

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



GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

DCA14MA081

**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

November 19, 2015

Cockpit Voice Recorder

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

A. EVENT

Location: Philadelphia, Pennsylvania
Date: March 13, 2014
Aircraft: Airbus A320-214, N113UW
Operator: US Airways, Flight 1702
NTSB Number: DCA14MA081

B. GROUP

A group was convened on March 26, 2014.

Chairman: Dr. Bill Tuccio
Aerospace Engineer
National Transportation Safety Board

Member: Bob Hendrickson
Air Safety Investigator
Federal Aviation Administration

Member: Captain Patrick Keally
Check Airman
US Airways

Member: Captain Jeff Diercksmeier
Accident Investigation Team Member
US Airline Pilots Association

Member: Captain Gary Christiansen
Director/Flight Operations Support
Airbus Americas Customer Support, Inc.

C. SUMMARY

On March 13, 2013, at about 1830 eastern daylight time (EDT), US Airways flight 1702, an Airbus A320, N113UW, experienced a nose gear collapse and other damage

after aborting the takeoff on runway 27L at Philadelphia International Airport (KPHL), Philadelphia, Pennsylvania. The airplane came to rest on the edge of the runway, and the passengers exited the aircraft via the emergency slides. There were no injuries to the passengers and crew members and the airplane was substantially damaged. The flight was operating under 14 *Code of Federal Regulations* Part 121 as a regularly scheduled passenger flight between KPHL and Fort Lauderdale/Hollywood International Airport (KFLL), Fort Lauderdale, Florida. 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 and a partial transcript was prepared for the last 38 minutes of the event flight that was recorded on a 2-hour and 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: **749556**

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 high quality 4-channel digital cockpit audio. The recorded audio data is separated and decompressed by the L-3 download software into four 2-hour electronic files. The resulting files contain one file of audio information from the cockpit area microphone (CAM), another with the Captain's audio panel hot microphone information, the third with First Officer's audio panel hot microphone information, and a fourth with the observer position audio information.

Recorder Damage

Upon arrival at the audio laboratory, it was evident that the CVR had not sustained any heat or structural damage and the audio information was extracted from the recorder normally, without difficulty.

Audio Recording Description

The 2-hour 4-minute recording consisted of four channels of audio information. Each channel's audio quality* is indicated in Table 1. Notably, channel four was unusable and appeared inoperative.

* See attached CVR Quality Rating Scale.

Table 1: Audio Quality

Channel Number	Content/Source	Quality
1	Captain	Excellent
2	First Officer	Excellent
3	Observer	Excellent
4	CAM	Unusable

Timing and Correlation

Timing on the transcript was established by correlating the timed air traffic control (ATC) recording to CVR radio transmissions. Specifically, the ATC transmission at 1813:57.0 EDT corresponded to the same transmission recorded on the CVR at 0153:38.7 CVR Elapsed Time (time from the beginning of the recording). Based on this information, 1620:18.3 was added to CVR Elapsed Time to convert to EDT.

There were three possible time discontinuities on the CVR at 0200:10, 0204:10, and 0204:13 CVR Elapsed Time. After comparison to the timed ATC recording, it was determined there were no time discontinuities at 0200:10 and 0204:10 CVR Elapsed Time; however, no conclusion could be made for the 0204:13 CVR Elapsed Time potential discontinuity. The only content on the CVR after 0204:13 CVR Elapsed Time was a radio transmission from some source other than USAirways 1702 as the recording was ending (this content is not included in the attached transcript).

Description of Audio Events

The first 1-hour and 25-minutes of the CVR recorded the arrival, landing, and subsequent taxi of USAirways flight 742 operated by a different flight crew than USAirways flight 1702. The CVR group began the transcription of USAirways flight 1702 at 1745:18 EDT, immediately after USAirways flight 742 related activities ceased. Since the CAM recording was unusable, some cockpit discourse and sounds may not have been recorded.

As part of the Safety Board's accident investigation process, the flight crew was invited to review the CVR recording and transcript and suggest corrections or additions. On April 23, 2014, the captain and first officer reviewed the transcript and made the following comments:

- The first officer noted that at 18:12:30.1 EDT, HOT-2 said, "the apple was just enough to make me mad."
- The first officer noted that at 18:24:00.4 EDT, HOT-2 said "no."

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, serial number 749556, installed on a US Airways Airbus A320-214 (N113UW), which experienced a nosewheel collapse during takeoff at the Philadelphia International Airport in Philadelphia, Pennsylvania.

