

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



GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

DCA21FA085

By
Kyle Garner

WARNING

The reader of this report is cautioned that the transcript of a cockpit voice recorder audio recording is not a precise science but is the best product possible from an NTSB 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

August 28, 2023

Cockpit Voice Recorder

Group Chairman's Factual Report By Kyle Garner

1. EVENT

Location: Near Denver, Colorado
Date: February 20, 2021
Aircraft: Boeing 777-222, Registration N772UA
Operator: United Airlines, Flight 328
NTSB Number: DCA21FA085

A solid-state cockpit voice recorder (CVR) was sent to the National Transportation Safety Board (NTSB) Vehicle Recorder Division for evaluation. The CVR group meeting convened on May 19, 2021, and a transcript was produced (see attachment).

2. COCKPIT VOICE RECORDER GROUP

Chairman: Kyle Garner
Sr. Aerospace Engineer – Recorder Specialist
National Transportation Safety Board

Member: Captain Bob Aaron
Senior Safety Pilot
The Boeing Company

Member: Captain Noel Ojeda
C34 Chairman and Captain Representative
Air Line Pilots Association

Member: Captain Bradley Peterson
777/787 Fleet Standards Manager
United Airlines

Member: Pat Hempen
Director, AVP-100 Accident Investigation
Federal Aviation Administration

3. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Division received the following CVR:

Recorder Manufacturer/Model: **Honeywell HFR5-V**
Recorder Serial Number: **CVR-01238**

3.1 CVR Carriage Requirements

The event aircraft, N772UA, was manufactured in 1995 and was operating such that it was required to be equipped with a CVR that recorded, at minimum, the last 2 hours of aircraft operation as cited in Title 14 CFR Part 121.359. 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.

3.2 Recorder Description

This model CVR, the Honeywell HFR5-V, records a minimum of 120 minutes of digital audio stored on solid-state memory modules. Four channels are independently recorded: one channel for each flight crew, one channel for a cockpit observer, and one channel for the cockpit area microphone (CAM).

3.3 Recorder Damage

Upon arrival at the laboratory, it was evident that the CVR had not sustained any heat or structural damage (see Figure 1), and the audio information was extracted from the recorder normally, without difficulty.



Figure 1. Condition of CVR, as received.

3.4 Audio Recording Description

Each channel's audio quality is indicated in Table 1.¹

Table 1: Audio Quality.

Channel Number	Content/Source	Quality	Duration
1	HOT – Observer	Excellent	02:10:39
2	HOT – First Officer	Excellent	02:10:39
3	HOT – Captain	Excellent	02:10:39
4	CAM	Good/Poor ²	03:12:14

3.5 Timing and Correlation

Timing on the transcript was established by correlating the CVR events to common events on the flight data recorder (FDR). Specifically, radio transmissions that the aircraft made before landing were correlated to the radio transmit microphone key parameter from the FDR. Once a correlation between the two recorders was established, a reference to Coordinated Universal Time (UTC) time was determined using the recorded UTC parameter on the FDR. UTC was then converted to local time, MST, by subtracting seven hours. The conversion from CVR elapsed time to MST is as follows:

$$\text{CVR MST} = \text{CVR elapsed time} + 12:34:11.4^3$$

For the remainder of this report, all times are referenced as MST.

3.6 Description of Audio Events

After reviewing the audio information in each channel, it was determined that only the CAM channel had captured the event. Channels 1, 2, and 3 all started at 13:35:46 after the aircraft had already landed at DEN post-event and only captured the aircraft rescue and firefighting (ARFF) response and the aircraft being towed to a maintenance hangar for passenger disembarkation.

Since the CAM channel does not record any inbound over-the-air (OTA) communications, audio information from the Denver (DEN) Air Traffic Control Tower (ATCT) and the DEN Terminal Radar Approach Control (TRACON) was obtained and overlaid on the CAM channel to assist in the development of the transcript. Audio information was not available or not obtained from the DEN ramp controller and OTA company communications, therefore, these transmissions are omitted from the transcript.

The CAM channel recording began at 12:34:11, which was during the engine startup sequence on the accident flight before the aircraft departed DEN. The transcript begins approximately 20 minutes later, at 12:55:48, as the crew is preparing to taxi to the departure runway at DEN. The transcript ends at 13:29:08, after the aircraft returned to DEN, landed, and came to a complete stop. The ARFF response and passenger disembarkation are not transcribed. The CAM channel recording ended at 15:46:25.

¹ See Attachment I - CVR Quality Rating Scale.

²For about five minutes following the event, the CAM channel was 'poor' quality and severely degraded by the presence of a 400 Hertz (Hz) tone. The CAM channel outside this five-minute period was 'good' quality.

