

Docket No. SA-538

Exhibit No. 12-A

NATIONAL TRANSPORTATION SAFETY BOARD

Washington, D.C.

Cockpit Voice Recorder (CVR)
Factual Report of Group Chairman

(54 Pages)

**NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Vehicle Recorder Division
Washington, D.C. 20594**



GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

DCA13MA133

**By
Bill Tuccio, Ph.D.**

WARNING

The reader of this report is cautioned that the transcription of a cockpit voice recorder audio recording is not a precise science but is the best product possible from a Safety Board group investigative effort. The transcript or parts thereof, if taken out of context, could be misleading. The transcript should be viewed as an accident investigation tool to be used in conjunction with other evidence gathered during the investigation. Conclusions or interpretations should not be made using the transcript as the sole source of information.

NATIONAL TRANSPORTATION SAFETY BOARD

Vehicle Recorder Division
Washington, D.C. 20594

January 28, 2014

Cockpit Voice Recorder - 12

Group Chairman's Factual Report By Bill Tuccio, Ph.D.

A. EVENT

Location: Birmingham, Alabama
Date: August 14, 2013
Aircraft: Airbus A300-600, N155UP
Operator: United Parcel Service, Flight 1354
NTSB Number: DCA13MA133

B. GROUP

A group was convened on August 16, 2013*.

Chairman: Bill Tuccio
Aerospace Engineer
National Transportation Safety Board

Member: Nathan K. Rohrbaugh
Flight Data Analyst
Federal Aviation Administration

Member: Captain Will Ashlock
Assistant Chief Pilot SDF Operations
United Parcel Service (UPS)

Member: Captain Rudy Canto
Director, Flight Operations Technical
Airbus

Member: Captain John West
Airbus A-300 Instructor
Independent Pilots Association (IPA)

* The Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile (BEA), the ICAO accredited representative, was invited to participate in the group but declined the invitation.

C. SUMMARY

On August, 14, 2013, at about 0447 central daylight time (CDT), United Parcel Service (UPS) flight 1354, an Airbus A300-600, N155UP, crashed short of runway 18 while on approach to Birmingham-Shuttlesworth International Airport (BHM), Birmingham, Alabama. The captain and first officer were fatally injured and the airplane was destroyed. The scheduled cargo flight was operating under the provisions of 14 *Code of Federal Regulations* (CFR) Part 121 and originated from Louisville International-Standiford Field Airport (SDF), Louisville, Kentucky. A solid-state cockpit voice recorder (CVR) was sent to the National Transportation Safety Board's Audio Laboratory for readout. The CVR group meeting convened on August 16, 2013 and a full transcript was prepared for the accident flight contained on the 2-hour, 4-minute digital recording (see attached).

D. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Division's Audio Laboratory received the following CVR:

Recorder Manufacturer/Model: **L-3/Fairchild FA2100-1020**
Recorder Serial Number: **Unknown due to damage**

Recorder Description

Per federal regulation, turbine engine powered aircraft operating under 14 CFR Part 121 must be equipped with a CVR that records a minimum of the last 2 hours of aircraft operation; this is accomplished by recording over the oldest audio data. When the CVR is deactivated or removed from the airplane, it retains only the most recent 2 hours of CVR operation. This model CVR, the L-3/Fairchild FA2100-1020, is a solid-state CVR that records 2 hours of digital cockpit audio. Specifically, it contains a 2-channel recording of the last 2 hours of operation and separately contains a 4-channel recording of the last 30 minutes of operation. The 2-hour portion of the recording is comprised of one channel of audio information from the cockpit area microphone (CAM) and one channel that combines two audio sources: the captain's audio panel information and the first officer's audio panel information. The 30-minute portion of the recording contains 4 channels of audio data; one channel for each flight crew, one channel for the CAM audio information, and a fourth channel for a third crewmember.

Recorder Damage

Upon arrival at the audio laboratory, it was evident that the exterior of the CVR had sustained significant heat and minor structural damage, as shown in figures 1 and 2. The crash survival memory unit (CSMU) was removed from the CVR, as shown in figure 3. The internal memory "puck" was removed from the CSMU and did not appear to have any heat or structural damage, as shown in figure 4. The stacked memory boards comprising the memory puck were checked for heat or structural damage and none were found, as shown in figure 5. A new memory interface cable was installed in

accordance with the L-3 procedures. The digital audio was successfully downloaded from the memory board using an NTSB surrogate recorder.

Figure 1. CVR after removal from aircraft.



Figure 2. CVR in NTSB laboratory.



Figure 3. Removal of CSMU.

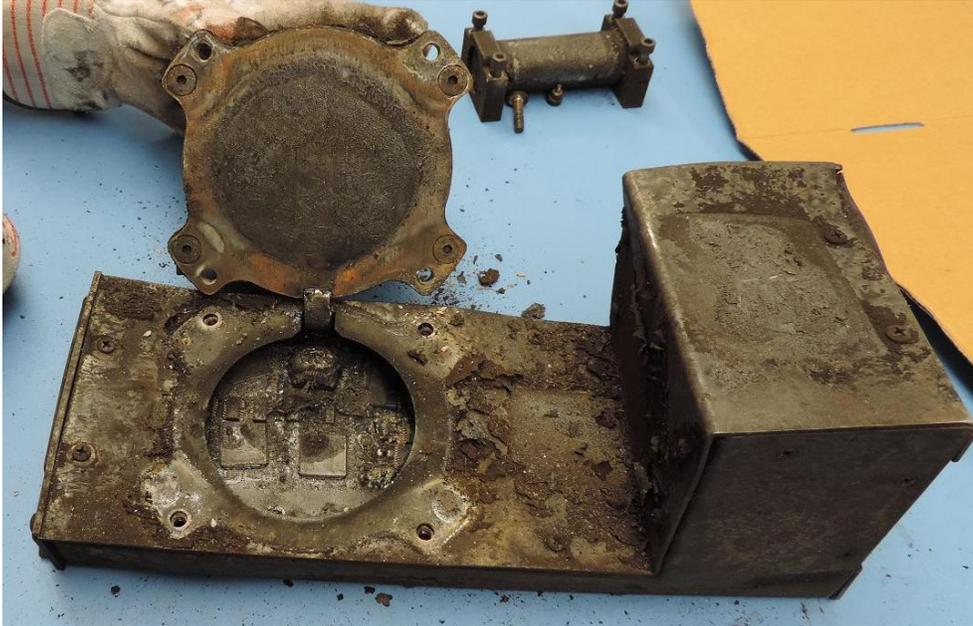


Figure 4. Memory "puck" retrieved from CSMU.



Figure 5. Stacked memory boards within memory puck.



