



National Transportation Safety Board Aviation Accident Final Report

Location:	Watertown, WI	Accident Number:	CHI06FA077B
Date & Time:	02/05/2006, 1654 CST	Registration:	N372AC
Aircraft:	Short Brothers SD-360-300	Aircraft Damage:	Substantial
Defining Event:		Injuries:	1 Minor, 2 None

Flight Conducted Under: Part 91: General Aviation - Other Work Use

Analysis

Prior to departure, both flight crews decided that they would join-up while in flight to take video and still pictures of each airplane. Both aircraft were Shorts Brothers SD-360-300 turboprop airplanes. While flying in formation, N3735W announced over the radio that they would turn right, toward N372AC, and descend. During the turn, N3735W's left wing impacted the left wing and engine of N372AC. After the collision, N372AC rolled to the left and pitched down significantly before the flight crew regained control of the airplane. After the collision, N372AC was losing hydraulic fluid and eventually had a complete hydraulic system failure. The airplane made an emergency landing at a nearby airport with its flaps retracted and its landing gear partially extended. The airplane overran the end of the runway, coming to rest about 100 feet from the departure threshold. White paint transfer markings and scrapes were observed on the left wing deice boot, the outboard side of the left engine cowling was crushed inboard, the left wing-strut leading edge was torn open and bent, and the lower fuselage skin, immediately forward of the landing gear wheel wells and stub wing, was torn from left to right, consistent with a propeller strike. N3735W impacted terrain and the airplane was destroyed during a subsequent ground fire. The flight crew and passenger were killed. The outboard three-quarters of the left wing was separated from the main wreckage and was not fire damaged. The upper wing surface had linear scrapes diagonally across the wing skin. The left aileron from N3735W was found on the runway where N372AC had landed.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The other airplane's flight crew failure to maintain clearance while maneuvering during formation flight. Contributing to the accident was the decision of both flight crews to fly in formation.

Findings

Occurrence #1: MIDAIR COLLISION
Phase of Operation: MANEUVERING

Findings

1. (F) FORMATION FLYING - PERFORMED - FLIGHTCREW
2. (C) CLEARANCE - NOT MAINTAINED - FLIGHTCREW OF OTHER AIRCRAFT

Factual Information

HISTORY OF FLIGHT

On February 5, 2006, at 1654 central standard time, two Shorts Brothers SD-360-300 airplanes (N3735W and N372AC) collided in-flight at approximately 2,500 feet mean sea level (msl) near Watertown, Wisconsin. Both aircraft were operated by Air Cargo Carriers, Inc., based in Milwaukee, Wisconsin. N3735W was destroyed during impact with the ground and subsequent ground fire. N372AC was substantially damaged during the midair collision and subsequent emergency landing at Dodge County Airport (UNU), Juneau, Wisconsin. Visual meteorological conditions prevailed at the time of the accident. Both airplanes were operating under the provisions of 14 Code of Federal Regulations Part 91 without flight plans. The pilot-in-command (PIC), second-in-command (SIC), and passenger aboard N3735W were fatally injured. The PIC and SIC of N372AC were not injured. The passenger aboard N372AC reported minor injuries. N3735W and N372AC departed General Mitchell International Airport (MKE) at 1555 and 1615, respectively, for local area flights.

According to the flight crew of N372AC, the flights were performed to verify the fuel flow rates for auxiliary fuel tanks that had been recently installed on both airplanes. Prior to departure, both flight crews decided that they would join-up after departure to take video and still pictures of each airplane.

After departure and clearing the MKE Class-C airspace, the flight crew of N372AC established radio and visual contact with N3735W. N3735W proceeded to perform several fly-bys past N372AC who remained on constant headings and altitude. N3735W then came up along their left side and flew in formation maintaining approximately 100-150 feet lateral separation.

N3735W announced over the radio that they would turn right, toward N372AC, and descend. During the turn, N3735W's left wing impacted the left wing and engine of N372AC. The PIC of N372AC reported that he attempted to climb in an attempt to avoid the collision with N3735W. After the collision, N372AC rolled to the left and pitched down significantly before the flight crew regained control of the airplane. The flight crew declared an emergency and diverted to UNU for an emergency landing. After the collision, N372AC was losing hydraulic fluid and eventually had a complete hydraulic system failure. An emergency landing was made on runway 8 (5,069 feet by 100 feet, asphalt) with the airplane's flaps retracted and its landing gear partially extended.

