NATIONAL TRANSPORTATION SAFETY BOARD Office of Research and Engineering Vehicle Recorder Division Washington, DC 20594



GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

DCA11IA040

By Christopher Babcock

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 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, DC 20594

July 21, 2011

Cockpit Voice Recorder

Group Chairman's Factual Report By Christopher Babcock

1. EVENT

Location:	New Orleans, Louisiana
Date:	April 4, 2011, 7:25 Central Daylight Time (CDT) ¹
Aircraft:	United Airlines Airbus A320, Flight 497
Registration:	N409UA
NTSB Number:	DCA11IA040

2. GROUP

A group was convened on April 8, 2011.

Chairman:	Christopher Babcock Aerospace Engineer National Transportation Safety Board
Member:	Romain Bévillard Accredited Representative Bureau d'Enquêtes et d'Analyses
Member:	Captain Rudy Canto Director Technical Flight Operations Airbus Americas, Inc.
Member:	Tony James Air Safety Investigator Federal Aviation Administration
Member:	Sylvain Molé Accredited Representative Bureau d'Enquêtes et d'Analyses

¹ All times are expressed in local CDT, unless otherwise noted

Member:	Captain Bradley Petersen Airbus Technical Manager United Airlines
Member:	Captain Christopher T. Rees

3. SUMMARY

On April 4, 2011, a United Airlines Airbus A320, registration N409UA, operating as flight 497 exited the left side of runway 19 at the Louis Armstrong International Airport, New Orleans, LA, after returning to the airport in response to automated warnings of smoke in an equipment bay. Flight 497 was operating under Title 14 Code of Federal Regulations (CFR) Part 121.

Airline Pilots Association

The solid-state cockpit voice recorder (CVR) from the aircraft was sent to the National Transportation Safety Board's Audio Laboratory for readout. The CVR group meeting convened on April 8, 2011, and a full transcript was prepared for the recording (see attached).

4. DETAILS OF INVESTIGATION

On April 5, 2011, the NTSB Vehicle Recorder Division's Audio Laboratory received the following CVR:

Recorder Manufacturer/Model:Honeywell 6020 SSCVR 30Recorder Serial Number:2290

4.2. Recorder Description

Per federal regulation, US registered aircraft requiring two pilots and containing six or more passenger seats manufactured prior to April 7, 2010, must be equipped with a CVR that records a minimum of the last 30 minutes of audio data; 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 30 minutes or 2 hours of aircraft operation, depending on the model.

This model CVR, the Honeywell 6020 SSCVR 30, is a solid-state CVR that records 30 minutes of digital cockpit audio in a four-channel format: one channel for each flight crew, one channel for the cockpit area microphone (CAM), and one channel for the interphone, public address, or additional crewmember.

4.3. 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.

4.4. CVR Channels

The recording consisted of four channels of audio information. Three of the channels contained excellent quality audio information from the captain's, first officer's,

and third crewmember audio panels.² One channel contained good quality CAM audio information.

4.5. Timing and Correlation

The recording for the incident flight was separated into three segments. A power interruption occurred 5 minutes after the recording started. A second interruption occurred 10 minutes and 24 seconds after power was restored from the first interruption. The third segment of the recording was 4 minutes, 27 seconds in length.

Timing on the second and third segments of the recording was determined by synchronizing the VHF radio transmissions from the aircraft recorded on the CVR with identical transmissions from the air traffic control recordings. The air traffic control recordings contain an IRIG timecode on one of the two channels which, when decoded, provides a correlation to Universal Coordinated Time (UTC).³ A 5 hour offset was applied to convert to local CDT.

While the flight data recorder does record a UTC time parameter, its accuracy is unknown. In order to correlate CVR information to data recorded on the FDR common events were compared from both recorders. Five VHF radio transmissions from N409UA heard on the CVR were matched to the 5 corresponding transmissions recorded on the "Key VHF" parameter on the FDR. Table 1 shows the CVR times of the 4 transmissions used in the correlation and the lower and upper bounds for when the transmission occurred on the FDR in subframe reference number (SRN). A subframe is recorded on the FDR once per second.

CVR Time (CDT)	FDR Time Low ^a (SRN)	FDR Time High (SRN)
0707:19.3	196051.16	196052.16
0707:32.3	196064.16	196065.16
0708:59.8	196151.16	196152.16
0709:07.6	196159.16	196160.16
0709:17.9	196169.16	196170.16

Table 1. CVR times used for FDR-CVR time correlation on Flight 497.