LEGEND

CAM	Cockpit area microphone voice or sound source
HOT	Flight crew audio panel voice or sound source
INT	Aircraft intercom
RDO	Radio transmissions from N113UW
GND	Radio transmission from the Philadelphia airport Ground controller
TWR	Radio transmission from the Philadelphia airport Tower controller
RAMP	Radio transmission from the Philadelphia US Airways ramp controller
FWC	Flight Warning Computer
ATIS	Automatic Terminal Information Service
PA	Passenger address system
RPA3297	Radio transmission from RPA 3297
RADIO	Radio transmission from a source other than ATC, N113UW, or RPA 3297
-1	Voice identified as the captain
-2	Voice identified as the first officer
-3	Voice identified as a flight attendant
-4	Voice identified as the pushback crew
-AC	Transmission from an aircraft other than N113UW or RPA 3297
-?	Voice unidentified
*	Unintelligible word
#	Expletive
()	Questionable insertion
[]	Editorial insertion

Note 1: Times are expressed in eastern daylight time (EDT).

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.

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
00:00:00 CVR Elapsed Time START OF RECORDING			
01:25:00.0 CVR Elapsed Time/17:45:18.3 EDT START OF TRANSCRIPT			
17:46:09.1 PA-3	[flight attendant announcement regarding stowage of baggage and personal items related to a full flight.]		
17:46:48.1 HOT	[unintelligible voice(s) including laughter, including captain and first officer. low volume.]		
17:46:54.2 PA-3	[flight attendant announcement: boarding complete, flight attendants prepare for departure, and personal electronic devices.]		
17:49:09.0 HOT	[unintelligible voice(s), including captain and first officer. low volume.]		

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
17:51:13.9 PA-1	<p>ladies and gentlemen from the uh flight deck we'd like to take a moment to welcome you aboard US Airways flight seventeen oh two service down to Fort Lauderdale. we'll be uh pushing off the gate here in just a few more minutes. and uh taxiing out to runway two seven left here in Philadelphia for our departure. uh once airborne this afternoon its gonna' be about two hours and fifteen minutes from uh take-off to touchdown. uh a little windy here in the Philadelphia area so uh we're expecting a rather bumpy ride for the first uh five er to eight thousand feet. it should go by pretty quickly and then uh once we do climb up and get closer to our cruising altitude it should be a pretty nice flight down to uh Fort Lauderdale. [describes route of flight along eastern seaboard and Florida]. [describes weather in Fort Lauderdale]. uh we have been issued a uh wheels up time of uh six twenty nine going to Fort Lauderdale. [explains reason for wheels up is related to construction at Fort Lauderdale airport.] so our uh time is six twenty nine so we'll head on out to the runway and wait uh. been talking with our uh company and they're stickin' pretty much uh air traffic control is stickin' to that departure time. so uh just a few minutes late uh to get in the air but hopefully uh we can make some of that time up enroute. welcome on board. [during his PA, captain was not recorded on the HOT channels.]</p>		
17:51:15.1 HOT	[sound of two buzzes]		
17:53:44.9 HOT-?	alright *** [female voice].		

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
		17:53:56.7 RAMP	[for about the next 14 minutes, the volume of ramp control on both HOT CVR channels was loud with frequent and rapid transmissions; this loudness and frequency obscured cockpit conversations that may have been otherwise present on the HOT CVR channels.]
17:53:58.7 PA-3	[flight attendant makes door closure announcement.]		
17:54:34.0 HOT	[unintelligible voice(s). low volume. including the words "(recorder) ground control" uttered by HOT-2.]		
17:54:45.0 HOT	** [sound of click] * [sound of click] * [sound of click] * oxygen verified checked***before start ***...*** altimeters verified two nine (eighty eight)*** [spoken mostly by HOT-2, with unintelligible utterances by HOT-1].		
17:55:21.4 HOT-1	reviewed. whatever.		
17:55:28.9 HOT-1	well let's see.		
17:55:31.4 INT-1	hey ya' down there?		
17:55:50.1 HOT-?	* we're waiting for*** [female voice].		

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
17:56:12.5 PA-3	flight attendants arm doors cross check. standby for all call please.		
17:56:19.2 PA	[sound of hi-lo chime, similar to cabin call]		
17:56:23.2 INT-3	* hello one L and one R armed and cross checked. two L and R armed and cross checked thanks. [multiple flight attendants speaking].		
17:56:33.5 INT-1	hey ya' down there?		
17:56:43.2 INT-1	flight deck to ground.		
17:56:45.2 HOT	[sound of rustling]		
17:56:56.1 HOT-2	**three*.		
17:56:57.0 HOT	[unintelligible voice(s). low volume.]		
17:57:02.1 HOT-1	alright thanks.		
17:57:15.4 INT-4	cockpit.		

