Aviation Investigation Final Report

Location:	Rapid City, South Dakota	**Accident Number:**	CEN09LA388
Date & Time:	June 15, 2009, 16:52 Local	**Registration:**	N4490M
Aircraft:	Beech B100	**Aircraft Damage:**	None
Defining Event:	Clear air turbulence encounter	**Injuries:**	1 Serious, 4 Minor
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled - Air Medical (Medical emergency)		

Analysis

The air-ambulance flight encountered clear-air turbulence during cruise descent. During the turbulence encounter, the patient's unrestrained upper-torso fell off the aircraft mounted stretcher assembly. After the turbulence had subsided, the patient's unrestrained head, neck, and upper-torso were laying off the stretcher in the center aisle. His restrained lower body remained attached to the stretcher which was elevated off the cabin floor. The cabin flight crewmembers stabilized the patient's neck before repositioning him back onto the stretcher. The airplane then made an uneventful landing at its intended destination. The patient suffered a fracture of the C3 cervical vertebra during the turbulence encounter. The stretcher's available over-the-shoulder restraints were not used because of an interference caused by a flexible lift system that was used to transfer the patient from the ambulance gurney to the aircraft's stretcher. After the accident the aeromedical transport company discontinued the use of the flexible patient lift system model used during the accident flight and required flight crewmembers to only use lift systems that allowed the use of the aircraft stretcher's available over-the-shoulder restraints.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The flight crewmembers' failure to secure the patient using the available over-the-shoulder restraints and the encounter with clear-air turbulence during cruise descent.

Findings

Aircraft	Passenger compartment equip - Incorrect use/operation
Personnel issues	Use of equip/system - Flight crew
Environmental issues	Clear air turbulence - Effect on personnel

Factual Information

History of Flight

Prior to flight	Aircraft loading event
Enroute-descent	Clear air turbulence encounter (Defining event)

On June 15, 2009, about 1652 mountain daylight time (mdt), a Beech B100 (King Air) airplane, N4490M, operated by Air Methods Corporation, encountered clear-air-turbulence while descending through 7,000 feet mean sea level (msl) en route to Rapid City Regional Airport (KRAP), Rapid City, South Dakota. Visual meteorological conditions prevailed during the flight. The air-ambulance flight was conducted in accordance with 14 Code of Federal Regulations (CFR) Part 135 while on an instrument flight plan. The patient was seriously injured as result of the turbulence encounter. The 4 flight crew members sustained minor injuries. The flight departed Gordon Municipal Airport (KGRN), Gordon, Nebraska, at 1619 mdt.

Before being loaded onto the airplane, the patient was lying on an ambulance gurney and was already secured to a flexible lift system at the waist and legs. The use of the flexible lift system allowed the easy transfer from the ambulance gurney to the aircraft-mounted stretcher assembly. The lift system comprised of a plasticized sheet and full body length foam pad. The patient was secured to this lift system using the available waist and leg straps.

For patient transfers, flight crewmembers grab the edges of the flexible lift system to lift and transfer the patient from the ambulance gurney to the airplane's stretcher. The airplane's stretcher also incorporated a full body pad, and its support frame articulated at the waist to elevate the patient's upper body from a supine position into an inclined position. The airplane's stretcher had leg, waist, and left and right over-the-shoulder straps. The over-the-shoulder straps combined at the waist strap buckle assembly.

The patient, who was already restrained in the flexible lift system by waist and leg straps, was then restrained to the airplane's stretcher using the stretcher's available waist and leg straps. The full body pad and plasticized sheet of the flexible lift system completely covered and prevented the use of the over-the-shoulder restraints installed on the airplane's stretcher.

During the flight, the stretcher's back support was raised into an inclined position for added patient comfort. During cruise descent, the airplane encountered clear-air-turbulence, during which the patient's upper-torso fell off the stretcher. After the turbulence encounter, the patient's unrestrained head, neck, and upper-torso were laying off the stretcher in the center aisle. His restrained lower body remained attached to the stretcher which was elevated off the cabin floor. The cabin flight crewmembers stabilized the patient's neck before repositioning him back onto the stretcher. The airplane then made an uneventful landing at its intended destination. The patient suffered a fracture of the C3 cervical vertebra during the turbulence

encounter.

After the accident, the aeromedical transport company discontinued the use of the flexible patient lift system model utilized during the accident flight and required flight crewmembers to only use lift systems that allowed the use of the aircraft stretcher's available over-the-shoulder restraints.

Pilot Information

Certificate:	Airline transport; Flight instructor	**Age:**	34,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	February 6, 2009
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	May 7, 2009
Flight Time:	3305 hours (Total, all aircraft), 516 hours (Total, this make and model), 3150 hours (Pilot In Command, all aircraft), 40 hours (Last 90 days, all aircraft), 1 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N4490M
Model/Series:	B100	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	BE-64
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	May 12, 2009 AAIP	**Certified Max Gross Wt.:**	11600 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo prop
Airframe Total Time:	9898 Hrs as of last inspection	**Engine Manufacturer:**	Garrett Airesearch
ELT:	C91 installed, not activated	**Engine Model/Series:**	TPE-331
Registered Owner:	Vesey Air, LLC.	**Rated Power:**	1428 Horsepower
Operator:	Air Methods Corporation	**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:	Black Hills Life Flight	**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KRAP,3204 ft msl	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	16:52 Local	**Direction from Accident Site:**	145°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	360°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.73 inches Hg	**Temperature/Dew Point:**	19°C / 10°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Gordon, NE (KGRN)	**Type of Flight Plan Filed:**	IFR
Destination:	Rapid City, SD (KRAP)	**Type of Clearance:**	IFR
Departure Time:	16:19 Local	**Type of Airspace:**	Class E

Wreckage and Impact Information

Crew Injuries:	4 Minor	**Aircraft Damage:**	None
Passenger Injuries:	1 Serious	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 4 Minor	**Latitude, Longitude:**	44.045276,-103.057502(est)

Administrative Information

Investigator In Charge (IIC):	Fox, Andrew
Additional Participating Persons:	Gary L Soldwich; Federal Aviation Administration - Rapid City FSDO; Rapid City, SD
Original Publish Date:	December 20, 2010
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=74135