National Transportation Safety Board
Aviation Accident Final Report

Location:	Wellsville, MO	**Accident Number:**	CHI07FA183
Date & Time:	06/28/2007, 0815 CDT	**Registration:**	N477MD
Aircraft:	Piper PA-46-500TP	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	3 Fatal
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

The pilot, before departure, obtained a weather briefing that indicated there were thunderstorms and areas of heavy precipitation along the route of flight. The pilot told the briefer that the airplane was equipped with onboard radar for weather avoidance. After takeoff, the pilot received two adverse weather advisories from the departure air traffic controller. The pilot acknowledged, requested and was cleared for course deviations to avoid the weather. The pilot was subsequently told to contact an en route traffic control center. The pilot did not request an update on, nor was he advised of, any additional adverse weather after switching over. Avionics data recovered from the wreckage showed the airplane encountered decreasing outside air temperatures (OAT) during the en route climb to a cruise altitude. The OAT decreased below freezing as the airplane climbed through 15,900 feet mean sea level. The primary flight display's (PFD) airspeed data decreased from about 140 knots indicated airspeed (KIAS) to 0 KIAS. During the loss of airspeed, the airplane's recorded climb rate decreased and the airplane entered a left turn. At this point, the en route controller asked the pilot if he had been given a clearance to deviate around weather. The pilot responded, "mike delta we've got problems uh... ." There were no additional communications received from the pilot and radar contact with the airplane was lost shortly thereafter. The recovered PFD data indicated that the airplane exceeded its maximum structural operating speed during a rapid descent. In the descent, the airplane reached a ground speed of 250 knots and vertical loads reaching 5g. The recovered data and witness marks from the right wing indicated the airplane sustained an in-flight breakup after exceeding the airplane's maximum load factor limit. A review of the available weather data indicated that there was an area of extreme precipitation associated with thunderstorms east of the accident site and that the airplane was likely in instrument meteorological conditions at the time of the upset. An on-scene investigation did not reveal any pre-impact anomalies with the airplane and its related systems. Analysis of the recovered PFD and Multi-Function Display (MFD) data indicated that the pilot did not utilize the available pitot tube heat that would have afforded ice protection. Recovered PFD/MFD data, along with a weather analysis, indicated that the airplane was operating in an environment conducive for pitot tube icing. Additionally, recovered data showed airspeeds were recorded during the rapid descent at altitudes lower than the observed freezing level. The before takeoff checklist indicated, "Pitot Heat ... ON."

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to activate the pitot heat as per the checklist, resulting in erroneous airspeed information due to pitot tube icing, and his subsequent failure to maintain aircraft control. Contributing to the accident was the pilot's continued flight in an area of known adverse weather.

Findings

Occurrence #1: IN FLIGHT ENCOUNTER WITH WEATHER
Phase of Operation: CLIMB

Findings
1. WEATHER CONDITION - THUNDERSTORM
2. IN FLIGHT WEATHER AVOIDANCE ASSISTANCE - NOT ISSUED - ATC PERSONNEL(ARTCC)
3. (C) PITOT/STATIC SYSTEM - ICE
4. (C) CHECKLIST - NOT COMPLIED WITH - PILOT IN COMMAND
5. WEATHER CONDITION - ICING CONDITIONS
6. (C) ANTI-ICE/DEICE SYSTEM - NOT USED - PILOT IN COMMAND
7. (F) FLIGHT INTO KNOWN ADVERSE WEATHER - CONTINUED - PILOT IN COMMAND

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: DESCENT - UNCONTROLLED

Findings
8. WING - OVERLOAD
9. DESIGN STRESS LIMITS OF AIRCRAFT - EXCEEDED - PILOT IN COMMAND
10. (C) AIRCRAFT CONTROL - NOT MAINTAINED - PILOT IN COMMAND

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
11. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On June 28, 2007, about 0815 central daylight time, a Piper PA-46-500TP, N477MD, was destroyed on impact with terrain following an in-flight breakup near Wellsville, Missouri. The personal flight was operating under Title 14, Code of Federal Regulations Part 91. Visual meteorological surface conditions prevailed in the area at the time of the accident. An instrument flight rules (IFR) flight plan was on file and was activated. The pilot and two passengers sustained fatal injuries. The flight originated from the Spirit of St Louis Airport, near Chesterfield, Missouri, about 0750, and was destined for the Buffalo Municipal Airport, near Buffalo, Minnesota.

