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

GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

DCA08MA098

By
Joe Gregor

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
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March 9, 2009

Cockpit Voice Recorder - 12

Group Chairman's Factual Report
By Joe Gregor

A. EVENT

Location:	Columbia, SC
Date:	September 19, 2008, 23:53 EDT *
Aircraft:	LearJet 60, N999LJ
Operator:	Inter Travel & Sevices
NTSB Number:	DCA08MA098

B. GROUP

A group was convened on September 29, 2008.

Chairman:	Joe Gregor National Transportation Safety Board
Member:	Victoria Anderson Air Safety Investigator FAA
Member:	Charles Perrigoue Director of Operations Global Exec Aviation
Member:	Ed Grabman Engineering Test Pilot Bombardier

C. SUMMARY

On September 19, 2008, a LearJet 60, registration N999LJ operated by Inter Travel & Sevices, overran the runway while aborting a takeoff in Columbia, SC. A solid state cockpit voice recorder (CVR) was sent to the National Transportation Safety Board's Audio Laboratory for readout. The CVR group meeting convened on

* All times are expressed in eastern daylight time (EDT), unless otherwise noted.

September 29, 2008 and a partial transcript was prepared for the 2-hour, 7-minute, 51-second digital recording (see attached).

D. DETAILS OF INVESTIGATION

On September 20, 2008, the NTSB Vehicle Recorder Division's Audio Laboratory received the following CVR:

Recorder Manufacturer/Model: **Universal 1603-02-12**
Recorder Serial Number: **1629**

Recorder Description

Per Federal regulation, CVRs record a minimum of the last 30 minutes 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 30 minutes or 2 hours of CVR operation, depending on the CVR model. This model CVR, the Universal 1603-02-12, is a solid-state CVR that records 2 hours of digital cockpit audio. Specifically, it contains a 2-channel recording of the last 2 hours of operation and separately contains a 4-channel recording of the last 30 minutes of operation. The 2-hour portion of the recording is comprised of one channel of audio information from the cockpit area microphone (CAM) and one channel that combines two audio sources: the Captain's audio panel information and the First Officer's audio panel information. The 30-minute portion of the recording contains 4 channels of audio data; one channel for each flight crew and one channel for the CAM audio information.

Recorder Damage

Upon arrival at the audio laboratory, it was evident that the exterior of the CVR had sustained substantial heat and structural damage. The outer case was removed and the interior crash-protected case did not appear to have any heat or structural damage (see Figures 1 – 4). The memory board within the crash–protected case was checked for heat or structural damage and none was found. A new set of ribbon-cable connectors was soldered to the memory board prior to interfacing with a surrogate CVR unit. The digital audio was successfully downloaded from the memory board using the surrogate CVR.

Audio Recording Description

For the 2-hour portion of the CVR recording, the CAM channel recording contained Poor quality[†] audio information, and the mixed flight crew channel contained good quality audio information. As shown in the table below, the 30-minute portion of the recording consisted of three channels of useable audio information. Each channel's audio quality[‡] is indicated in the table. Notably, channel number one did not contain any audio information (nor was it required by Federal regulations).

[†] See attached CVR Quality Rating Scale.
[‡] See attached CVR Quality Rating Scale.

Channel Number	Content/Source	Quality
1	N/A	N/A
2	FO	Good
3	CAPT	Good
4	CAM	Poor

Timing and Correlation

Timing on the transcript was established by correlating the air traffic control recording transmission time to the corresponding CVR event. Specifically, the CVR time of the final radio transmission from N999LJ as it appears in the FAA Aircraft Accident File CAE-ATCT-0074 was linked to the corresponding ATC local time, and all CVR events were offset to reflect the local eastern daylight time of the accident.

Description of Audio Events

The recording began at 2147:50, and the transcript began at 2336:32. From 2142 to 2158, the CVR recorded sounds consistent with an aircraft in cruise flight including cockpit discussion concerning aircraft systems, flight planning, and fuel management. At 2159, the pilot not flying indicated that the cruise check was complete. At 2204, the pilot not flying announced that she would be leaving the cockpit to arrange the passenger cabin area. At 2242, the descent checklist was initiated. Twenty-five seconds later the CVR recorded ATIS Uniform. At 2255, the approach into Columbia was briefed by the pilot flying, and the approach checklist was initiated. At 2301, N999LJ was cleared for the visual approach to runway 11 and the pilot flying called for flaps eight. At 2302:25, N999LJ was cleared to land on runway 11 and the pilot flying called for flaps twenty and gear down. At 2303:35, the pilot not flying announced that the landing check was complete. At 2305, the CVR recorded sounds consistent with an aircraft landing on a prepared surface. At 2308, the CVR recorded sounds consistent with engine shutdown. At 2312, the CVR recorded conversations consistent with the pilots receiving a clearance for the next leg of the flight to Van Nuys. From 2314, to 2336, the CVR recorded general sounds of movement outside the cabin and occasional unintelligible vocalizations.