³In the format hh:mm:ss.ms, where hh = hours, mm = minutes, ss = seconds, and ms = milliseconds.

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 Honeywell HFR5-V solid-state cockpit voice recorder installed on a United Airlines Boeing 777-200 aircraft, which experienced an engine failure after takeoff from Denver International Airport in Denver, Colorado.

LEGEND

ATCT	Radio transmissions from the Denver Air Traffic Control Tower
CAM	Cockpit area microphone voice or sound source
RDO	Radio transmissions from the accident aircraft
TRACON	Radio transmissions from Denver Terminal Radar Approach Control
-1	Voice identified as the captain
-2	Voice identified as the first officer
-?	Voice unidentified
*	Unintelligible word
#	Expletive
@	Non-pertinent word
()	Questionable insertion
[]	Editorial insertion

Note 1: Times are expressed in mountain standard time.

Note 2: 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
12:34:11.3	START OF CAM CHANNEL RECORDING		
12:55:48.9	START OF TRANSCRIPT		
12:55:56.8 CAM-1	* set flaps...five.		
12:55:59.8 CAM-2	yeah flaps going five.		
12:56:06.6 CAM-2	done with the A-P-U?		
12:56:07.5 CAM-1	done.		
12:56:13.4 CAM-1	rudders?		
12:56:14.1 CAM-1	left.		
12:56:16.0 CAM-1	center.		
12:56:17.3 CAM-1	right.		
12:56:19.2 CAM-1	center *.		
12:56:20.8 CAM-1	[sound similar to cough] after start checklist.		
12:56:22.2 CAM-2	all right there ya go...after start checklist.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
12:56:28.9 CAM-2	engine anti ice.		
12:56:31.3 CAM-1	auto.		
12:56:32.8 CAM-2	recall...checked. flight controls?		
12:56:36.3 CAM-1	checked.		
12:56:37.7 CAM-2	after start checklist is complete sir.		
12:56:39.9 CAM-1	okay ready to taxi.		
12:56:41.3 CAM-2	on one.		
		12:57:08.5 RDO-2	and ramp...uh...united three twenty eight heavy ready to taxi.
			<i>[DEN Ramp controller response was not transcribed]</i>
		12:57:30.5 RDO-2	alpha november three whiskey for united three twenty eight.
12:59:37.1 CAM-1	all right (up/on) radio one.		
12:59:38.5 CAM-2	all right (that's it/me too) radio one.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		12:59:47.2 RDO-2	and ground united...uh...three twenty eight heavy is uh coming out three whiskey with A-TIS.
		12:59:52.2 ATCT	united three twenty eight heavy denver ground. runway two five taxi via golf. i'm sorry i missed it verify information kilo?
		12:59:57.6 RDO-2	all right golf to two five. we'll pick up kilo. united three twenty eight heavy.
13:00:02.2 CAM-2	kilo.		
13:00:02.9 CAM-1	golf two five.		
13:00:09.9 CAM-1	let's get the flight attendants seated * * *.		
13:00:12.4 CAM-2	all right.		
13:00:13.2 CAM-2	yeah you bet.		
13:00:28.1 CAM	[sound similar to ACARS chime]		
13:00:30.1 CAM-2	kilo seventy now.		
13:00:34.7 CAM-2	it's supposed to snow tonight maybe a little bit.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:00:37.4 CAM-1	i believe it look at those clouds.		
13:00:39.0 CAM-2	yup.		
13:00:41.8 CAM-2	south wind at seven.		
13:00:44.5 CAM-2	little crosswind from the right.		
13:00:51.8 CAM-2	flight attendants please be seated for departure.		
13:01:31.2 CAM-2	all right if you're ready i'll run the before takeoff checklist.		
13:01:33.9 CAM-1	i'm ready.		
13:01:34.6 CAM-2	all right here we go. final weights.		
13:01:36.0 CAM-2	takeoff gross weight we got uh four seventy three six.		
		13:01:40.7 ATCT	united three twenty eight heavy. monitor one three five point three good day.
		13:01:44.2 RDO-2	thirty five three for united uh three twenty eight good day.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:01:56.6 CAM-2	all right uh we lost...two thousand pounds.		