About 0711, a person representing N477MD contacted Kankakee Automated Flight Service Station (AFSS) to file an IFR flight plan and obtain an abbreviated weather update. During the abbreviated weather update, the AFSS briefer advised the pilot that there was heavy rain and thunderstorm activity in Missouri along the aircraft's planned route of flight. The pilot stated that he had onboard radar for weather avoidance.

About 0750, N477MD departed SUS, contacted Federal Aviation Administration (FAA) air traffic controller (ATC) on the St. Louis (Gateway) Departure frequency about 0752, and was initially cleared to climb to 4,000 feet. The Gateway controller advised of light to moderate precipitation three miles ahead of the aircraft. The pilot requested a northerly course deviation for weather avoidance, which was approved. About 0753, N477MD was cleared to climb to 10,000 feet. The controller then advised of additional areas of moderate and heavy precipitation ahead of the airplane, gave the pilot information on the location and extent of the weather areas, and suggested a track that would avoid it. The pilot responded that he saw the same areas on his onboard radar and concurred with the controller's assessment. Radar data showed that the airplane flew northwest bound, and then turned toward the west. About 0757, N477MD was instructed to resume the Ozark 3 departure procedure, and the pilot acknowledged. About 0758, the pilot was cleared again to proceed direct to Macon, Missouri (MCM) VHF omnidirectional range distance measuring equipment (VOR/DME), and two minutes later, was instructed to contact Kansas City Center (ZKC).

The pilot contacted the ZKC R53 controller at 0800:47, and, after a discussion about the final requested altitude, was cleared to climb and maintain flight level 230. At 0801:42, a position relief briefing occurred and the R53 controller was replaced. The new R53 controller made no transmissions to N477MD, and was replaced by a third controller at 0806:27. The next transmission to N477MD occurred at 0812:26, when the R53 controller asked the pilot if he had been given a clearance to deviate. The flight's radar track showed that the airplane turned to the left. The pilot responded, "mike delta we've got problems uh..." The controller responded by asking the pilot if he was declaring an emergency, and made several other attempts to contact N477MD. The pilot did not respond to any of these calls, and radar contact was lost. None of the three ZKC controllers had given the pilot any weather information during the time he was controlled by ZKC.

Ground and aircraft observers located the airplane wreckage about 1040.

PERSONNEL INFORMATION

The pilot, age 44, held a FAA private pilot certificate with airplane single-engine land and

instrument airplane ratings. FAA records showed that the pilot's last medical examination was completed on January 25, 2007, when he was issued a third-class medical certificate with no limitations. On the application for that medical certificate, the pilot reported that he had accumulated 1,000 hours of total flight time. He reported that he had accumulated 100 hours of flight time in the six months prior to that medical certificate application.

The pilot obtained flight instruction for the PA-46-500TP from Simcom. A copy of a pilot proficiency certificate indicated that the pilot satisfactorily completed the PA-46-500TP initial course on November 10, 2006. Their training records showed that the pilot requested a flight review and instrument competency as part of the airplane training. The pilot reported to Simcom that he had accumulated 1,000 hours of total flight time, 300 hours of instrument flight time, and 50 hours of turbine aircraft flight time. He further reported that he had accumulated 200 hours of flight time in the last year, 70 hours in the last 90 days, and 25 hours in the last 30 days.

