National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: MIA98FA045	Aircraft Registration Number: N12172
Occurrence Date: 12/24/1997	Most Critical Injury: Fatal
Occurrence Type: Accident	Investigated By: NTSB

Location/Time

Nearest City/Place	State	Zip Code	Local Time	Time Zone	
RALEIGH-DURHAM	NC	27623	2008	EST	

Airport Proximity: Off Airport/Airstrip

Distance From Landing Facility: 1

Aircraft Information Summary

Aircraft Manufacturer	Model/Series	Type of Aircraft
Cessna	172M /172M	Airplane

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 December 24, 1997, about 2008 eastern standard time, a Cessna 172M, N12172, registered to a private individual, operating as a 14 CFR Part 91 personal flight, crashed shortly after takeoff from Raleigh-Durham International Airport, Raleigh-Durham, North Carolina. Instrument meteorological conditions prevailed and an IFR flight plan was filed. The aircraft was destroyed, and the instrument rated private pilot sustained fatal injuries. The flight departed 2 1/2 minutes before the accident.

The pilot used N12172 to commute to his hospital emergency room practice in Florence, S. C., from his home in Ahoskie, N. C. The pilot and N12172 arrived at the Raleigh-Durham Airport on December 19, 1997, and N12172 was parked until December 24, 1997, on the ramp of Piedmont Aviation, a local FBO. During that time the pilot and his family flew commercially to Denver for a vacation. On the day of the accident, the pilot and family had returned to Raleigh-Durham, where the family drove home, and the pilot planned to fly N12172 to his work in Florence.

According to taped conversations between a person identifying himself as the pilot of N12172 and Raleigh-Durham AFSS, for the time frame planned for his flight, a cold front was moving through the area. A low pressure area was centered west of the Carolinas, "pushing to the east" and a high pressure area prevailed to the northeast of the Piedmont area with clearing not forecast until about 0800 the next morning. The observed and forecast weather along his intended route, in general, was; ceilings between 200 and 1200 agl, reduced visibility in rain, mist, fog, and an occasional thunderstorm. En-route winds at the requested altitude, 6,000 feet, were 190 degrees at 32 to 34 knots, and level 3 precipitation could be expected nearer Florence.

A person identified as the pilot of N12172 received five weather briefings from the Raleigh-Durham Automated Flight Service Station for an IFR flight: one at 1709 where he says, "I'm not gonna file IFR, I'm gonna check again", another at 1806, where he suggests that he will get a new forecast at 7 P.M., a third at 1904 where he says, "thank you sir, I'll think this over a minute", a fourth at 1915 where he files his IFR flight plan to Florence, and the final brief at 1939. When the AFSS briefer queries the pilot about his choice of alternate airports, the pilot mentions his concern about a suitable alternate and answers, " Raleigh-Durham, barely".

According to transcripts of communications with the FAA ATCT at Raleigh-Durham, shortly after takeoff , the pilot made the following transmissions at the times indicated: (1) 0106:38, he read back a new altimeter setting given by the local controller by repeating, "two nine eight eight one seven two, (2) 0107:20, "...do you..(unintelligible).."

National Transportation Safety Board

FACTUAL REPORT

AVIATION

NTSB ID: MIA98FA045

Occurrence Date: 12/24/1997

Occurrence Type: Accident

Narrative (Continued)

, (3) 0107:21, when requested by the local controller to state his heading, the pilot of N12172 responded, "172 has got uh a vacuum problem". The departure clearance would have required a right turn after takeoff, but radar data shows N12172 commencing a left turn that continued until ground impact about 1.3 miles northwest of the tower on a heading of about 82 degrees.

PERSONNEL INFORMATION

The pilot's current logbook was not recovered. At the time of the pilot's application for his third class medical on August 8, 1997, he had stated his flight time as 693 hours with 100 hours flown within the last 6 months. FBO personnel in Florence estimated the pilot had been commuting there by private airplane for about 1.5 years.

AIRCRAFT INFORMATION

Neither the airplane nor the engine logbooks could be located. The only airplane records obtained were the various work orders and billing statements from those FBOs known to have been patronized by the pilot. According to the pilot's family, it would be likely that two round trips from the pilot's home to his work, about 6 hours, could be added to the airplane's total tachometer time since its annual inspection to estimate airframe total time.

