



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Aviation Investigation Final Report

Location:	Lake Michigan, Wisconsin	Accident Number:	CEN13FA438
Date & Time:	July 27, 2013, 14:40 Local	Registration:	N1549X
Aircraft:	Piper PA-28R-200	Aircraft Damage:	Destroyed
Defining Event:	Aircraft wake turb encounter	Injuries:	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was receiving flight-following services from an approach controller, who gave the pilot vectors to fly east over Lake Michigan and then north to avoid conflicting traffic. On the northerly heading, the accident pilot flew 1.4 miles behind the other airplane. When the accident pilot had the traffic in sight, the approach controller allowed him to pass behind the other airplane and then turn northbound as requested. Shortly thereafter, the approach controller lost radar contact with the pilot. Search and rescue operations were conducted, and the airplane was located in the lake. According to recorded radar data, the accident airplane's flightpath crossed the other airplane's flightpath at 1,800 feet mean sea level (msl) about 39 seconds after the other airplane passed the same location at the same altitude. Because the approach controller's plan explicitly had the accident pilot pass behind the other airplane and the other airplane was descending from above the accident airplane, it is likely that the accident airplane encountered wake turbulence. Primary radar returns detected by airport surveillance radar were consistent with the in-flight breakup of the airplane. The approach controller did not issue a wake turbulence advisory to the pilot. Although wake turbulence is primarily the pilot's responsibility, the Federal Aviation Administration Air Traffic Control Handbook does require controllers to provide pilots with a wake turbulence advisory if, in the controller's opinion, wake turbulence may adversely affect their aircraft. In this case, the approach controller should have been cognizant of the potential hazard and issued a wake turbulence advisory to the pilot.

Probable Cause and Findings

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

An encounter with wake turbulence, which resulted in the pilot's loss of control of the airplane and its subsequent in-flight breakup. Contributing to the accident was the approach controller's failure to issue a wake turbulence advisory to the pilot.

Findings

Environmental issues	Wake turbulence - Effect on operation
Personnel issues	Lack of action - Pilot
Personnel issues	Lack of action - ATC personnel
Environmental issues	Wake turbulence - Awareness of condition
Environmental issues	Wake turbulence - Contributed to outcome
Aircraft	(general) - Capability exceeded
Personnel issues	Lack of communication - ATC personnel

Factual Information

History of Flight

Enroute-cruise	Aircraft wake turb encounter (Defining event)
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On July 27, 2013, at 1438 central daylight time, a Piper PA-28R-200 airplane, N1549X, impacted Lake Michigan about 1.2 miles east of Cudahy, Wisconsin. The airline transport pilot and the passenger were fatally injured. The airplane was destroyed. The airplane was registered to and operated by a private individual under the provisions of 14 Code of Federal Regulations Part 91 as a personal flight. Visual meteorological conditions prevailed for the flight which operated without a flight plan. The flight originated from the John H Batten Airport (KRAC), Racine, Wisconsin, at 1431.

According to a fixed base operator (FBO) employee at KRAC, he saw the pilot in the parking lot before the flight with 4-5 people. Later he heard the pilot's voice on the radio talking to air traffic control (ATC).

The pilot was receiving visual flight rules (VFR) flight following services from Milwaukee approach; the pilot was given vectors to fly east over Lake Michigan and then north. On a northerly heading, the pilot flew 1.4 miles behind the final approach course of an MD-80 airplane inbound to the General Mitchell International Airport (KMKE), Milwaukee, Wisconsin. Shortly afterward, radar contact was lost and the air traffic controller was not able to contact the pilot.

Milwaukee ATC notified the United States Coast Guard and local authorities that the airplane had disappeared from radar. A search and rescue operation was conducted and about 30 minutes later the airplane wreckage was located by a dive team at the bottom of Lake Michigan.

Pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	Age:	75
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	Toxicology Performed:	Yes
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	January 7, 2013
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	32920 hours (Total, all aircraft)		

Pilot-rated passenger Information

Certificate:	Private	Age:	31
Airplane Rating(s):	Single-engine land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	Lap only
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:	September 7, 2011
Occupational Pilot:	No	Last Flight Review or Equivalent:	November 3, 2012
Flight Time:	200 hours (Total, all aircraft)		

The pilot in the left seat, age 79, held an airline transport pilot certificate for airplane multiengine land and airplane single-engine land. He also held a flight instructor certificate for airplane single and multiengine land, instrument airplane, and advanced ground instructor. He was issued a Class 2 limited medical certificate on January 7, 2013, with the limitations that he must wear corrective lenses for near and distant vision. The application for this medical certificate indicated that the pilot had logged 32,920 hours of flight experience; 350 hours of which were logged in the previous six months. This pilot's logbooks were not recovered; therefore, the entire scope of his experience could not be determined.

