NATIONAL TRANSPORTATION SAFETY BOARD
OFFICE OF AVIATION SAFETY
WASHINGTON, D.C. 20594

October 1, 2006

Aircraft Maintenance Records Factual Report

A. ACCIDENT: DCA06MA064

LOCATION: Lexington, Kentucky

DATE/TIME: August 27, 2006, 0607 (EST)

AIRCRAFT: Bombardier CL-600-2B19 (CRJ-100), N431CA, S/N 7472

B. GROUP MEMBERS:

Group Chairman: Pocholo Cruz
National Transportation Safety Board
Washington, DC

Member: Michael Mizell
Comair, Inc.
Erlanger, Kentucky

C: SUMMARY

On August 27, 2006, about 0607 eastern daylight time, Comair flight 5191, a Bombardier CL-600-2B19 (CRJ-100), N431CA, crashed during takeoff from Blue Grass Airport, Lexington, Kentucky (LEX). The airplane, which had been cleared for runway 22, taxied onto runway 26 instead and ran off the end of runway 26. Of the 47 passengers and 3 crewmembers on board the airplane, 49 were killed, and 1 received serious injuries. The airplane was destroyed by impact forces and postcrash fire. The flight was operating under the provisions of 14 *Code of Federal Regulations* Part 121 and was en route to Hartsfield-Jackson Atlanta International Airport, Atlanta, Georgia (ATL).

The Maintenance Records Group met with Comair, Inc. representatives at the Comair, Inc. Technical Training Center in Erlanger, Kentucky on August 29, 2006 to review the maintenance records of the airplane. The Maintenance Records Group departed on August 31, 2006.

D: DETAILS OF THE INVESTIGATION

1.0 Air Carrier Certificates

Comair, Inc. (doing business as Comair Airlines), 77 Comair Blvd., Erlanger, Kentucky 41018, Certificate Number COMA005B, was originally issued by the Federal Aviation Administration (FAA) Louisville Flight Standards District Office (FSDO), Southern Region on August 31, 1984 and reissued again on July 26, 2004.

Comair, Inc. also received a Part 145 Repair Station Certificate (Certificate Number COMR005B) on October 20, 1980 and was reissued again on May 10, 2006, from the FAA's Louisville FSDO. The repair station, which is located at 1107 Aviation Blvd., Hebron, Kentucky, was approved with the following ratings: Radio Class 1, 2, and 3, Limited Instrument, Limited Accessory, Limited Airframe, Limited Non-Destructive Test.

See Attachment 1 for additional information.

2.0 Operations Specifications (OpSpecs)[1]

Comair, Inc. has a Part 121 Certificate, which included the standards, terms, conditions, and limitations contained in the FAA approved Operations Specifications (Parts D and E) were reviewed.

(a) Air carrier was authorized as a 14CFR Part 121 operation.

[1] Operations Specifications contains the authorizations, limitations, and certain procedures under which each kind of operation, if applicable, is to be conducted by the certificate holder.

(b) Per section D072 of the OpSpecs, the Continuous Airworthiness Maintenance Program (CAMP), authorized Comair Inc. to use the manufacturer/Comair maintenance and engine maintenance programs to maintain the airplanes.

(c) Per section D076 of the OpSpecs, Comair, Inc. was authorized to use short-term escalations of maintenance intervals on their fleet.

(d) Per section D090 of the OpSpecs, Comair, Inc. was authorized to utilize CASE[2] as a means of qualifying a vendor for services, parts, and materials to satisfy the requirements of 14 CFR Section 121.373.

(e) Per section D091 of the OpSpecs, Comair, Inc. was authorized to make arrangements with other organizations to perform substantial maintenance.

(f) Per section D095 of the OpSpecs, Comair, Inc. was authorized to use an approved Minimum Equipment List (MEL).

(g) Per section D485 of the OpSpecs, Comair, Inc. had an Aging Aircraft Inspection and Records Review.

(h) Per section E096 of the OpSpecs, Comair, Inc. was authorized for a Weight and Balance Program.