The airplane had been modified with the Penn Yan Aero 180 HP Superhawk conversion STC, (SA 703GL) by Williamsburg Aviation of Williamsburg-Jamestown Airport, Virginia, in November, 1994. A standby vacuum system STC manufactured by Precise Flight, Inc., the SVS III, (SA2162NM) had been installed by Carolina Air Services, Inc., of Florence, South Carolina, in December, 1996. The FBO also replaced the artificial horizon with an overhauled unit in early May, 1997. The altimeter, static system, and altitude reporting feature of the transponder had been inspected for proper operation on June 28, 1997, by Bay Avionics of Hampton Roads, Virginia. The airplane had undergone a vacuum pump change due to a sheared shaft, by ISO Aero Service, Inc. of Kinston, North Carolina, on November 25, 1997, at a tachometer recorded time of 2264 hours. The airplane had undergone an annual inspection by Carolina Air Services, 20 days before the accident, on December 4, 1997, at a tachometer recorded time of 2275.7 hours.

METEOROLOGICAL INFORMATION

The 1951weather observation for the Raleigh-Durham Airport was: 6 miles visibility in light rain and mist, sky condition, 400 feet overcast, temperature, 46 degrees F., dew point, 46 degrees F., altimeter setting, 29.89 inches of mercury, remarks, rain ended 2006, and rain began 2027. WRECKAGE AND IMPACT INFORMATION

The wreckage of N12172 was located about 1.3 miles northwest of the geographic center of the Raleigh-Durham International Airport, about 500 yards west of the west perimeter road called Aviation Parkway, in dense pinewoods within the airport boundary, but outside the fenced area. Initial impact appeared to be with tree tops about 40 feet above ground level by the left wing, in a near wings level attitude, on a heading of 82 degrees. The wreckage path was about 120 feet long with some scattering of fuselage fragments up to 180 feet from initial impact. The descent angle, relative to the terrain, was about 18 degrees from initial collision to ground collision. The left wing and strut were found on the ground near initial impact. The main wreckage consisted of the fuselage, engine and propeller, empennage, and right wing. There was a postcrash fire from about the instrument panel forward. Most through-firewall hoses and cockpit instruments were destroyed by the fire. The propeller, still attached to the crankshaft flange, exhibited uniform rearward bending of both blades, with about 4 inches fractured and missing from one blade. Chordwise striations and burnishing, heavier at the leading edges, were evident on both blades. Two sections of pine tree trunk exhibited helical shaped carving with faint transfer of gray paint. The engine had torn loose from its mount and was displaced right-of-centerline, about 4 feet from the main wreckage, inverted, and exhibited evidence of impact with trees prior to ground collision. The vacuum pump, oil filter/housing and oil-cooler bypass, alternator, carburetor, and muffler assembly had broken their respective mounts, and were found detached.

All airframe components were found in the immediate area. Flight controls and airframe components showed no signs of precrash failure or malfunction. Integrity of all flight controls was established.

National Transportation Safety Board

FACTUAL REPORT

AVIATION

NTSB ID: MIA98FA045

Occurrence Date: 12/24/1997

Occurrence Type: Accident

Narrative (Continued)

It was reported the ELT activated on impact, but was not recovered. The ELT bracket and antenna were found intact. Examination of the engine at the crash site revealed the engine assembly rotated and continuity was established with the crankshaft, camshaft, valve train, and accessory drive gears. Both magnetos produced spark at the four leads during hand rotation. The top spark plugs exhibited deposit coloring consistent with normal engine operation. Engine oil appeared new and uncontaminated. The carburetor exhibited fracture consistent with impact overload. Teardown inspection of the carburetor revealed no abnormality. The carburetor bowl contained about 1 inch of uncontaminated fuel and testing for water content was negative. There was no evidence of foreign object ingestion or obstruction of the induction system. The muffler assembly was torn loose and located about 15 feet forward of the engine. The interior coloration was indicative of normal engine operation, and no obstructions to exhaust gas path were noted. Each wing fuel tank had been compromised at a welded seam.