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>
17:57:18.0 INT-1	yessir you ready?
17:57:20.3 INT-4	all set. ready to roll.
17:57:21.9 INT-1	okay we'll give them a call. hold on one second.
17:57:24.1 INT-4	copy that.
17:57:48.4 INT-1	okay uh we're ready for push. brakes released. cleared to push.
17:57:52.5 INT-4	copy that.

<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
17:57:33.2 RDO-2	ramp Cactus seventeen zero two. Bravo six push.
17:57:39.4 RAMP	Cactus seventeen zero two Philly Ramp your push is approved. top of the alley call for taxi.
17:57:44.9 RDO-2	top of the alley we'll call for taxi. Cactus seventeen zero two.
17:57:48.5 RAMP	[static] alpha nine is waiting to be pulled into the gate. so ah...have the crew reference both of those. once they pulled in then you can start the push top of the alley.

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>
17:58:00.2 HOT-1	who was that for?
17:58:11.2 INT-1	uh hold up. uh...they just told us to hold the push uh [stammer] some bus behind us.
17:58:11.3 HOT-2	hold the push.
17:58:18.9 INT-4	I see him. he's not he's not really in my way but I will **.
17:58:23.4 PA-3	[flight attendant passenger safety briefing announcement.]

<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
17:58:00.4 RDO-2	and who was that for?
17:58:02.5 RAMP	seventeen oh two. that's that's who's movin' right?
17:58:05.3 RDO-2	yeah we've we've already started movin' here.
17:58:07.7 RAMP	okay so ah. you're gonna' have to hold the push because there's a bus behind you.
17:58:12.8 RDO-2	alright hold the push. Cactus seventeen zero two.

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
17:58:24.7 INT-1	yeah I don't know what she cleared us and then as soon as you started movin' she starts callin' us stop. hold on one second. we'll ask her.		
17:58:30.5 HOT-2	she didn't even say the flight number.		
17:58:32.9 HOT-1	would you tell her * we can get around the bus.		
17:58:35.9 HOT-2	okay.		
		17:58:37.2 RAMP	[RAMP communicating with other aircraft.]
17:58:51.8 INT-4	the bus backed up some.		
17:58:52.5 HOT-2	where's he goin'?		
17:58:54.1 INT-1	okay good.		
17:58:55.9 HOT-2	where's he goin'? tell him to stop**.		
17:58:58.0 HOT-1	yeah but he says the bus has moved out of the way.		

**TIME and
SOURCE**

INTRA-AIRCRAFT CONTENT

17:59:06.5
HOT-1 just tell him. and tell her again.

17:59:20.5
INT-1 she wants you. you're good to do it. uh. she wants us to go up
to the top of the alley.

17:59:28.3
INT-4 gotch'ya.

17:59:28.9
INT-1 *.

18:00:29.5
HOT-2 nine nine two now [low volume].

18:00:32.1
HOT-1 wow. comin' up fast isn't it.

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION CONTENT

17:59:10.9
RDO-1 hey uh seventeen oh two. our push crew said the bus is gone.
is it okay for us to continue?

17:59:16.4
RAMP affirmative. take it to the top for me.

17:59:18.7
RDO-1 okay thanks.

18:00:07.3
ATIS advise on initial contact you have information yankee.

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:00:34.4 HOT-2	yeah. three hundred knot-- ah three hundred ** [obscured by RAMP radio transmission].		
18:00:40.2 HOT-1	alright. come'n around too.		
18:01:16.5 HOT-1	[sneeze or cough]		
18:01:19.7 HOT-1	man.		
18:01:27.5 HOT-1	whole lotta' pushin' goin' on.		
18:02:28.9 HOT-1	okay we can turn one.		
18:02:42.4 HOT-1	and we're good on one.		
18:02:45.7 HOT-1	*.		
		18:03:03.2 RAMP	[RAMP talks with a different aircraft about a broken towbar.]
18:03:21.4 HOT-1	wands up.		