3.0 Aircraft Information

The airplane was manufactured by Bombardier Aerospace in Montreal, Canada in January 2001. The airplane had 14,536.2 total hours with 12,048 total cycles at the time of the accident.

The airplane was equipped with two General Electric CF-34-3A1 turbofan engines and a Honeywell Auxiliary Power Unit (GTCP36-150RJ). The engine and APU had accumulated the following operating times at the time of the accident:

[2] The Air Carriers section of the Nonprofit Coordinating Agency for Supplier Evaluations (C.A.S.E.) was organized as a means of sharing non-prejudicial supplier quality approval data among the membership airlines. This increases surveillance coverage of suppliers and thereby upgrades their quality programs. It also has an economic impact on each C.A.S.E. member by decreasing the cost of supplier surveillance and making their surveillance programs more effective.

		No.1 Engine	No.2 Engine	APU
Manufacture Date		11/30/1998	5/9/1994	3/19/98
Date Installed		8/3/2006	11/27/2005	10/10/05
Serial Number		807567	807160	P-392
Location of Engine /APU Installation		CVG	CVG	CVG
Total Time (engine / APU hours) at installation		17,120.0	25,581	17,159
Total Cycles (engine / APU cycles) at installation		14,732	23,949	18,037
Total Time of Airframe during engine / APU installation (hours)		14,391	12,789	12,415
Total Cycles of Airframe during engine / APU installation		11,930	10,624	10,303
Time Since Overhaul (hours)		145.2	1,746.3	1,580
Hours since last installation (cycles)		145.2 (118)	1,746.3 (1,424)	1,580 (2,575)
Total Time in hours and (Cycles) as of 8/27/2006		17,265 (14,850)	27,327 (25,373)	18,739 (20,612)

4.0 Maintenance and Inspection Programs

Comair Inc. Canadair CL-600-2B19 Maintenance Time Limits Manual, revision 23 was approved by the FAA on June 22, 2006.

Summary of Maintenance Program

Airworthiness Directives and Manufacturer Service Bulletin compliance were written into the program when applicable. Additionally, all Zonal and Structural tasks were written into the Comair, Inc. maintenance program.

Line Checks (LC) – Line checks consisted of inspection and lubrication tasks. LC1 tasks occurred every 3 calendar days or 25 flight cycles (whichever was greatest) and LC2 tasks occurred every 10 calendar days or 50 flight cycles (whichever occurred first). LC2 tasks incorporated and complied with all elements of an LC1 tasks.

Phase Checks – The tasks of the "A" check portion of the maintenance program have been divided into a "Phased" program. The phased program consisted of 24 equalized phase checks (Phase 1 through 24). The phase check was accomplished sequentially at an interval of 300 hours and accomplished the entire task requirement of the "A" program within the individual item's time constraints. Tasks formerly accomplished as an "out-of-check" task, such as Engineering Orders and Computer Time Tracked items have been incorporated into the program where appropriate.

Phase checks consisted of several task type(s) to assure the continued airworthiness of the aircraft's powerplant, systems, components and structures. It also consisted of a review of the maintenance logbook and performed at stations where qualified maintenance personnel were available. Each phase check was compiled of tasks that were unique and repetitive for that interval. For example, a Phase 2 may have contained items that were accomplished on the Phase 1 and Phase 3 packages. It may have also contained tasks that were accomplished on the remaining even numbered phases, as well as tasks performed at other intervals. They did not contain any elements of a Line Check. Each inspection was tracked separately by the maintenance records and scheduling department, and was scheduled on or before the interval specified.

Mid Check (MC) – The Mid Check tasks were a comprehensive inspection of installations with maximum access to components and systems in various zones. Qualitative and quantitative checks were performed on the components / systems and aircraft structure to detect deterioration. MC1 was accomplished 12 months after entry into service. MC was accomplished 12 months after completion of MC1 and repeated every 12 months thereafter. Mid Checks were applicable to aircraft that have been bridged into the HMV program.