^a FDR Time columns indicate the lower and upper bounds of the discrete event on the FDR

The calculation showed that the recorded UTC time on the FDR was 2 seconds slower than actual UTC time. The correlation from FDR SRN to CDT is:

FDR SRN - 170412 = CDT

Because there were no common events from the CVR and FDR identified on the first 5-minute segment of the CVR, timing was determined using the FSK time recorded on channel 3 of the CVR.⁴ The flight recorder system encodes the UTC time parameters from the FDR onto the CVR at 4 second intervals. This encoding is audible as a "chirp" and is decoded using manufacturer software. Using the 2-second offset

² See Attachment I for the CVR Quality Rating Scale

³ The inter-range instrumentation group (IRIG) time encodes UTC time as a sine wave within a 1 kHz carrier signal.

⁴ Frequency-shift keying (FSK) is a frequency modulation system in which digital information is transmitted through discrete frequency changes of a carrier wave.

from recorded FDR/FSK UTC time to actual UTC time, and accounting for time zone offset, the start of the recording for the incident flight occurred at 6:53:46 CDT.

4.6. Summary of Recording Contents

The recording from the incident flight began with the Before Start checklist. The first power interruption occurred just prior to the aircraft pushing back from the gate. This segment of the CVR recording lasted 5 minutes. The recording resumed just prior to the right engine starting. Title 14 CFR §121.359(a) says:

No certificate holder may operate a large turbine engine powered airplane...unless an approved cockpit voice recorder is installed in that airplane and is operated continuously from the start of the use of the checklist (before starting engines for the purpose of flight), to completion of the final checklist at the termination of the flight.

The recording ended while the aircraft was in flight at 7:16:03 CDT. The first 10 minutes of the recording contained audio from a previous flight and provided no relevant information.

As part of the Safety Board's incident investigation process, the flight crew was invited to review the CVR transcript and suggest corrections or additions. They declined the invitation.

4.7. CVR Start/Stop Logic

4.7.1. Normal Operation

In normal operation on the ground the CVR automatically operates for 5 minutes after the aircraft electrical network is energized or when at least one engine is running. The recorder can also be manually started by switching the GND CTL switch (Figure 1) on the overhead recorder panel to "ON."



Figure 1. Recorder GND CTL switch (indicated by arrow) on overhead panel.

If the flight recorder GND CTL switch is "ON" at engine start, the switch will revert to "AUTO." The United A320 Flight Manual indicates that any power interruption may cause the GND CTL switch to revert to "AUTO."

In normal operation the CVR will cease recording on the ground five minutes after the last engine is shut down.

4.7.2. Loss of CVR Power in Flight

The CVR is powered by the AC Shed Ess bus of the electrical system. The bus provides 400 Hz 3-phase 115/200 Volt power to the CVR. In normal operation, this bus is supplied by the integrated drive generator (IDG) 1 through the AC 1 and AC Ess bus bars. In the event of loss of power from IDG 1, the AC1 and AC Ess bus can be supplied by IDG 2. In the case of loss of power from both IDG 1 and IDG 2 in the absence of APU power, or when Emergency Electrical Power is selected "ON" by the flight crew, the ram air turbine (RAT) will deploy, powering the blue hydraulic system which drives the emergency generator by means of a hydraulic motor. In this configuration power to both main AC bus bars is lost, but the AC Ess and AC Shed Ess bus bars remain powered through the emergency generator.

The CVR lost power twice in flight. The first interruption occurred from 7:11:43.5 to 7:11:49.2 CDT, when the captain turned off the number two IDG. If power is lost from both IDGs before the RAT has fully deployed, electrical power is supplied to the system by the batteries, shedding the AC Shed Ess bus bar until the emergency generator has spun up to speed causing a brief power interruption to the CVR.

The CVR ended at 7:16:03 while the aircraft was in flight returning to New Orleans just after the captain called for landing gear extension. When the landing gear is lowered or the RAT stalls, the emergency generation network automatically transfers to the batteries and the AC Shed Ess bus bar is shed, removing power from the CVR.

