National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: DEN08FA092	Aircraft Registration Number: N686F
Occurrence Date: 05/25/2008	Most Critical Injury: Fatal
Occurrence Type: Accident	Investigated By: NTSB

Location/Time

Nearest City/Place	State	Zip Code	Local Time	Time Zone	
Sunrise Beach	MO	65079	1921	CDT	

Airport Proximity: Off Airport/Airstrip	Distance From Landing Facility:

Aircraft Information Summary

Aircraft Manufacturer	Model/Series	Type of Aircraft
McDonnell Douglas Helicopter C	MD 500E/369E	Helicopter

Revenue Sightseeing Flight: No

Air Medical Transport Flight: No

Narrative

Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:

*** Note: NTSB investigators either traveled in support of this investigation or conducted a significant amount of investigative work without any travel, and used data obtained from various sources to prepare this aircraft accident report. ***

HISTORY OF FLIGHT

On May 25, 2008, at 1921 central daylight time, a McDonnell Douglas Helicopter Company MD 500E/369E, N686F, operated by a commercial pilot, impacted the water while attempting to land at a private helipad at Lake of the Ozarks, Sunrise Beach, Missouri. Visual meteorological conditions prevailed at the time of the accident. The personal flight was being conducted under the provisions of Title 14 Code of Federal Regulations Part 91 without a flight plan. The pilot and two passengers reported no injuries; one passenger sustained serious injuries, and one passenger was fatally injured. The local flight departed at 1917.

According to the pilot, the short helicopter ride was planned to fly the neighbor's children, his son, and his son's friend around the lake. The flight departed the pilot's residence, proceeded "across the north ridge of the lake," and then reversed course to proceed back towards the pilot's residence. The pilot reported that during approach for landing he initiated a turn towards the east and within a "few second at an altitude of approximately 35 feet, the helicopter began to spin rapidly to the right." The pilot stated that he "applied full opposite direction anti-torque pedal and a slight reduction in collective." He reported that the rotation "increased and became more violent." The helicopter impacted the water and sank. Prior to the spinning, there were no warning lights or sounds.

According to the front seat passenger, the flight was short, approximately five minutes in duration. She had not flown in a helicopter before and commented that the helicopter was "rocking" and did not know if this was normal. Just prior to landing the helicopter was "hovering or sitting still." The helicopter spun around once, paused, spun around again really fast, and eventually impacted the water. The rear seat passenger reported that the "tail" of the helicopter struck the water first.

The Missouri State Water Patrol took witness statements from twelve individuals. The National Transportation Safety Board (Safety Board) Investigator in Charge (IIC) interviewed two witnesses and received four additional witness statements. According to these witnesses the helicopter approached the landing zone from the north and made several turns, as if maneuvering to land. The helicopter turned towards the east and slowed to a hover. One witness reported that the helicopter made a "very quick 90-degree turn." The helicopter then rotated around, stopping on an approximate heading of east as it impacted the water. Multiple witnesses reported that the helicopter was spinning around to the right, multiple times, at a very high speed. The helicopter impacted the water and sank very quickly.

PERSONNEL INFORMATION

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The pilot, age 50, held a commercial pilot certificate with airplane single engine land and sea, multi-engine land and sea, rotorcraft helicopter, and instrument airplane ratings. He was issued a second class airman medical certificate on February 7, 2008. The certificate contained the limitation "must have available glasses for near vision."

According to the Pilot/Operator Aircraft Accident Report form submitted by the pilot, he had logged approximately 2,360 hours total time; 560 of which were in rotorcraft, and 350 of which were in the make and model of the accident helicopter. He reported that he had logged 33 hours total within the previous 90 days, 10 hours of which were in the make and model of the accident helicopter. His last flight review was successfully completed on February 4, 2008, in the accident helicopter.

AIRCRAFT INFORMATION

The accident helicopter, a McDonnell Douglas 500E Model 369E (serial number 0524E), was manufactured in 1995. It was registered with the Federal Aviation Administration on a standard airworthiness certificate for normal operations. The helicopter was powered by an Allison 250-C20B (Rolls-Royce) turbo shaft engine rated at 420 horsepower. The helicopter was equipped with a five-blade main rotor system.

