National Transportation Safety Board
Aviation Accident Final Report

Location:	Taylor, TX	**Accident Number:**	DFW08LA097
Date & Time:	04/10/2008, 0900 CDT	**Registration:**	N300FL
Aircraft:	RAYTHEON B200	**Aircraft Damage:**	Minor
Defining Event:	Cabin safety event	**Injuries:**	1 Fatal, 1 None
Flight Conducted Under:	Part 91: General Aviation - Personal		

Analysis

While performing a postmaintenance flight, the pilot heard a loud, high-pitched "screaming" sound emanating from behind the instrument panel. The pilot returned to the airport and radioed the mechanic regarding the loud sound. When the pilot brought the airplane to a stop, the sound diminished. With engines idling, the mechanic opened the door of the airplane to troubleshoot the malfunction. Cabin pressure existed when the mechanic attempted to open the entry door and the door "blew" outward. The door struck the mechanic's head. An examination of the airframe revealed that a vacuum line had separated from the vacuum controller at a T-fitting. The T-fitting was located in the area that the mechanic had worked in during installation of the vertical speed indicator. The disconnected line disabled the entire vacuum system and subsequently disabled the airplane's pressurization system outflow valve. Prior to the mechanic opening the door, the pilot reported turning the environmental controls off which stopped the in-flow of cabin pressure. However, because the vacuum system could not drive the safety valve open, the airplane remained pressurized. An examination of the door assembly and differential-pressure-sensitive diaphragm revealed no anomalies. Testing results conducted on the diaphragm were consistent with a new diaphragm. The door system met the certification requirements of 14 Code of Federal Regulations (CFR) Part 23. The Beech 200 has no means of alerting outside personnel that the airplane is still pressurized while on the ground other than resistance against the release-button, nor is it required to by 14 CFR Part 23. The Pilot's Operating Handbook onboard the airplane had not been updated. A current version of the checklist would have directed the pilot to verify a zero pressure differential during the after-landing checklist.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:
The failure of the pilot and mechanic to ensure that the airplane was depressurized prior to actuating the door. Contributing to the accident was the failure of the vacuum system.

Findings

Aircraft	Vacuum system - Failure (Factor)
	Pressurization control system - Malfunction
Personnel issues	Identification/recognition - Pilot (Cause)
	Identification/recognition - Maintenance personnel (Cause)

Factual Information

On April 10, 2008, approximately 0900 central daylight time, a Raytheon B200, N300FL, was substantially damaged during ground operations at Taylor Municipal Airport (T74), Taylor, Texas. The airplane was owned and operated by Alaro Inc.. Visual meteorological conditions prevailed at the time of the accident. The flight was being conducted under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91 without a flight plan. The commercial pilot, the sole occupant of the airplane, was not injured. However, a mechanic who was attempting to board the airplane was struck by the airplane's entry door and fatally injured. The flight had returned from a local post-maintenance flight check.

According to the pilot, the vertical speed indicator (VSI) had been replaced and a flight check was conducted on the airplane. During flight, the pilot heard a loud, high-pitched, "screaming" sound emanating from behind the instrument panel. The pilot returned to the airport and radioed the mechanic regarding the loud sound. When the pilot brought the airplane to a stop, the sound diminished. With engines idling, the mechanic opened the door of the airplane to troubleshoot the malfunction. Cabin pressure existed when the mechanic attempted to open the entry door and the door "blew" outward. The door struck the mechanic's head.

An inspector from the Federal Aviation Administration (FAA) examined the airplane with technical assistance from Hawker Beechcraft. The examination revealed that a vacuum line had separated from the vacuum controller at a T-fitting. The T-fitting was located in the area that the mechanic had worked in during installation of the VSI. The disconnected line disabled the

entire vacuum system and the airplane's pressurization system safety valve is actuated by vacuum system pressure. According to the manufacturer's Pilot Operating Handbook (POH), the safety valve serves three purposes: to provide pressure relief in the event of malfunction of the normal outflow valve, to allow depressurization of the pressure vessel when the cabin pressure switch is moved to the "DUMP" position, and to keep the airplane unpressurized when it is on the ground when the left landing-gear safety (squat) switch is compressed. Prior to the mechanic opening the door, the pilot reported turning the environmental controls off which stopped the in-flow of cabin pressure. However, because the vacuum system could not drive the safety valve open, the airplane remained pressurized.