Christopher Babcock Aerospace Engineer Vehicle Recorder Division

Attachment I

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 a cockpit voice recorder installed on a United Airlines A320 (N409UA) that departed the runway after return to the airport due to a smoke indication.

LEGEND CAM Cockpit area microphone voice or sound source HOT Flight crew audio panel voice or sound source PA Public Address system sound source INT Crew intercom system sound source GND Radio transmission from MSY Ground controller TWR Radio transmission from MSY Tower controller DEP Radio transmission from MSY departure controller -1 Voice identified as the pilot -2 Voice identified as the copilot -3 Voice identified as the gate agent -4 Voice identified as ground crew member -5 Voice identified as flight attendant Voice identified as first controller from identified facility -A -B Voice identified as second controller from identified facility -? Voice unidentified * Unintelligible word # Expletive @ Non-pertinent word () Questionable insertion [] Editorial insertion

Note 1: Times are expressed in Central Daylight Time.

- Note 2: Generally, only radio transmissions to and from the incident 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-Aircraft Communication	Time and Source	Over-the-Air Communication
6:53:45.8 START OF START OF	F RECORDING F TRANSCRIPT		
6:53:46.1 CAM-2	* good. got our clearance. looking good.		
6:53:54.2 CAM-2	* pressure. okay.		
6:53:56.1 CAM	[background noise]		
6:53:57.9 HOT-1	yes sir. go.		
6:53:58.9 HOT-2	departure briefing?		
6:53:59.7 HOT-1	complete.		
6:53:59.9 HOT-2	FMGC radios?		
6:54:00.8 HOT-1	programmed set verified.		
6:54:01.8 HOT-2	programmed set verified. ADIRS?		
6:54:02.9 HOT-1	nav aligned.		
6:54:03.5			

HOT-2 fuel panel?

Time and Source	I Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
6:54:03.6 HOT-1	six pumps on. cross feeds closed.		
6:54:05.6 HOT-2	fuel quantity?		
6:54:06.1 HOT-1	*.		
6:54:07.2 HOT-1	we've got uh fuel quantity. we've got thirty four four. uh verified.		
6:54:13.3 HOT-2	verified. cabin signs?		
6:54:14.2 HOT-1	on.		
6:54:14.6 HOT-2	oxygen check?		
6:54:15.6 HOT-1	complete.		
6:54:15.9 HOT-2	complete. engine master switches?		
6:54:17.2 HOT-1	off.		
6:54:17.4 HOT-2	parking brake?		
6:54:18.2 HOT-1	(set or check). pressure normal.		
6:54:19.2 HOT-2	altimeters?		

Time and Source	I Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
6:54:19.8 HOT-1	uh. good question. two nine eight four.		
6:54:22.2 HOT-2	eighty four is set.		
6:54:23.6 HOT-2	airspeed?		
6:54:24.9 HOT-1	air— uh. fourteen eleven. airspeed gross weight of uh one fifty three fifty four card. flaps three. thirty seven. thirty seven. forty one.		
6:54:34.5 HOT-2	gross weight one fifty three card. flaps three. negative flex. thirty seven. thirty seven. forty one. set. nosewheel steering disconnect message?		
6:54:42.1 HOT-1	displayed.		
6:54:42.5 CAM-2	okay.		
6:54:45.3 HOT-1	wow where's that noise coming from?		
6:54:48.7 HOT-1	it's not your window. is it?		
6:54:50.6 CAM-2	nope.		
6:54:54.9 HOT-1	[sound similar to three mic keys]		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
6:55:06.2 CAM-2	**.		
6:56:11.4 HOT-2	that's noisy.		
6:55:11.6 HOT-1	wowthat's noisy.		
6:55:59.9 CAM	[sound similar to electric seat motor]		
6:56:04.5 INT-1	hello hello.		
6:56:09.8 HOT-1	there goes the door.		
6:56:48.8 CAM-3	hi. do you guys have everything?		
6:56:51.4 HOT-1	good to go.		
6:56:52.4 CAM-3	good to go?		
6:56:53.1 HOT-1	yeah.		
6:56:53.6 CAM-3	alright. then I'll close you up.		
6:56:56.3 HOT-1	yeah you want to go with us?		
6:56:57.4 CAM-3	I wish I could. I love San Francisco.		
			DOMANTE