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:03:21.8 HOT-2	supposed to be inspected when you get a broken towbar. oh well. no worries.		
18:03:27.1 HOT-1	yeah.		
18:03:32.8 HOT-1	*. okay.		
18:03:33.0 HOT-2	gotta' good start on one.		
18:03:43.1 HOT-1	flaps two taxi.		
		18:04:18.8 RDO-2	Cactus seventeen zero two spot seven. we're ready to taxi. we have a wheels up time of two nine.
		18:04:25.7 RAMP	who's calling?
		18:04:27.2 RDO-2	Cactus seventeen zero two.
		18:04:30.0 RAMP	seventeen oh two you're gonna' move in just a second ma'am.
		18:04:33.6 RDO-2	alright.

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>
18:04:49.0 HOT-2	[RAMP loud on radio] quit yellin'.
18:04:51.3 HOT-1	yeah.
18:04:52.0 HOT	[sound of single chime, similar to level two caution]
18:04:54.2 HOT-2	we know that...
18:04:54.4 HOT-1	we know what that is.
18:04:57.0 HOT-2	clearr...ECAM?
18:04:59.1 HOT-1	yep.
18:05:00.3 HOT-2	clearr status?
18:05:01.8 HOT-1	clear status.
18:05:14.7 HOT-2	*.
18:05:15.0 HOT-1	*.

<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
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**TIME and
SOURCE**

INTRA-AIRCRAFT CONTENT

18:06:29.3
HOT-2 clear right.

18:06:31.4
HOT-1 alright.

18:06:37.9
HOT-2 well I can't get off this frequency fast enough.

18:06:41.4
HOT-1 really.

18:07:42.0
HOT-1 this is actually workin' out pretty good. I mean.

18:07:46.0
HOT-2 yeh.

18:07:49.9
HOT-1 if a delay can work out good. I mean.

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION CONTENT

18:05:16.9
RAMP seventeen oh two once those ah two three twenty ones on juliet start movin' eastbound I'm gonna' have you ah wait for the seven five crossin' right to left. behind the seven five make a right turn on juliet go down to spot two. ground's gonna' be point nine.

18:05:34.0
RDO-2 alright ah behind the seven five. a right turn on juliet ah spot two. Cactus seventeen zero two.

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>
18:07:51.4 HOT-2	yep. [three short laughs].
18:07:55.7 HOT	[sound of thunks, bumps, similar to aircraft moving]
18:08:35.8 HOT-1	alright. uh on yankee short of nine left.
18:09:42.6 HOT	[sound of thunks, bumps, similar to aircraft moving]
18:11:33.4 HOT-2	(what).
18:11:33.9 HOT-1	[chuckle] I was (just) yawnin'...I was like ahhh.
18:11:35.4 HOT-2	oh.

<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:08:18.0 RDO-2	Cactus seventeen zero two spot two yankee.
18:08:23.2 GND	Cactus seventeen zero two Philly Ground runway two seven left taxi via yankee hold short of the nine left approach.
18:08:30.4 RDO-2	and yankee hold short of the nine left approach. Cactus seventeen zero two.

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:12:12.7 HOT-1	well...here we are.		
18:12:17.1 HOT-2	yeh.		
18:12:17.3 HOT-1	nineteen minutes.		
18:12:30.1 HOT-2	(the hassle) is just enough to make me mad.		
18:12:33.1 HOT-1	[laughing] I know I know I'm like hungry now.		
18:12:34.7 HOT-2	[laughter].		
18:12:38.5 HOT-1	I'm like ready to...		
18:12:41.2 HOT-1	...get the..get out of here and eat.		
18:12:44.9 HOT-2	yeh.		
18:12:57.8 HOT-2	well this is a sure fire way to get us goin'. I'm gonna' open this up. yep.		
18:13:00.6 HOT-1	get us movin'. yep that's true.		

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>
18:13:11.4 HOT-1	[yawn].
18:13:12.8 HOT-2	two thirteen.
18:13:15.3 HOT-2	lot of time built into this.
18:13:19.6 HOT-1	yeah did they have a lot of time built into it?
18:13:22.7 HOT-2	two fifty two on the block time and two thirteen on the flight time.
18:13:26.6 HOT-1	yeah (some) (what).
18:14:03.3 HOT-2	clear right.
18:14:03.9 HOT-1	clear left.

<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:13:55.2 GND	Cactus seventeen zero two yankee sierra on sierra monitor tower.
18:13:59.5 RDO-2	yankee sierra monitor tower. Cactus seventeen zero two.

