NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

March 5, 2007

Human Performance

Addendum 1 - Human Performance Group Chairman's Factual Report

DCA06MA064

A. ACCIDENT

Location:	Bluegrass Airport, Lexington, KY
Date:	August 27, 2006
Time:	0607 eastern daylight time[1]
Operator:	Comair Airlines, DBA Delta Connection
Airplane:	Bombardier CRJ-100, N431CA

B. HUMAN PERFORMANCE INVESTIGATOR

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[1] All times are eastern daylight time (edt) based on a 24-hour clock, unless otherwise noted.

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D. SUMMARY

On August 27, 2006, about 0607 eastern daylight time[2], Comair flight 5191, a Bombardier CRJ-100, N431CA, crashed upon takeoff from Blue Grass Airport in Lexington, Kentucky (LEX). The airplane ran off the end of Runway 26 and was destroyed by impact forces and post crash fire. The flight had been cleared to takeoff from Runway 22. Of the 47 passengers and 3 crewmembers onboard, 49 were fatally injured and one (the first officer) survived in critical condition. The flight was operating under the provisions of 14 Code of Federal Regulations Part 121 and was en route to Atlanta, Georgia (ATL).

E. DETAILS OF THE INVESTIGATION

E.1 Initial On-Scene Taxi Observations

Members of the Operations/Human Performance Group conducted two observation activities, one during the day and the other in night conditions, at the Bluegrass Airport, Lexington, KY (LEX) on August 28, 2006.

During the daytime observation, group members traveled around the airport in a van shared with the Survival Factors/Airports Group. The purpose of this observation was to allow the group the opportunity to examine and become familiar with the taxiway markings, runway markings, airport signage, and other features in the airport environment along taxiway A, associated branch taxiways, construction areas, runways 22 and 26, and the ramp area. The activity was conducted about 1200 and weather conditions were overcast and rain.

During the nighttime observation, group members boarded a Comair CRJ100 for night taxi operations around the same areas examined during the daytime observation. The observation began about 2230. Weather conditions were broken overcast with no precipitation and good visibility. Ramp, taxiway, and runway surfaces were dry. The

[2] All times are eastern daylight time based on a 24-hour clock, unless otherwise noted.

airplane was positioned on the ramp near the gate that flight 5191 departed from. The airplane taxied along the taxi route used by flight 5191 and taxied down runway 26 to a point just past the intersection of runways 26 and 22 before turning around and taxiing down runway 26 to taxiway C to the ramp. The airplane then taxied to runway 22 using the former A5 taxiway. Upon reaching runway 22 the airplane taxied down the runway to taxiway C before making portions of both circuits again for other group members to conduct observations.

Operations/Human Performance group members present agreed on the following observations:

Taxi to the hold short line for runway 26

- Two runway holding position signs for 4-22 were visible as the airplane taxied on taxiway A past C.
- The taxiway marked with a taxiway location sign A6 was consistent with a taxiway identified as A4 in the Jeppesen airport diagram current at the time of the accident.

At the hold short line for runway 26

- The taxiway location sign and the runway holding position sign was on the left.
- The taxiway centerline split into three paths after the hold short line for runway 26.
    - The right centerline led to the old taxiway A, which was blocked by barricades with flashing red lights.
    - The middle centerline arced slightly to the left across runway 26 to the new taxiway A (designated A5 on the Jeppesen taxiway chart)
    - The left centerline arced more to the left into the centerline of runway 26. This path was inside the runway 26 numbers.
- The white runway numbers were visible to the right of the aircraft's nose with the aircraft lights in the taxi configuration. The concrete in the area around the numbers was light in color and provided relatively low contrast to the numbers.
- With taxi lighting on (located in the wing root) the taxi centerline markings were visible but appeared darker than the surrounding area as compared to their appearance with the takeoff lighting configuration (which included two landing lights in the nose) where they appeared brighter than the surrounding area.

In position on runway 26

- Edge lines on runway 26 were illuminated by aircraft lights in the Comair standard takeoff configuration. The markings appeared bright and reflective. With only the taxi light on the markings were visible but not as bright.
- Runway centerline striping was visible.
- The runway numbers were positioned behind the airplane and not visible.
    - The heading on left and right nav displays were 265 and 262 respectively.