PERSONNEL INFORMATION

N3735W -- PIC

According to Federal Aviation Administration (FAA) records, the PIC of N3735W, age 25, held a commercial certificate with airplane single-engine land, airplane single-engine sea, airplane multiengine land, and instrument airplane ratings. He had a type-rating for the Shorts Brothers SD-360-300. The PIC's last aviation medical examination was completed on July 28, 2005, when he was issued a first-class medical certificate with no restrictions or waivers.

According to company information, the PIC had accumulated 1,643 hours of flight time. He had flown 384 hours in single-engine airplanes and 1,259 hours in multiengine airplanes. He had accumulated 318 hours at night, 160 hours in actual instrument conditions, and 40 hours in simulated instrument conditions. The PIC had flown 1,181 hours in a Shorts Brothers SD-

360-300. His last flight review was completed on September 14, 2005, in a Shorts Brothers SD-360-300.

N3735W -- SIC

According to FAA records, the SIC of N3735W, age 42, held an airline transport pilot certificate with airplane single-engine land and airplane multiengine land ratings. The airplane single-engine land rating was limited to commercial privileges only. The SIC was also a certified flight instructor for single-engine land airplanes. He was type-rated for the Shorts Brothers SD-360-300 and Douglas DC-3. The SIC's last aviation medical examination was completed on September 13, 2005, when he was issued a first-class medical certificate with no restrictions or waivers.

According to company information, the SIC had accumulated 7,015 hours of flight time. He had flown 1,152 hours in single-engine airplanes and 5,863 hours in multiengine airplanes. He had accumulated 2,000 hours at night, 500 hours in actual instrument conditions, and 100 hours in simulated instrument conditions. The SIC had flown 4,984 hours in a Shorts Brothers SD-360-300. His last flight review was completed on January 19, 2006, in a Shorts Brothers SD-360-300.

N372AC -- PIC

According to FAA records, the PIC of N372AC, age 26, held a commercial certificate with airplane single-engine land, airplane multiengine land, and instrument airplane ratings. The PIC was also a certified flight instructor for single-engine land airplanes. He had a type-rating for the Shorts Brothers SD-360-300. The PIC's last aviation medical examination was completed on August 31, 2005, when he was issued a first-class medical certificate with no restrictions or waivers.

According to company information, the PIC had accumulated 1,524 hours of flight time. He had flown 753 hours in single-engine airplanes and 771 hours in multiengine airplanes. He had accumulated 416 hours at night, 173 hours in actual instrument conditions, and 25 hours in simulated instrument conditions. The PIC had flown 630 hours in a Shorts Brothers SD-360-300. His last flight review was completed on October 13, 2005, in a Shorts Brothers SD-360-300.

N372AC -- SIC

According to FAA records, the SIC of N372AC, age 23, held a commercial certificate with airplane single-engine land, airplane multiengine land, and instrument airplane ratings. He had a type-rating for the Shorts Brothers SD-360-300, limited to second-in-command privileges. The SIC's last aviation medical examination was completed on July 20, 2005, when he was issued a first-class medical certificate with no restrictions or waivers.

According to company information, the SIC had accumulated 519 hours of flight time. He had flown 338 hours in single-engine airplanes and 181 hours in multiengine airplanes. He had accumulated 155 hours at night, 61 hours in actual instrument conditions, and 60 hours in simulated instrument conditions. The SIC had flown 122 hours in a Shorts Brothers SD-360-300. His last flight review was completed on October 13, 2005, in a Shorts Brothers SD-360-300.

AIRCRAFT INFORMATION

Both aircraft were Shorts Brothers SD-360-300 turboprop airplanes. The airplanes were of all-metal construction incorporating a semimonocoque fuselage and empennage design. They were equipped with externally braced wings, wing flaps, constant speed propellers, and retractable tricycle landing gear. Each airplane was equipped with two 1,424 shaft-horsepower Pratt & Whitney PT6A-67R turbine engines and two Hartzell HC-A6A-3A propellers. Both aircraft were configured to seat six occupants and had certified maximum takeoff weights of 27,100 lbs.

