Aviation Investigation Final Report

Location:	Hollywood, Florida	**Accident Number:**	ERA16FA309
Date & Time:	September 3, 2016, 09:50 Local	**Registration:**	N6091E
Aircraft:	Cessna 172	**Aircraft Damage:**	Destroyed
Defining Event:	Windshear or thunderstorm	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot did not receive a weather briefing before beginning the cross-country flight. After takeoff, the pilot requested from air traffic control to fly below 500 ft above ground level along the ocean shoreline. The controller approved the request but advised of heavy precipitation (a thunderstorm) at the airplane's 12-o'clock position and 4 miles ahead. The controller further advised that the pilot should turn left and fly offshore 3 miles to avoid the thunderstorm. Although the pilot acknowledged the instructions, a review of radar and GPS data for the flight revealed that he continued on course. About 3 minutes later, the pilot reported the he was reversing direction, and no further communications were received from the pilot. Review of the airplane's GPS track overlaid on weather radar plots revealed that the airplane flew into an area of extreme intensity precipitation and then entered a rapid descent and impacted the ocean. Examination of the wreckage did not reveal any evidence of preimpact mechanical malfunctions. It is likely that the pilot lost control of the airplane when it encountered strong downdrafts and heavy rain associated with the thunderstorm.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inadequate preflight and in-flight weather planning, which resulted in continued flight into a thunderstorm and a subsequent loss of airplane control.

Findings

Personnel issues	Weather planning - Pilot
Environmental issues	Thunderstorm - Decision related to condition
Personnel issues	Aircraft control - Pilot

Factual Information

History of Flight

Enroute-cruise	Windshear or thunderstorm (Defining event)
Enroute-cruise	Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On September 3, 2016, about 0950 eastern daylight time, a Cessna 172N, N6091E, was destroyed when it impacted the Atlantic Ocean while maneuvering near Hollywood, Florida. The private pilot and the pilot-rated passenger were fatally injured. The airplane was owned by Volux Aviation LLC, and operated by the private pilot. Visual meteorological conditions prevailed, and no flight plan was filed for the personal flight conducted under the provisions of 14 *Code of Federal Regulations* Part 91. The airplane departed from Pompano Beach Airpark (PMP), Pompano Beach, Florida, at 0932 and was destined for Ocean Reef Club Airport (07FA), Key Largo, Florida.

While flying south along the shoreline, the pilot contacted the air traffic control tower at the Fort Lauderdale/Hollywood International Airport (FLL) and requested to fly through the tower's airspace below 500 ft above ground level. The air traffic controller approved the request but advised the pilot of "heavy precipitation at the 12 o'clock position and 4 miles ahead" and stated, "you should turn left and go off shore 3 miles to avoid the thunderstorm." The pilot acknowledged the communication, and 3 minutes later, the pilot reported, "I am turning back to the north." The air traffic controller approved the turn, and no further communications were received from the airplane.

Review of radar and GPS data that were downloaded from a portable GPS receiver, revealed that the pilot did not turn left and fly offshore as the air traffic controller advised. The data showed that the airplane instead maintained a southerly heading. The airplanes final GPS-derived position was recorded at 0950, with the airplane at a GPS altitude of 440 feet, a groundspeed of 85 knots, and tracking southbound. About 0951, when the pilot advised the controller that he was turning around and heading north, and when the airplane was about 3 miles east of FLL, radar contact was lost at a reported altitude of 200 feet with the airplane tracking eastbound. A search was initiated, and the airplane wreckage was located about 2 miles east of the shoreline submerged in the Atlantic Ocean in about 15 ft of water.

Pilot Information

Certificate:	Private	**Age:**	73,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
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:**	July 6, 2015
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	November 27, 2014
Flight Time:	(Estimated) 819 hours (Total, all aircraft), 700 hours (Total, this make and model), 2.5 hours (Last 90 days, all aircraft), 0.7 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Pilot-rated passenger Information

Certificate:	Private	**Age:**	66,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	March 2, 2016
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	March 15, 2014
Flight Time:	(Estimated) 198 hours (Total, all aircraft), 175 hours (Total, this make and model)		