The helicopter was registered to Impact Aviation LLC, operated by the pilot, and was maintained under an annual inspection program. A review of the maintenance records indicated that the last annual inspection had been completed by A & S Helicopters, Inc, of Cahokia, Illinois, on February 8, 2008, at an airframe total time of 4,345.5 hours. The airplane had flown 10.1 hours between the last inspection and the accident and had a total airframe time of 4,355.6 hours.

METEOROLOGICAL CONDITIONS

Level II Doppler weather radar data for Springfield (KSGF), Missouri, scanned the accident area at 1914:21, 1919:13, and 1924:05. The weather radar beam center was approximately 7,800 feet with the beam width of 6,800 feet. Data indicated reflectivity values of 35 to 60 dBz just south of the accident site. The Range Height Indicator Base Reflectivity Image for 1919:13, for the radial through the accident site, depicted weather radar echo tops of 48,000 feet in the accident area.

The National Weather Service Storm Prediction Center in Norman, Oklahoma, issued two severe thunderstorm watches (364 and 366) for areas just north and east of the accident location and a tornado watch for areas just south (358) of the accident location. Watch 364 was issued from 1600 to 2200. Hail, thunderstorm wind gusts to 70 miles per hour, and dangerous lightning were forecasted. Watch 366 was issued from 1835 to 0200 with the same weather expectations. Tornado watch 358 was effective from 1315 to 2000. Tornadoes, hail, thunderstorm wind gusts to 70 miles per hour, and dangerous lightning were forecasted.

Convective significant meteorological advisory (SIGMET) 02C was issued at 1755 and was valid until 1955 and covered the accident aircraft route of flight and landing location. The SIGMET advised of an area of severe thunderstorms moving from 270 degrees at 25 knots. Cloud tops were forecast to be above flight level 450. Tornadoes, hail, and wind gusts to 60 knots were possible.

The closest official weather observation station was Lee C Fine Memorial Airport (KAIZ), Kaiser Lake Ozark, Missouri, located 7 nautical miles (nm) southeast of the accident site. The elevation of the weather observation station was 869 feet msl. The routine aviation weather report (METAR) for KAIZ, issued at 1915, reported, winds, 160 degrees at nine knots, gusting to 16 knots; visibility, six miles with thunderstorms; sky condition, few clouds at 2,400 feet, scattered clouds at 5,500 feet, broken ceiling at 9,500 feet; temperature 20 degrees Celsius (C); dewpoint, 18 degrees C; altimeter, 29.87 inches. Distant lightning was noted in all quadrants and 0.14 inches of rain was reported.

The METAR for KAIZ issued at 1935, reported winds 180 degrees at 22 knots gusts to 47 knots; visibility 1 1/2 miles with thunderstorms; sky condition, scattered clouds at 1,100 feet, broken ceiling at 2,400 feet, overcast at 5,500 feet; temperature 20 degrees C; dew point 17 degrees C; altimeter setting 29.95 inches.

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Distant lightning was noted in all quadrants and 0.48 inch of rain was reported.

According to the pilot, at the time of the accident the sky was clear, there was no turbulence, and he estimated the wind speed at eight knots. He stated he was using smoke in the area and a flag near his residence to determine wind speed and direction. The front seat passenger stated that the sky was dark towards the "house" and she observed lightning in that direction. She reported that the winds were calm, and then they would "pick up." During the flight the pilot commented to her about the "incredible winds." Multiple witnesses to the accident reported strong, gusty surface winds at the time of the accident.

There was no evidence located indicating that the pilot obtained a weather briefing from either the Flight Service Station or Direct User Access Terminal Systems (DUATS). The pilot reported on his accident report form that he obtained weather information from the internet.

WRECKAGE AND IMPACT INFORMATION

The helicopter wreckage was located in 35 to 40 feet of water in Lake of the Ozarks. The terrain surrounding the accident location and landing zone was hilly, vegetated with tall deciduous trees, and multi-level homes. According to the Missouri State Water Patrol, the helicopter came to rest on its left side in the water. The helicopter was recovered from the water on May 26, 2008, and relocated to a Missouri State Water Patrol storage facility for further examination.