Audio Recording Description

For the 2-hour portion of the CVR recording, each channel contained good quality[†] audio information. As shown in the table below, the 30-minute portion of the recording consisted of four channels of audio information. Each channel's audio quality is indicated in Table 1. Notably, channel number one contained only frequency shift keying data and no recorded sounds (nor was it required to by federal law).

Table 1: Audio Quality

Channel Number	Content/Source	Quality
1	N/A	N/A
2	First Officer	Excellent
3	Captain	Excellent
4	CAM	Good

Timing and Correlation

Timing of the transcript was established by correlating the CVR events to common events on the flight data recorder (FDR) and then offsetting this value to local CDT.

Radio transmissions made by the aircraft recorded on the 30-minute portion of the CVR at 1614.0, 1724.3, 1730.8, and 1736.7 CVR Elapsed Time (time from the start of the 30-minute recording) were correlated to the radio transmit microphone key parameter from the FDR at 253,098.03125, 253,208.03125, 253,215.03125, and 253,221.03125 FDR Subframe Reference Number (SRN). Each of the five radio transmissions acted as an anchor point for a linear interpolation between the remaining CVR events. This linear interpolation resulted in a range of possible offsets from

[†] See attached CVR Quality Rating Scale.

251,483.4 to 251,483.7; the midpoint of 251,483.55 was used resulting in the relationship:

$$\text{CVR Elapsed Time (30-minute)} + 251,483.55 = \text{FDR SRN}$$

Once a correlation between the CVR and FDR was established, a reference to local time was determined to be $\text{CDT} = \text{FDR SRN} - 236,085.48^{\ddagger}$. Combining the offsets resulted in the following relationship for the 30-minute CVR:

$$\text{CDT} = \text{CVR Elapsed Time (30-minute)} + 15398.07.$$

The 30-minute CVR recording was then aligned with the 2-hour CVR recording, resulting in the following relationship for the accident flight portion of the 2-hour CVR recording:

$$\text{CDT} = \text{CVR Elapsed Time (2-hour)} + 9,799.45.$$

Description of Audio Events

The recording began when another crew was flying UPS flight 321 from Mexico City to Louisville Kentucky. During the flight, the crew encountered a bird strike. After the aircraft landed, power was removed from the CVR. Power was restored to the CVR 30 minutes and 20 seconds after the start of the CVR recording.

Attachment I contains a full transcript of the remainder of the recording after power was restored to the CVR. The pre-flight portion of the transcript details: (a) equipment and avionics tests; (b) crew conversations about the flight, duty time regulations, and first officer rest; and (c) checklists leading to engine start and taxi. The in-flight portion of the transcript details the take-off and cruise from Louisville, briefing of the profile approach, the Localizer Runway 18 approach into Birmingham, and the subsequent crash.

[‡] See the Performance Group Chairman Factual Report and the Flight Data Recorder Group Chairman Factual Report available in the NTSB Public Docket for this accident.

CVR Quality Rating Scale

The levels of recording quality are characterized by the following traits of the cockpit voice recorder information:

Excellent Quality	Virtually all of the crew conversations could be accurately and easily understood. The transcript that was developed may indicate only one or two words that were not intelligible. Any loss in the transcript is usually attributed to simultaneous cockpit/radio transmissions that obscure each other.
Good Quality	Most of the crew conversations could be accurately and easily understood. The transcript that was developed may indicate several words or phrases that were not intelligible. Any loss in the transcript can be attributed to minor technical deficiencies or momentary dropouts in the recording system or to a large number of simultaneous cockpit/radio transmissions that obscure each other.
Fair Quality	The majority of the crew conversations were intelligible. The transcript that was developed may indicate passages where conversations were unintelligible or fragmented. This type of recording is usually caused by cockpit noise that obscures portions of the voice signals or by a minor electrical or mechanical failure of the CVR system that distorts or obscures the audio information.
Poor Quality	Extraordinary means had to be used to make some of the crew conversations intelligible. The transcript that was developed may indicate fragmented phrases and conversations and may indicate extensive passages where conversations were missing or unintelligible. This type of recording is usually caused by a combination of a high cockpit noise level with a low voice signal (poor signal-to-noise ratio) or by a mechanical or electrical failure of the CVR system that severely distorts or obscures the audio information.
Unusable	Crew conversations may be discerned, but neither ordinary nor extraordinary means made it possible to develop a meaningful transcript of the conversations. This type of recording is usually caused by an almost total mechanical or electrical failure of the CVR system.

Transcript of an L-3/Fairchild FA2100-1020 solid-state cockpit voice recorder[§], installed on an UPS Airbus A300-600 (N155UP), which crashed during approach at the Birmingham-Shuttlesworth International Airport (KBHM) in Birmingham, Alabama.

LEGEND

CAM	Cockpit area microphone voice or sound source
HOT	Flight crew audio panel voice or sound source
INT	Intercom sound source
RDO	Radio transmissions from N155UP
GND	Radio transmissions from Louisville ground controller
TWRSDF	Radio transmissions from Louisville airport tower controller
APRSDF	Radio transmissions from Louisville approach controller
CTRINDY	Radio transmissions from Indianapolis center controller
CTRMEM1	Radio transmissions from first Memphis center controller frequency
CTRMEM2	Radio transmissions from second Memphis center controller frequency
CTRATL1	Radio transmissions from first Atlanta center controller frequency
CTRATL2	Radio transmissions from second Atlanta center controller frequency
TWRBHM1	Radio transmissions from first Birmingham tower controller frequency
TWRBHM2	Radio transmissions from second Birmingham tower controller frequency
UPSRAMP	Radio transmissions from UPS ramp controller
VEH	Radio transmissions from a ground vehicle at Birmingham
AC	Radio transmissions from another aircraft
ATIS	Automated Terminal Information Service
EPGWS	Enhanced Ground Proximity Warning System
TCAS	Traffic Alert and Collision Avoidance System
WXRADAR	Weather Radar
-1	Voice identified as the captain
-2	Voice identified as the first officer
-MECH	Voice identified as a mechanic
-WB	Voice identified as weight and balance personnel
-?	Voice unidentified
*	Unintelligible word
#	Expletive
()	Questionable insertion
[]	Editorial insertion

[§] Due to damage, the serial number of the recorder could not be determined.

Note 1: Times are expressed in central daylight time (CDT).

Note 2: Generally, only radio transmissions to and from the accident aircraft were transcribed.

Note 3: Words shown with excess vowels, letters, or drawn out syllables are a phonetic representation of the words as spoken.

Note 4: A non-pertinent word, where noted, refers to a word not directly related to the operation, control or condition of the aircraft.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

START OF RECORDING**

03:14:07.3 CDT

START OF TRANSCRIPT

03:13:39.5

CAM [power applied to CVR]

03:14:07.3

CAM [unintelligible voice likely of first officer (f/o) of accident flight talking to an unidentified other person. f/o seems to be talking about range vs. payload mode.]

