



National Transportation Safety Board Aviation Incident Final Report

Location:	Covington, KY	Incident Number:	NYC011A072
Date & Time:	01/03/2001, 0832 EST	Registration:	N933CA
Aircraft:	Bombardier CL-600-2B19	Aircraft Damage:	Minor
Defining Event:		Injuries:	46 None

Flight Conducted Under: Part 121: Air Carrier - Scheduled

Analysis

During climbout, an airframe vibration developed. All gauges, readouts, synoptic pages, and airplane controls were normal. The crew contacted their maintenance base and attempted to troubleshoot the problem, but could not determine its cause. The vibration remained unchanged until the airplane leveled off at 7,000 feet during an approach. At that time, the crew felt a bump, then the vibration completely ceased. The airplane landed, and taxied to the gate without further incident. Post-flight inspection revealed that the number 1 exhaust fairing was missing, and that the left, aft fuselage had a dent. The 30 bolts that would have normally attached the exhaust nozzle assembly to the exhaust frame were all missing, "without a trace." Seven months earlier, the tailpipe was found loose. Ten bolts were replaced, and the rest were re-torqued. The last inspection on the airplane had been completed about 2 weeks earlier, 105 hours prior to the incident. Company personnel had previously found cracked bolts on exhaust flanges from other engines. Laboratory examination of used bolts from another engine revealed no anomalies. Engine shop buildup and shop exit manuals were subsequently revised to make the installation and torquing of exhaust nozzle bolts a required inspection item.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: Missing exhaust nozzle bolts for undetermined reasons. A factor was inadequate maintenance inspection of the affected area.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION

Phase of Operation: APPROACH

Findings

1. EXHAUST SYSTEM, EXHAUST CONE/TAILPIPE (JET ENGINE) - SEPARATION
2. (F) MAINTENANCE, INSPECTION - INADEQUATE - COMPANY MAINTENANCE PERSONNEL
3. (C) MISCELLANEOUS, BOLT/NUT/FASTENER/CLAMP/SPRING - MISSING

Factual Information

On January 3, 2001, at 0832 Eastern Standard Time, a Bombardier CL600-2B19 Regional Jet (CRJ), N933CA, operating as Comair flight 5360, sustained minor damage when an engine exhaust separated from the airplane, while approaching Cincinnati/Northern Kentucky International Airport (CVG), Covington, Kentucky. The 3-person crew and the 43 passengers were not injured. Visual meteorological conditions prevailed at the time of the incident. The flight was operating on an instrument flight rules flight plan, between Minneapolis-St. Paul International Airport (MSP), Minneapolis, Minnesota, and Covington. The scheduled passenger flight was conducted under 14 CFR Part 121.

According to the captain, when he reported onboard, a mechanic advised him that the number 1, A system jet overheat loop was not operating normally, and that "he would defer it."

Startup, taxi, and takeoff "occurred without incident;" however, during the climb, an airframe vibration developed. All gauges, readouts, synoptic pages, and airplane controls were normal. The crew contacted Comair maintenance, and attempted to troubleshoot the problem, but could not determine its cause.

The flight attendant reported to the captain that the passengers were either not aware of, or not concerned with the vibration.

The flight continued, and the vibration remained unchanged until the airplane leveled off at 7,000 feet during the approach to Covington. At that time, the crew felt a bump, and then the vibration completely ceased. Again, all gauges, readouts, synoptic pages, and airplane controls were normal. The airplane landed, and taxied to the gate without further incident.

Post-flight inspection revealed that the number 1 exhaust fairing was missing, and that the left, aft fuselage had a dent in the vicinity of station 800, 9 inches below the vertical stabilizer.

According to a Federal Aviation Administration (FAA) inspector, the engine was removed after the incident, and taken to the company's maintenance facilities where an inspection was performed. The exhaust nozzle assembly would have normally been attached to the exhaust frame case with 30 bolts. All 30 bolts were missing, "with no trace." No visible damage was noted to the mating flange, other than what was characterized as "normal wear."

The exhaust frame case had marks on both sides, at approximately the 3 o'clock and 9 o'clock positions, about 6 inches forward of the mating flange. The marks appeared to be aluminum deposits. The exhaust nozzle assembly was never located.

Because Comair maintenance personnel had previously found cracked bolts connecting other exhaust flanges, the FAA inspector requested that the Safety Board examine sample bolts with over 6,600 hours of service. The bolts, which were not from the incident airplane, were also compared to new bolts. According to the metallurgist's factual report, there was no evidence of cracking or over-aging in the used bolts. The new bolts were within the tensile strength and hardness specifications required, and the hardness and the tensile strength results increased from the new bolts to the used bolts.

According to Comair maintenance personnel, on September 9, 1999, the engine was installed on the airplane. On October 18, 1999, the C-sump o-rings were replaced, which required the removal of the tailpipe. There was no mention in the maintenance records of changing the bolts. On May 3, 2000, the tailpipe was found to be loose, and 10 bolts were replaced. The

remaining bolts were re-used and re-torqued.

The airplane was being inspected under an approved inspection program (AAIP). According to the operator's report, the last inspection was performed December 15, 2000, 105.7 hours prior to the incident.

According to the FAA inspector, subsequent to the incident, Bombardier was considering a bolt change. In addition, there was ongoing discussion about reusing bolts. In the meantime, Comair changed its engine shop buildup and shop exit manuals to make exhaust nozzle bolts a required inspection item.

Pilot Information

Certificate:	Airline Transport	Age:	34, 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:	Yes
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	Last FAA Medical Exam:	01/22/2001
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:			

Co-Pilot Information

Certificate:	Commercial	Age:	32, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Right
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 1 Valid Medical--w/ waivers/lim.	Last FAA Medical Exam:	01/15/2001
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Bombardier	Registration:	N933CA
Model/Series:	CL-600-2B19	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Transport	Serial Number:	7040
Landing Gear Type:	Retractable - Tricycle	Seats:	53
Date/Type of Last Inspection:	12/15/2000, AAIP	Certified Max Gross Wt.:	51000 lbs
Time Since Last Inspection:	105 Hours	Engines:	2 Turbo Fan
Airframe Total Time:	16298 Hours at time of accident	Engine Manufacturer:	GE
ELT:	Not installed	Engine Model/Series:	CF34-3A1
Registered Owner:	First Security Bank Utah	Rated Power:	9220 lbs
Operator:	COMAIR INC	Operating Certificate(s) Held:	Flag carrier (121)
Operator Does Business As:		Operator Designator Code:	COMR

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	CVG, 897 ft msl	Distance from Accident Site:	
Observation Time:	0851 EST	Direction from Accident Site:	
Lowest Cloud Condition:	Few / 800 ft agl	Visibility	6 Miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	6 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	210°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.39 inches Hg	Temperature/Dew Point:	-13°C / -14°C
Precipitation and Obscuration:			
Departure Point:	Minneapolis, MN (MSP)	Type of Flight Plan Filed:	IFR
Destination:	Covington, KY (CVG)	Type of Clearance:	IFR
Departure Time:	EST	Type of Airspace:	Class E

Wreckage and Impact Information

Crew Injuries:	3 None	Aircraft Damage:	Minor
Passenger Injuries:	43 None	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	46 None	Latitude, Longitude:	

Administrative Information

Investigator In Charge (IIC): Paul R Cox **Report Date:** 01/02/2002

Additional Participating Persons: Julio Figueroa; FAA/FSDO; Louisville, KY

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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