



National Transportation Safety Board Aviation Accident Final Report

Location:	Mansfield, MA	Accident Number:	ATL07FA125
Date & Time:	09/08/2007, 1030 EDT	Registration:	N19952
Aircraft:	Cessna 172M	Aircraft Damage:	Substantial
Defining Event:		Injuries:	2 Fatal, 2 Serious
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

A review of a video recording of the accident showed the airplane wavering during climb out, in a nose-high attitude, and beginning a turn to the left. The airplane reached an approximate altitude of 100 feet before increasing the turn to approximately 60 degrees. The airplane then appears to pitch nose down to a sharp roll to the left and impacts the ground. The National Transportation Safety Board's Vehicle Recorder Division Audio Laboratory conducted a sound spectrum study on video recording, which revealed that the fixed pitch propeller was spinning at approximately 2,340 RPM. During examination of wreckage it was discovered that the flaps were deployed at 10 degrees, and the airplane was about 64 lbs over the gross weight limit. The pilot's miscalculation of the gross weight limit would have resulted in a higher stall speed.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's improper use of wing flaps during takeoff, which resulted in reduced climb performance and a subsequent stall. Contributing to the accident was the exceedance of the airplane's maximum gross weight.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings

1. (C) FLAPS - IMPROPER USE OF - PILOT IN COMMAND
2. (C) AIRCRAFT WEIGHT AND BALANCE - EXCEEDED - PILOT IN COMMAND
3. (C) STALL - INADVERTENT - PILOT IN COMMAND

Occurrence #2: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: DESCENT - UNCONTROLLED

Findings

4. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On September 8, 2007, at 1030 eastern daylight time, a Cessna 172M, N19952, stalled and collided with the ground during initial climb out at the Mansfield Municipal Airport (1B9), Mansfield, Massachusetts. The airplane was substantially damaged. The private pilot and forward passenger were killed, and the two rear passengers were seriously injured. Visual meteorological conditions prevailed at the time of the accident and no flight plan was filed for the personal flight. The airplane was registered to and operated by Twin Cities Air Service LLC, under the provisions of 14 Code of Federal Regulations (CFR) Part 91.

A witness reported that he had just cleared runway 32, when he heard the pilot radio he was on the take off roll. Shortly thereafter he heard the pilot call "mayday, mayday, I can't clear the trees." The witness said that he observed the airplane in a "slight nose up attitude and climbing slightly." He went on to say "the airplane made a sharp left turn and the nose dropped. The airplane then made a half spiral and crashed nose first."

Another witness to the accident stated that he was manning the radios at the end of runway 32. He said that as the airplane took off from runway 32 it was at an extreme climb angle. He heard the pilot radio "mayday, mayday, I'm going around, I don't think I'll clear the trees." He watched as the pilot turn into the wind, flying very slowly with approximately 10 to 15 degrees of flaps deployed. The airplane made almost a full 180 degrees, then descended from approximately 150 feet straight nose down.

PILOT INFORMATION

The pilot, aged 38, held a private pilot's certificate with a rating for airplane single engine land. His certificate was issued on July 1, 2006. He held a third class medical certificate issued November 18, 2006, with no medical restrictions. A review of the pilot's logbook revealed that within the last 30 days the pilot accumulated 3.6 flight hours. He was endorsed to fly solo in the Cessna 172 on March 7, 2006. At the time of the accident he had accumulated 5.6 total flight hours in the accident airplane make and model.

AIRCRAFT INFORMATION

The four-seat, high-wing, fixed gear airplane, was manufactured in 1972. It was powered by a Lycoming O-320-E2D, 160-horsepower engine and equipped with a two bladed McCauley propeller model DTM 7557 M1. Review of the airplane maintenance logbook records showed that an annual inspection was completed on September 22, 2006, at a tachometer reading of 862.4 hours, and an airframe total time of 4,952.5 hours. The engine was overhauled on May 19, 2007. A 100-hour inspection was conducted on July 13, 2007, at a tachometer time of 1,195.3 hours. At the time of the accident the tachometer time indicated a total of 1,278.1 hours. There were 82.8 hours since the last 100-hour inspection.

