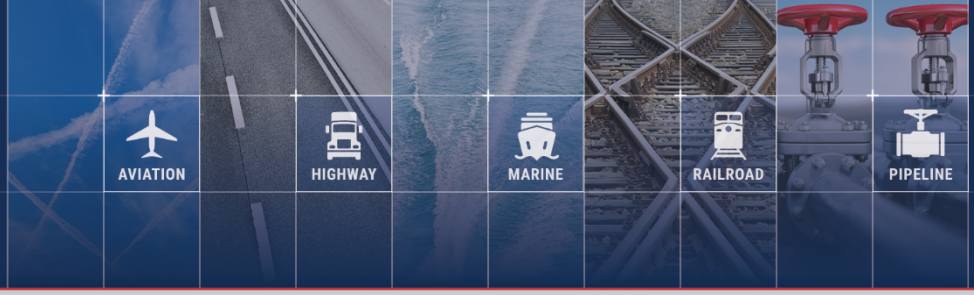

Aviation Investigation Final Report

Location:	Castalia, North Carolina	**Accident Number:**	ERA19FA188
Date & Time:	June 7, 2019, 13:31 Local	**Registration:**	N709CH
Aircraft:	Piper PA46	**Aircraft Damage:**	Destroyed
Defining Event:	Windshear or thunderstorm	**Injuries:**	4 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot departed on the cross-country flight with the airplane about 730 lbs over its maximum gross weight. While in cruise altitude at 27,000 ft mean sea level (msl), the pilot reported to air traffic control that he observed weather on his radar along his route and ahead of his position. The areas of weather included thunderstorms with cloud tops up to 43,000 ft msl. The controller acknowledged the weather; however, she did not provide specifics to the pilot, including the size and strength of the area of precipitation or cloud tops information, nor did she solicit or disseminate any pilot reports related to the conditions, as required.

The airplane entered an area of heavy to extreme precipitation, likely a thunderstorm updraft, while in instrument meteorological conditions. Tracking information indicated that the airplane climbed about 300 ft, then entered a right, descending spiral and broke up in flight at high altitude. The recovered wreckage was found scattered along a path about 2.6 miles in length. Both wings separated, and most of the empennage was not located. The airplane was likely about 148 lbs over the maximum allowable gross weight at the time of the accident.

Examination of the wreckage revealed no evidence of a preaccident malfunction or failure that would have prevented normal operation.

The pilot, who owned the airplane, did not possess an instrument rating. The pilot-rated passenger in the right seat was instrument-rated but did not meet recency of experience requirements to act as pilot-in-command.

Toxicology testing detected a small amount of ethanol in the pilot's liver but not in muscle. After absorption, ethanol is uniformly distributed throughout all tissues and body fluids; therefore, the finding in one tissue but not another is most consistent with post-mortem production.

Hazardous weather avoidance is ultimately the pilot's responsibility, and, in this case, the airplane was sufficiently equipped to provide a qualified pilot with the information necessary to navigate hazardous weather; however, the controller's failure to provide the pilot with adequate and timely weather information as required by Federal Aviation Administration Order JO 7110.65X contributed to the pilot's inability to safely navigate the hazardous weather along his route of flight, resulting in the penetration of a thunderstorm and the resulting loss of airplane control and inflight breakup.

Probable Cause and Findings

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

The pilot's failure to navigate around hazardous weather, resulting in the penetration of a thunderstorm, a loss of airplane control, and an inflight breakup. The air traffic controller's failure to provide the pilot with adequate and timely weather information as required by FAA Order JO 7110.65X contributed to the pilot's inability to safely navigate the hazardous weather along his route of flight.

Findings

Environmental issues	Thunderstorm - Decision related to condition
Personnel issues	Use of available resources - Pilot
Personnel issues	Aircraft control - Pilot
Personnel issues	Lack of communication - ATC personnel
Personnel issues	Use of policy/procedure - ATC personnel

Factual Information

History of Flight

Enroute-cruise	Windshear or thunderstorm (Defining event)
Enroute-cruise	Loss of control in flight
Uncontrolled descent	Aircraft structural failure

On June 7, 2019, about 1331 eastern daylight time, a Piper PA 46-350P, N709CH, was destroyed when it was involved in an accident near Castalia, North Carolina. The private pilot, a pilot-rated passenger, and two additional passengers were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* (*CFR*) Part 91 personal flight.