13:02:00.9 CAM-2	speeds. takeoff gross weight. we got uh four seventy four five. we have one forty eight one fifty two one fifty four set.		
13:02:09.0 CAM-1	set.		
13:02:10.0 CAM-2	all right thrust we've got uh reduced ee-purr [EPR].		
13:02:13.7 CAM-2	one point three seven two ee-purr [EPR] set.		
13:02:17.2 CAM-2	trims at zero. zero. five point five. set.		
13:02:23.7 CAM-2	F-M-Cs we're looking at uh...runway two five. ZIMMR two CHNGY transition. set.		
13:02:31.3 CAM-1	set.		
13:02:33.0 CAM-2	M-C-P V two is uh one fifty four L-NAV. V-NAV.		
13:02:38.6 CAM-2	heading two sixty.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		13:02:41.3 ATCT	united three twenty eight heavy denver tower another * wind calm runway two five cleared for takeoff.
13:02:41.5 CAM-2	ten thousand feet. set.		
		13:02:46.0 RDO-2	all right cleared for takeoff two five. united uh...three twenty three- three twenty eight heavy.
13:02:54.6 CAM-2	let's see it's uh showing flight level two three zero on this thing.		
13:02:59.1 CAM-1	let's see.		
13:03:00.1 CAM-2	for the top altitude?		
13:03:01.3 CAM-1	right.		
13:03:02.0 CAM-2	departure announcement is complete. transponder set for traffic.		
13:03:06.0 CAM-2	recalled and checked.		
13:03:08.4 CAM-2	and the before takeoff checklist is complete.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:03:19.5 CAM	[sound similar to shoulder harness clipping in]		
13:03:23.2 CAM	approaching two five [electronic voice].		
13:03:41.2 CAM	[sound similar to engine thrust increase]		
13:03:47.2 CAM	on runway two five [electronic voice].		
13:03:52.1 CAM	[config gear steering EICAS and siren]		
13:03:55.0 CAM-1	all right.		
13:03:56.5 CAM	[sound similar to engine thrust increasing]		
13:03:57.5 CAM-1	check thrust.		
13:03:59.1 CAM-2	thrust is set.		
13:04:16.2 CAM-2	one hundred knots.		
13:04:28.7 CAM	vee one [electronic voice].		
13:04:31.1 CAM-2	rotate.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:04:36.1 CAM-?	positive rate.		
13:04:36.9 CAM-1	gear up.		
13:04:37.1 CAM	[sound similar to landing gear handle movement]		
13:04:37.3 CAM-2	gear up.		
13:04:41.0 CAM-1	L-NAV.		
13:04:58.3 CAM-1	V-NAV speed.		
		13:04:59.8 ATCT	united three twenty eight heavy contact departure. have a good day.
		13:05:03.3 RDO-2	denver departure united three twenty eight heavy *.
		13:05:07.9 RDO-2	denver departure united three twenty eight heavy is uh with you out of six for flight level two three zero.
		13:05:13.3 TRACON	united three twenty eight heavy denver departure radar contact. climb and maintain flight level two three zero-moderate turbulence from fourteen to flight level two two zero.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		13:05:21.9 RDO-2	okay i understand. thanks for the pie-rep [PIREP]...uh...cleared to flight level two three zero. united uh three twenty eight heavy.
13:05:27.8 CAM-1	flaps one.		
13:05:28.5 CAM-2	flaps one.		
13:05:28.7 CAM	[sound similar to flap handle movement]		
13:05:45.2 CAM-1	flaps up.		
13:05:46.3 CAM-2	flaps up.		
13:05:46.5 CAM	[sound similar to flap handle movement]		
13:05:58.3 CAM-2	yeah it does definitely looks like it's rough.		
13:06:01.4 CAM-1	yeah.		
13:06:11.8 CAM-2	after takeoff checklist is complete sir.		
13:06:23.6 CAM-1	autopilot's on.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:06:24.8 CAM-2	yeah.		
		13:06:39.2 TRACON	united three twenty eight heavy cleared direct ZIMMR.
		13:06:41.9 RDO-2	all right direct to uh ZIMMR. united three twenty eight heavy.
13:06:45.4 CAM-2	ZIMMR.		
13:06:46.5 CAM-1	yup. looks good. execute.		
13:06:48.6 CAM-1	L-NAV.		
13:06:59.6 CAM-1	which section do you live in?		
13:07:01.6 CAM-2	i live up uh...up here in uh-loveland.		