03:15:08.8

CAM [multiple sounds of tone, similar to ACARS message alerts, received prior to engine start] [also, multiple sounds of various unidentified voices and clicks and clunks and warnings]

03:26:42.7

WXRADAR monitor radar display. go around. windshear ahead. windshear ahead. windshear ahead. [crew initiated weather radar test]

03:28:21.7

EGPWS glideslope. pull up. terrain ahead pull up. [crew initiated EGPWS test]

03:28:39.6

CAM [accident crew talking about fuel transfer, mostly unintelligible]

03:31:40.8

TCAS TCAS Test. TCAS Test Pass. [crew initiated TCAS test]

03:32:21.3

CAM [first officer tests a panel, notes progress to captain]

** The CVR recording began 30 minutes and 20 seconds before the start of the transcript. See section "Description of Audio Events" in this report for a summary of content prior to the start of the transcript.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

03:34:11.1
CAM [crew discussion and entry of preliminary weight and balance information, partly unintelligible]

03:36:10.9
CAM-1 before start to the line.

03:36:12.8
CAM-2 okay.

03:36:13.9
CAM-2 oxygen.

03:36:14.7
CAM-1 checked one hundred percent.

03:36:15.3
CAM-2 checked one hundred percent.

03:36:16.3
CAM-2 flight *.

03:36:17.4
CAM-1 alright right side. fifteen twenty two and three zero zero eight.

03:36:23.3
CAM-2 fifteen twenty two and three zero zero eight set.

03:36:26.6
CAM-2 fuel quantity.

03:36:27.3
CAM-1 (** six) takeoff fuel (* four).

03:36:30.6
CAM-2 overhead panel.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

03:36:32.2

CAM-1 set.

03:36:32.7

CAM-2 brakes.

03:36:33.6

CAM-1 checked norm on.

03:36:34.2

CAM-2 parking brake.

03:36:34.8

CAM-1 set.

03:36:35.9

CAM-2 (down to the line complete).

03:36:37.2

CAM-1 alright.

03:36:38.5

CAM-1 [captain begins takeoff brief] (okay it's my turn again). (left seat three hundred and three thousand pound take off. flaps fifteen zero). profile.

03:36:46.1

CAM-1 five thousand three five right. pink page. basically ah...

03:36:53.5

CAM-1 ** weight * (thirty) five right. ** climbing right hand turn.

03:36:59.8

CAM-1 DME off the localizer. to a magnetic heading of zero zero five. basically stay clear of ah Humana. [chuckle].

03:37:07.7

CAM-2 (okay).

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

03:37:08.5

CAM-1 and uhhh. **. gonna be runway heading. five thousand. turn on course.

03:37:15.5

CAM-1 as far as the reject. eighty knots. call it out loud and clear. ahhh. after v-one ahh. high speed. critical items only. after v-one ** pink page. transition altitude eighteen thousand feet.

03:37:31.0

CAM-1 this is ramp six so ahh push outt'a here right turn. runway (three five right) is close. so uhm probably won't be a problem on the engines. (* call it complete).

03:37:41.9

CAM-2 (sounds good).

03:37:44.1

CAM-1 numbers.

03:37:45.7

CAM-2 * we're gonna be [unintelligible].

03:38:14.4

CAM [crew discussion, mostly unintelligible]

03:40:55.2

CAM [sound similar to ACARS alert, captain notes weight and balance]

03:40:58.8

INT-MECH good morning captain maintenance standing by.

03:41:22.5

CAM [first officer and captain discuss weight and balance and acknowledging ACARS message.]

03:41:53.0

CAM-1 we have two extra hours today in Birmingham.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

03:41:58.0

CAM-1 Rockford is only fourteen hours and * minutes rest. so you figure a thirty minute ride to-for hotel....

03:42:04.1

CAM-2 I know by the time you...

03:42:06.0

CAM-1 ...fourteen hours...

03:42:08.1

CAM-1 ...by the time you go to sleep you are down to about twelve. (wow).

03:42:14.5

CAM-1 this is where ah the passenger side you know the new rules they're gonna make out.

03:42:17.0

CAM-2 they're gonna make out.

03:42:18.3

CAM-1 yeah. we need that too.

03:42:20.2

CAM-1 I mean I [stammer^{††}] don't get that. you know it should be one level of safety for everybody.

03:42:23.1

CAM-2 it makes no sense at all.

03:42:24.3

CAM-1 no it doesn't at all.

03:42:25.5

CAM-2 I know. I know.

^{††} As used in this report, stammer is used to describe an utterance with many quick hesitations.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

03:42:26.2

CAM-1 nope.

03:42:27.9

CAM-1 which means that you know * real pilot.

03:42:30.4

CAM-1 you know.

03:42:32.1

CAM-2 and to be honest. [stammer] it should be across the board. to be honest in my opinion whether you are flying passengers or cargo or you know box of chocolates at night. if you're flying this time of day...

03:42:36.9

CAM-1 mm hmm.

03:42:44.9

CAM-1 yup.

03:42:48.2

CAM-1 (we work).

03:42:49.1

CAM-2 ...the you know [stammer] * fatigue is definitely...***.

03:42:49.7

CAM-1 yeah...yeah...yeah...**.

03:42:54.0

CAM-2 I was out and I slept today. I slept in Rockford. I slept good.

03:42:59.3

CAM-1 me too.

03:43:00.1

CAM-2 and I was out in that sleep room and when my alarm went off I mean I'm thinkin' I'm so tired...

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

TIME and SOURCE

INTRA-COCKPIT CONTENT

TIME and SOURCE

COCKPIT-GROUND COMMUNICATION CONTENT

03:43:06.1

CAM-1 I know.

03:43:06.1

CAM-2 ...and I slept today.

03:43:07.6

CAM-1 exactly.

03:43:08.1

CAM-2 I you know and we just are goin' to Birmingham. what if I was goin' to Burbank?

03:43:10.6

CAM-1 and these people---

03:43:11.8

CAM-1 really God I know these people have no clue. I know.

03:43:14.8

CAM-2 and I just don't understand what they---

03:43:17.5

CAM-1 and they you know they talk about cost. well on the passenger side it just costs just as much. the same thing. you know I mean give me a break. (and these companies are the ones that are really making the money). they got a lot nerve.

03:43:22.0

CAM-2 exactly.

03:43:23.6

CAM-2 exactly.

03:43:28.2

CAM-2 making the money.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

03:43:29.9

CAM-2 I know (I).

03:43:30.9

CAM-1 yeah they do that [stammering] * says [stammering] a lot about what they how they think about you.