The flight departed Naples Municipal Airport (APF), Naples, Florida, at 1053 under an instrument flight rules flight plan to Easton Airport (ESN), Easton, Maryland. After deviating around weather about 7 minutes after departure, the flight was uneventful until the pilot contacted the Washington (ZDC) Air Route Traffic Control Center controller at 1301 at an altitude of 27,000 ft mean sea level (msl). The controller advised the pilot that she would have a revised routing to ESN shortly. At 1304, the pilot was given the revised routing, and the pilot read back the clearance. At 1305, the controller broadcast that the ZDC Center Weather Advisory (CWA) was available on Hazardous Inflight Weather Advisory Service (HIWAS) and via flight service.

At 1317, the pilot advised the controller that his radar showed weather ahead of his route and asked the controller if she observed the same. The controller responded, advising that some aircraft had been going around it and some had been going through it. She cleared the pilot to deviate right of course and, when able, proceed direct to Richmond VORTAC (RIC). The pilot acknowledged.

At 1320, the controller advised the pilot that he could deviate left or right around the weather, whichever was better for him, until able to proceed direct RIC. The pilot responded, saying that RIC looked like “dicey” weather too, and asked the controller, “is that okay for us?” The controller responded that she did not know; she did not work that sector and advised it looked “a little rough” and that the following sector controller would be able to provide something for him.

At 1321, the pilot advised that it might be better for him to proceed east toward the coast to get around the weather. The controller replied that there was an active restricted area in that direction and asked if a routing of Franklin (FKN), direct Harcum (HCM), direct TAPPA, direct Patuxent (PXT) would work. The pilot advised he would check. At 1324, the pilot stated that he would like to proceed to FKN. The controller cleared the pilot direct FKN, direct HCM, direct TAPPA, direct PXT, with the rest of the route unchanged. The pilot did not respond.

At 1329, the pilot reported that he was about to go into some rain and asked the controller if she had any information about where the cloud tops were located. The controller advised that she did not but had some weather deviations and advised the pilot that he could go further right if needed. At 1330, the pilot requested to deviate 30° right. The controller approved the deviation and instructed the pilot to proceed direct FKN when able. The pilot acknowledged with a correct readback. No further transmissions were received from the pilot.

A review of radar and automatic dependent surveillance – broadcast (ADS-B) data revealed that the airplane climbed to 27,300 ft msl followed by a rapidly descending right turn and loss of radar contact. The last recorded return, at 1331:03, showed the airplane at 20,200 ft msl.

Pilot Information

Certificate:	Private	**Age:**	58,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	April 25, 2019
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	October 3, 2017
Flight Time:	312 hours (Total, all aircraft), 147 hours (Total, this make and model), 15 hours (Last 90 days, all aircraft), 2 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Pilot-rated passenger Information

Certificate:	Private	**Age:**	54,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	April 24, 2019
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	April 14, 2017
Flight Time:	1062 hours (Total, all aircraft), 173 hours (Total, this make and model)		

The pilot, seated in the left cockpit seat, was also the registered owner of the airplane. He held a private pilot certificate with an airplane single-engine land rating; however, he did not possess an instrument rating. His most recent flight review was completed on October 3, 2017. He filed a flight plan using ForeFlight Mobile and listed himself as the pilot-in-command.

The pilot-rated passenger, seated in the right cockpit seat, held a private pilot certificate with an airplane single-engine land and instrument ratings. His most recent flight review was completed on April 14, 2017. He had not logged the instrument approaches and tasks required by 14 CFR 61.57 (c) to act as pilot-in-command, nor had he accomplished a flight review required by 14 CFR 61.56 (c) to act as pilot-in-command.

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N709CH
Model/Series:	PA46 350P	**Aircraft Category:**	Airplane
Year of Manufacture:	2007	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	4636431
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	April 29, 2019 Annual	**Certified Max Gross Wt.:**	4358 lbs
Time Since Last Inspection:	12 Hrs	**Engines:**	1 Turbo prop
Airframe Total Time:	1449 Hrs at time of accident	**Engine Manufacturer:**	Pratt & Whitney Canada
ELT:	C126 installed	**Engine Model/Series:**	PT6A-35
Registered Owner:		**Rated Power:**	750 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The low-wing, retractable tricycle gear-equipped airplane was manufactured in 2007. In 2017, the original reciprocating engine was removed, and a Pratt and Whitney Canada PT6A-35 turboprop engine was installed per a JetProp LLC supplemental type certificate.