The vacuum pump mounting was fractured, but mechanical integrity was established for the shear coupler and vane and rotor assembly. No evidence of vacuum system contamination within the pump could be found. The vacuum regulator, filter, and associated plumbing were destroyed. All vacuum system hose clamps were secure and tight. The pump-to-firewall vacuum hose had been torn at the firewall through-fitting, but the hose-end and clamp were secured to the fitting. Damage appeared to be impact related. Vacuum system plumbing aft of the firewall sustained fire damage, and system integrity was impossible to access. The suction gage was recovered and the needle was mechanically jammed to the off scale/high reading.

The cockpit control to the standby vacuum system was found pulled out to the "standby system selected" position. The shuttle valve at the other end of the cockpit control was also in the "standby system selected" position; however, the operating cable had been stretched by impact. Tubing to the sensing unit of the standby system that illuminates a light on the instrument panel placarded, "Instrument source warning/pump inop", when vacuum pressure falls to a predetermined level, 3.5 inches Hg. in this case, was found disconnected. According to factory engineers, had that tubing connection worked loose in-flight, the result would have been illumination of the warning light, but no actual vacuum source malfunction.

Certified repair station disassembly inspection, with NTSB oversight, of the airplane's two primary gyro-operated flight instruments revealed no evidence of in-flight gyro malfunction. One gyro withstood the impact still mounted in its bearings. The other gyro had broken loose from its bearings and showed rotational scoring. The vacuum pump was examined twice for evidence of in-flight malfunction, once at the accident site, and again at an FAA certified instrument repair facility. No indication of precrash malfunction could be found.

MEDICAL AND PATHOLOGICAL INFORMATION

Post-mortem examination of the pilot was performed on December 26, 1997, at the Chief Medical Examiner's Office, Chapel Hill, N.C., by Dr. Robert L. Thompson, and revealed cause of death to be traumatic injuries of head and chest. No findings that could be considered causal were noted. Toxicological tests were conducted at the Federal Aviation Administration Research Laboratory, Oklahoma City, Oklahoma. The tests were negative for ethanol, carbon monoxide, basic, acidic, and neutral drugs.

TESTS AND RESEARCH

Except for fire damaged hoses, the standby vacuum system was removed as a unit and sent to the manufacturer for examination, with FAA oversight. The manufacturer found no component failure, and installation recommendations appeared to have been complied with. The FAA inspector, as well as the manufacturer's representative, tested the vacuum warning sense tubing for installation integrity and for tolerance to twisting and tension and reported no in-flight disconnection of the tubing was likely. Additionally, the interior of the sense tubing or the bayonet fitting that mates to the tubing contained no dirt or foreign matter as would be the case if the tubing were disconnected prior to ground impact. (For additional information see Record of Telephone Call).

The Cessna Aircraft Company publication, "Pilot Safety and Warning Supplements" contains a chapter dedicated to loss of gyro instruments and vacuum pump failures entitled, "Instrument Power".

National Transportation Safety Board

FACTUAL REPORT

AVIATION

NTSB ID: MIA98FA045

Occurrence Date: 12/24/1997

Occurrence Type: Accident

Narrative (Continued)

Under the heading, "Gyro Spin Down", the text mentions that vacuum driven gyro operated instruments normally operate between 20,000 and 24,000 rpm and can take up to 10 minutes or more to spin down after power is removed. Total elapsed time between N12172 acknowledging that he is cleared for takeoff and his transmission about a vacuum problem was 2 1/2 minutes.

ADDITIONAL INFORMATION

The aircraft wreckage, less the components listed on the Release of Aircraft Wreckage, was released to Lieutenant Melvin M. Vinson of the Raleigh Durham Airport police on December 27, 1997. The wreckage was subsequently released to Mr. James Brewer, representing the operator's insurance company, on December 31, 1997. All components retained by the NTSB for further examination were returned to Inflite Aviation, 2272 Lakeshore Rd. S., Denver, North Carolina, 28037, per instructions from Mr. Brewer.