According to Federal Aviation Administration (FAA) records, the pilot held a private pilot certificate with an airplane single-engine land rating. His most recent FAA third-class medical certificate was issued on July 6, 2015. At that time, he reported a total flight experience of 795 hours. A review of the pilot's logbook revealed that he had accumulated a total of 818.4 hours of flight experience before the accident flight, and had flown 3.5 hours in the previous 90 days.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N6091E
Model/Series:	172 N	**Aircraft Category:**	Airplane
Year of Manufacture:	1978	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	17271989
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	February 9, 2016 Annual	**Certified Max Gross Wt.:**	2299 lbs
Time Since Last Inspection:	105 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	5153.2 Hrs at time of accident	**Engine Manufacturer:**	LYCOMING
ELT:	C91 installed, not activated	**Engine Model/Series:**	O-320 SERIES
Registered Owner:		**Rated Power:**	160 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

According to FAA and aircraft maintenance records, the airplane was issued an airworthiness certificate on December 13, 1978. It was powered by a Lycoming O-320-H2AD engine that was driving a McCauley propeller. According to maintenance records, the most recent annual inspection was completed on February 16, 2016, at a total time in service of 5,047.8 hours. At that time, the engine had accumulated 38.3 hours since major overhaul. At the time of the accident, the airplane had flown about 105 hours since the last annual inspection.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	FLL,11 ft msl	**Distance from Accident Site:**	8 Nautical Miles
Observation Time:	09:53 Local	**Direction from Accident Site:**	280°
Lowest Cloud Condition:	Scattered / 1500 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 10000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots /	**Turbulence Type Forecast/Actual:**	/ Unknown
Wind Direction:	150°	**Turbulence Severity Forecast/Actual:**	/ Unknown
Altimeter Setting:	30.05 inches Hg	**Temperature/Dew Point:**	27°C / 23°C
Precipitation and Obscuration:	Light - None - Rain		
Departure Point:	POMPANO BEACH, FL (PMP)	**Type of Flight Plan Filed:**	None
Destination:	KEY LARGO, FL (07FA)	**Type of Clearance:**	None
Departure Time:	09:32 Local	**Type of Airspace:**	Class E

There was no record of the pilot receiving any preflight weather briefing from flight service or a direct user access terminal.

At 0953, FLL reported wind from 150° at 10 knots, visibility 10 statute miles in light rain, scattered clouds at 1,500 ft and 6,000 ft, ceiling broken at 10,000 ft, broken clouds at 25,000 ft, temperature 27°C, dew point temperature 23°C, and altimeter 30.06 inches of Hg. The remarks section of the observation stated that rain began at 0952, and there were cumulonimbus clouds overhead through the north and from the west to northwest moving northeast. A thunderstorm was reported at FLL at 0956 with occasional in-cloud lightning to the north. The thunderstorm ended at 1023 with 0.01 inch of rain reported at the airport and with no significant change in flight conditions or wind gusts.

The National Weather Service Miami (KAMX) Weather Surveillance Radar – 1988, Doppler (WSR-88D) was operating in the severe storm precipitation mode surrounding the time of the accident. KAMX WSR-88D composite reflectivity images at 0938, 0943, 0948, and 0953 depicted a band of heavy-to-extreme intensity echoes along the southeast Florida coast and immediately east of FLL during the period, with the echoes in the immediate vicinity of the accident site reaching maximum intensity and then decreasing in intensity with time and moving north-northeastward. The lowest 0.5°-elevation scan depicted the conditions immediately above the airplane between 870 to 3,220 ft and depicted echoes between 40 to 52 dBZ (heavy-to-extreme intensity). Overlaying the airplane's GPS track on the 0953 0.5°-base reflectivity image (see figure 1) indicated that the airplane traveled into a small but intense reflectivity core of 51dBZ (extreme intensity) precipitation.