The contents of the fuselage were weighed at the accident site. These weights, as well as passenger weights provided by family members, were used to calculate the airplane's weight at takeoff from APF and at the time of the accident, based on expected fuel consumption. In additional to the four adults on board, the airplane contained passenger luggage, personal items, and family pets.

The maximum allowable gross takeoff weight for the airplane was 4,340 lbs. According to personnel at APF, all fuel tanks were filled to capacity before departure. The remaining useful load under these conditions was 128 lbs. The estimated takeoff weight at APF was 5,070 lbs, and the aircraft weight at the time of the accident was about 4,488 lbs.

The airplane was equipped with a factory-installed, wing-mounted weather radar pod. The airplane was also capable of receiving XM Satellite Weather information with a subscription. It

was not determined if the pilot was utilizing XM Satellite Weather information during the accident flight.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KLHZ,369 ft msl	**Distance from Accident Site:**	18 Nautical Miles
Observation Time:	13:40 Local	**Direction from Accident Site:**	247°
Lowest Cloud Condition:	Scattered / 400 ft AGL	**Visibility**	3 miles
Lowest Ceiling:	Broken / 4700 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.88 inches Hg	**Temperature/Dew Point:**	22°C / 21°C
Precipitation and Obscuration:	Moderate - None - Rain		
Departure Point:	Naples, FL (APF)	**Type of Flight Plan Filed:**	IFR
Destination:	Easton, MD (ESN)	**Type of Clearance:**	IFR
Departure Time:	10:53 Local	**Type of Airspace:**	Class A

A frontal boundary was located from the western Atlantic Ocean across northern North Carolina and into Kentucky, with the cold front section of the frontal boundary located over the accident site. The Storm Prediction Center (SPC) issued a Convective Outlook at 1226 with areas of general thunderstorms forecast for the accident site. Satellite imagery at 1330 and 1340 indicated an extensive layer of cloud cover, cumuliform in nature, over the accident site with the cloud cover moving southwest to northeast. Approximate cloud tops over the accident site at 1330 were about 38,000 ft.

Consolidated Storm Prediction for Aviation (CoSPA) images were retrieved for 1325, 1330, and 1335. The data showed areas of rain shower and thunderstorm activity over the accident site, moving southwest to northeast, about 15 knots, with cloud tops at 43,000 ft msl and Video Integrator Processor (VIP) precipitation intensity levels of 3 to 4 (moderate to heavy).

The ZDC ATC's radar display of Weather and Radar Processor (WARP) weather derived imagery, weather radar representation, settings, and aircraft movement of the accident aircraft was captured at 1323, 1325, 1327, 1329, 1331, and 1333, respectively. The ZDC radar display of WARP weather derived imagery indicated the accident aircraft was in an area of moderate precipitation at 1325. The accident airplane entered an area of heavy precipitation between 1329 and 1331 and remained in the heavy precipitation through the accident time.

A playback of En Route Automation Modernization (ERAM) data was performed, and screen captures at 1324 and 1331 were examined. About the time the pilot accepted the last clearance

from the controller (to proceed direct FKN), the airplane flew directly into areas of heavy to extreme precipitation. At 1331, the airplane was depicted inside the same area of heavy to extreme precipitation.

Federal Aviation Administration (FAA) Order JO 7110.65X, *Air Traffic Control*, includes air traffic control procedures and phraseology pertaining to weather for use by personnel providing air traffic control services. Chapter 2, *General Control*, requires controllers to solicit and disseminate pilot reports (PIREPS) when requested, deemed necessary, or if thunderstorm activity exists or is forecast in their area of responsibility. Chapter 2 also requires controllers to issue pertinent information regarding observed and/or reported weather areas to potentially affected aircraft. This information includes azimuth, size of the weather area, and precipitation intensity.

The CoSPA, WARP, and ERAM products listed above, as well as other weather sources, were available to the controller before the accident. A review of recorded communications and interviews with ATC personnel revealed no evidence that the controller issued details of displayed weather to the accident pilot or to any other aircraft within her airspace. Also, the controller did not solicit or disseminate PIREPS regarding the thunderstorm activity or cloud tops.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	3 Fatal	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	4 Fatal	**Latitude, Longitude:**	36.137222,-77.995834(est)

Examination of the airframe, engine, and propeller revealed no evidence of a preaccident malfunction or failure that would have prevented normal operation.