WRECKAGE AND IMPACT INFORMATION

The wreckage came to rest 380 feet off of the left side of the departure end of runway 32, on a 245-degree heading. Examination of the airplane revealed that all flight controls remained attached to their airframe components, and flight control continuity was established. Examination of the airframe and flight controls revealed no evidence of a preimpact mechanical failure or malfunction.

Examination of the engine revealed that all of the cylinders remained attached to the crankcase and visually appeared undamaged. The cylinders were borescoped and exhibited no signs of mechanical damage. All rocker arms were oil coated and moved accordingly when the engine was rotated. Compression was achieved on all four cylinders, and internal gear and valve train continuity was established. The carburetor was disassembled, and the bowl attachment screws were secure. The accelerator pump was functional and expelled fuel when operated. The carburetor float bowl contained a residual amount of fuel. The floats and needle float valve remained intact and undamaged. The needle valve seat was undamaged. Examination of the fuel inlet screen revealed that it was free of debris. The carburetor box was crushed upwards, and the heat valve was in the midrange position. Examination of the engine revealed no evidence of a preimpact mechanical failure or malfunction.

The propeller remained attached to the crankshaft propeller flange. The blades were marked "A & B," and blade "A" exhibited chordwise scoring, and twisting throughout the span of the blade. Blade "A" was bent aft approximately mid-span of the length of the blade. Examination of blade "B" revealed that it was bent slightly aft.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot on September 9, 2007, by the Office of the Chief Medical Examiner of The Commonwealth of Massachusetts, as authorized by the Chief forensic Investigator of Mansfield, Massachusetts. The cause of death was reported as "blunt trauma to head and torso."

Forensic toxicology was performed on specimens from the pilot by the Federal Aviation Administration (FAA) Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma. The toxicology report stated no ethanol was detected in the liver or muscle, and no drugs were detected in the liver.

ADDITIONAL INFORMATION

A review of a video recording of the accident begins with the airplane approximately 70 feet above ground level (AGL) at the midpoint of runway 32. The video shows the airplane wavering, in a nose-high attitude, barely climbing to another 50 to 100 feet before leveling off, and beginning a turn to the left. The bank angle in the turn increases to approximately 60 degrees before the airplane pitches nose down to near vertical with a sharp roll to the left and impacts the ground. The video shows the flaps deployed and the sound of the airplane's engine could be heard throughout the video.

The National Transportation Safety Boards Vehicle Recorder Division's Audio Laboratory conducted a sound spectrum study on a compact disc containing 14 seconds of digital footage of the accident sequence. The video shows the airplane just after takeoff moving from left to right on runway heading while the camera pans to keep the airplane in the field of view. Approximately seven seconds into the recording the airplane turns to the left and heads away from the camera. The audio contains narrowband frequency components at 78 Hz and 156 Hz. This corresponds to the blade passage frequency and harmonic for the two-blade, fixed pitch propeller spinning at approximately 2,340 RPM.

The density altitude at the time of the mishap was computed to be 1,976 feet. The owner's manual take-off data chart for 2,500 feet mean sea level (msl) indicates a distance of 1,910 feet

is needed to clear a 50-foot obstacle with the airplane at gross weight and the flaps up. An interpolation of the maximum rate-of-climb chart indicates the airplane should have been able to climb approximately 480 feet per minute, flaps up at gross weight. The owner's manual indicates 10 degrees of flaps, if used for take-off, may shorten the take-off distance, but will degrade climb performance.

A review of the pilot's flight plan and fuel loading notes indicated that there were 12 gallons of fuel on board for the accident flight. The baggage was re-weighed, and a corrected baggage weight of 50 pounds (lbs) was recorded, not 25 lbs as recorded on the pilot's weight and balance calculation sheet. A corrected airplane empty weight of 1,402.5 lbs for the airplane gross weight was added, not 1,364 lbs as indicated on the pilot's weight and balance calculation sheet. This corrected calculation indicated that the airplane was about 64 lbs over the gross weight limit for the accident flight, not the 4 lbs over the gross weight limit that was calculated by the pilot.