13:07:03.8 CAM-1	lubbock?		
13:07:04.4 CAM-2	uh-loveland.		
13:07:05.5 CAM-1	oh loveland.		
13:07:06.9 CAM-2	it's kinda up by fort collins.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:07:21.2 CAM-1	ten thousand.		
13:07:54.6 CAM-1	maybe i'll change my climb to like two eighty.		
13:07:56.6 CAM-2	all right.		
13:08:10.1 CAM-1	cut through this stuff.		
13:08:11.7 CAM-2	yeah.		
13:08:18.1 CAM-2	give you some more thrust too if you want it.		
13:08:20.3 CAM-1	yeah.		
13:08:31.5 CAM	[sound similar to engine failure]		
13:08:33.0 CAM-?	* what was that.		
13:08:39.1 CAM-?	* * *		
		13:08:42.5 RDO-2	and denver departure united uh-
13:08:45.9 CAM-?	we need to turn.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		13:08:48.6 RDO-2	* uh united three twenty eight uh heavy we've experienced an engine failure. we need to turn.
13:08:51.7 CAM	[sound similar to fire bell]		
13:08:58.3 CAM-1	mayday.		
		13:08:59.1 RDO-2	mayday mayday united uh twenty eight. united three twenty eight heavy mayday mayday aircraft uh.
		13:09:02.3 TRACON	united three twenty eight heavy just got here. uh- say again please.
13:09:04.4 CAM-?	* * *		
		13:09:07.9 TRACON	united three twenty eight heavy say again please? i need all that again.
		13:09:10.5 RDO-2	denver departure united three twenty eight heavy mayday aircraft uh just experienced an engine failure need to turn immediately.
		13:09:17.5 TRACON	united three twenty eight heavy left or right turn?
		13:09:19.9 RDO-2	uh...left turn.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		13:09:20.7 TRACON	united three twenty eight heavy turn left heading zero eight zero.
13:09:23.6 CAM	[single chime, cabin call]		
		13:09:23.7 RDO-2	left heading zero eight zero united three twenty eight heavy.
13:09:26.9 CAM-1	run the checklist.		
13:09:28.0 CAM-2	yeah.		
13:09:30.1 CAM	[single chime, cabin call]		
13:09:30.4 CAM-1	okay...uh.		
13:09:32.4 CAM-1	let's go ahead and get the autopilot back on.		
13:09:40.7 CAM-2	all right.		
13:09:41.5 CAM-1	left. i'll fly the airplane and i'll handle the radios.		
13:09:45.1 CAM-1	* * *		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		13:09:50.4 TRACON	united three twenty eight heavy descend at pilot's discretion. maintain niner thousand.
		13:09:54.2 RDO-1	okay descend and maintain nine thousand united three twenty eight heavy.
13:09:58.0 CAM-2	all right nine thousand.		
		13:09:59.5 TRACON	united three twenty eight heavy do you want a straight in to runway seven?
13:10:01.9 CAM-?	*		
13:10:03.2 CAM-1	no we don't need an immediate let's finish the checklist.		
		13:10:06.4 RDO-1	united...uh...three twenty eight...uh...no we don't need an immediate we need to uh- let's go ahead- we need to run some checklists.
		13:10:13.3 TRACON	and united three twenty eight heavy roger just let me know what you need to do. if you want to hold for left turns let me know.
		13:10:17.1 RDO-1	very good united three twenty eight heavy.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:10:20.6 CAM-?	***		
13:10:29.6 CAM-2	* * uh run uh checklist here.		
13:10:32.3 CAM-?	*		
13:10:39.1 CAM-?	*		
13:10:42.1 CAM-2	okay...uh...fire- fire engine right.		
13:10:45.4 CAM-2	right autothrottle arm switch.		
13:10:47.6 CAM-2	confirm.		
13:10:48.5 CAM-1	confirm.		
13:10:53.0 CAM-2	right thrust lever confirm idle.		
13:10:55.8 CAM-1	confirm.		
13:11:08.7 CAM-2	right thrust lever confirm idle.		
13:11:11.0 CAM-?	* * *		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:11:14.4 CAM-?	*** override ***		
13:11:21.5 CAM-2	right fuel control switch confirm cutoff.		
13:11:26.4 CAM-1	confirm.		
13:11:32.1 CAM-2	right engine fire switch confirm pull.		