MEDICAL AND PATHOLOGICAL INFORMATION

In accordance with Missouri State law a blood specimens was collected for toxicological testing. This specimen was collected within an hour of the accident. Testing was performed by the FAA's Civil Aerospace Medical Institute, Oklahoma City, Oklahoma (CAMI Reference #200800106001). Carbon Monoxide and cyanide tests were not performed. No ethanol was detected. Diphenhydramine (0.022 ug/ml) and butalbital (0.077 ug/ml) were detected in the blood.

A review of the pilot's medical records, maintained by the FAA Aerospace Medical Certification Division, was conducted by the Safety Board medical officer. The records documented that the pilot had a history of diabetes diagnosed in 1993 and controlled with diet alone at that time. Subsequent applications beginning February 3, 1998, specifically indicated no history of diabetes, and no glucose or protein was noted on urinalysis on any of those applications. On June 6, 1998, a letter to the pilot from the Manager of the FAA Aeromedical Certification Division indicated in part that the pilot was eligible for a third class medical certificate and that due to the pilot's "history of diabetes, operation of aircraft is prohibited at any time new symptoms or adverse changes occur or any time medication is required."

Following the accident, the pilot was questioned by the Safety Board IIC about the use of any medication prior to the accident, to which he responded that he had not taken any. When presented with the toxicology results, he responded he could not recall what he had taken. A letter from the pilot to an FAA Regional Flight Surgeon dated September 11, 2008 stated in part that a family member had provided the pilot with a pill from her "butalbital prescription" when the pilot had asked for an aspirin for a mild headache more than 24 hours prior to the accident. The letter also stated that the pilot had taken an over the counter diphenhydramine the day prior to the accident.

SURVIVAL ASPECTS

According to the front seat passenger, this was her first flight in a helicopter. She was sitting in the front right seat and the three boys were in the back. The pilot fastened her seatbelt and closed the door. She was not shown how to operate the door or how to fasten/unfasten her seatbelt. After the helicopter impacted the water, she felt something hitting her in the head. She was "about to pass out" when she got her seatbelt unlatched. She was unable to recall how she exited the helicopter.

The rear left seat passenger reported that he fastened his own seatbelt, which was later checked by the pilot.

Narrative (Continued)

He had flown with the pilot on previous occasions. He stated that his friend was sitting in the rear right seat and was sharing a seatbelt with the fatal victim. After the helicopter impacted the water, he was able to take his seatbelt "right off" kneed out the window, and was able to get out quickly. He stated that the tail was still above the water when he came to the surface.

The rear right seat passenger reported that he had flown with the pilot (his father) on multiple occasions. He fastened the seatbelt around himself and the fatal victim. After the helicopter impacted the water, he unbuckled the seatbelt and went to an "air bubble" under the water with the victim. He obtained a "quick breath" and then exited the helicopter from the left door. He stated that the helicopter was not at the bottom of the lake when he exited. The door was already open; he did not have to open it.

The pilot stated that he recalled helping his front seat passenger unbuckle her seat harness after the helicopter was submerged in water. He could not recall how he egressed out of the helicopter.

According to family members the fatal victim had never flown in a helicopter prior to the accident flight.

The helicopter was not equipped with nor required to be equipped with personal flotation devices.

TESTS AND RESEARCH

On May 27 and 28, 2008, the wreckage was examined by the Safety Board IIC, investigators from Boeing, MD Helicopters (formerly McDonnell Douglas), Rolls Royce, and inspectors from the FAA.

The main wreckage that was recovered included the fuselage, and empennage. The five main rotor blades separated and were not recovered from the lake. The fuselage, to include the landing skids, four doors, flight controls, and instrument panel, was water logged in most internal areas and was muddy. The upper left and right, and lower right windscreens were partially fragmented. The windscreens on the front and aft cabin doors on the left side were missing. The skin on the aft left door was wrinkled. The doors on the right side of the cabin were unremarkable.

The forward cabin included the pilot seat, front passenger seat, two sets of seatbelt/shoulder harness assemblies, two sets of flight controls, and a center mounted instrument panel. Both seat belts were unlatched but remained attached at their design mounting points. The inertial reels on both sides locked when forward or down forces were applied.