03:43:34.3

CAM-2 * says a lot *.

03:43:38.6

CAM-WB **. [weight and balance personnel]

03:43:41.0

CAM-WB you'all ready to go?

03:43:42.6

CAM-1 yessir.

03:43:46.9

CAM-WB there you go.

03:44:05.6

CAM [individual words mostly unintelligible. crew discussing final weight and balance].

03:45:38.8

CAM [sound of clicks and snaps, indistinct voice saying thank you]

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

03:46:31.3

RDO-2 thirteen fifty four is load complete.

03:46:36.8

UPSRAMP thirteen fifty four you are cleared for immediate. you have a nice flight.

03:46:40.3

RDO-2 cleared for immediate have a good one.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

03:46:47.2

CAM [sound of clicks, clunks, similar to main entry door closing and captain sitting down in cockpit]

03:47:08.1

CAM **.

03:47:50.7

CAM-1 ** I think we are the lone ones on this ramp.

03:47:56.7

CAM-2 ** I think you're right.

03:47:58.5

CAM-1 yep. yeah.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

03:48:02.3

INT [captain and mechanic discuss engine start]

03:48:11.4

CAM-1 below the line.

03:48:19.8

HOT-2 logbook.

03:48:20.5

HOT-1 on board and signed.

03:48:21.4

HOT-2 seat belt sign.

03:48:22.5

HOT-1 it's on.

03:48:24.0

HOT-2 I'm supposed to say onboard and signed too.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

03:48:25.9

HOT-2 v-speeds.

03:48:26.3

HOT-1 one fifty three. one fifty seven. one sixty set.

03:48:28.2

HOT-2 fifty three. fifty seven. sixty set.

03:48:29.9

HOT-2 CDU.

03:48:30.6

HOT-1 set.

03:48:30.9

HOT-2 set. doors and windows.

03:48:31.9

HOT-1 closed slide armed.

03:48:32.5

HOT-2 closed slide armed. before start complete.

03:48:34.2

HOT-1 thank you.

03:48:35.1

INT-1 okay sir we are ready to start when you guys get all set down there.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

03:48:39.3

INT-MECH copy.

03:50:14.6

HOT-1 okay come on let's go.

03:50:16.8

HOT-2 I know. * what's goin' on now.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

03:50:58.3
INT-1 okay turning two.

03:50:59.6
HOT-1 turn two.

03:51:04.4
HOT-2 two's turning.

03:51:16.1
CAM [sound of engine, similar to engine start]

03:52:16.9
INT-1 turning one.

03:52:21.0
HOT-1 turn one.

03:52:24.2
CAM [sound of engine, similar to engine start]

03:53:49.7
HOT-1 after start.

03:53:50.7
HOT-2 after start.

03:53:51.7
CAM [sound of clicks and clunks, similar to after start first officer flow]

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

03:50:53.9
INT-MECH alright captain. marshalling is finally clear. you are cleared for start your discretion.

03:52:19.0
INT-MECH copy cleared for start.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

03:54:04.4
HOT-2 after start. anti-ice.

03:54:05.7
HOT-1 off.

03:54:06.3
HOT-2 ignition.

03:54:06.7
HOT-1 off.

03:54:07.1
HOT-2 auto-brakes.

03:54:07.7
HOT-1 max.

03:54:08.1
HOT-2 speed brakes.

03:54:08.7
HOT-1 armed.

03:54:09.2
HOT-2 trim.

03:54:09.7
HOT-1 zero. zero. point four nose down set.

03:54:12.8
HOT-2 checked. after start checklist complete.

03:54:14.8
INT-1 okay so we have two good starts and you're cleared to disconnect.
appreciate your help. and we'll see you next time.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

03:54:42.3
HOT-2 clear over here as far as I can see.

03:54:44.4
HOT-1 okay.

03:54:50.0
HOT-2 here. here he comes. **.

03:54:52.6
HOT-1 okay.

03:54:56.5
HOT-2 I don't see nobody now.

03:54:58.3
HOT-1 okay clear left.

03:55:01.5
HOT-1 slats extend.

03:55:02.8
HOT-2 slats extend.

03:55:03.8
CAM [sound of clicks, similar to flap handle]

03:56:04.4
HOT-2 of course. of course. of course.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

03:54:20.6
INT-MECH copy. you got two good starts. bypass pin never installed. doors are secured. have a safe and pleasant trip. see you next time through.

03:55:58.8
RDO-2 hello ground UPS thirteen fifty four heavy alpha spot six ready to taxi.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

03:56:33.5
HOT-1 alright follow the airplane to the left.

03:56:37.2
HOT-1 clear on the tops when you get a chance.

03:56:38.8
HOT-2 all righty.

03:57:00.2
HOT-2 tops are good.

03:57:01.1
HOT-1 okay right rudder.

03:57:03.1
HOT-2 right box.

03:57:04.1
HOT-1 and left rudder.

03:57:06.4
HOT-2 left box rudder checks.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

03:56:07.1
GND two people calling at once. the woman calling ground say again.

03:56:11.0
RDO-2 UPS thirteen fifty four heavy information alpha spot six taxi.

03:56:19.5
GND UPS thirteen fifty four heavy Louisville Ground. follow heavy MD-
eleven ahead and to your left for runway three five right. taxi via Delta.

03:56:29.4
RDO-2 we'll follow the MD out to three five right via Delta for UPS thirteen fifty
four heavy.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

03:58:13.8

HOT-1 okay left seat. three hundred and two thousand pound take-off. flaps fifteen zero profile up to five thousand. off the right side. pink page [stammering] is going to be reviewed and its complete. unless there's any questions?

03:58:26.8

HOT-2 sounds good.

03:58:27.8

HOT-1 before takeoff check.

03:58:28.5

HOT-2 before takeoff checklist flaps.

03:58:30.8

HOT-1 fifteen zero.

03:58:32.0

HOT-2 fifteen zero. flight controls.

03:58:33.8

HOT-1 checked.

03:58:34.3

HOT-2 checked. TRP V speeds.

03:58:35.8

HOT-1 set.

03:58:36.6

HOT-2 set. ignitions. continuous relight. bleeds and packs are set. one's off just for noise. takeoff configuration is normal for takeoff. before takeoff checklist complete.

03:58:46.1

HOT-1 thank you.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:00:46.0
HOT-1 alright line up and wait three five right. right side verified.

04:00:47.8
HOT-2 line up and wait.

04:00:51.1
HOT-2 final's cleared. three zero zero nine's the new altimeter.

04:00:54.1
HOT-1 thirty oh nine.

04:01:50.8
HOT-2 three five right's verified.

04:01:53.0
HOT-1 yeah.

04:02:26.1
HOT-1 cleared to go.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:00:03.9
TWRSDF Louisville International information Bravo current.