Heavy Maintenance Visit (HMV) – The HMV tasks were a comprehensive inspection of installations with maximum access to components and systems in various zones. Qualitative and quantitative checks were performed on the components / systems and aircraft structure to detect deterioration. There were eight HMVs. Each HMV did not include a "Phase" or "A" checks. Each HMV was accomplished every 5,200 flight cycles or 24 months (whichever came first) after each HMV.

The following is a listing of the previous inspections accomplished on airplane N431CA.

CHECK	DATE	LOCATION	TOTAL TIME	TOTAL CYCLES
LC1	8/24/06	CVG**	14,521.2	12,032
LC2	8/27/06	LEX**	14,536	12,048
A Check (Phase 14)	7/24/06	DAY**	14,314	11,869
Mid Check	1/3/06	CVG**	13,020	10,819
HMV2 (2C*)	12/12/04	HOT**	10,085	8,230

*"C" Check program was being phased out. On March 23, 2005, a bridging program was in place to convert all "C" check tasks to HMV tasks.

** CVG - Cincinnati/Northern Kentucky International Airport, LEX – Blue Grass Airport, DAY – James Cox Dayton International Airport, HOT – Memorial Field Airport.

5.0 Continued Analysis And Surveillance System (CASS)[3]

Comair, Inc. conducted a daily CASS meeting to review the previous days maintenance discrepancies on the fleet. The CASS was an accepted program by the FAA. The program was in place to ensure the adequacy of the maintenance programs and to confirm the programs were properly followed and controlled.

In addition, Comair, Inc. conducted a monthly reliability meeting. The reliability report covered the preceding month's activity. The report was a statistical analysis of maintenance data collected from the following sources: (1) Departure delays; (2) Flight cancellations; (3) Pilot reports; (4) Component removals. The FAA Principal Maintenance Inspector or representatives attended most of the meetings. A review of the current report did not reveal any issues with the Comair, Inc. CL-600-2B19 fleet nor airplane N431CA.

6.0 Minimum Equipment List (MEL)[4]

Comair, Inc. was authorized to use an approved MEL on its CL-600-2B19 (CRJ-100) fleet per its OPS-SPECS.

[3] As established by 14 CFR Part 121.373, each certificate holder shall establish and maintain a system for the continuing analysis and surveillance of the performance and effectiveness of its inspection program and the program covering other maintenance, preventative maintenance and alterations and for the correction of any deficiency in those programs, regardless of whether those programs are carried out by the certificate holder or by another person.

[4] The FAA approved Minimum Equipment List contains a list of equipment and instruments that may be inoperative on a specific aircraft for continuing flight beyond a terminal point.

At the time of the accident, there were two open MEL items in the airplane logbook. The left jet pipe fire detection loop was inop on approach to Hopkins International Airport (CLE). The MEL was opened on August 25, 2006. The MEL was scheduled to be worked and was to be closed on September 4, 2006.

The other MEL was for the monitoring of the left engine chip detector due to a mechanic finding a chip detector light on. Comair, Inc. maintenance program called for a daily monitoring of the chip detector per the GE fault isolation manual (72-00-00 page 173) until lab results were known.

7.0 Supplemental Type Certificates (STC)[5]

Supplemental Type Certificates (STC), supplied by air carrier, was reviewed. The only STC installed on the airplane is listed below:

STC ST01408LA, EO 25-127, Installation of a reinforced cockpit door per C & D Interiors Controlled Drawing List, 4631000, Revision B, dated December 9, 2002, or later approved revision. The new cockpit door was installed on N431CA on January 25, 2003.

See Attachment 2 for additional information.

8.0 Airworthiness Directive (AD)[6] and Service Bulletin (SB) Summary

The air carrier provided AD and SB summaries, which were reviewed. The following were of note:

AD 94-22-06 – Stall Warning Computer Wiring. In order to prevent the loss of stall warning protection on the airplane, modify the stall protection computer input wiring in accordance with Alert Service Bulletin A601R-34-028 Rev. A. The AD was not applicable to N431CA per the effectivity serial number range of the AD.