At 2336:32, the CVR recorded sounds consistent with the cabin door being closed. At 2336:50, the CAPT announced that, “I briefed ‘em all.” At 2341, the CVR recorded sounds consistent with engine start. At 2346:45, the Columbia ground controller cleared N999LJ to taxi. At 2349:53, the Columbia ground controller cleared N999LJ to back taxi down runway 11 and cleared them for takeoff. At 2351:22, the pilot flying briefed the takeoff and aborted takeoff procedure. At 2354:51, the FO stated, “power’s set.” At 2355:00, the FO stated, eighty knots. crosscheck.” At 2355:11, the FO stated, “V-one.” Approximately 1.5 seconds later, the CVR recorded loud rumbling sounds and the FO repeating, “go.” At 2355:17, the CAPT announced that, “…we’re not goin’ though.” At 2355:29, the FO stated, “shut ‘em off.” – followed by, “they’re shut off they’re shut off.” At 2355:36, the FO radioed, “roll the equipment we're goin' off the end.” The recording ended shortly thereafter at 2355:42.

Figure 1. External view of the Universal 1603-02-12 (s/n 1629) showing extensive heat/fire damage.

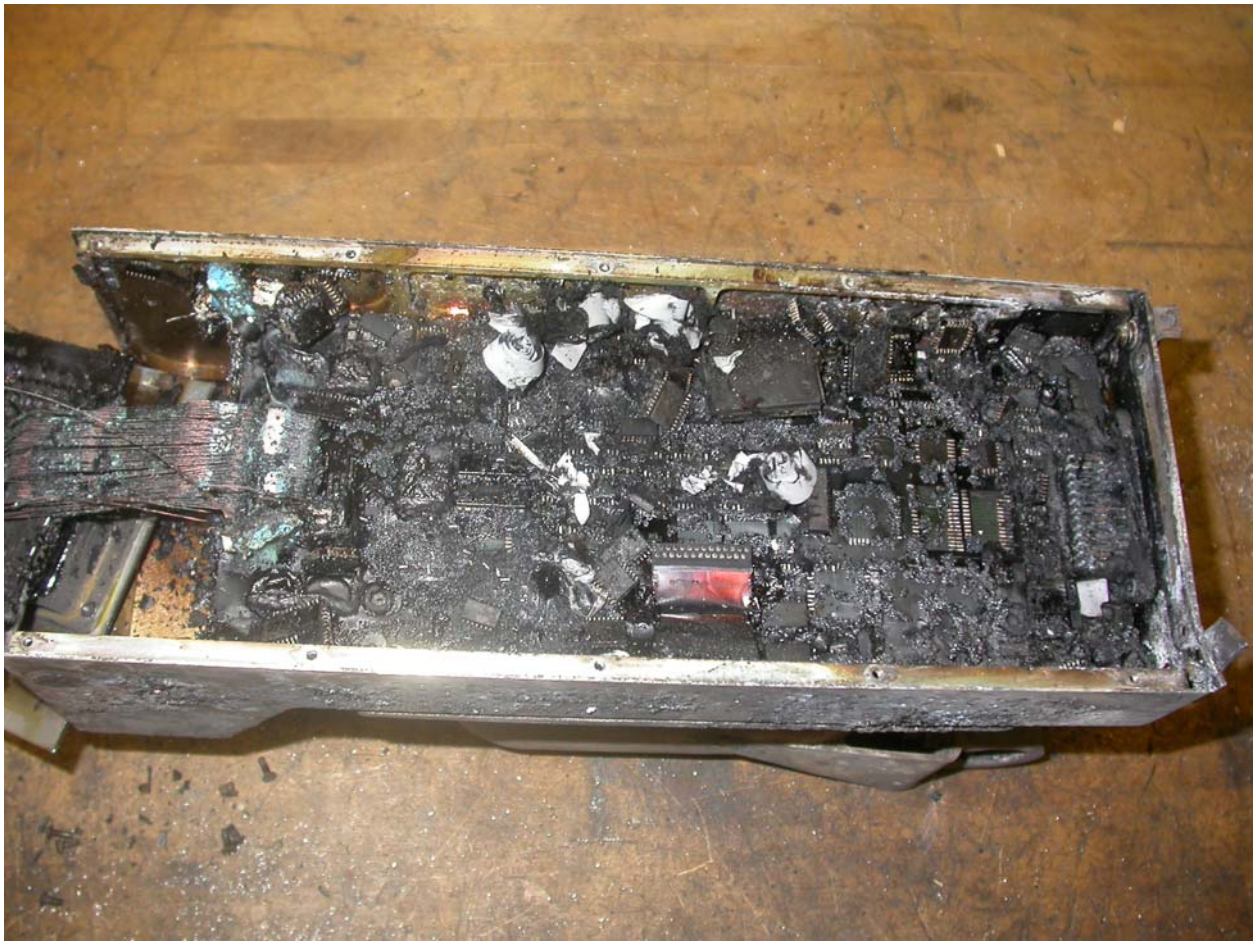

Figure 2. Internal view of the Universal 1603-02-12 (s/n 1629) showing extensive heat/fire damage.