A review of FAA-H-8083-3, Airplane Flying Handbook, revealed: "...At the same gross weight, airplane configuration, and power setting, a given airplane will consistently stall at the same indicated airspeed if no acceleration is involved. The airplane will, however, stall at a higher indicated airspeed when excessive maneuvering loads are imposed by turns, pull-ups, or other abrupt changes in its flight path. Stalls entered from such flight situations are called "accelerated maneuver stalls. Failure to take immediate steps toward recovery when an accelerated stall occurs may result in a complete loss of flight control. At any given airspeed, the load factor increases as angle of attack increases, and the wing stalls because the angle of attack has been increased to a certain angle. The speed at which a wing will stall is proportionate to the square root of the load factor."

According to the load factor chart in FAA Advisory Circular 61-23C, Pilot's Handbook of Aeronautical Knowledge, a bank angle of 45 degrees will produce a load factor of 1.4, a bank angle of 60 degrees will produce a load factor of 2, and a bank angle of 80 degrees will produce a load factor of 6 (or 3 times the stalling speed).

A review of the "Stall Speeds" chart in the 172M Skyhawk Information Manual revealed that at maximum gross weight, the most rearward center of gravity, and with a 10 degree flap setting, the airplane would stall at the following calibrated airspeeds:

- 1) At a bank angle of 20 degrees, the stall speed would be about 54 knots.
- 2) At a bank angle of 40 degrees, the stall speed would be about 59 knots.
- 3) At a bank angle of 60 degrees, the stall speed would be about 74 knots.

Pilot Information

Certificate:	Private	Age:	38, Male
Airplane Rating(s):	Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 3 Without Waivers/Limitations	Last FAA Medical Exam:	11/01/2006
Occupational Pilot:		Last Flight Review or Equivalent:	07/01/2006
Flight Time:	74 hours (Total, all aircraft), 7 hours (Total, this make and model), 30 hours (Pilot In Command, all aircraft), 4 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	Registration:	N19952
Model/Series:	172M	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	17260882
Landing Gear Type:	Tricycle	Seats:	4
Date/Type of Last Inspection:	05/01/2007, 100 Hour	Certified Max Gross Wt.:	
Time Since Last Inspection:	83 Hours	Engines:	1 Reciprocating
Airframe Total Time:	4952 Hours at time of accident	Engine Manufacturer:	Lycoming
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	O-320-E2D
Registered Owner:	Twin Cities Air Services LLC	Rated Power:	160 hp
Operator:	Twin Cities Air Services LLC	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	TAN, 43 ft msl	Distance from Accident Site:	11 Nautical Miles
Observation Time:	1052 EDT	Direction from Accident Site:	133°
Lowest Cloud Condition:	Clear	Visibility	10 Miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	9 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	210°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.04 inches Hg	Temperature/Dew Point:	29° C / 19° C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	MANSFIELD, MA (1B9)	Type of Flight Plan Filed:	None
Destination:	MANSFIELD, MA (1B9)	Type of Clearance:	None
Departure Time:	1030 EDT	Type of Airspace:	

Airport Information

Airport:	MANSFIELD MUNI (1B9)	Runway Surface Type:	Asphalt
Airport Elevation:	122 ft	Runway Surface Condition:	Dry
Runway Used:	32	IFR Approach:	Unknown
Runway Length/Width:	3500 ft / 75 ft	VFR Approach/Landing:	Unknown

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:	1 Fatal, 2 Serious	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Fatal, 2 Serious	Latitude, Longitude:	42.007778, -71.191389

Administrative Information

Investigator In Charge (IIC):	Eric H Alleyne	Report Date:	09/26/2008
Additional Participating Persons:	Edward Stalzer; FAA/FSDO; Boston, MA		
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 pubinq@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](#).