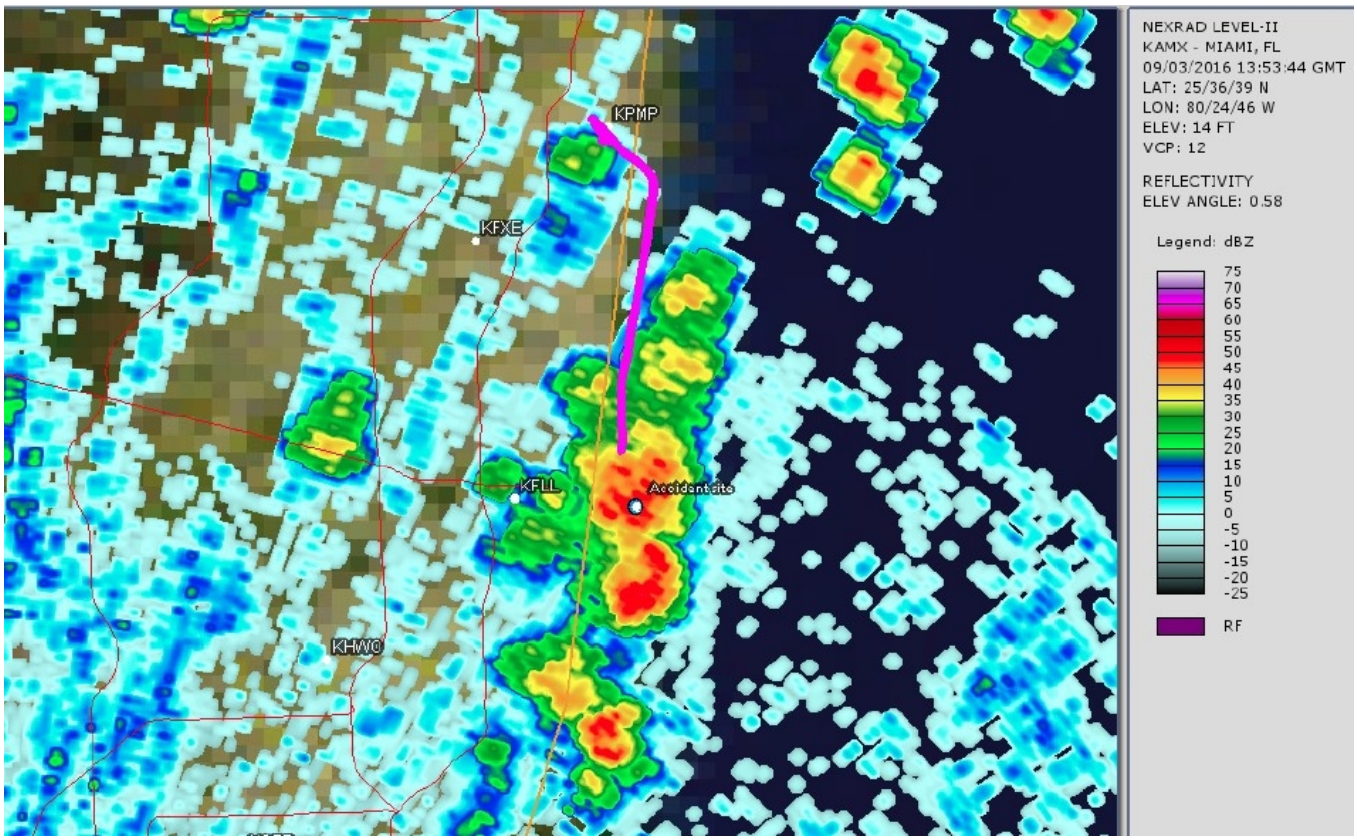

Figure 1 - KAMX WSR-88D Composite Reflectivity Image at 0953 with the airplane's 0950 GPS-derived position superimposed in magenta.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	26.046667,-80.061943(est)

The airplane was recovered from the water and examined. The left and right wings were separated from the fuselage at their roots and exhibited aft crushing along their leading edges. Flight control cable continuity was established from the cockpit area to all flight control surfaces. The measurement of the elevator trim actuator corresponded to a nose-down trim. Engine valve train continuity was verified, and thumb compression on all cylinders was established by rotating the propeller. All flight control surfaces remained at least partially attached to their respective attachment points. The flaps were in the "up" position. Both fuel tanks were breeched and exhibited signs of hydraulic deformation. The left main landing gear was separated from the fuselage. All seats were separated from their mounting points.

Medical and Pathological Information

The Broward County Medical Examiner, Fort Lauderdale, Florida, performed an autopsy on the pilot by. The autopsy findings included "multiple blunt force injuries."

The FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, conducted forensic toxicology on specimens from the pilot. The toxicology report stated that no carbon monoxide was detected in the blood, and no drugs were detected in the urine.