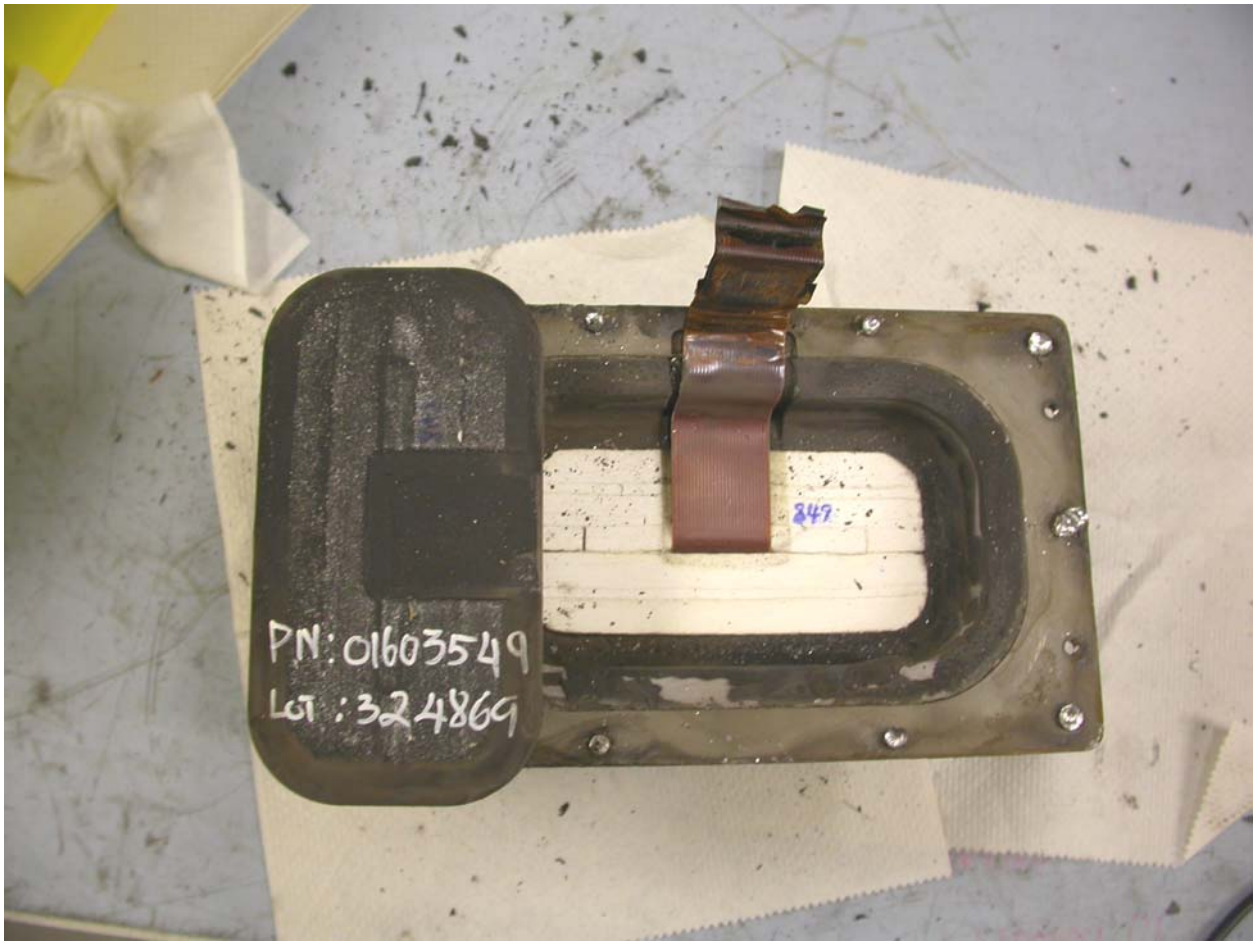

Figure 3. Internal view of the Universal 1603-02-12 (s/n 1629) showing the interior of the crash-protected memory case.