04:00:39.2
TWRSDF UPS thirteen fifty four heavy Louisville Tower runway three five right line up and wait.

04:00:43.0
RDO-2 line up and wait three five right. thirteen fifty four heavy.

04:02:17.9
TWRSDF UPS thirteen fifty four heavy fly runway heading runway three five right cleared for takeoff.

04:02:22.0
RDO-2 fly runway heading runway three five right cleared for takeoff UPS thirteen fifty four heavy.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:02:26.7
HOT-2 cleared to go runway heading.

04:02:28.6
CAM [sound of increased noise, similar to engine spool up]

04:02:33.6
HOT-1 set takeoff thrust.

04:02:45.6
HOT-2 thrust set.

04:02:49.1
HOT-2 eighty knots.

04:02:49.8
HOT-1 checked.

04:03:05.3
HOT-2 v-one rotate. v-two.

04:03:13.2
HOT-2 positive rate.

04:03:14.0
HOT-1 gear up.

04:03:21.8
HOT-1 heading select.

04:03:22.7
HOT-2 heading select.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:03:46.9
TWRSDF UPS thirteen fifty four heavy contact departure have a good flight.

04:03:50.1
RDO-2 departure have a good one.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:04:05.5
HOT-1 ten thousand.

04:04:07.0
HOT-1 slats retract.

04:04:07.0
HOT-2 ten thousand.

04:04:07.8
HOT-2 slats retract.

04:04:08.5
HOT-1 after takeoff checklist.

04:04:09.5
HOT-2 after takeoff checklist.

04:04:22.1
HOT-2 after takeoff checklist complete.

04:04:23.9
HOT-1 thank you.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:03:53.2
RDO-2 (hello) departure UPS thirteen fifty four heavy two point six climbing to five thousand runway heading.

04:03:57.7
APRSDF UPS thirteen fifty four heavy Louisville Departure good morning you're radar contact. climb and maintain one zero thousand.

04:04:03.1
RDO-2 one zero thousand UPS thirteen fifty four heavy.

04:04:24.5
APRSDF UPS thirteen fifty four heavy turn right heading zero niner zero.

TIME and SOURCE

INTRA-COCKPIT CONTENT

04:04:31.0
HOT-1 zero nine zero.

04:04:33.4
HOT-2 zero nine zero.

04:05:27.7
HOT-1 right turn going to Bowling Green.

04:05:35.8
HOT-1 look's good. I'll take it.

04:05:43.6
HOT-2 nav's available.

04:05:45.2
HOT-1 nav.

04:05:45.7
HOT-2 nav is selected.

04:05:46.8
HOT-1 thank you.

TIME and SOURCE

COCKPIT-GROUND COMMUNICATION CONTENT

04:04:27.4
RDO-2 right turn zero niner zero UPS thirteen fifty four heavy.

04:05:21.6
APRSDF UPS thirteen fifty four heavy turn right direct Bowling Green.

04:05:25.2
RDO-2 right turn direct Bowling Green UPS thirteen fifty four heavy.

04:06:10.2
APRSDF UPS thirteen fifty four heavy contact Indy Center one two one point one seven. twenty one seventeen. we'll see ya.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:06:26.8
HOT-1 nine for ten.

04:06:27.7
HOT-2 one to go.

04:06:43.9
HOT-1 twenty three is in the box. out of ten. direct Birmingham.

04:06:44.3
HOT-2 twenty three and direct Birmingham.

04:07:02.7
HOT-2 nav is available and selected.

04:07:04.5
HOT-1 roger. roger nav's armed.

04:07:13.5
HOT-2 ops normal away.

04:07:32.6
HOT-2 winds are calm still in Birmingham. ten miles. broken at a thousand.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:06:15.8
RDO-2 twenty one seventeen. have a good day. thirteen fifty four.

04:06:28.5
RDO-2 (Indy) Center UPS thirteen fifty four nine point three for one zero thousand direct Bowling Green.

04:06:34.5
CTRINDY UPS thirteen fifty four Indy Center roger cleared direct Birmingham climb maintain flight level two three zero.

04:06:39.8
RDO-2 direct Birmingham and up to two three zero for thirteen fifty four.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:07:43.0
HOT-1 autopilot one command.

04:07:44.7
HOT-2 autopilot one command.

04:10:09.4
HOT-1 two eight oh.

04:10:10.1
HOT-2 twenty eight.

04:10:18.4
HOT-1 alright ninety two set.

04:10:19.7
HOT-2 ninety two set.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:10:02.5
CTRINDY UPS thirteen fifty four climb and maintain flight level two eight zero.

04:10:07.0
RDO-2 two eight zero thirteen fifty four.

04:13:34.3
CTRINDY UPS thirteen fifty four contact Memphis Center one two four point one two.

04:13:39.4
RDO-2 twenty four twelve UPS thirteen fifty four goodnight.

04:13:47.6
RDO-2 good morning Memphis UPS thirteen fifty four twenty four eight climbing two eight zero.

04:13:52.9
CTRMEM1 UPS thirteen fifty four Memphis Center roger.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:14:48.3

HOT-2 one to go.

04:14:49.6

HOT-1 one to go.

04:16:03.2

HOT-1 **,

04:16:06.0

HOT-2 I like it.

04:16:11.6

HOT-1 **,

04:16:12.3

HOT-2 that's the way every flight should be.

04:16:23.2

HOT-1 (you can't bid to hold *.)

04:16:24.8

HOT-2 I know. I know.

04:16:26.2

HOT-1 * you might get something *.

04:16:28.1

HOT-1 this bid period and the next one you get something completely different. yep.

04:16:30.3

HOT-2 * it's crazy.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:21:23.9

HOT-2 well. did you hear any of Papa?

04:21:27.1

HOT-1 I didn't hear any of it.

04:21:28.1

HOT-2 they're sayin' six and two-four is closed. they're doin' the localizer to one eight.

04:21:33.0

HOT-1 localizer (to) one eight. it figures.

04:21:35.3

HOT-2 I know. especially since were [stammer] a little heavy. I mean [chuckle].

04:21:40.8

HOT-1 yep.

04:23:15.5

HOT-1 alright. I guess I'll brief it. briefing guide.

04:23:17.9

HOT-2 (okay).

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:20:53.4

ATIS

Birmingham Airport information Papa zero eight five three Zulu observation wind calm visibility one zero. sky condition ceiling one thousand broken. seven thousand five hundred overcast. temperature two three. dewpoint two two. altimeter two niner niner seven. localizer runway one eight in use. landing and departing runway one eight. notice to airmen runway six two-four closed. all departing aircraft contact tower one one niner point niner for clearance taxi and takeoff. advise controller on initial contact you have Papa.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:23:22.1

HOT-1 so review profile approach summary table for approach set-up.
aaaaannndddd.