The pilot in the right seat, age 31, held a private pilot certificate for airplane single-engine land. He was issued a Class 3 medical certificate on September 7, 2011, with no limitations. The application for his medical certificate indicated that he had logged 200 hours of flight experience; 25 hours of which were logged in the previous six months. According to this pilot's logbooks, he had accumulated about 173 total flight hours and his most recent flight review was completed on November 3, 2012.

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	Registration:	N1549X
Model/Series:	PA-28R-200	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	28R-7535322
Landing Gear Type:	Retractable - Tricycle	Seats:	4
Date/Type of Last Inspection:	July 1, 2013 Annual	Certified Max Gross Wt.:	
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:	7961 Hrs as of last inspection	Engine Manufacturer:	LYCOMING
ELT:	Installed, not activated	Engine Model/Series:	I0360 SER
Registered Owner:	Ann Marie Schmid	Rated Power:	180 Horsepower
Operator:	Ann Marie Schmid	Operating Certificate(s) Held:	None

The airplane was a 4-seat, low wing, single engine Piper PA-28R-200 Arrow, N1549X, s/n: 28R-7535322, manufactured in 1975. It was powered by a Lycoming IO-360-C1C, serial number L-13237-51A, which was driven by a 3-blade metal Hartzell propeller. The most recent annual inspection was completed on July 1, 2013.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KMKE, 693 ft msl	Distance from Accident Site:	6 Nautical Miles
Observation Time:	14:52 Local	Direction from Accident Site:	277°
Lowest Cloud Condition:	Scattered / 3400 ft AGL	Visibility	10 miles
Lowest Ceiling:	Overcast / 4000 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	13 knots / None	Turbulence Type Forecast/Actual:	/
Wind Direction:	300°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.9 inches Hg	Temperature/Dew Point:	16°C / 7°C
Precipitation and Obscuration:			
Departure Point:	Racine, WI (KRAC)	Type of Flight Plan Filed:	None
Destination:	Oshkosh, WI (KOSH)	Type of Clearance:	None
Departure Time:	14:31 Local	Type of Airspace:	

At 1452, an automated weather reporting facility at KMKE, located 3 nautical miles west of the accident site, reported wind from 300 degrees at 13 knots, 10 miles visibility, scattered clouds at 3,400 feet, an overcast cloud layer at 4,000 feet, temperature 61 degrees Fahrenheit (F), dewpoint 45 degrees F, and a barometric pressure of 29.91 inches of mercury.

Wreckage and Impact Information

Crew Injuries:	2 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Fatal	Latitude, Longitude:	42.943611,-87.771942(est)

The main wreckage was located in Lake Michigan at 42:57.883 N, 087:49.06 W, at a depth of 46 feet. The site was 3.2 miles east of the departure end of runway 25L at KMKE and 1.2 miles from the shoreline of Cudahy, Wisconsin. The airplane was fragmented and pieces were scattered along the bottom of the lake. About 50% of the airplane was recovered during the extraction process. The fuselage was noted to be broken into three sections.

The left wing separated from the fuselage. The outboard section, including the aileron, was not recovered. The right wing inboard section remained attached to the fuselage. The rudder was attached to the vertical stabilizer at its hinge points and was impact damaged. The stabilator was attached to its mounting blocks. The flight control cables were continuous from the cockpit controls to the rudder and stabilator. The flight control cables remained attached at both aileron bell cranks. Both aileron control cables were separated in overload near the wing roots.

The landing gear was in the retracted position. The main landing gear were found in the wheel wells. The nose landing gear separated from the fuselage.

The engine control lever console separated from the instrument panel, the levers were in a forward position, and the friction lock was on. The engine control cables for the throttle, propeller, and mixture controls were attached to their respective levers.

The engine was rotated by turning the propeller; continuity of the crankshaft to the rear gears and to the valve train was confirmed. Compression and suction was observed from all four cylinders. The interiors of the cylinders were examined using a lighted borescope. The only anomalies noted were water and mud in the cylinders.

Both magnetos were operated by hand and neither would produce a spark. They were disassembled and no damage was noted to the internal components other than water contamination. The spark plugs were all intact and observed as light brown, revealed signs of normal operation, and some were covered in mud.

Water residue and a small amount of oil were observed in the engine crankcase. The oil cooler was separated from the engine baffling and was impact damaged.

The propeller blades remained secured in the propeller hub and attached to the engine. All three blades were bent aft about 10 degrees. The blade tips were bent aft about 45 degrees and revealed leading edge damage and scratches.

The right fuel tank was ruptured and portions were not recovered. The left fuel tank was not recovered. The servo fuel inlet screen was clear of debris. The fuel flow divider remained attached to the engine and no damage was noted. The fuel injector nozzles remained free of obstructions. The engine-driven fuel pump remained attached to the engine and when actuated by hand, liquid was expelled from the pump outlet. Liquid with an odor consistent with that of aviation gasoline was observed in the hoses from the electric fuel pump to the engine driven fuel pump and from the engine driven fuel pump to the fuel injector servo. The same liquid was noted in the engine driven fuel pump, the fuel injector servo, and the fuel flow divider.