		13:11:32.4 TRACON	united three twenty eight heavy do you want to uh- hold up to the north? and when able i need the fuel and souls onboard.
13:11:36.3 CAM-?	***		
13:11:45.7 CAM-2	right engine fire switch turn.		
13:11:50.7 CAM-?	*		
13:11:52.2 CAM-2	if after thirty seconds right engine * * .		
13:11:57.1 CAM	[sound similar to cabin call or ACARS chime]		
13:12:04.1 CAM-?	**		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:12:07.2 CAM-?	*		
13:12:29.8 CAM-2	engine fire switch turn.		
13:12:31.9 CAM-1	what was that?		
13:12:32.9 CAM-2	turn.		
13:12:33.6 CAM-1	(turn/confirm).		
13:12:36.1 CAM-?	***		
13:12:39.1 CAM-2	A-P-U. start the A-P-U.		
13:12:46.2 CAM-2	transponder T-A only.		
13:12:50.1 CAM-2	plan to land at nearest suitable that's denver.		
13:12:52.3 CAM-2	plan on a flaps at twenty ***.		
13:12:57.2 CAM-2	(confirm/turn).		
13:13:00.6 CAM-?	* * *		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:13:07.1 CAM-2	okay landing distance non normal.		
13:13:09.3 CAM-?	* * *		
13:13:13.3 CAM-2	check the A-CARS landing data.		
13:13:15.0 CAM-2	familiar we're in denver.		
13:13:19.5 CAM-2	planning a uh- flaps twenty approach * * *.		
13:13:26.2 CAM-1	yup.		
13:13:26.9 CAM-?	*		
13:13:28.6 CAM-2	go back to den.		
13:13:29.3 CAM-2	ground proximity flap override switch override. * * *		
13:13:38.0 CAM-2	checklist complete except deferred items.		
13:13:42.6 CAM-2	do we need to make an announcement to tell them that we're returning to denver?		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:13:45.4 CAM-1	yeah.		
13:13:49.4 CAM-2	ladies and gentlemen this is the first officer speaking uh those of you on board obviously felt uh- the uh surge in power...um...we've experienced uh- one of our engines uh- has failed and we'll be returning to denver. uh please remain calm and uh we'll have you on the ground safely *** thank you.		
13:14:14.4 CAM-2	okay.		
13:14:18.6 CAM-1	let's see where we're at here.		
13:14:19.9 CAM-1	* * approach landing.		
13:14:19.9 CAM-2	all right.		
13:14:21.4 CAM-2	* *		
13:14:22.4 CAM-1	yup.		
13:14:23.0 CAM-1	you got that.		
13:14:23.5 CAM-2	let me call-uh i'm gonna call denver ops.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:14:28.6 CAM-2	do we want me to fly the airplane for now? do you want to do some coordinating or do you want to uh do you want me to uh-		
13:14:34.1 CAM-1	i'd rather- well we already declared an emergency.		
13:14:35.6 CAM-2	already declared an emergency already did that.		
13:14:36.5 CAM-1	yeah so i'd- i'd say let's just get back on the ground. the uh-		
13:14:43.4 CAM-1	cause it is an engine fire right?		
13:14:45.7 CAM-2	* * *		
13:14:48.0 CAM-2	what we have right now we have uh-		
13:14:54.9 CAM-2	right engine fire.		
13:14:56.6 CAM-1	i'd say get on the ground A-S-A-P.		
13:14:57.4 CAM-2	on the ground we'd want uh-		
13:15:04.0 CAM-1	we have to return anyway.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:15:05.4 CAM-2	yeah we have to return. i guess- let me uh- let me get ahold of company though let them know that uh we're coming back.		
13:15:11.2 CAM-1	all right. we need to get the landing data as- A-S-A-P.		
13:15:13.9 CAM-2	yeah.		
13:15:22.2 CAM-2	three one zero seven.		
		13:15:29.5 TRACON	united three twenty eight heavy approach.
13:15:29.7 CAM-2	zero seven.		
		13:15:31.5 RDO-1	two eight heavy go ahead.
		13:15:32.7 TRACON	united three twenty eight when able uh- fuel and souls onboard and intentions.
		13:15:35.8 RDO-2	<p><i>[This transmission from RDO-2 is OTA to company operations personnel on the ground. The inbound response from the company operations personnel is not transcribed.]</i></p> <p>and denver united uh- three twenty eight heavy.</p>

