection. The electrodes were new to slightly worn and light gray in color when compared to a Champion Check-A-Plug chart. The No. 1 spark plug ceramic insulator was fractured. Oil was observed in the engine. The oil filter was crushed; and the oil suction screen was absent of debris.

The carburetor was separated from the intake manifold and was impact and heat damaged, the control cables were not attached to their respective arms. The carburetor was partially disassembled and no damage was noted on the internal components.

The propeller and hub were separated from the engine crankshaft consistent with impact damage. One propeller blade was slightly bent aft with no noticeable twist and exhibited leading edge gouging and chordwise scratches. The other propeller blade was bent aft at the mid-span with a slight twist. It exhibited chordwise scratches and leading-edge gouging, with streaks of missing white paint, and the tip was separated by impact.

The directional gyro was removed from the wreckage and disassembled. Rotational scoring was present on the spinning gyro and its housing. The vacuum pump was removed from the engine and disassembled. The rotor displayed several fractures that were consistent with impact damage, and the vanes were undamaged.

MEDICAL AND PATHOLOGICAL INFORMATION

The FAA's Forensic Sciences Laboratory performed toxicology testing on the pilot’s tissue samples, which identified diphenhydramine in liver and urine tissue (0.5 mg/kg). Blood was not available for testing.

Diphenhydramine is a sedating antihistamine used to treat allergy symptoms and as a sleep aid. It is available over the counter under the names Benadryl and Unisom. Diphenhydramine carries the following warning: may impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery). Compared to other antihistamines, diphenhydramine causes marked sedation; it is also classed as a CNS depressant, and this is the rationale for its use as a sleep aid. Altered mood and impaired cognitive and psychomotor performance may also be observed. However, there is no direct relationship between post-mortem liver levels and antemortem blood levels; these cannot be calculated from the available data.

ADDITIONAL INFORMATION

Spatial Disorientation

The FAA Civil Aeromedical Institute's publication, "Introduction to Aviation Physiology," defines spatial disorientation as a loss of proper bearings or a state of mental confusion as to position, location, or movement relative to the position of the earth. Factors contributing to spatial disorientation include changes in acceleration, flight in instrument meteorological conditions (IMC), frequent transfer between visual meteorological conditions (VMC) and IMC, and unperceived changes in aircraft attitude.

The FAA's Airplane Flying Handbook (FAA-H-8083-3B) describes some hazards associated with flying when the ground or horizon are obscured. The handbook states, in part:

A VFR pilot is in IMC conditions anytime he or she in unable to maintain airplane attitude control by reference to the natural horizon regardless of the circumstances or the prevailing weather conditions. Additionally, the VFR pilot is, in effect, in IMC anytime he or she is inadvertently or intentionally for an indeterminate period of time unable to navigate or establish geographical position by visual reference to landmarks on the surface. These situations must be accepted by the pilot involved as a genuine emergency requiring appropriate action.

The vestibular sense (motion sensing by the inner ear) can and will confuse the pilot. Because of inertia, the sensory areas of the inner ear cannot detect slight changes in airplane attitude, nor can they accurately sense attitude changes that occur at a uniform rate over a period of time. On the other hand, false sensations are often generated, leading the pilot to believe the attitude of the airplane has changed when, in fact, it has not. These false sensations result in the pilot experiencing spatial disorientation.

According to the FAA's publication "Spatial Disorientation: Why You Shouldn't Fly By the Seat of Your Pants" (AM-400-03/1):

"*The graveyard spiral… is associated with a return to level flight following an intentional or unintentional prolonged bank turn. For example, a pilot who enters a banking turn to the left will initially have a sensation of a turn in the same direction. If the left turn continues (~20*

seconds or more), the pilot will experience the sensation that the airplane is no longer turning to the left. At this point, if the pilot attempts to level the wings this action will produce a sensation that the airplane is turning and banking in the opposite direction (to the right). If the pilot believes the illusion of a right turn (which can be very compelling), he/she will reenter the original left turn in an attempt to counteract the sensation of a right turn. Unfortunately, while this is happening, the airplane is still turning to the left and losing altitude. Pulling the control yoke/stick and applying power while turning would not be a good idea–because it would only make the left turn tighter. If the pilot fails to recognize the illusion and does not level the wings, the airplane will continue turning left and losing altitude until it impacts the ground."

Pilot Information

Certificate:	Private	**Age:**	61,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	August 27, 2019
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 2100 hours (Total, all aircraft), 205 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	American Aviation	**Registration:**	N26455
Model/Series:	AA5 A	**Aircraft Category:**	Airplane
Year of Manufacture:	1978	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	AA5A0599
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	April 5, 2018 Annual	**Certified Max Gross Wt.:**	2200 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	3607 Hrs as of last inspection	**Engine Manufacturer:**	Lycoming
ELT:	C91 installed	**Engine Model/Series:**	O-320 SERIES
Registered Owner:	On file	**Rated Power:**	150 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	CGS,50 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	19:48 Local	**Direction from Accident Site:**	293°
Lowest Cloud Condition:		**Visibility**	2 miles
Lowest Ceiling:	Overcast / 500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.03 inches Hg	**Temperature/Dew Point:**	10°C / 9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	College Park, MD (CGS)	**Type of Flight Plan Filed:**	IFR
Destination:	White Plains, NY (HPN)	**Type of Clearance:**	IFR
Departure Time:	14:45 Local	**Type of Airspace:**	

Airport Information

Airport:	College Park CGS	**Runway Surface Type:**	Asphalt
Airport Elevation:	48 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:	15	**IFR Approach:**	None
Runway Length/Width:	2607 ft / 60 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-ground
Total Injuries:	1 Fatal	**Latitude, Longitude:**	38.971389,-76.893058

Administrative Information

Investigator In Charge (IIC):	Hill, Millicent
Additional Participating Persons:	Steven O'Rourke; FAA/FSDO; College Park, MD Mike Childers; Lycoming; Williamsport, PA
Original Publish Date:	August 12, 2022
Last Revision Date:	
Investigation Class:	Class 3
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=100740