AD 98-13-24 - Replacement of the Horizontal Stab Trim Control Unit (HSTCU). Within 18 months after the effective date of the AD, replace the HSTCU with a new HSTCU having part number 601R92301-9. As of the effective date of the AD, no person shall install on any airplane any HSTCU having part number 601R92301-5, 601R92301-7, or 601R92301-951. The AD was not applicable to N431CA per the effectivity serial number range of the AD.

[5] The FAA issues Supplement Type Certificates, which authorize a major change or alteration to an aircraft, engine or component that has been built under an approved Type Certificate.
[6] Airworthiness Directive (AD) is a regulatory notice sent out by the FAA informing the operator of an action that must be taken for the aircraft to maintain its airworthiness status.

AD 2000-14-17 – Modification of Air Data Reference System. Within 18 months after the effective date of the AD, modify the air data reference systems in accordance with Canadair Regional Jet Service Bulletin S.B. 601R-34-094, Revision 'B,' (Installation of a new Air Data Computer (ADC) 822-0372-140 and new Air Data Reference Panel (ARP) 622-9819-104). The AD was not applicable to N431CA per the effectivity serial number range of the AD.

AD 2002-16-02 - Horizontal Stab Trim Actuator (HSTA). Within 14 days after the effective date, revise Maintenance Requirements Manual to include life limits for the HSTA, Canadair part number (P/N) 601R92305-1 (vendor P/N 8396-2), and Canadair P/N 601R92305-3 (vendor P/N 8396-3), as specified in (TR) 2B-816. Life Limit of 19,200 flight hours. N431CA was installed with HSTA P/N: 8396-3 S/N: 1362; Airplane Total Time of 2,955 hours on April 2, 2002.

AD 2005-10-10 – Maintenance Program Change to HSTA. The AD was to detect and correct latent failure of the primary load path of the HSTA in conjunction with a failure of the HSTA secondary nut. N431CA was installed with HSTA P/N: 8396-3 S/N: 1362 at Aircraft Total Time of 2,955 hours. Although the initial inspection was not required until 5,000 total flight hours on the HSTA, the unit was inspected on January 3, 2006 on Work Order 197907. This inspection was performed by EC C27-42-103-01, Task Card CRJ-2-321012. Total time on the unit at time of the inspection was 1,449 hours.

AD 2006-05-11R1 – Shear Pin Inspection. This AD resulted from a report that the shear pin located in the input lever of two pitch feel simulator (PFS) units failed due to fatigue. This AD was issued to prevent undetected failure of the shear pin of both PFS units simultaneously, which could result in loss of pitch feel forces and consequent reduced control of the airplane. N431CA was inspected on August 27, 2006 at an Aircraft Total Time of 14,536 hours using EC -02444, Task Card SB-2-O0001. Repeat inspections occurred every 100 flight hours. Comair, Inc. performed this task at each LC2 inspection.

Comair, Inc. provided a SB listing for aircraft N431CA. No discrepancies were found during the review of the listing.

9.0 Aircraft Maintenance Logbook

The Airplane Maintenance Logbooks contained daily flight and maintenance information. The logbooks were reviewed from February 1, 2006 through August 28, 2006. The review indicated that the maintenance check records were up to date and complete. No discrepancies were noted.

See Attachment 3 for additional information.

10.0 Weight and Balance Summary

Per the Comair OpSpecs, the airplanes were to be weighed every thirty-six (36) calendar months.

The last documented weight and balance summary was accomplished on January 21, 2004 by Comair Inc. on work order 70488 in CVG.

Basic Empty Weight:	30,354 pounds
Arm:	529.19 inches
Moment:	16,063.11

Basic Operating Weight:	31,323.80 pounds
Arm:	519.52 inches
Moment:	16,273.25

The aircraft weight was recalculated due to the installation of an enlarged galley door to accommodate crew baggage on May 22, 2006.