04:23:31.7

HOT-1 GPS primary doesn't apply to localizer. RNP doesn't apply.

04:23:36.9

HOT-1 FMC disagree doesn't apply. temperature not applicable.

04:23:45.7

HOT-1 ahhh. verify VNAV path on approach chart. ah it is.

04:23:56.6

HOT-1 ILS glideslope out approaches.

04:24:00.5

HOT-1 VNAV path is the same as the ILS glideslope.

04:24:11.2

HOT-1 alright and uh. determine DA or D-DA and set altimeter bugs. and there
is a note there only-only authorized operators may use VNAV DA in
lieu of uhm MDA. alright so it will be twelve hundred for us. and uhhh.

04:24:19.4

HOT-2 mmm hmm.

04:24:25.9

HOT-2 twelve hundred huh.

04:24:34.3

HOT-1 okay. and in case uh a barometric DA may be utilized on the following
approaches. ILS glideslope out. or approaches titled ILS or localizer
runway. which is this case. or ILS or localizer DME runway bla bla bla.

04:24:52.8

HOT-1 all approaches with VNAV ball note. ball note states only authorized
operators may use VNAV DA in lieu of MDA.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:25:00.8

HOT-1 alright. this is US airspace. load approach in FMC database. enter DA. or D-DA on approach page.

04:25:17.2

HOT-1 okay and uh. verify database vertical path angle agrees with approach chart within one degree.

04:25:29.9

HOT-2 [mumbling] ** verify * approach to * point one degrees.

04:25:30.8

HOT-1 okay.

04:25:35.3

HOT-1 and.

04:25:37.8

HOT-1 adjust approach on approach page if necessary. v-approach. that's not necessary.

04:25:42.5

HOT-1 accomplish the brief. briefing and activate final approach mode.

04:25:47.0

HOT-1 and in the last note. select profile and verify P descent on an ILS glideslope out approaches or localizer approaches when the VNAV path crosses the final approach fix below the FAF minimum altitude. start a one thousand feet per minute descent at the FAF and immediately select profile mode to capture the path.

04:26:06.5

HOT-1 so. ahhh eleven dash two is the plate. seventeen august twelve. localizer frequency is one eleven three. final approach course is one eight three. and ah.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:26:27.4

HOT-1 BASKN is the ahhh final approach fix. twenty three hundred feet. down to a ah DA of twelve hundred. five sixty ah on the radio altimeter.

04:26:41.2

HOT-1 touchdown zone is six forty four and airport's six fifty. MSA is thirty seven hundred feet and it's based on the Vulcan VOR.

04:26:49.4

HOT-1 missed approach climb to fifteen hundred feet on a heading one eight three. and a climbing left turn to thirty eight hundred feet on the Vulcan one thirty seven radial. and outbound to handle [missed approach fix is HANDE]. twenty seven point--twenty eight point six off of Vulcan and hold or as directed by ATC.

04:27:08.9

HOT-1 so if that's the case this morning then we'll just follow the nav path for the missed.

04:27:13.4

HOT-1 missed approach will be go-around thrust flaps positive rate gear up. four hundred feet nav. thousand feet autopilot one command. fifteen hundred feet climb thrust and at alt star we'll set green dot and clean it up on schedule.

04:27:23.3

HOT-1 for the discontinued approach outside of anap [stammer] a thousand I'll announce discontinued approach. altitude hold probably one sixty...

04:27:29.8

HOT-1 once we're ahhh accelerating and stable it'll be ahhh flaps and gear. the runway we just talked about...

04:27:33.6

HOT-2 okay.

04:27:37.7

HOT-1 ...it's short.

TIME and SOURCE

INTRA-COCKPIT CONTENT

04:27:59.9
HOT-1 alright it's got REIL PAPI on the left...

04:28:01.9
HOT-1 it's a three point two degree angle....and uh...

04:28:11.3
HOT-1 probably use most of this today. probably either probably Golf at the end. and uh.

04:28:20.7
HOT-1 I think on this one they bring you off on ah Bravo--

04:28:23.4
HOT-2 (okay)

TIME and SOURCE

COCKPIT-GROUND COMMUNICATION CONTENT

04:27:38.5
CTRMEM1 UPS thirteen fifty four contact Atlanta Center one two eight point seven two.

04:27:45.6
RDO-2 twenty eight seventy two UPS thirteen fifty four.

04:27:53.2
RDO-2 Atlanta UPS thirteen fifty four two eight zero.

04:27:56.5
CTRATL1 UPS thirteen fifty four Atlanta Center roger.

04:28:03.2
CTRATL1 attention all aircraft hazardous weather inf-- AIRMET for Tennessee, Kentucky, West Virginia, Louisiana, Mississippi, and Alabama available on HIWAS Flight Watch Flight Service frequencies.

04:28:22.4
CTRATL1 Delta thirteen fifty four Atlanta approach one two five point seven.

TIME and SOURCE

INTRA-COCKPIT CONTENT

04:28:30.8
HOT-1 Delta thirteen fifty four. wow.

04:28:33.7
HOT-2 what was that?

04:28:34.4
HOT-1 Delta thirteen fifty four. it's the same as our number.

04:28:36.3
HOT-2 I know it's the same as ours *.

04:28:37.5
HOT-1 yeah.

04:28:39.9
HOT-1 okay so it'll be Bravo to ah...Foxtrot...which will be a left turn and then down to the UPS ramp. low brakes.

04:28:55.0
HOT-1 and the only other thing we gotta do is when I come out of ahh...I guess I'll do that now--

04:29:06.2
HOT-1 oh pilot's discretion two four zero. okay.

TIME and SOURCE

COCKPIT-GROUND COMMUNICATION CONTENT

04:28:27.4
AC uh that was twenty five point seven Delta thirteen fifty four.

04:28:30.7
RDO-? altimeter two niner niner seven.

04:28:58.4
CTRATL1 UPS thirteen fifty four descend at pilot's discretion maintain flight level two four zero.

04:29:03.2
RDO-2 pilot's discretion two four zero UPS thirteen fifty four.

TIME and SOURCE

INTRA-COCKPIT CONTENT

04:29:09.6

HOT-1 so that's good three point three...and...ahhh...twelve hundred...and we'll just activate final when we start down.

04:29:16.4

HOT-2 we'll just activate that once we're on the uh. you notice this radio hasn't shut up since we took-- I mean it's been chatter the whole time [chuckle].

04:29:17.6

HOT-1 (yeah). (yeah). oh I know. I know. on this particular trip. yeah.

04:32:08.2

HOT-1 two four zero.

04:32:21.0

HOT-1 UPS.