AIRCRAFT INFORMATION

N477MD, a 2006 Piper PA-46-500TP, Meridian, serial number 4697264, was an all-metal airplane with semimonocoque fuselage and conventional design. The wing was a three-section structure. The center section built-up main spar extended through the lower fuselage and approximately three feet outboard of each main landing gear. This section had two forward spars and a rear spar, which were pin jointed at the fuselage sides. The outboard section of each wing, to within approximately 18 inches of the tip, was a sealed integral fuel cell. Portions of the wing structure were adhesively bonded, and skins were butt jointed and flush riveted for a smooth airfoil surface.

An 850-horsepower, Pratt & Whitney Canada PT6A-42A turbo-propeller engine with serial number PCE-RM0284, which was derated to 500-horsepower, powered the airplane. The engine drove a metal, constant speed, electrically deiced, four-bladed Hartzell HC-E4N-3Q propeller. The airplane was equipped with a pressurized cabin, wing flaps, and retractable tricycle landing gear. The airplane had a maximum seating capacity of six occupants, to include two cockpit positions and four cabin positions. The airplane had a certified maximum ramp weight of 5,134 lbs.

The airplane was maintained under a progressive inspection program. The program cycle consists of two 100-hour events, which provides for a complete aircraft inspection in 200 aircraft flying hours. The complete inspection cycle, Events 1 and 2, must be completed within 12 calendar months. Event 2 was completed on June 20, 2007, and the airplane was returned to service. The airplane Hobbs meter was recorded as 201.7 hours at the time of that event inspection.

The airplane was equipped with dual Avidyne Flightmax Entegra EXP5000 Primary Flight Displays (PFD) and an Entegra EX5000 Multi-Function Display (MFD). Each PFD starts up once power is applied. The PFD was designed to display indicated air data to include indicated airspeed, altitude, vertical speed, outside air temperature, true airspeed, and ground speed. The PFD indications included attitude data, navigation data, and flight director command bars. The PFD could display engine parameters to include engine torque, inter-turbine temperature, fuel flow, fuel quantity, and engine start parameters.

Each PFD contained two flash memory devices mounted on a riser card. The flash memory stored information that the PFD unit used to generate the various primary flight data displays.

Additionally, the PFD had a data logging function, which is used by the manufacturer for maintenance and diagnostics. The PFD sampled and stored several data streams in a sequential fashion; when the recording limit of the PFD was reached, the oldest record was dropped and a new record was added. Data from the Air Data and Attitude Heading Reference System (ADAHRS) such as pitch, roll, heading, and accelerations were recorded at a rate of 5 times per second (Hz). Air data information such as pressure altitude, indicated airspeed, and vertical speed were recorded at 1 Hz. GPS and navigation display and setting data were recorded at a rate of .25 Hz, and information about pilot settings of heading, altitude, and vertical speed references were recorded when changes are made.

The MFD display indicated navigation data to include a moving map presentation. The MFD displayed engine and electrical system parameters. The MFD displayed information from the X-band on-board radar that was designed for weather location and analysis and for ground mapping. The radar system was designed to detect storms along the flight path and gave pilots a visual colored indication of storm intensity. Intensity was displayed in five color levels with black representing weak or no returns and green, yellow, red, and magenta indicating progressively stronger returns. The MFD displayed detected electrical discharge information from the Stormscope WX-500 unit.

The MFD unit contained a compact flash memory card located in a slot on the side of the unit. This memory card contained all of the software that the MFD needed to operate. Like the PFD, the MFD also had a data logging function, which stored periodic information such as engine parameters and flight track data. Specifically, the MFD recorded GPS position, engine performance data (such as torque, interstage turbine temperature, fuel flow, outside air temperature) and some electrical bus conditions. This data was also stored on the unit's compact flash memory card. The MFD generated new data files for each power-on cycle. Similar to the PFD, the oldest file was dropped and replaced by a new file once the storage limit has been reached. MFD data was sampled every six seconds, and was recorded to its memory card once every minute. If an interruption of power occurred during the minute between MFD memory write cycles, data sampled during that portion of a minute were not recorded.

The cockpit's right side instrument panel contained a placard about eye level. The placard stated, "STORMSCOPE NOT TO BE USED FOR THUNDERSTORM AREA PENETRATION."