- A runway holding position sign for runway 4-22 was visible to the left of the aircraft's nose.
- No runway lights associated with runway 26 were illuminated
- Edge lights for runway 22 were visible.
- The first distance remaining marker "2" on the right side of runway 26 was not visible
- The end of the runway was not visible and it was a dark horizon. Group members described the view as a black hole except for red obstruction lights on a shack to the right of runway 26 and on radio towers NW of the airport.
- The runway surface was brighter near the airplane than it was further down the runway.
- There were taxiway lights visible from that position to the left and right of the aircraft. There were more on the left side than on the right.

In position on runway 22 at A (old A5)

- 1000 foot markers were visible and illuminated by the Comair standard takeoff lighting configuration.
- Centerline striping was visible and illuminated by the Comair standard takeoff lighting configuration.
- Edge lights for runway 22 were visible and with balanced brightness left and right. Approximately 10 pair of runway edge lights were visible. No runway end identifier lights were visible.
- Although the edge lines were visible their appearance was less distinct as compared to their appearance on runway 26.
  - The end of the runway was not visible and it was a dark horizon.
- Ramp floodlights and terminal lighting was visible.

E.2 Follow-on Photo Documentation

Members of the Operations and Human Performance groups met at LEX on September 25, 2006 to obtain images from a representative airplane taken along the accident taxi route.

E.2.1 Objectives

1. Photo-document signage, surface markings, and lighting, along the taxi and takeoff path used by Comair 5191.

2. Photo-document signage, surface markings, and lighting, at runway 22 taxiway A hold short line, and in position on runway 22.

3. Photo-document the view of the test airplane from tower.

E.2.2 Weather and Ambient Lighting

The taxi testing was conducted during the hours of darkness starting at about 2330 and continued until about 0430 on September 26. Runway surfaces were dry. The average weather conditions for the testing was: clear, greater than 10 miles visibility, no precipitation and no moon.

Airport lighting was consistent with that in place at the time of the accident on August 27. Intensity of runway 22 lighting was set at 3 and taxiway lighting was set at 2.

E.2.3 Airplane configuration

A "sister ship" CRJ-100 airplane was used for the testing. The engines were off and the APU provided electrical power. The left cockpit seat was removed to position the tripod for the pictures. The airplane's lighting was consistent with Comair standard lighting configurations for taxi and takeoff, as appropriate.

E.2.4 Test results

The airplane was towed into each of the positions (Attachment 1) and the tug was disconnected. The group elected not to take photographs at positions 4, 10, and 14.

E.2.4.1 Cockpit Pictures

Digital photographs were taken at each location from the left cockpit seat area at the approximate design eye reference position (Attachment 2).