The POH states that inadvertent door opening is protected by the requirement to depress a release button adjacent to the door handle, making door operation a two-handed motion. The door is further protected by a differential-pressure-sensitive diaphragm incorporated into the release-button mechanism. In the presence of differential pressure, it will be increasingly difficult to actuate the release-button.

A review of Title 14 CFR Part 23 revealed that each external passenger or crew door must have a "means to lock and safeguard the door against inadvertent opening during flight by persons, by cargo, or as a result of mechanical failure." In addition, each door of the pressure vessel on a pressurized airplane must have a "means to lock and safeguard each external door, including cargo and service type doors, against inadvertent opening in flight, by persons, by cargo, or as a result of mechanical failure or failure of a single structural element, either during or after closure."

The door assembly was examined at the Hawker Beechcraft factory by the NTSB and FAA with the assistance of Hawker Beechcraft. In order to test the integrity of the diaphragm, 16 pounds per square inch (psi) differential pressure was applied. After 1 minute, the diaphragm leaked 0.05 psi, which is within the accepted tolerance of 2 psi for retaining pressure. The diaphragm was next tested across a range of zero to 6 inches of differential pressure to calculate the force required to initially and fully actuate the release button. With 0 psi, it would take 4 pounds to initially actuate and 6.5 pounds at fully actuate the release button mechanism. With 0.5 psi, it would take 8 pounds to initially actuate and 12 pounds to fully actuate the release-button mechanism. With 6 psi, it would take 37 pounds to initially actuate and 46 pounds to fully actuate the release-button mechanism. Despite signs of wear, the accident diaphragm's provided resistance similar to a new diaphragm. Testing confirmed that the airplane's door could be opened while the airplane was still pressurized, but that action would require more force to overcome the resistance.

The B200 has no means of alerting outside personnel that an airplane is sill pressurized while on the ground other than resistance against the release-button. Pilots can read cabin pressure on a gauge located on the throttle quadrant.

The current POH is "C6," dated December 2004. Step 9 of the "After Landing" checklist, states "Pressurization Differential.....Verify 0." The POH the pilot operated with was revision "C" dated December 2000. Revision "C" direct pilots to check the pressure differential after landing. Federal Aviation Regulations do not require Part 91 operators to update the POH.

History of Flight

Unknown	Sys/Comp malf/fail (non-power)
Standing-engine(s) operating	Cabin safety event (Defining event)

Pilot Information

Certificate:	Flight Instructor; Commercial	**Age:**	66, 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:**	No
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Instrument Airplane	**Toxicology Performed:**	No
Medical Certification:	Class 2 With Waivers/Limitations	**Last FAA Medical Exam:**	05/01/2007
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	01/01/2008
Flight Time:	29000 hours (Total, all aircraft), 8000 hours (Total, this make and model), 29000 hours (Pilot In Command, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	RAYTHEON	**Registration:**	N300FL
Model/Series:	B200	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	BB-1629
Landing Gear Type:	Retractable - Tricycle	**Seats:**	9
Date/Type of Last Inspection:	01/04/2008, Continuous Airworthiness	**Certified Max Gross Wt.:**	12500 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo Prop
Airframe Total Time:	4102.7 Hours as of last inspection	**Engine Manufacturer:**	Pratt & Whitney
ELT:	Installed, not activated	**Engine Model/Series:**	PT6A-42
Registered Owner:	Alaro Inc	**Rated Power:**	850 hp

Operator:	Alaro Inc	**Operating Certificate(s) Held:**	None
Operator Does Business As:	Alaro Inc	**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	GTU	**Distance from Accident Site:**	14 Nautical Miles
Observation Time:	0855 CDT	**Direction from Accident Site:**	291°
Lowest Cloud Condition:	Clear	**Visibility**	10 Miles
Lowest Ceiling:	Broken / 10000 ft agl	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	340°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.98 inches Hg	**Temperature/Dew Point:**	14°C / 4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	TAYLOR, TX (T74)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	

Airport Information

Airport:	TAYLOR MUNI (T74)	**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:	NA	**IFR Approach:**	Unknown
Runway Length/Width:		**VFR Approach/Landing:**	Unknown

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Minor
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	1 Fatal	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 1 None	**Latitude, Longitude:**	30.572500, -97.443056 (est)

Administrative Information

Investigator In Charge (IIC):	Jason T Aguilera	**Report Date:**	05/06/2009
Additional Participating Persons:	John V Bures; FAA FSDO; San Antonio, TX Neil Sandvik; Hawker-Beechcraft; Wichita, KS		
Publish Date:	05/06/2009		
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/.		