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:14:22.0 HOT-2	I told ya'.		
18:14:23.5 HOT-1	[laughing] I know.		
18:14:25.9 HOT-1	you were right.		
		18:15:12.9 RDO	[radio communications switch from ground to tower frequency]
18:16:18.4 HOT-2	you ever try any of those uhm. (flavor uh like vinegar).		
18:16:25.1 HOT-1	uh no like. oh raspberry or something. I've had that. I've had that...that's about the only one I think.		
18:16:37.4 HOT	[crew discusses food. the conversation is partially obscured by Tower transmissions to other aircraft.]		
18:18:27.6 HOT-1	well. I guess about. I don't know. (at) twenty or whatever we'll crank the other one.		
		18:19:29.0 TWR	Cactus seventeen oh two number six for departure.
		18:19:32.9 RDO-1	seventeen oh two roger.

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:19:34.5 HOT-2	thank you.		
18:19:35.8 HOT-1	so we're like six. why don't we go ahead and start that engine.		
18:19:40.9 HOT-2	alrighty.		
18:20:28.7 HOT	[sound of click] [this sound of click is about the same time as a momentary FDR recording interruption]		
18:20:36.1 HOT-2	alright.		
18:20:37.0 HOT-1	alright.		
18:20:38.8 HOT-2	full up. full down. neutral. full left. full right. neutral. full left. full right. and neutral.		
		18:21:21.7 TWR	ahh Cactus seventeen oh two you'll be next for departure following the Southwest.
		18:21:25.8 RDO-2	seventeen zero two.
18:21:28.1 HOT-1	(and ah).		

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:21:30.7 PA-2	ladies and gentlemen we are just about ready for departure. flight attendants please take your stations.		
18:21:35.6 HOT-1	[Tower transmission obscures any prior utterance by HOT-1] * checklist.		
18:21:38.0 HOT-2	alright.		
18:21:39.2 HOT-2	[Tower transmission obscures any prior utterance by HOT-2] * checklist.		
18:21:43.0 HOT-2	verify two planned.		
18:21:46.0 HOT-1	two planned. two indicated.		
18:21:47.3 HOT-2	one planned. one indicated. my error.		
18:21:49.0 HOT-1	I'm sorry. okay. one planned. one indicated.		
18:21:52.1 HOT-2	take-off data verify. one fifty seven. one fifty nine. one fifty nine. and * [Tower transmission obscures end of utterance].		
18:21:57.8 HOT-1	one fifty seven. one fifty nine. one fifty nine. flex fifty three.		

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:22:01.7 HOT-2	weight verify one fifty three zero.		
18:22:01.8 HOT	[sound of buzzer, similar to flight attendant call to cockpit]		
18:22:04.9 HOT-1	one fifty...three zero.		
18:22:08.3 INT-2	hello.		
18:22:08.8 INT-3	hey taxi slowly we got a guy that got up and went in the lav.		
18:22:12.2 INT-2	alright.		
18:22:12.6 INT-3	okay. I'll buzz I'll buzz you back whenever he comes out...uhp he's comin' out right now. thanks.		
18:22:12.8 INT-2	alright. alright.		
18:22:23.5 HOT-2	alright.		
18:22:24.9 HOT-2	weight verify...one fifty three zero.		
18:22:28.6 HOT-1	one fifty three zero.		

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:22:30.1 HOT-2	stabilizer trim verify thirty two point nine percent and zero.		
		18:22:33.7 TWR	Cactus seventeen zero two runway two seven left line up and wait.
18:22:34.8 HOT-1	thirty two point nine. zero.		
18:22:36.6 HOT	[sound of increased noise, similar to increased thrust]		
		18:22:37.2 RDO-2	line up and wait two seven left. Cactus seventeen zero two.
18:22:40.8 HOT-2	engine anti-ice.		
18:22:42.2 HOT-1	off.		
18:22:42.8 HOT-2	E-CAM verify take-off. no blues. or take-off signs blue. status checked.		
18:22:47.4 HOT-1	take-off signs blue. status checked.		
18:22:49.4 HOT-2	taxi checklist to the line complete. runway and FMS verify runway two seven left.		