Time and Source	I Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
6:56:59.0 HOT-1	well just— just come on we'll go.		
6:57:01.8 CAM-3	I know. right? by the time you make it to the taxiway		
6:57:06.4 HOT-1	oh you'll be home.		
6:57:07.1 CAM-3	they will be opening up them door taking me off.		
6:57:09.4 HOT-1	[sound of laughter] see you later.		
6:57:13.4 CAM-3	bye.		
6:57:18.5 CAM-2	little windy here this morning.		
6:57:22.2 HOT-1	groovy.		
6:57:36.6 HOT-1	it was windy last night.		
6:57:54.0 CAM-2	yeah let's close early and get out of here man. **.		
6:57:57.7 HOT-1	yeah there we go.		
6:58:10.8 CAM-2	**.		
6:58:12.3 HOT-1	yeah. [sound of laughter] got to be in * after that.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
6:58:15.3 CAM-2	do we need this one? this one doesn't matter. it's the LA one right?		
6:58:17.9 HOT-1	it's the LA one that matters.		
6:58:29.0 CAM-2	it's eleven twenty is that local? we get in at twelve forty three?		
6:58:33.7 HOT-1	yeah and we're uh—.		
6:58:34.2 CAM-2	we'll get in— we'll get in before that. Denver weather's good I hope.		
6:58:37.4 INT-4	and pre departure check is complete. **.		
6:58:42.1 INT-1	okay roger that. would you like the brakes and we'll call—.		
	[POWER INTERRUPTION LASTIN	G FROM 6:58:44 TO 7:	01:19.7]
7.01.38 7			

7:01:38.7

INT-4 pin is out. towbar removed.

7:01:40.8

okay you're cleared disconnect. I'll watch for your salute. and ya'll have a nice day. INT-1

7:01:44.9

INT-4 you have a good flight.

7:01:45.9

INT-1 thank you.

Time and Source	I Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
7:01:46.0 HOT-2	clear on two. here goes.		
7:01:47.3 HOT-1	*.		
7:02:11.8 HOT-1	salute and release from guidance.		
7:02:55.1 HOT-2	clear on flaps. here goes.		
7:02:56.8 HOT-1	ready for it?		
7:03:00.7 HOT-1	full up…full down. neutral.		
7:03:05.0 HOT-2	check.		
7:03:05.7 HOT-1	full leftfull right. neutral.		
7:03:09.3 HOT-2	check.		
7:03:09.8 HOT-1	rudder. leftcenterrightcenter.		
7:03:13.6 HOT-2	check. check.		
7:03:15.3 HOT-1	ready when you are sir.		
7:03:22.1 HOT-2	APU's coming down. here we go.		
			DCA11IA040 CVR Factual Report Page 12-15

Time and Source	I Intra-Aircraft Communication	Time and Source	I Over-the-Air Communication
		7:03:25.1 RDO-2	ground United four ninety seven off of charlie five now with hotel ready for taxi.
		7:03:30.9 GND	United four ninety seven runway one niner taxi via echo sierra cross runway two eight and two four on sierra.
		7:03:38.8 RDO-2	alright echo sierra cross two eight and two four on sierra for United four ninety seven runway one niner thanks.
7:03:42.9 HOT-1	clear over here.		
7:03:43.9 HOT-2	clear right.		
7:03:45.4 HOT-1	echo sierra. got it.		
7:03:48.2 CAM	[sound similar to increasing engine RPM]		
7:03:50.2 HOT-2	echo sierra. cross two eight two four.		
7:03:51.8 HOT-1	to right and then left all the way to the end.		
7:03:56.2 HOT-2	right and then left. two eight and two— yeah that makes sense.		
7:04:15.7 HOT-2	ready to read em and weep?		
7:04:17.2 HOT-1	let's do it.		