Preventing Similar Accidents

Thunderstorm Encounters

Even when pilots are flying under instrument flight rules (IFR) and in contact with air traffic controllers, accidents can still occur due to in-flight weather because the pilots are either not advised of the severe weather ahead or are given incorrect information. Often, pilots have readily available alternatives that, if utilized, could prevent an accident.

Severe weather avoidance is primarily ***the pilot's responsibility.*** The primary job of the controllers is to keep IFR aircraft separated. When their workload permits, controllers are also required to provide additional services such as weather advisories, and, upon pilot request, suggested headings to avoid radar-displayed precipitation. The proper use of air traffic control (ATC) weather advisory services may be critical to safety when operating near areas of convective activity. Pay attention to weather alerts broadcast by ATC, especially SIGMETS and Center Weather Advisories, and obtain further details from HIWAS or Flight Watch if the advisory is anywhere along or near your route. Flight Watch can also supply "big picture" weather information beyond what ATC may have time to provide to you.

The precipitation detection and display capabilities of ATC facilities vary from poor to excellent. Some have older analog radar systems that depict precipitation as a monochrome reflective area with no associated intensity values, while others have fully digitized radar systems with color displays showing both the extent and intensity of precipitation. Approach control radar systems provide near-real-time weather depiction. En route centers receive weather radar information from National Weather Service NEXRAD sites that refresh the color precipitation data on ATC displays every 4 to 5 minutes. Be aware that en route weather displays may be a few minutes behind the storm and allow extra distance from reported intense precipitation, especially in front of fast-moving convective activity. Be especially diligent about asking for updates after being transferred from one ATC facility to another. The new controller may have better equipment or be using a different radar site and have an entirely different picture of what lies ahead.

ATC radar systems depict ***only*** precipitation. Controllers cannot use radar to warn of turbulence, icing, freezing rain, or other hazards to flight. However, the presence of substantial precipitation implies the existence of thunderstorm hazards such as severe turbulence and hail. ATC weather advisories should

include the location, extent, and intensity of radar-observed precipitation. The descriptive words for intensity were recently changed to ensure consistency across all ATC facilities. The old level 1 is now "light"; level 2 is "moderate"; levels 3 and 4 are described as "heavy"; and levels 5 and 6 are described as "extreme." If precipitation is described to you without any reference to intensity, ask for the information so you can make a good decision about how to proceed. Not all ATC radar systems can provide intensity information. In such situations, you should be told "intensity unknown."

Become familiar with the various on-board weather avoidance technologies available, including data-linked onboard NEXRAD weather services, and consider whether the additional information will help you to avoid encounters with severe weather.

Sometimes the controller may be uncertain about whether a pilot is visually avoiding severe weather areas or needs radar weather assistance. The controller may think the pilot is able to see what is ahead, and the pilot may think the controller is watching out for him. It is especially important that you advise controllers if your flight conditions change from visual to instrument, and that when operating in instrument conditions you regularly request updated information on radar-depicted weather ahead of your aircraft.

Ambiguous use of the term "when able" has also led to confusion. Some controllers use "Cleared direct xxx when able" to mean "when weather permits you to turn safely on course," while pilots may understand such an instruction to mean "Go direct to xxx as soon as you can navigate there." In some cases, this ambiguity has apparently led pilots receiving ATC weather avoidance assistance to conclude that it was safe to turn direct to the specified fix, resulting in subsequent entry into thunderstorms. If you have any uncertainty about whether a course change will keep you clear of convective weather, ***ASK!***

You can help controllers and other pilots by giving pilot reports. Controllers use them to confirm their radar weather depiction, and to obtain details such as cloud tops or the existence of icing that may not be available through any other source. Pilot reports also help controllers advise other aircraft about what to expect and what to avoid.

The safest plan when avoiding severe weather activity is to entirely avoid the affected area or land and wait for it to pass. Make decisions about weather deviations as far in advance as possible. Controllers will have more time to respond to your needs, perform any necessary coordination, and provide you with the information you require to conduct a safe flight.

See http://www.ntsb.gov/safety/safety-alerts/documents/SA_011.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):	Boggs, Daniel
Additional Participating Persons:	Jaun Garcia; FAA-FSDO; Miami, FL James Childers; Lycoming; Atlanta, GA Jon Hirch; Textron; Witchita, KS
Original Publish Date:	July 20, 2017
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=93938