N3735W, serial number SH-3735, was issued an FAA transport category airworthiness certificate and registration certificate on November 18, 2005. The airplane had a total service time of 10,077 hours at the time of the accident. The airplane was maintained in accordance with an approved manufacturer inspection program. The last inspection was completed on January 24, 2006. The left engine, serial number PCE-106128, had accumulated 13,640 hours total time and 26 hours since last major overhaul. The right engine, serial number PCE-106007, had accumulated 9,587 hours total time and 5,195 hours since last major overhaul. A review of the maintenance records found no history of unresolved airworthiness issues.

N372AC, serial number SH-3720, was issued an FAA transport category airworthiness certificate on February 2, 2006. The FAA issued the current aircraft registration certificate on December 7, 2005. The airplane had a total service time of 21,996 hours at the time of the accident. The airplane was maintained in accordance with an approved manufacturer inspection program. The last inspection was completed on February 2, 2006. The left engine, serial number PCE-106151, had accumulated 9,556 hours total time and 201 hours since last major overhaul. The right engine, serial number PCE-106094, had accumulated 11,771 hours total time and 4,273 hours since last major overhaul. A review of the maintenance records found no history of unresolved airworthiness issues.

METEOROLOGICAL INFORMATION

The closest weather reporting facility was at the Watertown Municipal Airport (RYV), about 5 nautical miles east of the in-flight collision. The airport was equipped with an automated weather observing system (AWOS). At 1657 central standard time, the RYV AWOS reported the following weather conditions: Wind 310 degrees true at 7 knots; visibility 10 statute miles; sky clear; temperature -2 degrees Celsius; dew point -8 degrees Celsius; altimeter setting 29.84 inches of mercury.

COMMUNICATIONS

Both airplanes received radar service during their respective departures from MKE. Radar services were terminated when each aircraft exited the MKE Class-C airspace to the west. Neither airplane was in contact, nor were they required to be in contact, with air traffic control at the time of the in-flight collision. N372AC reported the in-flight collision on 121.5 megahertz and Madison Approach Control provided assistance as it maneuvered for the emergency landing into UNU.

An individual heard two airplanes communicating on 123.45 megahertz about the time of the accident. The radio frequency 123.45 megahertz is commonly used for aircraft-to-aircraft communications when not in contact with an air traffic control facility. Based on what he heard, the individual believed the airplanes were flying in formation and that one of them was maneuvering around the other. He also believed one airplane was taking photographs of the other airplane as it flew past.

FLIGHT RECORDERS

Neither airplane was equipped, nor were they required to be equipped, with a cockpit voice recorder or flight data recorder.

WRECKAGE AND IMPACT INFORMATION

N3735W impacted terrain and was consumed during a subsequent ground fire. The outboard three-quarters of the left wing was about 0.42 nm from the main wreckage and was not fire damaged. The upper wing surface had linear scrapes diagonally across the wing skin. N3735W's left aileron was found on runway 8 at UNU where N372AC had landed.

N372AC came to rest off the end of runway 8 with its flaps retracted and landing gear partially extended. The airplane overran the end of the runway, coming to rest about 100 feet from the departure threshold. There was no apparent damage to any of the flight control surfaces. White paint transfer markings and scrapes were observed on the left wing deice boot. The outboard side of the left engine cowling was crushed inboard. The left wing-strut leading edge was torn open and bent. The lower fuselage skin, immediately forward of the landing gear wheel wells and stub wing, was torn from left to right, consistent with a propeller strike.

MEDICAL AND PATHOLOGICAL INFORMATION

According to the Jefferson County Coroner's Office, the cause of death for the PIC, SIC, and passenger aboard N3735W was "multiple body trauma - plane crash."

Toxicology samples for the flight crews aboard both airplanes were submitted to the FAA Civil Aerospace Medical Institute, Oklahoma City, Oklahoma, for forensic toxicology testing.

N3735W -- PIC

The toxicology results indicated that no ethanol was detected in liver or kidney samples, and no reportable drugs were detected in liver samples.

N3735W -- SIC

The toxicology results indicated that 12 mg/dL of ethanol was detected in liver. No ethanol was detected in muscle. The lower cut-off for reporting ethanol was 10 mg/dL. No reportable drugs were detected in liver samples.

