



National Transportation Safety Board Aviation Accident Final Report

Location:	Charlotte Amali, VI	Accident Number:	MIA08LA149
Date & Time:	06/01/2008, 1250 AST	Registration:	N411FS
Aircraft:	AERO COMMANDER 500-B	Aircraft Damage:	Substantial
Defining Event:	Sys/Comp malf/fail (non-power)	Injuries:	7 None
Flight Conducted Under:	Part 135: Air Taxi & Commuter - Non-scheduled		

Analysis

While inbound for landing, undetected fatigue cracks in a hard aluminum hydraulic line near a flared end cracked through the tube wall thickness resulting in the loss of hydraulic fluid and the inability of the pilot to fully extend all landing gears using either the normal or emergency landing gear extension systems. During the landing roll, the left main landing gear collapsed. Fatigue cracking of the tube was likely caused by vibratory loads due to in-service bends and improper clamping; the tube was only clamped in one location though two clamps were required. Additionally, wear on the tube in the area of the clamp was consistent with a loose clamp. The airplane was last inspected in accordance with an Annual/100-Hour inspection on April 30, 2008, or approximately 62 hours earlier. Inspection of the tube for condition is required during the 100 hour inspection.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The failure of maintenance personnel to identify inadequate clamping of the aluminum line during inspection, and the undetected fatigue cracking of the line which resulted in the loss of hydraulic fluid.

Findings

Aircraft	Hydraulic, main system - Fatigue/wear/corrosion (Cause)
	Hydraulic power system - Incorrect service/maintenance (Cause)
Personnel issues	Scheduled/routine maintenance - Maintenance personnel (Cause)

Factual Information

On June 1, 2008, about 1250 Atlantic standard time, an Aero Commander 500-B, N411FS, registered to a private individual and operated by Bevins Air Service, Inc., experienced collapse of the left main landing gear during the landing roll at Cyril E. King Airport (TIST), Charlotte Amalie, U.S.V.I. Visual meteorological conditions prevailed at the time and a visual flight rules (VFR) flight plan was filed for the 14 Code of Federal Regulations (CFR) Part 135 non-scheduled, international, passenger flight from Cane Field (TDCF), Roseau, Dominica. The airplane was substantially damaged and the certificated commercial pilot and six passengers were not injured. The flight originated about 1050, from TDCF.

The pilot stated that after takeoff the flight proceeded to the destination airport and when it was approximately 20 miles from there, the airplane's hydraulic pressure which actuates the landing gear and flaps, began to fluctuate. He lowered the landing gear using the normal gear extension system but the left main landing gear did not go into the down and locked position. He advised the control tower of the situation and attempted to extend the left main landing gear by bouncing the right main landing gear on the runway but was unsuccessful. He departed, and attempted to extend the left main gear using the emergency extension procedure which was also unsuccessful. The flight returned for landing, and during the landing roll, the left main landing gear collapsed.

The National Transportation Safety Board was notified of the accident on July 21, 2008. According to the mechanic who inspected the airplane after the accident, he found a cracked aluminum tube in the left hand nacelle. The tube was cracked beneath the sleeve at the flare for the B-nut which attaches at the inboard side of the left engine nacelle. The tube was supported by one phenolic block about midway along its length. Additionally, all hydraulic fluid was drained from the primary stand pipe reservoir. The tube, P/N 6790246-101, identified as Tube Assembly Hydraulic Pressure, was removed from the airplane and sent to the National Transportation Safety Board (Safety Board's) Materials Laboratory, in Washington, D.C.

Examination of the tube by personnel from the Safety Board's Materials Laboratory revealed that the majority of the crack was perpendicular to the surface and contained faint crack arrest positions consistent with fatigue cracking. Small ratchet marks were noted in the central portion of the crack adjacent to the outside diameter surface, indicating that initiation of the crack was from multiple origin areas at the beginning of the flared end. No evidence of material defects or mechanical damage was noted in the origin area. The flared end of the tube adjacent to the fracture surface showed evidence of use but did not contain large amounts of deformation. The flared end at the opposite end of the tube was out-of-round. Further examination of the tube revealed a circumferential wear area approximately 4 inches from the middle radius of a 90-degree bend near the cracked end of the tube; the wear was consistent of being made by a loose clamp. A second area of wear was noted near the first but on the opposite side of the tube. The tube also exhibited gradual bends that were not consistent with discrete bends associated with a newly manufactured tube.

Personnel from the airplane Type Certificate Data Sheet holder reported that the cracked tube is required to be supported within 6 inches of the tangent point of each bend; therefore, a minimum of two clamps are required. Inspection of the tube for condition is specified in the 100-Hour inspections.

The operator reported that the total time on the tube is the same as the airplane total time, or

18,153.9 hours. Additionally, the mechanic reported the airplane is maintained in accordance with the manufacturer's inspection program, and the last Annual/100-Hour inspection occurred on April 30, 2008. The airplane total time at that time was 18,092.3 hours.

History of Flight

Enroute-cruise	Sys/Comp malf/fail (non-power) (Defining event)
Landing-landing roll	Landing gear collapse

Pilot Information

Certificate:	Commercial	Age:	27, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 2 Without Waivers/Limitations	Last Medical Exam:	08/16/2007
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	06/29/2007
Flight Time:	4677 hours (Total, all aircraft), 3150 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	AERO COMMANDER	Registration:	N411FS
Model/Series:	500-B	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	1162-85
Landing Gear Type:	Retractable - Tricycle	Seats:	7
Date/Type of Last Inspection:	04/30/2008, Continuous Airworthiness	Certified Max Gross Wt.:	6750 lbs
Time Since Last Inspection:	62 Hours	Engines:	2 Reciprocating
Airframe Total Time:	18092 Hours	Engine Manufacturer:	Lycoming
ELT:	Installed, not activated	Engine Model/Series:	TIO-540 SER
Registered Owner:	ROMAIN BEVIN G	Rated Power:	310 hp
Operator:	Bevins Air Service, Inc.	Air Carrier Operating Certificate:	On-demand Air Taxi (135)
Operator Does Business As:		Operator Designator Code:	B5VA

Meteorological Information and Flight Plan

Observation Facility, Elevation:	TIST, 23 ft msl	Observation Time:	1253 AST
Distance from Accident Site:		Condition of Light:	Day
Direction from Accident Site:		Conditions at Accident Site:	Visual Conditions
Lowest Cloud Condition:	Clear	Temperature/Dew Point:	29° C / 22° C
Lowest Ceiling:	None	Visibility	10 Miles
Wind Speed/Gusts, Direction:	15 knots, 150°	Visibility (RVR):	
Altimeter Setting:	30 inches Hg	Visibility (RVV):	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Roseau (TDCF)	Type of Flight Plan Filed:	VFR
Destination:	Charlotte Amali (TIST)	Type of Clearance:	VFR
Departure Time:	1050 AST	Type of Airspace:	

Airport Information

Airport:	Cyril E. King (TIST)	Runway Surface Type:	Asphalt
Airport Elevation:		Runway Surface Condition:	Dry
Runway Used:		IFR Approach:	None
Runway Length/Width:	7000 ft / 150 ft	VFR Approach/Landing:	Full Stop; Straight-in

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Substantial
Passenger Injuries:	6 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	7 None		

Administrative Information

Investigator In Charge (IIC):	Timothy W Monville	Adopted Date:	09/30/2009
Additional Participating Persons:	Manuel Perez; FAA/FSDO; San Juan, PR		
Publish Date:	08/04/2011		
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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