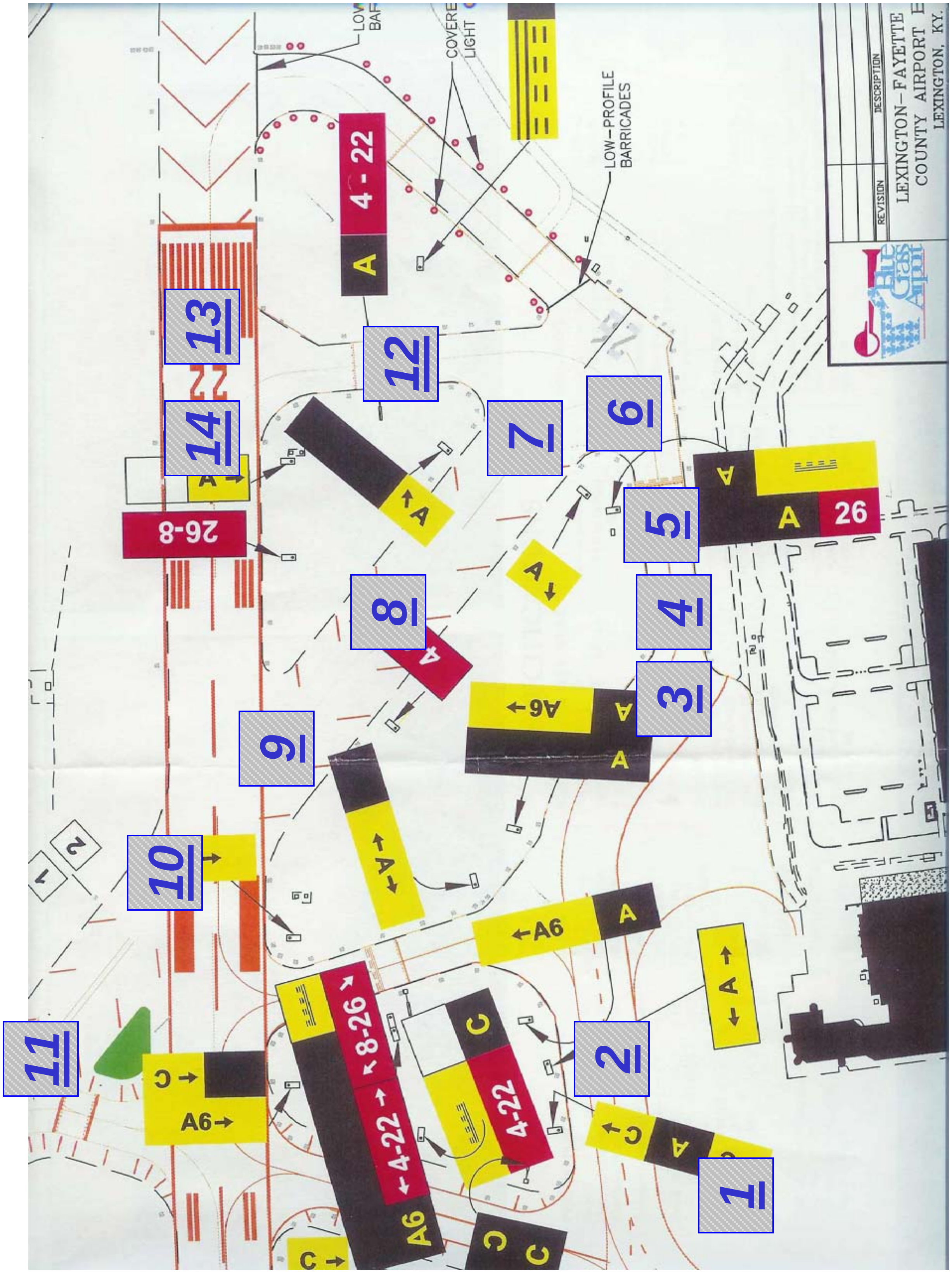
The group agreed that the resultant photographs did not accurately represent the actual visual conditions that were physically observed from the cockpit. The multiple light sources of varying intensities tended to cause almost all the photographs to be overexposed. Most of the overexposed photographs show more objects external to the cockpit than were visible to the group. In addition, most lighted airport signs are unreadable, many photographs are blurred, had reflections, and/or light refraction (i.e. ghosting). See Section 1 above for the Human Performance and Operational Factors group observations during the on-scene taxi test for more details.

E.2.4.2 ATC Control Tower

35mm photographs were taken at each location that the airplane stopped (Attachment 3). The camera was positioned at normal eye height at the approximate location where the controller would have stood when working local control duties.

See Air Traffic Control Group Chairman's Factual report for a discussion of the visual observations made by the ATC group during the on-scene taxi test.

ATTACHMENT 1: TAXI TEST POSITIONS (PAGE 6-7)


LOW-PROFILE BARRICADES
REVISION
DESCRIPTION
LEXINGTON-FAYETTE COUNTY AIRPORT
LEXINGTON, KY.
4 - 22
A
26-8
26
A6
8-26
4-22
C
1
2
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14

ATTACHMENT 2: IMAGES FROM TEST AIRPLANE COCKPIT

Figure 1. Position 3 - Forward view towards RW 26 hold short line. (Image is overexposed. RW 8-26 sign washed out. Horizon was not visible.)

Figure 2. Position 5 – Forward view of RW 26 numbers, taxi lines, and hold short line. (Image is overexposed. Horizon was not visible.)

Figure 3. Position 6 – Forward view towards RW 22 hold short. (Image is overexposed. RW 4-22 sign washed out. Horizon was not visible.)

Figure 4. Position 6 – View through right windshield of barricade. (Image is overexposed. Horizon was not visible.)

Figure 5. Position 7 – Forward view down RW 26. (Image is overexposed. RW 4-22 sign washed out. Horizon and distant structures were not visible.)

Figure 6. Position 7 – View through right windshield of RW 22 hold short line. (Image is overexposed. Horizon was not visible. RW 4-22 sign washed out and refracted.)