Medical and Pathological Information

An autopsy was performed on the pilot on July 29, 2013, by the Milwaukee County Medical Examiner's Office, Milwaukee, Wisconsin. The cause of death was determined to be multiple blunt force injuries and the manner of death was an accident. The FAA Civil Aerospace Medical Institute (CAMI) prepared a Final Forensic Toxicology Fatal Accident Report. The results were negative for all screened substances.

An autopsy was performed on the second pilot on July 29, 2013, by the Milwaukee County Medical Examiner's Office, Milwaukee, Wisconsin. The cause of death was determined to be multiple blunt force injuries and the manner of death was an accident. The FAA CAMI prepared a Final Forensic Toxicology Fatal Accident Report. The results were negative for all screened substances.

Additional Information

Air Traffic Control Information

The accident airplane was radar identified at 1431:37, 1 mile north of the Racine airport climbing under VFR to 1,500 feet. At 1435:42, the MKE controller transmitted, "November four nine x-ray if you could turn to the east I do have traffic (inbound) for runway two five left I'll point them out and then you can pass behind them." The pilot responded, "all right." The controller then issued a traffic advisory about N1549X to Delta Airlines flight 931 (DAL931) and transferred the Delta flight to the tower frequency.

At 1436:25, the controller instructed the pilot of N1549X to turn right heading 090 and the pilot acknowledged. The controller continued, "...there is traffic just to you ah twelve o'clock and about two miles descending out of two thousand three hundred, an MD-80." The pilot replied, "all right, I can go

down lower if you like" The controller responded, "...negative I need you just to turn out of there then I'll get you northbound as soon as I can." The pilot then stated, "OK, I've got them in sight." The controller replied, "...thank you, just pass behind that traffic and then you can proceed northbound as requested." The pilot responded, "All right."

At 1437:34, the MKE approach controller advised the local controller in the tower that the pilot of N1549X had the Delta flight in sight. At 1438:11, the approach controller attempted to advise the pilot that radar contact was lost, with no response. There was no further contact with the pilot.

According to recorded radar data, the flight path of N1549X crossed the flight path of DAL931 at 1437:51 at 1,800 feet, which was 39 seconds after DAL931 passed the same point at the same altitude.

At the time of the accident, N1549X was operating within Milwaukee Class C airspace and was subject to mandatory separation. Separation, traffic advisories, and safety alerts are to be issued between IFR and VFR aircraft. In addition to the standard separation requirements above, controllers are also required to issue wake turbulence advisories when, in their opinion, wake may have an adverse effect on an aircraft. Since wake turbulence is unpredictable, the controller is not responsible for anticipating its existence or effect.

An FAA Advisory Circular states that vortex visualization and avoidance procedures should be exercised by pilots using the same degree of concern as in collision avoidance. Pilots are reminded that in operations conducted behind all aircraft, acceptance of instructions from ATC in the following situations is an acknowledgment that the pilot will ensure safe takeoff and landing intervals, and accepts the responsibility for providing wake turbulence separation: traffic information; instructions to follow an aircraft; the acceptance of a visual approach clearance. Under certain conditions, ATC applies procedures for separating IFR aircraft. If a pilot accepts a clearance to visually follow a preceding aircraft, the pilot accepts responsibility for separation and wake turbulence avoidance. The controllers will also provide to VFR aircraft, with whom they are in communication and which in the tower's opinion may be adversely affected by wake turbulence from a larger aircraft, the position, altitude and direction of flight of larger aircraft followed by the phrase "CAUTION - WAKE TURBULENCE." After issuing the caution for wake turbulence, the controllers generally do not provide additional information to the following aircraft unless they know the following aircraft is overtaking the preceding aircraft. Whether or not a warning or information has been given, however, the pilot is expected to adjust aircraft operations and flight path as necessary to preclude serious wake turbulence encounters.

Radar Data

The radar data used for this investigation was obtained from the ASR-9 airport surveillance radar located at MKE. N1549X was observed from immediately after departure at Racine until the end of the flight southeast of MKE. Just before the accident, the airplane presented a normal transponder return showing 1,500 to 1,600 feet altitude. At 1437:45, the altitude readout dropped to 0, which was likely representing unintelligible/unusable altitude data, and then showed 1,800 feet by 1437:49. The last MKE transponder return occurred at 1437:54, reporting the airplane's altitude as 1,400 feet. Beginning at 1437:54, four primary (non-transponder) radar returns were detected by the radar, originating just before the target where N1549X reported an altitude of 1,800 feet.

Administrative Information

Investigator In Charge (IIC):	Lindberg, Joshua
Additional Participating Persons:	Ray Yank; Federal Aviation Administration; Milwaukee, WI Ron Maynard; Piper Aircraft; Vero Beach, FL Mike Childers; Lycoming Engines; White, GA
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Note:	
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=87588

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