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		13:15:38.1 RDO-1	we'd like to return to denver as soon as possible here and we'll uh- get you the souls in just a minute.
		13:15:40.7 RDO-2	<p><i>[This transmission from RDO-2 is OTA to company operations personnel on the ground. The inbound response from the company operations personnel is not transcribed.]</i></p> <p>three twenty eight heavy we experienced an engine failure right powerplant. and uh * * * returning to denver we're just running some checklists.</p>
		13:15:43.2 TRACON	united three twenty eight roger. cleared to denver via radar vectors. do you want a left turn into the airport right now or do you want delay vectors for uh- uh- anything else you might need.
		13:15:51.1 RDO-1	yeah we're gonna- yeah we'll need delay vectors we need to still run a few checklists and get some landing data.
		13:15:55.2 TRACON	okay i'm just gonna keep you in that heading there. left turns all the way around the uh- aerodrome and whatever runway you line up for and you want just let me know and we'll make it happen.
		13:15:56.0 RDO-2	<p><i>[This transmission from RDO-2 is OTA to company operations personnel on the ground. The inbound response from the company operations personnel is not transcribed.]</i></p> <p>very good united three twenty eight heavy.</p>

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		13:16:04.8 RDO-1	three twenty eight heavy thank you.
13:16:08.7 CAM-1	okay have you talked to denver?		
13:16:10.6 CAM-2	yup.		
13:16:11.6 CAM-2	i got ahold of them.		
13:16:13.1 CAM-1	okay can you- do you know how to go now to the front page on the- F-M and then just uh- it takes you right to landing data.		
13:16:23.6 CAM-1	do you know what i'm talking about?		
13:16:24.5 CAM-2	yeah.		
13:17:26.6 CAM-1	let's go flaps one.		
13:17:28.4 CAM-2	all right speed checks. flaps one.		
13:17:30.7 CAM	[sound similar to flap lever moving]		
13:17:35.0 CAM	[sound similar to ACARS chime]		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:17:36.6 CAM-1	cabin? no comm.		
13:17:39.5 CAM	[sound similar to ACARS chime]		
13:17:41.8 CAM-1	keep running.		
		13:17:41.9 TRACON	united three twenty eight heavy when able fly heading zero five zero.
		13:17:44.8 RDO-1	heading zero five zero united three twenty eight heavy.
13:17:48.9 CAM-2	engine vibration monitor eye-cass [EICAS] message on the right.		
13:17:52.1 CAM	[sound similar to ACARS chime]		
13:17:55.6 CAM-2	plane is starting to write itself up.		
13:18:00.2 CAM	[sound similar to ACARS chime]		
13:18:01.5 CAM	[sound similar to paper tearing]		
13:18:05.7 CAM-2	i mean i don't think we need to dump fuel right? we're plenty good on the landing weight.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:18:06.2 CAM	[sound similar to ACARS chime]		
13:18:14.1 CAM-1	let's see we're at four-sixty-nine.		
13:18:19.1 CAM-2	man this thing's just shaking itself to pieces here.		
13:18:31.0 CAM-2	god #.		
13:18:42.1 CAM	[sound similar to ACARS chime]		
		13:18:56.9 RDO-1	and uh- what runway you planning for three twenty eight heavy.
		13:18:59.8 TRACON	united three twenty eight heavy you can have uh- any runway you like so just let me know um- keeping you wide there if you want to go into the west runways or i can take you up to the north and take you to the south runways it's really your call.
13:19:08.8 CAM-1	all right.		
13:19:10.2 CAM-2	okay we are uh above max landing weight right now but uh-		
		13:19:14.2 TRACON	closest runway would probably be runway uh- two six.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:19:19.6 CAM-2	we're like twenty pounds over- twenty thousand pounds over.		
13:19:21.7 CAM-1	let's just plan on going ahead and landing.		
13:19:23.7 CAM-2	all right.		
13:19:24.2 CAM-1	uh two six. set up for runway two six.		
13:19:33.0 CAM	[sound similar to ACARS chime]		
13:19:38.8 CAM-1	okay eleven dash eight page.		
13:19:41.3 CAM	[sound similar to ACARS chime]		
13:19:41.5 CAM-1	two sixty three GRASP at seven thousand feet.		
13:19:45.7 CAM-2	all right.		
13:19:47.0 CAM-1	uh...in case we go around it will be a flaps five go around right turn out to CEDUK to hold and- nine thousand foot missed approach altitude.		
13:19:53.3 CAM	[sound similar to ACARS chime]		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:19:55.5 CAM-2	okay we started with a fire and now we got an engine fail because we shut it off...you want me to run through this checklist?		
13:20:00.5 CAM	[sound similar to ACARS chime]		
13:20:02.5 CAM-2	right engine fail.		
13:20:03.5 CAM-1	yeah.		
13:20:03.8 CAM-1	engine fail.		