Figure 7. Position 8 – Forward left view down RW26. (Image is overexposed. Runway 4-22 sign washed out. Horizon and end of RW was not visible.)

Figure 8. Position 9 – Forward right view down RW26. (Image is overexposed. Horizon, end of RW, RW remaining signs, other structures were not visible.)

Figure 9. Position 11 – Forward left view down RW26. (Image is overexposed. Horizon, end of RW, RW closed "X", other structures were not visible.)

Figure 10. Position 11 – Forward right view down RW26. (Image is overexposed. Horizon, end of RW, RW closed "X", other structures were not visible.)

Figure 11. Position 13 – Forward view from the end of RW 22. (Image is overexposed. Horizon, RW 26-8 sign, other structures were not visible.)

ATTACHMENT 3: PHOTOGRAPHS OF TEST AIRPLANE TAKEN FROM CONTROL TOWER

Figure 1. View of Test Airplane in Position 1

Figure 2. View of Test Airplane in Position 3

Figure 3. View of Test Airplane in Position 5

Figure 4. View of Test Airplane in Position 6

Figure 5. View of Test Airplane in Position 7

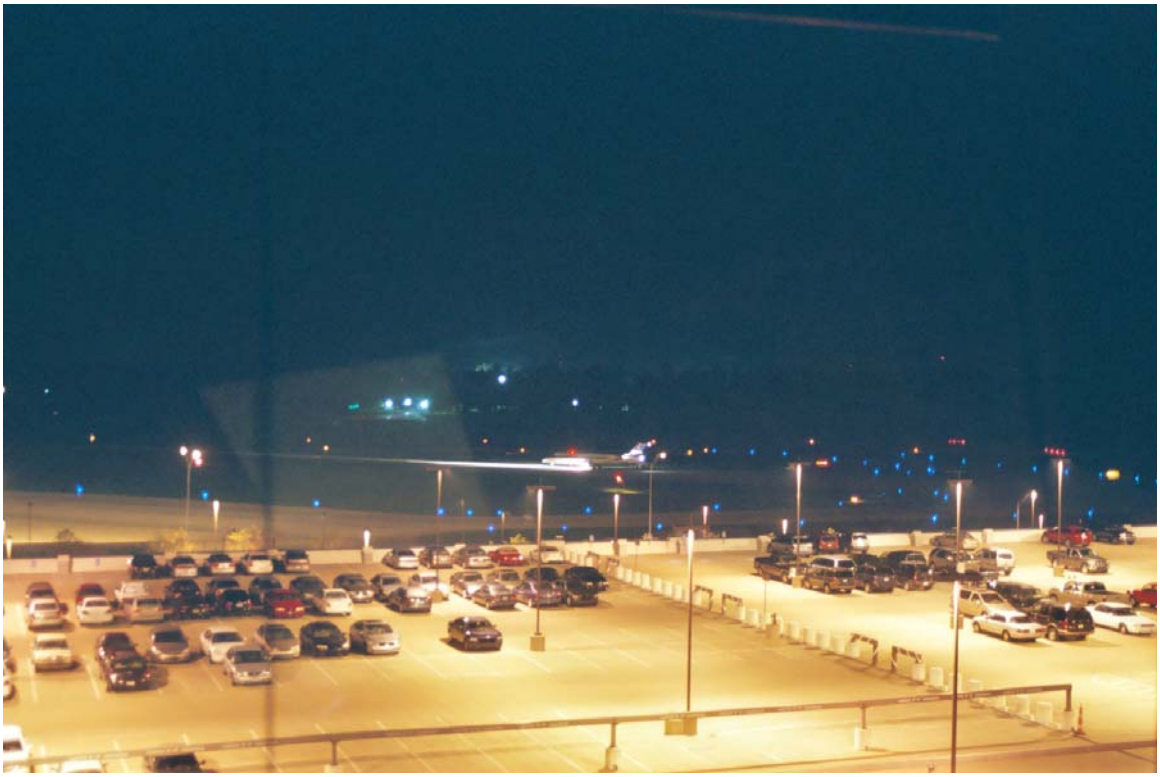

Figure 6. View of Test Airplane in Position 8

Figure 7. View of Test Airplane in Position 9

Figure 8. View of Test Airplane in Position 11

Figure 9. View of Test Airplane in Position 12

Figure 10. View of Test Airplane in Position 13

Figure 11. View of tower cab position