Time and Source	I Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
7:04:18.4 HOT-2	before takeoff checklist. control check?		
7:04:20.4 HOT-1	complete.		
7:04:20.9 HOT-2	complete. engine anti-ice?		
7:04:21.9 HOT-1	it's off.		
7:04:22.5 HOT-2	autobrake?		
7:04:23.8 HOT-1	max.		
7:04:24.3 HOT-2	flaps?		
7:04:25.5 HOT-1	three planned three indicated uh detent.		
7:04:28.4 HOT-2	engine mode selector?		
7:04:29.9 HOT-1	normal.		
7:04:30.7 HOT-2	takeoff weight change minus seventeen hundred pounds. speeds checked and set.		
7:04:34.0 HOT-1	set.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
7:04:34.6 HOT-2	trim twenty six point eight percent zero. FMGC's runway one nine radar vectorsset.		
7:04:42.8 HOT-1	set.		
7:04:43.1 HOT-2	GPWS radar display?		
7:04:44.5 HOT-1	terrain.		
7:04:44.9 HOT-2	terrain. PWS is auto. thrust?		
7:04:46.7 HOT-1	it is uh one point three nine one. flex EPR set.		
7:04:50.5 HOT-2	FCU?		
7:04:51.7 HOT-1	managed speed uh one ninety uh five. one ninety three okay yeah. one ninety three. and uh four thousand set.		
7:04:55.0 HOT-2	ninety three.		
7:05:05.1 HOT-2	takeoff configuration normal. ECAM status check is complete. I thought we had a status message before. did it fix itself?		
7:05:15.6 HOT-1	CFDS yeah.		
7:05:18.8 HOT-2	alright clear.		

Time and	Time and			
Source	Intra-Aircraft Communication	Source	Over-the-Air Communication	
7:05:19.6 HOT-1	all clear.			
7:05:35.8 PA-5	[sound of Rhapsody in Blue] thank you for your attention. the flight attendants will now come through the aisle for their final safety check. if you have any questions regarding your safety please ask a flight attendant. [FO monitoring PA]			
7:05:46.8 PA-2	flight attendants prepare for takeoff please.			
7:05:58.1 HOT-2	little less than a minute to go on the engine and we are good. it's all coming together.			
7:06:00.4 HOT-1	roger roger.			
7:06:29.6 HOT-1	clear to cross. all clear.			
7:06:31.6 HOT-2	clear right.			
7:06:44.1 HOT-2	alright you're up on tower twenty five five.			
7:06:46.3 HOT-1	roger that.			
7:06:47.3 HOT-2	roger.			
		7:07:19.3 RDO-2	tower good morning. United four ninety seven approaching	

runway one nine ready for release.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		7:07:28.0 TWR	United four ninety seven runway one niner. fly the runway heading. cleared for takeoff.
		7:07:32.3 RDO-2	runway heading. cleared for takeoff. runway one nine. thanks very much United four nine seven.
		7:07:35.2 TWR	any time.
7:07:36.4 HOT-2	final items. cabin notification complete. transponder traffic. takeoff memo's green. before takeoff checklist complete.		
7:07:39.9 HOT-1	roger roger.		
7:07:41.7 HOT-2	let's get the # outta here. let's get the # outta here man.		
7:07:41.9 HOT-1	brakes are released. you got it man. throttles yours.		
7:07:48.9 HOT-1	whatever you want to do.		
7:07:54.7 HOT-2	alright here comes the power.		
7:07:59.5 CAM	[sound similar to engine rpm increase]		
7:08:09.1 HOT-2	MAN TOGA. SRS. runway.		
7:08:17.3 HOT-1	eighty knots. thrust set.		