A copy of a letter regarding the pilot's revocation of acceptance of the airplane purchase was reviewed. The letter referenced maintenance issues to include PFD and MFD issues. Airplane maintenance logbook entries showed that the indicated issues were repaired prior to the accident.

The airplane's pilot operating handbook (POH) limitation section listed 127 knots indicated airspeed (KIAS) as the airplane's maximum operating maneuvering speed (Vo). The limitation associated with Vo stated, "Do not make full or abrupt control movements above this speed." The POH listed 188 KIAS as the airplane's maximum operating speed (Vmo). The limitation associated with Vmo stated, "Do not exceed this speed in any operation."

The airplane's flight load factor limit was 3.7 g with flaps up.

The POH normal procedures section, in part, stated:

Turbulent Air Operation

In keeping with good operating practice, it is recommended that when turbulent air is

encountered or expected, the airspeed be reduced to maneuvering speed to reduce the structural loads caused by gusts and to allow for inadvertent speed build-ups which may occur as a result of the turbulence or of distractions caused by the conditions.

The POH emergency procedures section, in part, stated, "AIRSPEEDS FOR EMERGRNCY OPERATIONS ... OPERATING MANEUVERING SPEED 127 KIAS.

The pilot's instrument panel contained a placard about eye level. That placard read, "Vo 127 KIAS."

The pilot's and copilot's pitot tube provided ram air inputs to their respective PFD's ADAHRS. The POH, in part, stated:

Pitot pressure for the airspeed indicators is sensed by heated pitot heads installed on the bottom of the left and right wings and is carried through lines within the wing and fuselage to the two ADAHRS units on the PFDs. Static pressure for the two ADAHRS units and standby altimeter and airspeed indicators is sensed by static source ports on the underside of the fuselage. ...

An alternate static source control valve is located below the instrument panel to the left of the pilot. For normal operation, the lever remains down. To select alternate static source, place the lever in the up position. When the alternate static source is selected the airspeed and altimeter and vertical speed indicator are vented to alternate static ports on the aft sides of the fuselage. During alternate static source operation, these instruments may give slightly different readings. ...

If one or more of the pitot static instruments malfunction, the system should be checked for dirt, leaks or moisture. The holes in the sensors for pitot and static pressure must be fully open and free from blockage. Blocked sensor holes will give erratic or zero readings on the instruments.

Both the pitot and static can be drained through separate drain valves located on both the right and left lower side panel next to the crew seats. Three drains exist on the pilot side. The forward valve is the pilots PFD primary static drain. The middle drain is the alternate static drain. The aft drain is the left hand pitot drain. Two drains exist on the copilot side. The forward valve is the copilot's PFD primary static drain. The aft drain is the right hand pitot drain.

The heated pitot heads, which alleviate problems with icing and heavy rain, are standard equipment. The switch for pitot heat is located on the right overhead switch panel. Static source ports have been demonstrated to be non-icing; however, in the event that icing does occur, selecting the alternate static source will alleviate the problem.

According to the POH, the airplane's annunciator panel was equipped with an amber caution light that displayed "PITOT HEAT OFF" which "Indicates the pitot heat has not been selected ON." The annunciator also contained two red warning lights that displayed L[eft] PITOT HEAT and R[ight] PITOT HEAT which indicates that the respective side "pitot heat has failed." The "BEFORE TAKEOFF" checklist in the POH stated, "Pitot Heat ... ON."

According to a Piper Aircraft representative, their data for similarly equipped Meridians showed an increase of approximately 13 amperes when the pitot heat is turned on. The pitot heat system is designed to cycle itself on and off at a 30-second rate while the airplane is on the ground with the pitot heat switch selected on. While in-flight and the pitot heat selected on,

the pitot heat is on continually and it does not cycle.

The airplane was equipped with backup flight instruments including a barometric altimeter, an airspeed indicator, and a direct current powered electromechanical attitude indicator. The attitude indicator was powered from an emergency battery and was designed to operate for 45 minutes after the loss of the airplane electrical system. The backup airspeed indicator was connected to the pilot's PFD pitot tube source.