The main wreckage, consisting of the fuselage, inboard sections of both wings, landing gear, engine, and propeller, impacted wooded terrain about 4 miles northeast of the town of Castalia. The fuselage was found inverted on a heading of 045° magnetic. There was no fire. Impact signatures to the terrain and trees were consistent with a near-vertical impact angle at a level attitude. The entire fuselage exhibited vertical crushing signatures that reduced the cabin volume. Flight control cable continuity was confirmed from the cockpit to the control surfaces, except for cuts made by recovery personnel or by overload separations. All three of the landing gear were found in the retracted position. The flap actuator jackscrew was found in the retracted (flaps-up) position.

The left and right outboard sections of both wings were found about 1.3 and 1.4 miles north-northeast of the main wreckage, respectively. The wing-mounted weather radar pod was separated from the wing and was found within the wreckage path. All fracture surfaces on the wing structures showed failure signatures consistent with overload.

The engine was examined and exhibited impact damage in several areas. The engine was partially disassembled during the examination. The engine displayed limited rotational signatures between the power turbine vane and the power turbine, consistent with a windmilling engine. There was a lack of rotational signatures on the compressor turbine and the upstream side of the power turbine vane.

About 9 months after the accident, a local resident found sections of the elevator and elevator trim tab near his home while horseback riding. These parts were found about 2.6 miles north-northeast of the main wreckage area.

As of the release date of this report, most of the empennage, including the vertical stabilizer, rudder, and horizontal stabilizer, have not been located.

Medical and Pathological Information

According to the Office of the Chief Medical Examiner, Raleigh, North Carolina, autopsy report, the cause of death of the private pilot was blunt force injuries due to the airplane crash and the manner of death was accident. The examination was limited by extensive injuries; no natural disease was identified by the medical examiner.

Toxicology testing performed by the FAA Forensic Sciences laboratory detected ethanol in the private pilot's liver tissue at 0.020 grams per hectogram (gm/hg); no ethanol was detected in muscle tissue. No other tested for drugs were detected in muscle tissue.

According to the Office of the Chief Medical Examiner, Raleigh, North Carolina, autopsy report, the cause of death of the pilot-rated passenger was blunt force injuries due to the airplane crash and the manner of death was accident. The examination was limited by extensive injuries; no contributory natural disease was identified by the medical examiner.

Toxicology testing performed by the FAA Forensic Sciences laboratory detected ethanol in the pilot-rated passenger's muscle tissue at 0.015 gm/hg; no ethanol was detected in liver tissue. Irbesartan, a non-impairing medication used to treat high blood pressure, was detected in liver and muscle tissue. Toxicology testing detected cannabis' inactive metabolite carboxy-delta-9-tetrahydrocannabinol (THC-COOH) in the pilot-rated passenger's liver tissue.

Ethanol

Ethanol is a social drug commonly consumed by drinking beer, wine, or liquor. It acts as a central nervous system depressant; it impairs judgment, psychomotor functioning, and vigilance. Ethanol is water soluble, and after absorption it quickly and uniformly distributes throughout the body's tissues and fluids. The distribution pattern parallels water content and blood supply of the tissue. A small amount of ethanol can be produced after death by microbial activity, usually in conjunction with other alcohols, such as propanol.

Cannabis

The plant *Cannabis sativa* contains chemicals called cannabinoids; tetrahydrocannabinol (THC) is the primary psychoactive cannabinoid compound. THC's mood-altering effects include euphoria and relaxation. In addition, cannabis causes alterations in motor behavior, time and space perception, and cognition. Significant performance impairments are usually observed for at least 1-2 hours following cannabis use, and residual effects have been reported up to 24 hours.

THC is rapidly metabolized, but the rate of metabolism is not linear and depends on the means of ingestion (smoking, oil, and edibles), potency of the product, frequency of use, and user characteristics. The primary metabolite, 11-hydroxy-delta-9-THC, is equally psychoactive but is rapidly metabolized to the non-psychoactive metabolite THC-COOH. THC is fat soluble, so is stored in fatty tissues and can be released back into the blood long after consumption. So, while the psychoactive effects may last a few hours, THC can be detected in the body for days or weeks. Thus, test results do not necessarily reflect recent use and cannot be used to prove that the user was under the influence of the drug at the time of testing.

Administrative Information

Investigator In Charge (IIC):	Hicks, Ralph		
Additional Participating Persons:	John Combrinck-Graham; FAA/FSDO; Greensboro, NC Jonathan Hirsch; Piper Aircraft; Vero Beach, FL Helen Tsai; TSB; Ottawa Jeff Davis; P&WC Karina Marinas; NATCA		
Original Publish Date:	May 19, 2022	**Investigation Class:**	3
Note:			
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=99567		

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.