National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: MIA98FA045

Occurrence Date: 12/24/1997

Occurrence Type: Accident

Landing Facility/Approach Information

Airport Name	Airport ID:	Airport Elevation	Runway Used	Runway Length	Runway Width
RALEIGH-DURHAM INT'L	RDU	436 Ft. MSL	5R	7500	150

Runway Surface Type: Asphalt

Runway Surface Condition: Wet

Approach/Arrival Flown:

VFR Approach/Landing: None

Aircraft Information

Aircraft Manufacturer	Model/Series	Serial Number
Cessna	172M /172M	17261858

Airworthiness Certificate(s): Normal; Utility

Landing Gear Type: Tricycle

Amateur Built Acft?	Number of Seats:	Certified Max Gross Wt.	Number of Engines:
No	4	2300 LBS	1

Engine Type:	Engine Manufacturer:	Model/Series:	Rated Power:
Reciprocating	Lycoming	O-360A4M	180 HP

- Aircraft Inspection Information

Type of Last Inspection	Date of Last Inspection	Time Since Last Inspection	Airframe Total Time
Annual	12/1997	6 Hours	2282 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
ROBERT F. BROWN	419 N. WEST ST. P.O.BOX 752	AHOSKIE	NC	27910

Operator of Aircraft	Street Address	City	State	Zip Code
ROBERT F. BROWN	419 N. WEST ST. P.O.BOX 752	AHOSKIE	NC	27910

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

National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: MIA98FA045

Occurrence Date: 12/24/1997

Occurrence Type: Accident

First Pilot Information

Name	City	State	Date of Birth	Age
On File	On File	On File	On File	42

Sex: M | Seat Occupied: Left | Occupational Pilot? Doctor/Dentist | Certificate Number: On File

Certificate(s): Private

Airplane Rating(s): Single-engine Land

Rotorcraft/Glider/LTA: None

Instrument Rating(s): Airplane

Instructor Rating(s): None

Current Biennial Flight Review?

Medical Cert.: Class 3 | Medical Cert. Status: Valid Medical--w/ waivers/lim. | Date of Last Medical Exam: 08/1997

- 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	700									
Pilot In Command(PIC)										
Instructor										
Instruction Received										
Last 90 Days										
Last 30 Days										
Last 24 Hours										

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

Flight Plan/Itinerary

Type of Flight Plan Filed: IFR

Departure Point	State	Airport Identifier	Departure Time	Time Zone
Same as Accident/Incident Location		RDU	2005	EST

Destination	State	Airport Identifier
FLORENCE	SC	FLO

Type of Clearance: IFR

Type of Airspace: Class C

Weather Information

Pilot's Source of Wx Information:

Flight Service Station

National Transportation Safety Board

FACTUAL REPORT AVIATION

NTSB ID: MIA98FA045

Occurrence Date: 12/24/1997

Occurrence Type: Accident

Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
RDU	1951	EST	436 Ft. MSL	1 NM	165 Deg. Mag.

Sky/Lowest Cloud Condition: Unknown 0 Ft. AGL

Condition of Light: Night/Dark

Lowest Ceiling: Overcast 400 Ft. AGL

Visibility: 6 SM

Altimeter: 29.00 "Hg

Temperature: 8 °C

Dew Point: 8 °C

Weather Conditions at Accident Site: Instrument Conditions

Wind Direction: 100

Wind Speed: 9

Wind Gusts:

Visibility (RVR): 0 Ft.

Visibility (RVV) 0 SM

Precip and/or Obscuration:

Accident Information

Aircraft Damage: Destroyed

Aircraft Fire: Ground

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					
- TOTAL ABOARD -	1				1
Other Ground	0	0	0		0
- GRAND TOTAL -	1	0	0		1

National Transportation Safety Board

FACTUAL REPORT
AVIATION

NTSB ID: MIA98FA045

Occurrence Date: 12/24/1997

Occurrence Type: Accident

Administrative Information

Investigator-In-Charge (IIC)

ALAN C. STONE

Additional Persons Participating in This Accident/Incident Investigation:

DEREK WATTS
WINSTON SALEM, NC

BUCK B WELCH
WICHITA, KS

MARK W PLATT
VAN NUYS, CA