METEOROLOGICAL INFORMATION

A National Transportation Safety Board (NTSB) Senior Meteorologist prepared a Meteorological factual report. The report indicated that the 0819 radar summary chart depicted a band of echoes across central Missouri which were characterized as heavy and associated with rain showers with cell movement to the east at 22 knots and echo tops to 33,000 feet above mean sea level (MSL). An area of "extreme" intensity echoes associated with thunderstorms was depicted over eastern Missouri, which was east of the accident site.

National Weather Service Weather Surveillance Radar-1988, Doppler (WSR-88D) reflectivity images were reviewed. The WSR-88D images depicted radar returns of 30 to 45 dBZ consistent with “moderate to heavy” intensity echoes along the flight track and the upset location.

Geostationary Operations Environmental Satellite number 12 (GOES-12) visible and infrared imagery data surrounding the time of the accident was obtained. The GOES-12 infrared imagery depicted an enhanced band of clouds along and ahead of the front, which extended over the accident site. The GOES-12 visible image depicted an area of enhanced clouds over central and northern Missouri. The clouds identified north of St. Louis and in the vicinity of the accident site were consistent with cumulus clouds with significant vertical development. The clouds could be classified as cumulus congestus to nimbostratus type clouds, with cumulonimbus type clouds developing north of the St. Louis area. The cloud types depicted over the accident airplane's track increased the likelihood that the flight was in instrument meteorological conditions (IMC) at the time of the upset.

The closest surface weather reporting facility to the accident site was at the Columbia Regional Airport (COU), Columbia, Missouri, located approximately 30 miles southwest of the accident site, at an elevation of 889 feet MSL.

The COU hourly weather observation at 0754 was wind from 250 degrees at 3 knots, visibility 6 miles in light rain and mist, a few clouds at 1,900 feet, ceiling broken at 3,300 feet, overcast at 4,300 feet, temperature 21 degrees C, dew point temperature 20 degrees C, altimeter setting 30.07 inches of Hg. Remarks: automated observation system, sea level pressure 1017.5-hPa, hourly precipitation 0.49 inches, temperature 21.1 degrees C, dew point 20.0 degrees C.

The COU special weather observation at 0817 was wind from 210 degrees at 3 knots, visibility 10 miles in light rain, ceiling broken at 2,200 feet, broken at 2,600 feet, overcast at 3,100 feet, temperature 21 degrees C, dew point 20 degrees C, altimeter 30.08 inches of Hg. Remarks: automated observation system, hourly precipitation 0.01 inches.

The COU special weather observation at 0826 was wind from 170 degrees at 4 knots, visibility 9 miles in light rain, scattered clouds at 300 feet, ceiling broken at 2,000 feet, overcast at 2,800 feet, temperature 21 degrees C, dew point 20 degrees C, altimeter 30.08 inches of Hg. Remarks: automated observation system, hourly precipitation 0.01 inches.

A pilot report from an aircraft at 16,000 feet over the St. Louis area indicated that the wind from the west at 25 knots and the temperature was -3 degrees C.

AIDS TO NAVIGATION

The Ozark 3 departure route description stated, "Fly assigned heading for vector to appropriate route. Maintain 2,500 feet or higher assigned altitude. Expect clearance to filed altitude 10 minutes after departure."

The Macon Transition indicated to fly from over the Saint Louis (STL) VOR Tactical Air Navigation (VORTAC) via STL 297 degree radial and MCM 110 degree radial to the MCM VOR/DME.

FLIGHT RECORDERS

The airplane was not equipped with a cockpit voice recorder nor was it required to be equipped with one.

The PFDs and the compact flash from the MFD were shipped to the NTSB Vehicle Recorder Laboratory. The MFDs compact flash exhibited minor crushing and its data was extracted, copied, and read out. The PFDs were crushed and some of the PFDs' flash memory devices pins were torn out from the devices. Microscopic connections were made to the flash devices' torn pins. The pilot's and copilot's PFD data was transferred from their flash memory to donor flash devices.