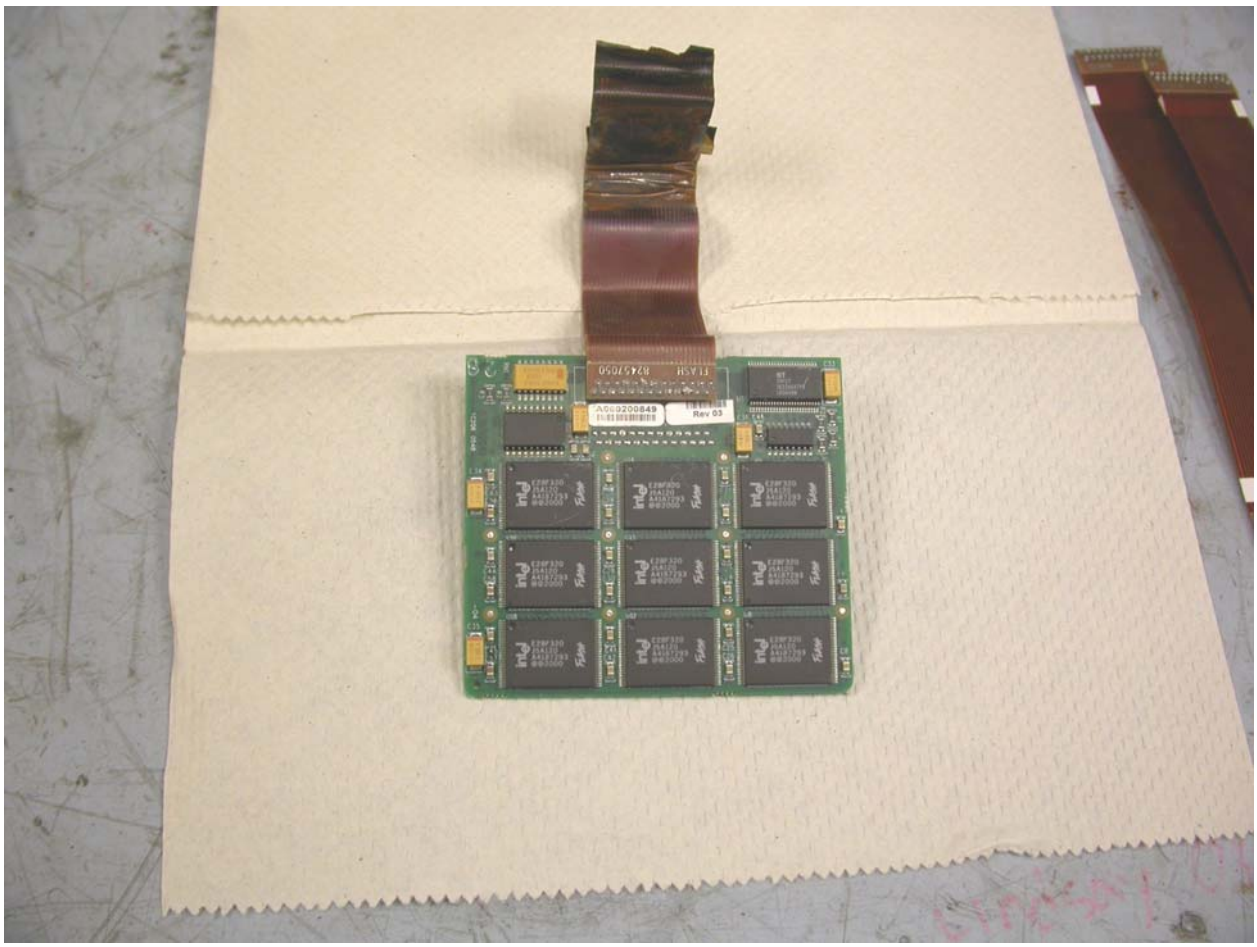

Figure 4. Internal view of the Universal 1603-02-12 (s/n 1629) showing the non-volatile memory module prior to ribbon-cable replacement.