13:20:04.2 CAM-2	all right thrust loss on both engines. no.		
13:20:09.4 CAM-2	engine severe damage we got vibration...severe damage indicated.		
13:20:17.1 CAM-2	uh let's see we've got uh-		
13:20:17.1 CAM	[sound similar to ACARS chime]		
13:20:22.2 CAM-2	* i guess.		
13:20:23.7 CAM-2	override the checklist. confirmed off.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:20:28.6 CAM-2	we're at idle.		
13:20:28.8 CAM	[sound similar to ACARS chime]		
13:20:31.1 CAM-2	right fuel control switch we're at cutoff.		
13:20:33.9 CAM-2	driftdown we got.		
13:20:36.7 CAM-2	restart it?		
13:20:38.3 CAM-2	no.		
13:20:38.9 CAM	[sound similar to ACARS chime]		
13:20:43.1 CAM-2	engine stays failed or is damaged? yes.		
13:20:47.9 CAM-2	land nearest suitable. transponder T-A we are.		
13:20:54.9 CAM-2	all right.		
13:20:57.6 CAM-2	land at nearest suitable that's uh- denver.		
13:21:00.5 CAM-1	let's go flaps five.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:21:02.0 CAM-2	all right flaps coming five.		
13:21:03.8 CAM	[sound similar to flap lever moving]		
		13:21:03.9 TRACON	united three twenty eight heavy when able fly heading three six zero.
13:21:06.8 CAM-2	i'm back with you.		
13:21:07.5 CAM-1	three six zero.		
		13:21:08.2 RDO-2	right heading three six zero united three twenty eight heavy.
		13:21:11.1 TRACON	left turn heading three six zero for united three two- heavy. and just- again just let me know which runway you want. they're all available.
13:21:13.9 CAM	[sound similar to engine fire bell]		
13:21:15.9 CAM-1	two six.		
		13:21:16.8 RDO-2	okay united three twenty eight request runway two six.
13:21:18.8 CAM	[sound similar to engine fire bell]		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		13:21:21.6 TRACON	united three twenty eight heavy runway two six. expect the visual approach or do you want the instruments?
13:21:23.0 CAM	[sound similar to ACARS chime]		
13:21:25.5 CAM-1	instrument I-L-S.		
		13:21:25.9 RDO-2	instrument I-L-S. united three twenty eight heavy.
		13:21:28.4 TRACON	united three twenty eight heavy roger. descend and maintain eight thousand.
		13:21:31.4 RDO-2	all right cleared to eight thousand united uh three twenty eight heavy.
13:21:34.3 CAM-1	eight flich [FLCH].		
13:21:35.9 CAM-2	denver denver * * .		
13:21:41.3 CAM-2	runway two six you got that.		
13:21:44.6 CAM-1	let's go autobrakes uh- two.		
13:21:49.0 CAM-1	flaps twenty.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:21:49.2 CAM-2	all right autobrakes two.		
13:22:05.4 CAM-1	airport in sight.		
		13:22:07.9 TRACON	united three twenty eight heavy information quebec is current. the denver altimeter is two niner six six.
		13:22:12.6 RDO-2	understand two nine six six for united three twenty eight heavy.
13:22:20.8 CAM-2	two niner six six.		
13:22:29.7 CAM-2	all right i'm going to extend GRASP. uh- you want FUZZZ or GRASP?		
13:22:32.6 CAM-1	uh- FUZZZ please.		
13:22:34.7 CAM-2	all right.		
		13:22:49.2 RDO-1	three twenty eight heavy we can take a tighter turn in here.
		13:22:52.5 TRACON	united three twenty eight heavy bout uh- eight miles from GRASP. turn left heading two niner zero. maintain at or above seven thousand til established on the localizer. cleared I-L-S approach runway two six.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		13:23:04.3 RDO-2	all right cleared the I-L-S two six united uh three twenty eight heavy.
13:23:14.1 CAM-1	heading select flich [FLCH].		
13:23:16.0 CAM-2	all right.		
13:23:23.9 CAM-2	all right let me uh continue on i'll go ahead and uh see you got autobrakes two go around would be the tower runway uh two six.		
13:23:52.2 CAM-1	loc [LOC].		
13:23:53.5 CAM-2	all right localizer.		
13:23:55.9 CAM	[sound similar to cabin call chime]		
13:23:58.0 CAM-2	we got uh-		
13:23:58.9 CAM-1	cabin call.		
13:23:59.6 CAM	[sound similar to phone lifting from cradle]		
13:24:00.6 CAM-1	hello?		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:24:01.2 CAM-2	ground proximity override is overridden.		
13:24:05.0 CAM-1	all right did you tell the flight attend-		
13:24:05.6 CAM-2	have you talked to them?		
13:24:06.7 CAM-1	yeah i did talk to them already but can you tell them that uh- be on the ground just a couple minutes and uh-		
13:24:10.6 CAM-2	okay.		
13:24:13.6 CAM-1	yeah we're not going to do the prep for landing.		
13:24:18.5 CAM	[sound similar to ACARS chime]		
13:24:19.4 CAM	twenty five hundred [electronic voice].		
13:24:19.7 CAM-2	hey @ hey it's @ we're going to be on the ground in about uh- four minutes. uh- just plan- at least right now just plan uh to be remain seated. yeah just uh- at least right now.		