04:32:25.9

HOT-1 the other airline [chuckle].

04:32:26.9

HOT-2 I know. it's the other one. the F word er. not the F word * [trails off to chuckle].

TIME and SOURCE

COCKPIT-GROUND COMMUNICATION CONTENT

04:32:12.7

RDO-2 and UPS thirteen fifty four leaving two eight zero for two four zero.

04:32:18.7

CTRATL1 FedEx thirteen fifty four roger.

04:32:21.1

RDO-2 no it's UPS thirteen fifty four.

04:32:22.9

CTRATL1 sorry UPS thirteen fifty four roger.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:32:35.7

HOT-2 I just want'a make sure---you remember that in recurrent? you remember there was like ah...

04:32:38.7

HOT-1 [chuckle].

04:32:40.3

HOT-2 ...some other aircraft following another...when there's...cause I thought you said there was a Delta thirteen fifty four. so I wanted to make sure (they) [trails off to chuckle].

04:32:46.8

HOT-1 mmm hmmm.

04:32:49.4

HOT-2 so he knew who was doin' what [chuckle].

04:32:51.1

HOT-1 yeah...exactly [chuckle].

04:32:53.4

HOT-1 like who we are.

04:32:54.6

HOT-2 mmm hmmm.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:33:09.8

CTRATL1 UPS thirteen fifty four contact Memphis Center one two zero point eight.

04:33:14.3

RDO-2 one two zero point eight UPS thirteen fifty four. good night.

04:33:20.6

RDO-2 morning Memphis UPS thirteen fifty four twenty five seven for two four zero.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:33:37.5
HOT-1 alright discretion level we'll keep it goin'.

04:33:39.9
HOT-2 keep 'er goin'.

04:34:09.9
HOT-1 they're generous today. usually they kind'a take you to fifteen and they hold you up high.

04:34:11.0
HOT-2 I know. hold you up there.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:33:26.0
CTRMEM2 UPS thirteen fifty four Memphis Center roger descend at pilot's discretion maintain one one thousand. Birmingham altimeter two niner niner six.

04:33:32.7
RDO-2 pilot's discretion one one thousand. Birmingham twenty nine-ninety six for thirteen fifty four.

04:33:42.2
RDO-2 and for UPS thirteen fifty four we're just keep 'er goin' down to eleven.

04:33:45.8
CTRMEM2 roger.

04:37:03.7
CTRMEM2 UPS thirteen fifty four contact Atlanta Center one two seven point three.

04:37:08.1
RDO-2 one twenty seven point three UPS thirteen fifty four.

04:37:15.8
RDO-2 er Atlanta UPS thirteen fifty four out of one eight oh for one one thousand.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:37:18.1
CAM [sound of four clacks/clunks]

04:37:27.3
HOT-1 ninety six. approach checklist.

04:37:29.4
HOT-2 ninety six. approach checklist.

04:37:34.1
HOT-2 seat belt sign is on. landing elevation is set to six fifty. autobrakes are set to low. ECAM status is checked. standby airspeed bugs...

04:37:42.9
HOT-1 one thirty seven. two ahhh seventeen set.

04:37:45.4
HOT-2 ...thirty seven. two seventeen set. altimeters.

04:37:48.5
HOT-1 two nine nine six set twice.

04:37:50.2
HOT-2 twenty nine ninety six set. approach checklist complete.

04:37:53.2
HOT-1 alright thank you.

04:40:24.3
HOT-1 one to go.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:37:21.3
CTRATL2 UPS thirteen fifty four latest weather Birmingham altimeter two niner niner six.

04:37:25.1
RDO-2 ninety six thirteen fifty four.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:40:25.3

HOT-2 one to go.

04:40:49.5

CAM [background sound decreases, similar to reduction in airspeed. lower sound continues until gear extension]

04:41:26.1

HOT-2 (let) me ask him for lower or?

04:41:28.6

HOT-1 mmm hmm.

04:41:59.5

HOT-1 yep.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:41:30.6

RDO-2 is there any chance for lower for UPS thirteen fifty four?

04:41:33.1

CTRATL2 UPS thirteen fifty four contact Birmingham Approach one two seven point six seven. goodday.

04:41:37.3

RDO-2 twenty seven sixty seven goodday.

04:41:43.6

RDO-2 Birmingham UPS thirteen fifty four we're at one one thousand we have papa look'n for lower.

04:41:49.4

TWRBHM1 UPS thirteen fifty four heavy Birmingham Tower descend and maintain three thousand and uhm...runway six is still closed. you want to ah want the localizer one eight?

04:42:00.2

RDO-2 yessir the localizer one eight will work.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:42:13.1
HOT-1 ten right join the localizer.

04:42:14.9
CAM [sound of click]

04:42:16.1
HOT-2 I don't think we have many choices if runway six is [laughter].

04:42:17.7
HOT-1 ahhh [laughter] I know what else can we do [laughing]?

04:42:19.0
HOT-2 and when he said there for me I'm like ahhh well what else ahh you gonna unroll another one out there for us real quick or whatever [chuckling].

04:42:20.9
HOT-1 it's like...okay....yeah you got another ... yeah you got an ILS on some'n else? [chuckling]

04:42:25.2
HOT-2 uh...I know [chuckling].

04:42:38.1
HOT-1 gear down.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:42:02.0
TWRBHM1 [static] copy that.

04:42:04.8
TWRBHM1 UPS thirteen fifty four heavy turn ten degrees right join the localizer maintain three thousand.

04:42:09.2
RDO-2 okay. ten right join the localizer. maintain three thousand. thirteen fifty four heavy.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:42:40.3

HOT-2 gear down speed checks.

04:42:40.7

CAM [sound of multiple clicks, similar to landing gear handle movement]

04:42:42.1

CAM [sound of snap and increased noise, similar to landing gear extension]

04:42:52.1

HOT-1 and they keep you high [laughter].

04:42:53.8

HOT-2 at at'll getch'ya down [chuckling]...

04:42:55.2

HOT-1 oh I know. I * [chuckling].

04:42:55.7

HOT-2 ...yeah they were doin' good until...then...

04:42:57.0

HOT-1 eh I know it's unbelievable [chuckling].

04:42:58.5

HOT-2 ...I kept seein' COLIG come closer and closer. and I'm like oh brother.

04:43:00.2

HOT-1 I know it's like...it's like comin' comin' fast. ah yup [chuckling].

04:43:09.4

HOT-1 divin' for the airport. unbelievable.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:43:24.3

TWRBHM1 UPS thirteen fifty four heavy is one one miles from BASKIN maintain two thousand five hundred till established on localizer. cleared localizer one eight approach.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:43:37.4
HOT-1 two point five till established cleared for the localizer.

04:43:40.4
HOT-2 least there's like eight miles between...