WRECKAGE AND IMPACT INFORMATION

The forward fuselage, inboard wing sections, and nose came to rest in a field about one mile southwest of the intersection of Highway AA and Red Barn Road. A smell consistent with jet fuel was present at the forward fuselage. The rear fuselage and empennage came to rest inverted about one quarter mile northwest of the forward fuselage section. The recovered wreckage, including both outboard wing sections, was found along a path approximately on a 225-degree magnetic heading from the furthest piece of wreckage to the forward fuselage section. The distance of that path was about four nautical miles.

An on-scene examination of the wreckage was conducted. The inboard section of the right wing remained attached to the fuselage. The inboard section of the left wing separated from the fuselage and was found about 15 feet south of the forward fuselage. Examination of the top of the fuselage at the cabin entrance door revealed a linear depression with linear media transfers consistent with the color and spacing of the right wingtip's green color, the red color of the wing's fuel cap, and the wing's leading edge black de-icing boot. The cabin window opening on the left side of the fuselage aft of the cabin door contained deformed and curled sections of aluminum. Those sections were coated with sealant and exhibited a smell consistent with jet fuel. Flight control cables were traced and all breaks found were consistent with overload.

The engine was disassembled. Engine control cables were traced from the cabin to the engine. Liquid consistent with jet fuel was found in the fuel filter. The turbine disks and blades rotated when the compressor was rotated by hand.

No engine or airframe pre-impact anomalies were detected.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot by the Montgomery County Coroner's Office. The autopsy listed massive blunt trauma as the cause of death.

The FAA Civil Aerospace Medical Institute prepared a Final Forensic Toxicology Accident Report. The report stated, "IBUPROFEN detected in Urine."

TESTS AND RESEARCH

The donor flash devices were taken to the Avidyne Corporation for downloading and decoding. The pilot's and co-pilots donor flash devices were soldered to exemplar riser cards, the exemplar riser cards were mounted in a bench PFD, and the pilot's and co-pilot's PFD data was serially downloaded. It was subsequently decoded. An Aerospace Engineer from the NTSB's Vehicle Recorder Division parsed that decoded data into spreadsheets and prepared a Cockpit Displays Factual Report. Those spreadsheets revealed that the airplane maneuvered to a northbound heading about 0753. About 0756, the airplane turned to about a 265 degree heading and tracked that heading until about 0800. The airplane then turned to about a 290 degree heading and tracked that heading until about 0811. The airplane was climbing about 900 feet per minute while the headings were tracked. The MFD data showed that the outside air temperature dropped from about 24 degrees C at the surface to 0 degrees C about 0809:41 at 15,900 feet MSL. The pilot's PFD airspeed data dropped from about 142 KIAS to zero about 0810:45 and the co-pilot's PFD airspeed dropped from about 140 KIAS to zero about 0810:51. The airplane climb rate decreased as the PFDs' airspeed data dropped to zero and about 0811 the airplane's heading started to turn to the left from the straight track. About 0811:04 on the pilot's PFD and 0811:06 on the copilot's PFD, non-zero airspeed values were recorded for approximately 25 seconds and approximately 10 seconds respectively before the recorded data indicated zero again on both PFDs. About 0811:51 on the pilot's PFD and 0811:58 on the copilot's PFD, non-zero airspeed values were recorded for approximately 20 seconds and approximately 8 seconds respectively before the recorded data indicated zero again on both PFDs. Both PFDs' airspeed, vertical speed, and altimeter display data validity bits switched to a fail state. A red X is flagged over displayed parameters that have failed validity bits. The pilot's PFD data was in the flagged fail state approximately between 0812:13 and 0812:42. The co-pilot's PFD data was in the flagged fail state approximately between 0810:55 and 0811:03 and approximately between 0811:25 and 0811:43. The data showed that airplane's engine was operational and that there was no reduction in power as the airplane started the left turn. About 0812:30, the data showed the airplane had achieved a 250 knot ground speed and then sustained two vertical accelerations about 5g. The data showed that the airplane subsequently descended and rolled during its descent. During the airplanes descent below 14,000 MSL both PFDs recorded non-zero value airspeed data. Review of MFD data did not reveal any approximate 30-second cyclic based changes in the output load on generator prior to takeoff. The data did not reveal any approximate 13 ampere load increase during taxi or during the remaining flight.