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:22:55.7 HOT-1	two seven right.		
18:22:57.7 HOT-1	that's what. (s* to) here. two seven right.		
18:23:00.2 HOT-2	ttthh...we've gotta put the different runway in.		
18:23:07.0 HOT-2	boy.		
18:23:10.3 HOT-1	there you go.		
18:23:11.0 HOT-2	[exhale]		
18:23:13.1 HOT-2	ah. take-off min fuel verify twenty two eight required. anddd. twenty four four on board.		
18:23:19.1 HOT	[sound of two thunks]		
18:23:19.4 HOT-1	twenty two eight. twenty four four on board.		
18:23:22.1 HOT-2	flight attendants notified. engine mode is normal. TCAS is T-A-R-A. taxi checklist is---		

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>
18:23:28.3 HOT-1	#.
18:23:33.9 HOT-1	alright here we go.
18:23:37.4 HOT	[sound of increased background noise, similar to power increase]
18:23:39.1 HOT	[sound of steady background noise, similar to intermediate power]
18:23:40.7 HOT	[sound of increased background noise, similar to power increase]

<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:23:24.6 TWR	Cactus seventeen zero two fly heading two three zero. runway two seven left clear for take-off.
18:23:29.0 RDO-2	two tree zero and cleared for take-off. Cactus seventeen zero two.
18:23:33.4 TWR	Brickyard thirty two ninety seven runway two seven left line up and wait.
18:23:36.7 RPA 3297	two seven left line up and wait Brickyard thirty two ninety seven.

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:23:43.4 HOT-1	flex.		
18:23:45.0 HOT-2	annnd flex set.		
18:23:46.9 HOT	[sound of single chime, similar to level two caution]		
18:23:47.6 HOT-1	#.		
18:23:49.8 HOT-2	engine thrust levers not set.		
18:23:50.9 HOT	[sound of cyclical thumps, similar to nosewheel on centerline lights (6.8 seconds)]		
18:23:50.9 HOT	[sound of change in background noise, similar to power increase, decrease, and increase (4.2 seconds total)]		
18:23:52.8 HOT-1	they're set.		
18:23:54.3 FWC	retard.		
18:23:55.5 FWC	retard.		

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>
18:23:55.7 HOT-1	what did you do? you didn't load. we lost everything.
18:23:56.9 FWC	retard.
18:23:58.2 FWC	retard.
18:23:59.5 FWC	retard.
18:24:00.4 HOT-2	(no).
18:24:00.7 FWC	retard.
18:24:02.0 FWC	retard.
18:24:03.1 HOT-1	we'll get that straight when we get airborne.
18:24:03.3 FWC	retard.
18:24:04.5 FWC	retard.
18:24:05.8 FWC	retard.

<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
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<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:24:07.1 FWC	retard.		
18:24:08.5 FWC	retard.		
18:24:09.2 HOT-2	wh*. I'm sorry.		
18:24:09.7 FWC	retard.		
18:24:11.6 FWC	retard.		
		18:24:11.7 TWR	Brickyard thirty two ninety seven runway two seven left. fly runway [transmission obscured by sound of impact of USAir 1702] cleared for take-off.
18:24:12.9 FWC	retard.		
18:24:13.3 HOT	[sound of decreased background noise, similar to power reduction]		
18:24:13.8 HOT	[sound of first impact]		
18:24:15.0 HOT	[sound of about 7 rattles]		

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>
18:24:15.1 HOT	[sound of decreased background noise, similar to engine spool down]
18:24:15.2 HOT-1	oh #.
18:24:16.6 HOT	[sound of single chime, similar to level two caution]
18:24:18.7 HOT	[sound of second impact]
18:24:19.9 HOT	[sound of third impact]
18:24:23.7 HOT	[sound of repetitive chime, similar to Continuous Repetitive Chime (3.0 seconds)]

<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:24:16.4 RPA 3297	two seven left runway heading cleared for take-off. Brickyard thirty two ninety seven.
18:24:19.5 TWR	(Brickyard) [transmission obscured by sound of impact of USAirways 1702] runway two seven left line up and wait.
18:24:22.2 RADIO-AC	two seven left line up and wait Brickyard [transmission obscured by sound of impact of USAirways 1702] .

<u>TIME and SOURCE</u>	<u>INTRA-AIRCRAFT CONTENT</u>	<u>TIME and SOURCE</u>	<u>AIR-GROUND COMMUNICATION CONTENT</u>
18:24:27.4 HOT	[sound of repetitive chime, similar to Continuous Repetitive Chime, continues until end of recording]		
18:24:29.1 HOT	[sound similar to power interruption to CVR]		
		18:24:30.4 RADIO-?	tower there's somethin' goin' on on the runway-- [truncated, due to sound similar to power interruption to CVR].
18:24:31.8 HOT	[sound similar to power interruption to CVR]		
END OF TRANSCRIPT END OF RECORDING[†] 18:24:31.8 EDT			

[†] The CVR contained 1 second of additional recording; see section "Timing and Correlation."