04:43:42.0
HOT-1 oh I know this is---

04:43:43.3
HOT-2 ...COLIG and BASKIN [chuckle].

04:43:53.5
HOT-2 there's loc star.

04:43:53.6
HOT-1 loc's alive.

04:43:55.7
HOT-1 one eight three set.

04:44:05.5
HOT-2 [dash dash dash...dot dot dash dot dot dash] [may be two idents at same time, one sounds similar to DME]

04:44:11.6
HOT-1 you can activate that...

04:44:12.1
HOT-2 good ident on the localizer.

04:44:13.1
HOT-1 ...activate that final if you haven't already.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:43:32.0
RDO-2 two thousand five hundred till established. cleared for the localizer one eight approach UPS thirteen fifty four heavy.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:44:15.0

HOT-2 alright.

04:44:18.2

HOT-1 thirty five for twenty five.

04:44:19.6

HOT-2 thirty five for twenty five. final's activated.

04:44:37.5

HOT-1 slats extend.

04:44:39.1

HOT-2 speed checks. slats extend.

04:44:40.3

CAM [sound of click, similar to flap handle movement]

04:44:49.2

HOT-1 unbelievable.

04:44:51.3

HOT-2 I know [chuckling].

04:45:08.4

HOT-1 flaps fifteen.

04:45:10.2

HOT-2 speed checks. flaps fifteen.

04:45:13.8

CAM [sound of multiple clicks, similar to flap handle]

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:44:60.0

TWRBHM1 FedEx fourteen eighty eight Birmingham.

04:45:07.0

TWRBHM1 ah should be closed ah about another fifteen minutes.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:45:38.3
HOT-1 flaps twenty.

04:45:39.9
HOT-2 speed checks flaps twenty.

04:45:43.3
CAM [sound of multiple clicks, similar to flap handle]

04:45:50.6
CAM [sound of background noise continues to decrease, similar to airspeed decreasing]

04:45:50.9
HOT-1 flaps forty speed one thirty seven landing check.

04:45:53.8
HOT-2 okay...

04:45:54.7
HOT-1 set the missed approach altitude.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:45:18.5
TWRBHM1 UPS thirteen fifty four heavy change to my frequency one one niner point niner.

04:45:22.4
RDO-2 nineteen nine.

04:45:28.9
RDO-2 thirteen fifty four up nineteen nine.

04:45:31.3
TWRBHM2 UPS thirteen fifty four heavy runway one eight cleared to land wind calm.

04:45:34.8
RDO-2 one eight cleared to land thirteen fifty four heavy.

TIME and SOURCE

INTRA-COCKPIT CONTENT

04:45:55.0

HOT-2 [sound of multiple clicks, similar to flap handle] speed checks flaps forty landing checklist missed approach altitude.

04:46:05.2

HOT-2 landing gears down three green pressure check. TRP thrust limit GA.

04:46:09.1

HOT-2 flaps thirty forty.

04:46:14.2

HOT-2 speed brakes armed. ignition continuous relight.

04:46:17.4

HOT-2 landing checklist complete.

04:46:18.4

HOT-1 unbelievable kept us high...

04:46:24.7

HOT-2 let's see you're in...vertical speed...okay.

TIME and SOURCE

COCKPIT-GROUND COMMUNICATION CONTENT

04:45:58.5

TWRBHM2 airport fifteen tower.

04:46:09.4

VEH tower Airport Twelve * two go ahead.

04:46:12.7

TWRBHM2 Airport Twelve ah are we ah on schedule to open back up at ah one zero Z?

04:46:19.0

VEH affirm uhm they're very close to the end right now uh.

04:46:24.8

TWRBHM2 roger.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:46:27.0

HOT-1 ...yeah I'm gonna do vertical speed. yeah he kept us high.

04:46:29.6

HOT-2 kept ya high. could never get it over to profile (we didn't) do it like that.

04:46:31.4

HOT-1 uh uh I know.

04:46:33.7

HOT-2 I'll put your missed approach altitude in there.

04:46:35.7

HOT-1 yeah. thank you.

04:46:46.8

HOT-1 alright so at three point three should be at thirteen eighty.

04:46:49.2

HOT-2 damn I'm gonna actually have to...

04:46:53.7

HOT-1 and we're like way high...

04:46:56.8

HOT-1 ...or higher [chuckle].

04:46:57.1

HOT-2 about...a couple hundred feet...yeah.

04:46:59.4

HOT-1 yeah.

04:47:02.9

HOT-2 there's a thousand feet instruments cross checked no flags.

04:47:05.4

HOT-1 alright ah DA is twelve ah hundred.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:47:08.1
HOT-2 twelve hundred yeah...

04:47:10.9
HOT-1 two miles.

04:47:19.6
HOT-2 it wouldn't happen to be actual [chuckle].

04:47:21.4
CAM [sound of snap]

04:47:23.0
HOT-1 oh I know.

04:47:24.5
EGPWS sink rate.

04:47:25.9
EGPWS sink rate.

04:47:26.6
HOT-2 (there it is) [mumbling].

04:47:26.7
HOT-1 uhhr.

04:47:27.9
HOT-1 oh I got the runway out there twelve o'clock.

04:47:28.5
HOT-2 got the runway in sight, eh.

04:47:29.7
HOT-1 autopilot's off.

04:47:29.9
HOT-2 eh.

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT

04:47:30.6

HOT-2 alrighly.

04:47:31.5

CAM [sound of click, similar to autopilot paddle switch]

04:47:31.9

CAM [sound of cavalry charge, similar to autopilot disengagement continues for 4.3 seconds]

04:47:32.5

CAM [sound of rustling, similar to impact, volume increases for about 5.4 seconds]

04:47:32.9

HOT-2 ooh.

04:47:33.4

HOT-1 oh # #.

04:47:33.5

EGPWS too low terrain [recorded on CAM]

04:47:35.1

HOT-1 oh did I hit (somethin')?

04:47:36.6

HOT-1 oh...oh # [exclaiming].

04:47:37.9

HOT-2 oh.

04:47:37.9

CAM [cessation in rustling/impact sounds]

04:47:38.3

HOT-1 oh. oh God.

**TIME and
SOURCE**

INTRA-COCKPIT CONTENT

04:47:38.8

CAM [sound of rustling, similar to impact, continues at higher volume until end of recording]

04:47:39.9

HOT-? [grunting].

04:47:41.1

HOT [static].

04:47:41.3

CAM [end of loudest noise]

04:47:41.6

HOT [end of recording]

END OF TRANSCRIPT

04:47:41.7 CDT

END OF RECORDING

04:47:41.7 CDT

**TIME and
SOURCE**

COCKPIT-GROUND COMMUNICATION CONTENT