N372AC -- PIC

The toxicology results indicated that no ethanol or reportable drugs were detected in blood samples.

N372AC -- SIC

The toxicology results indicated that no ethanol or reportable drugs were detected in blood samples.

TESTS AND RESEARCH

A handheld global positioning system (GPS) receiver was recovered from N372AC after the accident. The downloaded GPS data was plotted alongside radar data provided by FAA air traffic control facilities near the accident site. The recorded radar data consisted of reinforced beacon code returns (discrete codes) and primary returns. The processed radar data showed N3735W departing from MKE to the west and then making several turns awaiting N372AC to intercept its position. The plotted data then showed the two airplanes flying in close proximity

to each other and one airplane making several crossing maneuvers in-front of the other airplane.

A video camera and digital still camera were recovered from N372AC after the accident. The cameras were examined by the National Transportation Safety Board's Vehicle Recorder Division in Washington, D.C. The video recording contained about 3 minutes of footage related to the accident flight. The airborne video footage was taken from the cockpit of N372AC. The footage showed another airplane flying maneuvers near the camera's position. The video footage did not show the in-flight collision. The digital still camera contained three images taken during the accident flight. The images were taken from the cockpit of N372AC. The recorded images were of another airplane, flying in close proximity to the camera's position. The final recorded image was analyzed to determine the distance between the airplane and the camera. Calculations revealed that the airplane shown in the image was about 112 feet from the camera. Additional information concerning the video and digital still images is contained in the Video/Image Study Report included with the docket material.

Pilot Information

Certificate:	Flight Instructor; Commercial	Age:	26, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane Single-engine	Toxicology Performed:	Yes
Medical Certification:	Class 1 Without Waivers/Limitations	Last FAA Medical Exam:	08/01/2005
Occupational Pilot:		Last Flight Review or Equivalent:	10/01/2005
Flight Time:	1524 hours (Total, all aircraft), 630 hours (Total, this make and model), 89 hours (Last 90 days, all aircraft), 13 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Co-Pilot Information

Certificate:	Commercial	Age:	23, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 1 Without Waivers/Limitations	Last FAA Medical Exam:	07/01/2005
Occupational Pilot:		Last Flight Review or Equivalent:	10/01/2005
Flight Time:	519 hours (Total, all aircraft), 122 hours (Total, this make and model), 99 hours (Last 90 days, all aircraft), 14 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Short Brothers	Registration:	N372AC
Model/Series:	SD-360-300	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Transport	Serial Number:	SH-3720
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	01/01/2006, AAIP	Certified Max Gross Wt.:	27100 lbs
Time Since Last Inspection:		Engines:	2 Turbo Prop
Airframe Total Time:	21996 Hours at time of accident	Engine Manufacturer:	Pratt & Whitney
ELT:	Installed, not activated	Engine Model/Series:	PT6A-67R
Registered Owner:	Air Cargo Carriers, Inc.	Rated Power:	1424 hp
Operator:	Air Cargo Carriers, Inc.	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Dusk
Observation Facility, Elevation:	RYV, 833 ft msl	Distance from Accident Site:	5 Nautical Miles
Observation Time:	1657 CST	Direction from Accident Site:	90°
Lowest Cloud Condition:	Clear	Visibility	10 Miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	7 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	310°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.84 inches Hg	Temperature/Dew Point:	-2° C / -8° C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Milwaukee, WI (MKE)	Type of Flight Plan Filed:	None
Destination:		Type of Clearance:	
Departure Time:	1615 CST	Type of Airspace:	

Wreckage and Impact Information

Crew Injuries:	2 None	Aircraft Damage:	Substantial
Passenger Injuries:	1 Minor	Aircraft Fire:	
Ground Injuries:	N/A	Aircraft Explosion:	
Total Injuries:	1 Minor, 2 None	Latitude, Longitude:	43.180278, -88.833056

Administrative Information

Investigator In Charge (IIC):	Andrew T Fox	Report Date:	03/31/2008
Additional Participating Persons:	Cathy Vuksanovic; Federal Aviation Administration - Milwaukee FSDO; Milwaukee, WI		
Publish Date:			
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 pubinquiry@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

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The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).