Joe Gregor
Vehicle Recorder Division

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 Universal 1603-02-12 solid-state cockpit voice recorder, serial number 1629, installed on an Inter Travel & Sevices LearJet 60 (N999LJ), which crashed while attempting to abort a takeoff at Columbia Airport in Columbia, SC.

LEGEND

CAM	Cockpit area microphone voice or sound source
HOT	Flight crew audio panel voice or sound source
RDO	Radio transmissions from N999LJ
GND	Radio transmission from the Columbia Airport ground controller
-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 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.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:23:40.1 **[start of recording]**			
23:36:31.9 **[start of transcript]**			
23:36:31.9 **CAM**	[sound consistent with cabin door closing].		
23:36:50.3 **CAM-1**	I briefed 'em all.		
23:36:51.8 **CAM-2**	did you tell them about the temperature?		
23:36:54.0 **CAM-1**	ah no I didn't.		
23:36:54.8 **CAM-?**	let let let us know * *.		
23:37:00.4 **CAM-?**	[unintelligible vocalizations].		
23:37:13.3 **HOT-1**	hey we're startin' engines.		
23:37:17.0 **HOT-1**	okay I'll call you when we get in.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:37:20.0 **HOT-1**	I'm gonna wake you up.		
23:37:27.1 **HOT-1**	yeah I talked to @ I think we may just check into the Airtel for a little while.		
23:37:32.1 **HOT-1**	alright?		
23:37:35.6 **HOT-1**	okay. thanks talk to you in a bit.		
23:37:40.6 **HOT-1**	okay perfect appreciate it. okay should only be a little over five hours so.		
23:37:48.5 **HOT-1**	I appreciate that. talk to you later. bye.		
23:38:10.4 **CAM-1**	* *?		
23:38:11.4 **CAM-2**	yeah * *.		
23:38:18.4 **CAM-?**	[unintelligible vocalizations].		
23:38:45.7 **CAM-2**	so I think. (that's the wrong).		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:38:53.0			
CAM-1	there's beer in there there's beer the bottom drawer and then there's a bunch in there (that we're) putting on ice.		
23:39:07.5			
HOT-2	'kay.		
23:39:10.6			
HOT-2	alright and do you have the ah checklist?		
23:39:15.0			
CAM-1	do you want do you want me to get something?		
23:39:17.5			
CAM-1	it's no it's no problem its easier to do it now, are you sure? okay.		
23:39:24.3			
CAM-1	I wonder if they should, want those lights on?		
23:39:26.8			
HOT-2	no they didn't they- I asked 'em they said no but I don't know why they're on.		
23:39:30.6			
HOT-2	unless they turn on on the ground.		
23:39:32.5			
CAM-1	* * (armed) * in an emergency * *?		
23:39:33.8			
HOT-2	yeah.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:39:35.5 **HOT-2**	I don't know the answer to that.		
23:39:39.9 **HOT-2**	ahm do you have the checklist over there?		
23:39:42.9 **CAM-1**	* * * (no) * * *. *(I think) yeah there ya go.		
23:39:49.8 **HOT-2**	okay.		
23:39:55.7 **HOT-2**	let's go ah before start right? pilot side window?		
23:39:58.7 **HOT-1**	is ahhh doesn't open.		
23:40:01.1 **HOT-1**	I'm sorry?		
23:40:01.5 **CAM-?**	one more question do you have water?		
23:40:02.9 **HOT-1**	water yeah.		
23:40:03.7 **HOT-2**	shou- should be one in each armrest already in your cup holders.		
23:40:04.1 **HOT-1**	there should be some water bottles-		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:40:07.9			
HOT-1	oh okay just leave it for me there that's fine thank you.		
23:40:12.6			
HOT-1	yeah there's some there and then if you need more- if you open this there's some in the back. and then anything else just let me know we'll get it for you when we get up.		