Time and Source	Intra-Aircraft Communication	Time and Source	d Over-the-Air Communication
7:08:28.8 HOT-1	V one V R V two.		
7:08:36.2 HOT-2	positive climb. gear up.		
7:08:42.4 HOT-2	pull for heading please.		
7:08:45.0 HOT-1	done.		
		7:08:56.9 TWR	United four ninety seven contact departure. good day.
		7:08:59.8 RDO-2	and four ninety seven departure. good day.
7:09:01.7 CAM	[sound similar to engine rpm decrease]		
7:09:04.2 HOT-2	let's go flaps one please.		
		7:09:07.6 RDO-1	departure United four ninety seven. uh fifteen hundred climbing to four thousand.
		7:09:12.3 DEP-A	United four ninety seven New Orleans Departure. radar contact. climb maintain one five thousand. turn right heading two five zero.
		7:09:17.9 RDO-1	one five fifteen thousand. right turn two fifty uh United uh four nine seven.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
7:09:23.6 HOT-1	four nine seven. is that right?		
7:09:24.7 HOT-2	four nine seven.		
7:09:26.6 HOT-2	one five thousand. got it. heading two fifty. here we go.		
7:09:45.9 HOT-2	and flaps up please. after takeoff checklist at your leisure.		
7:10:08.7 HOT-1	alright landing gear's up. flaps up. alright wait a minute what do we got here.		
7:10:25.7 HOT-1	okay ECAM I got the uh— uh you got the jet. I got this.		
7:10:30.2 HOT-2	I got the jet.		
7:10:30.8 HOT-1	perceptible smoke.		
7:10:31.5 HOT-2	give me two twenty * stand by.		
7:10:33.0 HOT-1	there you go.		
7:10:34.8 HOT-1	mask on. we don't have that.		
7:10:36.2 HOT-1	cabin fans off.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
7:10:38.0 HOT-1	blowercabin fans.		
7:10:40.9 HOT-1	where are where's our cabin fans? that's um		
7:10:42.4 HOT	[sound of single chime]		
7:10:43.6 CAM	[sound similar to engine rpm increase]		
7:10:46.6 HOT-1	hey you lost the autopilot too.		
7:10:48.2 HOT-2	what's that?		
7:10:49.0 HOT-1	your autoflight's just went off.		
7:10:51.4 HOT-1	auto— autopilot won't *.		
7:10:53.3 HOT	[sound of single chime]		
7:10:54.5 HOT-1	we— we got a no # uh deal. blower off.		
7:10:57.7 HOT-1	cabin fans. where the hell are they at? uh there on your side.		
7:10:59.1 CAM	[sound similar to engine rpm decrease]		
7:11:04.0 HOT-1	cabin fans off.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
7:11:08.0 HOT-1	blower override.		
7:11:11.6 HOT-1	uh extract to override.		
7:11:18.1 HOT-1	electrical generator uh line off.		
7:11:22.8 HOT-1	line one off.		
7:11:29.8 HOT-1	okay emergency electrical power man on when uh emergency generator available. gen two off.		
7:11:38.4 HOT-1	gen two.		
7:11:40.2 HOT-2	you want me to start getting vectors back?		
7:11:41.4 HOT-1	yeah uh gen two off.		

[POWER INTERRUPTION LASTING FROM 7:11:43.5 to 7:11:49.2]

7:11:50.0

HOT [sound of continuous repetitive chime]

7:11:50.4

HOT-1 we just went to uh—. *.

7:11:54.7 **RDO-1** and United uh—.

Time and	
Source	

Time and Source

Over-the-Air Communication

7:11:58.4

HOT-1 I don't— I don't know if we want that do we?

7:12:01.2

HOT-1 min RAT speed one forty. good God we're in emergency electric config.

7:12:04.7

HOT-2 yup confirm. let's go back.

7:12:05.5 RDO-1	uh United one uh—.
7:12:08.9 RDO-1	four ninety seven we need a vector back to the airport. we got a uh smoke uh issue with the airplane.
7:12:16.5 DEP-A	United four ninety seven turn right heading zero three zero and uh maintain four thousand.
7:12:21.6 RDO-1	right zero three zero. four thousand. we'd like the longest runway too please.
7:12:29.8 DEP-A	four ninety seven roger. they did just close runway one zero we'll check on it and make— and uh see if they can get it back open for you quickly.
7:12:38.5 RDO-1	okay roger that.
7:12:39.8 RDO-1	we're emergency airplane too.

7:12:40.0 **HOT-2** alright.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
7:12:44.0 HOT-1	aw great I've lost my ability.		
7:12:46.2 HOT-2	alright five for four.		
7:12:47.9 HOT-2	zero two zero turn—.		
7:12:48.7 HOT	[sound of single chime]		
7:12:49.5 HOT-1	yeah zero three zerofour thousand.		
7:12:51.5 HOT-2	alright I have no instruments though.		
7:12:53.3 HOT-1	I tell you what. I got it.		
7:12:54.3 HOT-2	you got the aircraft. it's your aircraft. I got the radios.		
7:12:54.5 HOT-1	yeah go ahead and uh give the uh flight attendants a call.		
		7:12:56.6 DEP-A	United four ninety seven there's men and equipment on the runway. they're gonna try to get them off. uh descend

7:13:02.6

RDO-2 alright pilot's discretion to two thousand for United four ninety seven. we are declaring an emergency. and please roll the equipment for our landing please.

at pilot's discretion maintain two thousand.