ADDITIONAL DATA/INFORMATION

FAA Order 7110.65, in part, stated:

2-1-1. ATC SERVICE

The primary purpose of the ATC system is to prevent a collision between aircraft operating in the system and to organize and expedite the flow of traffic, and to provide support for National Security and Homeland Defense. In addition to its primary function, the ATC system has the

capability to provide (with certain limitations) additional services. ... The provision of additional services is not optional on the part of the controller, but rather is required when the work situation permits. ...

2-6-4. WEATHER AND CHAFF SERVICES

a. Issue pertinent information on observed/reported weather and chaff areas. When requested by the pilot, provide radar navigational guidance and/or approve deviations around weather or chaff areas.

1. Issue weather and chaff information by defining the area of coverage in terms of azimuth (by referring to the 12-hour clock) and distance from the aircraft or by indicating the general width of the area and the area of coverage in terms of fixes or distance and direction from fixes.

A National Air Traffic Controllers Association (NATCA) representative was asked to provide a listing of accidents that NATCA was a party to and that involved weather encounters. The list he provided included the following cases: CHI04LA129, MIA05LA083, ATL05FAMS1, ATL05LA105, MIA06FA008, AND CHI06MA115.

Subsequent to and as a result of the CHI06MA115 investigation, the NTSB issued Safety Alert SA-11, Thunderstorm Encounters. The alert, in part, stated:

The problem: Recent NTSB investigations have identified several accidents that appear to be wholly or partly attributable to in-flight encounters with severe weather. These accidents have all involved aircraft operating under instrument flight rules and in contact with air traffic controllers. Investigations show that pilots were either not advised about areas of severe weather ahead or were given incomplete information. Each pilot had readily available alternatives that, if utilized, would have likely prevented the accident. ATC training and briefings to controllers have not been sufficient to ensure that pilots receive the weather advisories needed to support good in-flight weather avoidance decisions. ... How can pilots avoid becoming involved in a similar accident? Severe weather avoidance is primarily your responsibility.

The NATCA supplied list also included accidents that occurred subsequent to SA-11. Those subsequent cases were: ATL06FA076, DFW06FA193, NYC06MA208, and DEN06MA119.

The ZKC R53 controller on duty at the time of the accident was interviewed by a NTSB National Resource ATC Specialist. The controller reported that the airplane was observed in moderate level weather after the previous controller was relieved. The interview of the controller on duty, in part, stated, "The aircraft was already in the weather ... there was no requirement to reissue weather to the pilot."

Subsequent to this investigation, the FAA issued a guidance letter, dated July 26, 2007, to ZKC personnel on "Weather Dissemination Special Emphasis Item" requirements. The purpose of that guidance was to "insure that weather displayed/depicted ... is issued" and that the "weather is issued correctly by specifying intensity and precipitation." The guidance stated that "if an aircraft has been transferred to you and the aircraft is already in depicted precipitation or about to enter depicted precipitation, you are required to provide that information to the pilot. ... Do not assume the previous controller issued the weather."

FAA publication, FAA-S-8081-4D Instrument Rating Practical Test Standards for Airplane,

Helicopter, Powered Lift, dated April 2004, in part, stated:

The FAA has stressed that it is imperative for instrument pilots to

acquire and maintain adequate instrument skills and that they be capable of performing instrument flight with the use of the backup systems installed in the aircraft. ... Technically advanced aircraft may be equipped with backup flight instruments or an additional electronic flight display that is not located directly in front of the pilot.