Basic Operating Weight:	31,498.74* pounds
Arm:	516.05* inches
Moment:	16,255.10*

* Note: Several recalculations to the weight and balance of the aircraft were conducted between January 21, 2004 and May 22, 2006.

See Attachment 4 for additional information.

11.0 Service Difficulty Reports (SDR)[7]

From March 2003 through August 2006, Comair, Inc. reported eleven Operational/Structural Difficulty Reports to the FAA for aircraft N431CA. The breakdown of the SDRs are as follows: Structural (7), Flight Control (1), Fuel (1), Thrust Reverser (1), Pneumatics (1). Twelve additional SDRs (from August 2001 to April 2002) for the airplane were found in the FAA SDR database that Comair, Inc. did not have in the original records. All discrepancies to the airplane were rectified.

12.0 Major Repairs and Alterations

The airplane major repair records were reviewed. Five major structural repairs (left engine support beam cracked, right hand bottom side of engine support beam cracked, left 484 intercostal cracked, cargo bay landing plate cracked at fuselage station 574 and right 640 frame cracked) were identified and

[7] A Service Difficulty Report (SDR) is a report of the occurrence or detection of each failure, malfunction, or defect as required by 14 CFR 121.703.

corrected during the airplanes HMV visit on December 12, 2004 in Hot Springs, Arkansas.

The major alteration records were reviewed. Two major alterations were accomplished on the airplane since its delivery from Bombardier: Installation of a reinforced cockpit door (EO 25-127) on January 25, 2003 and Installation of Automatic External Defibrillator (EO 25-089) on January 31, 2001.

13.0 Vendors

The Maintenance Records Group reviewed the Approved Vendor List provided by Comair, Inc.. On the average, Comair, Inc. accomplished audits of the approved vendors on a two-year basis. As previously stated, Comair, Inc. was authorized to use CASE.

14.0 Method of Record Keeping

All routine and non-routine work forms, log books, serviceable part tags from components installed, deferred items records, engine records, etc., were entered into the aircraft computer records on a daily basis. A computer file history was maintained so that all inspections and checks were monitored for time limitations. The computer files were backed up daily to prevent total loss of history files. All hard copies of the paperwork were also kept by Comair, Inc..

15.0 Manuals

Comair, Inc. used the following manual to maintain the airworthiness of its fleet and management of the airline.

General Maintenance Manual (GMM) – A guide to company polices and procedures to be followed by all persons performing maintenance and inspection services on company aircraft.

Maintenance Time Limits Manual – FAA approved time limits for the accomplishment of the overhaul, replacement, periodic inspection and routine checks of the aircraft, and its component parts, accessories and appliances.

Job Instruction Card Manual – Provided maintenance and inspection personnel with information via work cards, used when accomplishing particular scheduled or unscheduled maintenance tasks.

Minimum Equipment List (MEL) – list of equipment and instruments that may be inoperative on a specific aircraft.

Weight and Balance Manual – Weight and balance procedures to be followed by maintenance and flight operations personnel on all aircraft operated by Comair, Inc.

Comair C.A.S.E. Air Carrier Section Policies and Procedures Manual – Policies and procedures to be followed by Comair, Inc. for the sharing of surveillance information for vendors listed on the CASE Register.

Manufacture Supplied Manuals - Aircraft Maintenance Manuals, Structural Repair Manuals, Wiring Diagrams, Overhaul Manuals, Illustrated Parts Catalog.

16.0 Navigation Components

Standby Compass

Maintenance Program:

There were no hard time limits for the removal of the component. A functional check was accomplished every 36-calendar months (MRB 34-22-01-01, Task Card CRJ-2-22809). The last functional check was accomplished on June 8, 2006 based on the history below.

History:

On June 8, 2006, the standby compass was replaced in CVG due to the compass being stuck several times on the incorrect heading. A compass swing was accomplished after the replacement. No other discrepancies with the standby compass were found in the six month review of the defect report.

Attitude Heading Reference System

Maintenance Program:

There were no hard time limits for the removal of the component. The component was replaced on condition.

History:

No discrepancies were found on the component in the six month review of the defect report.

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