The following indications were observed on the instrument panel:

Airspeed Indicator - 72 knots
Attitude Indicator - 28 degrees left bank, nose down
Altimeter - 366 feet
Kollsman Window - 29.77 inches
Vertical Speed Indicator - 3,000 feet per minute descent
Heading Indicator - 342 degrees

Rotor rpm - zero
Engine Torque - zero
N1 - zero
Oil Pressure - zero to one percent

The engine and flight controls were observed in the following positions:

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Collective - Up
Throttle - Flight Idle
Fuel Knob - In

Control continuity from the cyclic and collective was continuous to the main rotor and the anti-torque pedals aft to the tail rotor.

The aft cabin included two seats, two sets of seatbelt/should harness assemblies, a Start Pack, and a survival kit. The seat belts were unlatched and remained attached at their designed mounting points. The inertial reels locked when forward or down forces were applied.

The engine remained attached in its aft mounted location. The surrounding cowling was bent and wrinkled. The compressor section (N1) rotated freely by hand. The exhaust stacks were removed and the turbine section (N2) rotated freely by hand. The engine to transmission connection was continuous. Fuel control continuity was confirmed.

The tail boom remained attached to the fuselage. The bottom of the tail boom was buckled 45 inches forward of the tail rotor gearbox attach point. The gearbox moved freely when activated by hand without any grinding or binding. Both tail rotor blades remained attached to the gearbox. The tail rotor fork bolt was broken and the head was missing. The tail rotor blades were arbitrarily labeled "A" and "B" for identification purposes only. Blade A exhibited a slight bend seven inches outboard from the hub on the trailing edge. Blade B exhibited a slight bend three inches outboard from the hub.

The transmission to tail rotor connection was not continuous. Inspection panels were removed and revealed the tail rotor drive shaft separated towards the fuselage. The gearbox was removed and remained attached to nine feet of the tail rotor driveshaft. The point of separation exhibited twisting and collapsing of the tube. A dent was observed 35.25 inches forward from the aft end of the shaft. One hundred and eighty degrees of rotational scoring was observed opposite the dent in the tail rotor driveshaft. Additional 180 degree rotation scoring was noted 41.5 inches inboard of the aft end of the shaft.

The forward end of the tail rotor driveshaft was 52 inches in length and exhibited twisting and collapsing at the point of separation. Extensive rotational scoring was noted 18 to 19 inches aft from the attach point.

The tail rotor driveshaft and hub were shipped to the Safety Board Materials Laboratory for further examination. Examination found deformation and fracture features in the driveshaft that were consistent with a torsional overstress. No indications of preexisting cracking were apparent in either component.

ADDITIONAL INFORMATION

Title 14 Code of Federal Regulations Part 91.107 "Use of Safety belts, shoulder harnesses, and child restraint systems states in part "Unless otherwise authorized by the Administrator - (1) No pilot may take off a U.S.-registered civil aircraft ... unless the pilot in command of that aircraft ensures that each person on board is briefed on how to fasten and unfasten that person's safety belt and, if installed, shoulder harness. (2) No pilot may cause to be moved on the surface, take off, or land a U.S.-registered civil aircraft ... unless the pilot in command of that aircraft ensures that each person on board has been notified to fasten his or her safety belt and, if installed, his or her shoulder harness. (3) Except as provided in this paragraph, each person on board a U.S.-registered civil aircraft ... must occupy an approved seat or berth with a safety belt and, if installed, shoulder harness, properly secured about him or her during movement on the surface, takeoff, and landing."
Updated on Apr 16 2009 8:35AM

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Landing Facility/Approach Information

Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
		Ft. MSL	N/A		

Runway Surface Type:

Runway Surface Condition:

Approach/Arrival Flown: NONE

VFR Approach/Landing: Full Stop

Aircraft Information

Aircraft Manufacturer	Model/Series	Serial Number
McDonnell Douglas Helicopter C	MD 500E/369E	0524E