Time and Source	Intra-Aircraft Communication	Time and Source	d Over-the-Air Communication
7:13:10.6 HOT	[sound similar to altitude alert]		
7:13:11.6 HOT-2	two thousand?		
7:13:12.3 HOT-1	two thousand.		
7:13:13.3 HOT-2	alright zero three zero?		
7:13:14.9 HOT-1	zero three zero. two thousand.		
7:13:19.6 HOT-2	should I call her in the back?		
7:13:20.6 HOT-1	yeah.		
7:13:26.4 HOT-1	we're overweight too I think.		
		7:13:28.7 DEP-A	United four ninety seven if able— or if unable ten can you take nineteen?
		7:13:33.8 RDO-1	uh we'd prefer the long one.
7:13:38.5 INT-2	are you there?		
		7:13:39.4 DEP-A	United four ninety seven roger. we're clearing the runway now.

Time and Source	Intra-Aircraft Communication	Time and Source		Over-the-Air Communication
		7:13:41.9 RDO-1	roger.	
7:14:01.8 HOT-1	if you can't get ahold of her just open the door and yell at her			
7:14:09.2 PA-2	flight attendants call the cockpit please.			
7:14:13.9 INT-1	are you there there?			
7:14:19.7 HOT-1	flaps one.			
7:14:22.1 HOT-2	one.			
7:14:25.1 HOT-2	you want me to get up?			
7:14:25.9 HOT-1	yeah that's fine.			
7:14:30.8 HOT-2	uh no seat. I can't get back.			
7:14:32.6 HOT-1	yeah uh reach.			
		7:14:33.0 DEP-A	United four remaining.	ninety seven say souls on board and fuel

7:14:33.2 **HOT-2** adjust it.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		7:14:37.1 RDO-2	United four ninety seven. souls one hundred and six souls on board. fuel remaining thirty two thousand four hundred uh pounds.
7:14:47.4 HOT-2	you got the radio for a sec?		
7:14:48.0 HOT	[sound of movement of the first officer's boom microphone]		
		7:14:48.1 DEP-A	United four ninety seven roger they're still trying to get all the vehicles off of the runway and nineteen is still available if you like. wind one eight zero at one five.
		7:14:55.7 RDO-1	uh we need uh runway ten.
7:14:57.4 HOT	[sound of movement of the first officer's boom microphone]		
		7:14:58.9 DEP-B	United four nine seven we're working as fast as we can we got a * closure * we got a bunch of equipment on the runway we're trying to get them off now.
7:14:59.5 HOT-2	l'm off.		
7:15:00.5 HOT	[sound of movement of the first officer's boom microphone]		
		7:15:05.5 RDO-1	okay we're emergency aircraft you need to clear that for us.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication	
		7:15:09.0 DEP-B	I understand sir. we're getting them off as fast as we can.	
7:15:11.5 HOT	[sound similar to altitude alert]			
7:15:14.1 CAM	[sound similar to metallic clang]			
7:15:18.5 HOT-1	** two thousand okay.			
7:15:22.0 HOT-2	[sound of movement of the first officer's boom microphone]			
7:15:22.2 HOT-1	tell her to remain in their uh seats— uh when we land tell them to remain in their seats if uh **.			
7:15:26.6 HOT-2	you got it.			
7:15:29.5 HOT-1	PA should be working.			
7:15:35.7 HOT-1	the RAT's out.			
		7:15:36.9 DEP-A	United four ninety seven turn right heading one four zero. maintain uh two thousand until established on the localizer. cleared ILS runway one zero approach.	
7:15:38.6				

HOT-2 I got it.

Time and	
Source	Intra

Intra-Aircraft Communication

Time and Source

Over-the-Air Communication

7:15:43.9

RDO-2 heading one four zero two thousand until established. cleared for ILS— ILS runway one zero approach United four ninety seven.

7:15:50.9

HOT-2 okay I have no way to put that in so it's gonna be a visual.

7:15:52.4

HOT [sound of continuous repetitive chime until end of recording]

7:15:52.8

HOT-1 yeah.

7:15:56.3

HOT-1 select gear down.

7:15:57.8

HOT-2 gear down?

7:15:58.5

HOT-1 yeah. let's go to the emergency...

7:16:00.0

CAM [sound similar to landing gear deployment]

7:16:02.9

HOT-1 right one four—.

7:16:03.4

END OF TRANSCRIPT END OF RECORDING