13:24:30.6 CAM	[sound similar to ACARS chime]		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:24:33.7 CAM-2	on the right side yeah.		
13:24:35.8 CAM-2	yeah it shows that.		
13:24:36.0 CAM	[sound similar to ACARS chime]		
13:24:37.4 CAM-2	all right. yeah just a normal landing it should be a normal landing. uh no no no you're going to be on the ground in about four minutes.		
		13:24:41.7 TRACON	united three twenty eight heavy contact tower one three three point three.
13:24:43.5 CAM-1	* *		
		13:24:45.3 RDO-1	three three three so long. united three twenty eight heavy.
13:24:47.8 CAM-2	bye bye.		
13:24:48.1 CAM	[sound similar to ACARS chime]		
		13:24:51.0 RDO-1	tower united uh- emergency aircraft united three twenty eight heavy. seven thousand. inbound runway two six.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:24:57.6 CAM	[sound similar to ACARS chime]		
		13:24:57.6 ATCT	united three twenty eight heavy denver tower. wind three six zero * niner. runway two six cleared to land. denver altimeter two niner six six.
		13:25:04.9 RDO-1	cleared to land two six united three twenty eight heavy.
13:25:12.5 CAM-1	# #. that's gotta be the cowling that's come loose or something to shake that bad.		
13:25:15.9 CAM-2	yeah i'm not sure.		
		13:25:33.7 ATCT	united three twenty eight heavy. equipment is standing by. your discrete frequency when you land and rollout to talk to the personnel on the ground is one two zero point one five.
		13:25:43.8 RDO-2	all right. twenty fifteen for united three twenty eight.
		13:25:58.3 ATCT	and united three twenty eight heavy and say intentions. understand you want to do a uh- full stop landing. and then do you want to stay on the runway or do you plan on taxiing back?
13:26:03.4 CAM-1	full stop yeah.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:26:07.2 CAM-2	you want to taxi clear or?		
13:26:07.8 CAM-1	if i can control it i'll taxi clear. yeah.		
		13:26:10.0 RDO-2	uh...for united three twenty eight uh- we'd like to uh- taxi clear. and we just have the uh- have them follow us.
13:26:16.3 CAM-1	glideslope. flaps fifteen.		
13:26:17.9 CAM-2	flaps fifteen.		
13:26:18.6 CAM	[sound similar to flap lever movement]		
		13:26:18.7 ATCT	united three twenty eight heavy thank you.
13:26:19.3 CAM-1	gear down.		
13:26:20.8 CAM	[sound similar to landing gear handle movement]		
13:26:28.3 CAM-1	yeah the- the vibration- the power comes back the vibration drops way off.		
13:26:38.0 CAM-1	god #. okay let's go flaps twenty. set the approach speed for me.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:26:42.5 CAM-2	all right flaps twenty.		
13:26:44.0 CAM	[sound similar to flap handle movement]		
		13:26:46.1 ATCT	united three twenty eight heavy. plan a full stop on the runway. and uh- then the personnel will come and check out your aircraft and then we'll get you moving from there.
13:26:46.8 CAM-2	one fifty six.		
		13:26:54.1 RDO-2	okay full stop on the runway. united three twenty eight heavy.
13:26:56.4 CAM-1	thousand feet. set missed approach altitude.		
13:26:57.9 CAM-2	thousand feet.		
13:27:01.5 CAM-2	let's see you say nine thousand feet?		
13:27:04.0 CAM-1	landing checklist complete?		
13:27:05.2 CAM-2	all right. go ahead and get you a checklist.		
		13:27:09.9 ATCT	runway two six arrival wind three six zero at niner.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		13:27:15.0 RDO-2	copy.
13:27:16.4 CAM-1	autopilot's coming off.		
13:27:17.9 CAM-2	all right.		
13:27:22.7 CAM-1	all right looking good. flaps twenty. okay. cleared to land. * stable.		
13:27:24.7 CAM-2	all right speedbrakes.		
13:27:28.6 CAM-2	thousand feet. landing checklist is complete.		
13:28:01.1 CAM	fifty forty thirty twenty ten [electronic voice].		
13:28:12.0 CAM	[sound similar to autothrottle disconnect tone]		
13:28:15.4 CAM	[sound similar to nosewheel touchdown]		
13:28:18.7 CAM-2	all right speed a hundred thirty. left side's all you got.		
13:28:30.0 CAM-2	tell the people to remain seated.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
13:28:32.3 CAM-2	remain seated remain seated remain seated.		
13:28:35.0 CAM	three thousand remaining [electronic voice].		
13:28:39.3 CAM-2	eighty knots.		
13:28:42.1 CAM	two thousand remaining [electronic voice].		
13:28:44.7 CAM-2	sixty. sixty knots.		
13:28:53.7 CAM	one thousand remaining [electronic voice].		
13:28:56.8 CAM-1	all right i'll wait til they come over here and inspect us.		
13:28:59.1 CAM-2	all right.		
13:29:08.1	END OF TRANSCRIPT		
15:46:25.2	END OF RECORDING		