Airworthiness Certificate(s): Normal

Landing Gear Type: Skid

Amateur Built Acft?	Number of Seats:	Certified Max Gross Wt.	Number of Engines:
No	4	3000 LBS	1

Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:
Turbo Shaft	Allison	250-C20B	425 HP

- Aircraft Inspection Information

Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time
Annual	02/2008	Hours	4346 Hours

- Emergency Locator Transmitter (ELT) Information

ELT Installed?/Type	ELT Operated?	ELT Aided in Locating Accident Site?
Yes /	Yes	No

Owner/Operator Information

Registered Aircraft Owner	Street Address	City	State	Zip Code
Impact Aviation	13450 Clayton Road	Saint Louis	MO	63131

Operator of Aircraft	Street Address	City	State	Zip Code
On File	On File	St. Louis	MO	63131

Operator Does Business As:

Operator Designator Code:

- Type of U.S. Certificate(s) Held: None

Air Carrier Operating Certificate(s):

Operating Certificate:

Operator Certificate:

Regulation Flight Conducted Under: Part 91: General Aviation

Type of Flight Operation Conducted: Personal

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First Pilot Information

Name	City	State	Date of Birth	Age
On File	On File	On File	On File	50

Sex: M | Seat Occupied: Left | Occupational Pilot? No | Certificate Number: On File

Certificate(s): Commercial

Airplane Rating(s): Multi-engine Land; Multi-engine Sea; Single-engine Land; Single-engine Sea

Rotorcraft/Glider/LTA: Helicopter

Instrument Rating(s): Airplane

Instructor Rating(s): None

Current Biennial Flight Review? 02/2008

Medical Cert.: Class 2 | Medical Cert. Status: With Waivers/Limitations | Date of Last Medical Exam: 02/2008

- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Mult-Engine	Night	Instrument Actual	Instrument Simulated	Rotorcraft	Glider	Lighter Than Air
Total Time	2360	350	600	1200				560		
Pilot In Command(PIC)	2130	350	500	1100				530		
Instructor										
Instruction Received										
Last 90 Days	33	10	3	22				10		
Last 30 Days	9	5		4				5		
Last 24 Hours	2	2						2		

Seatbelt Used? Yes | Shoulder Harness Used? Yes | Toxicology Performed? Yes | Second Pilot? No

Flight Plan/Itinerary

Type of Flight Plan Filed: None

Departure Point	State	Airport Identifier	Departure Time	Time Zone
Same as Accident/Incident Location			1917	CDT

Destination	State	Airport Identifier
Local Flight	MO	

Type of Clearance: None

Type of Airspace:

Weather Information

Pilot's Source of Wx Information:

Internet

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Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
DMO	1953	CDT	Ft. MSL	NM	Deg. Mag.

Sky/Lowest Cloud Condition: Clear Ft. AGL

Condition of Light: Day

Lowest Ceiling: None Ft. AGL

Visibility: 10 SM

Altimeter: 29.80 "Hg

Temperature: 26 °C

Dew Point: 18 °C

Weather Conditions at Accident Site: Visual Conditions

Wind Direction: 180

Wind Speed: 8

Wind Gusts:

Visibility (RVR): Ft.

Visibility (RVV) SM

Precip and/or Obscuration:

No Obscuration; No Precipitation

Accident Information

Aircraft Damage: Substantial

Aircraft Fire: None

Aircraft Explosion None

- Injury Summary Matrix	Fatal	Serious	Minor	None	TOTAL
First Pilot				1	1
Second Pilot					
Student Pilot					
Flight Instructor					
Check Pilot					
Flight Engineer					
Cabin Attendants					
Other Crew					
Passengers	1	1		2	4
- TOTAL ABOARD -	1	1		3	5
Other Ground					
- GRAND TOTAL -	1	1		3	5

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Administrative Information

Investigator-In-Charge (IIC)

Jennifer Rodi

Additional Persons Participating in This Accident/Incident Investigation:

Steven B Davis
FAA Flight Standards District Office
Kansas City, MO

Michael A Weber
Rolls-Royce
Indianapolis, IN

John Hobby
MD Helicopters
Phoenix, AZ

Adrian Booth
The Boeing Company
Mesa, AZ