In a letter to the Investigator-In-Charge, an Avidyne Corporation representative, in part, stated:

When the system was originally designed, it was decided that either an invalid airspeed measurement or an invalid altitude measurement should cause all air data indications to flag. That is, an invalid airspeed will cause altitude and vertical speed to flag as well as airspeed, and vice versa. This conservative design decision was made because there was no known mechanism other than outright failure by which either measurement could become invalid and because there are enough common elements contributing to the measurements that a common mode failure is possible. ...

While proper pilot technique should preclude the possibility of pitot icing (by means of avoidance of icing conditions and proper use of pitot heat), a mechanism by which in-flight IAS [indicated air speed] may become invalid has now been identified. Accordingly, we have reconsidered our decision to flag all air data based on invalid airspeed or altitude. We will, in a future release of the PFD software, decouple these indications. Invalid airspeed measurements will cause airspeed alone to be flagged. Invalid altitude measurements will cause altitude and vertical speed to be flagged without affecting IAS. This change will be implemented in a software release currently scheduled for November of [2009].

In a letter to the Investigator-In-Charge, a FAA representative, in part, stated:

In addition, Piper intends to provide information in the form of a temporary change to the airplane flight manual (AFM). Once the Avidyne software change has been incorporated into a given airplane, the flight manual temporary pages can be removed. This office intends to issue a Special Airworthiness Information Bulletin when the Piper AFM change is issued.

In accordance with the provisions of Annex 13 paragraph 5.18 to the Convention on International Civil Aviation, the Transportation Safety Board (TSB) of Canada and the Air Accidents Investigation Branch (AAIB), United Kingdom participated in the investigation as the representatives of the State of Design and Manufacture and provided accredited representatives to the investigation. Pratt & Whitney Canada and S-TEC/Cobham plc participated in the investigation as technical advisers to the TSB and AAIB respectively.

Pilot Information

Certificate:	Private	**Age:**	44, Male
Airplane Rating(s):	Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Without Waivers/Limitations	**Last FAA Medical Exam:**	01/01/2007
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	11/01/2006
Flight Time:	1000 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N477MD
Model/Series:	PA-46-500TP	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	4697264
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	06/01/2007, Continuous Airworthiness	**Certified Max Gross Wt.:**	5134 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo Prop
Airframe Total Time:	201.7 Hours as of last inspection	**Engine Manufacturer:**	Pratt & Whitney Canada
ELT:	Installed, activated, aided in locating accident	**Engine Model/Series:**	PT6A-42A
Registered Owner:	MCC AVIATION SERVICES LLC	**Rated Power:**	500 hp
Operator:	David L. McCormick	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	COU, 889 ft msl	**Distance from Accident Site:**	30 Nautical Miles
Observation Time:	0817 CDT	**Direction from Accident Site:**	225°
Lowest Cloud Condition:		**Visibility**	10 Miles
Lowest Ceiling:	Broken / 2200 ft agl	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	210°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.08 inches Hg	**Temperature/Dew Point:**	21°C / 20°C
Precipitation and Obscuration:	Light - In the Vicinity - Rain		
Departure Point:	ST LOUIS, MO (SUS)	**Type of Flight Plan Filed:**	IFR
Destination:	BUFFALO, MN (CFE)	**Type of Clearance:**	IFR
Departure Time:	0750 CDT	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	2 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 Fatal	**Latitude, Longitude:**	39.123611, -91.578333 (est)

Administrative Information

Investigator In Charge (IIC):	Edward F Malinowski	**Adopted Date:**	11/09/2009
Additional Participating Persons:	Lawrence Sadowski; Federal Aviation Administration; St Ann, MO Paul Crosby; Pratt & Whitney Canada; Bridgeport, WV Paul Lehman; Piper Aircraft, Inc.; Vero Beach, FL Fred Barber; Avidyne Corporation; Lincoln, MA Elaine M Summers; Transportation Safety Board of Canada; Dorval, Quebec, Alan Thorne; Air Accidents Investigation Branch, United Kingdom; Hampshire , UK, Robert DuRall; S-TEC/Cobham plc; Mineral Wells, TX		
Publish Date:	11/09/2009		
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		

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