23:40:18.8			
CAM-?	(no problem).		
23:40:19.6			
HOT-1	sure.		
23:40:21.1			
HOT-1	alright.		
23:40:21.4			
HOT-2	pilot side window?		
23:40:22.3			
HOT-1	ahh doesn't open.		
23:40:23.8			
HOT-2	parking ah yeah this one doesn't right? parking ah brake chocks?		
23:40:25.7			
HOT-1	*.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:40:27.3 **HOT-1**	our brakes are pulled right? parking brake's set.		
23:40:30.0 **HOT-2**	* ah beacon nav light?		
23:40:32.0 **HOT-1**	beacon nav lights we've got the nav light on throw the beacon on now.		
23:40:35.5 **HOT-2**	* * * * logo on now I'm gonna turn on this * * anything * cockpit set up.		
23:40:39.6 **CAM**	[sound similar to seatbelt chime].		
23:40:43.7 **HOT-1**	cockpit set up a it's good for now.		
23:40:46.1 **HOT-2**	air conditioning they said they're warm but I'll get it back on after start.		
23:40:49.8 **HOT-1**	okay.		
23:40:49.9 **HOT-2**	aux heat is off EFIS avionics masters?		
23:40:52.7 **HOT-1**	are comin' off.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:40:53.7 **HOT-2**	off right.		
23:40:57.2 **HOT-2**	okay we're up to starting the engines.		
23:40:59.7 **HOT-1**	alright.		
23:41:00.8 **HOT-2**	ah beacon's on.		
23:41:02.5 **HOT-1**	okay I'm gonna start the left one first.		
23:41:04.3 **HOT-2**	'kay.		
23:41:04.6 **HOT-1**	it's clear on the left.		
23:41:06.2 **CAM**	[sound of decreasing background noise].		
23:41:07.3 **HOT-1**	ahh.		
23:41:11.8 **CAM**	[sound of increasing background noise].		
23:41:14.3 **HOT-1**	(comin') up two lights.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:41:28.4 **HOT-2**	we're ah pretty heavy so I'm gonna re-bug for flaps eight if you don't object.		
23:41:33.8 **HOT-1**	no that's fine.		
23:41:34.1 **HOT-2**	we got plenty of runway.		
23:41:35.1 **HOT-1**	yeah.		
23:41:53.4 **HOT-1**	'kay that looks good generator's comin' on and ready on the right?		
23:41:59.2 **HOT-2**	clear right.		
23:42:00.1 **HOT-1**	'kay.		
23:42:00.4 **CAM**	[sound of decreasing background noise].		
23:42:04.7 **HOT-1**	two lights.		
23:42:18.8 **CAM**	[sound of increasing background noise].		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:42:19.9 **CAM**	[unintelligible vocalizations].		
23:42:35.3 **HOT-1**	that side is a little hotter. lights are out.		
23:42:42.1 **HOT-1**	two five five and two back on. kill the APU.		
23:42:53.0 **HOT-2**	okay you ready?		
23:42:54.2 **HOT-1**	ready.		
23:42:54.8 **HOT-2**	master caution inhibited.		
23:42:56.1 **HOT-1**	alright.		
23:42:57.1 **HOT-2**	GPU is off.		
23:42:59.6 **HOT-2**	EFIS avionics masters.		
23:43:01.1 **HOT-1**	are back on.		
23:43:02.5 **HOT-2**	engine instruments.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:43:03.4 **HOT-1**	engine instruments are two five five and two look good.		
23:43:06.6 **HOT-2**	generators E-P-M.		
23:43:08.1 **HOT-1**	ah as expected twenty eight.		
23:43:10.9 **HOT-2**	windshield ah heat anti-ice ah you can pass on it if you want now.		
23:43:13.2 **HOT-1**	ah yeah I'm gonna skip those I'm not.		
23:43:16.1 **HOT-2**	spoilers (systems) auto spoilers.		
23:43:17.6 **HOT-1**	ah I'm gonna skip that * too.		
23:43:18.7 **HOT-2**	flight controls.		
23:43:19.4 **HOT-1**	flight controls are.		
23:43:22.9 **HOT-1**	excuse me I'm sorry.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:43:24.2 **HOT-2**	that's alright.		
23:43:24.5 **HOT-1**	(alright) good.		
23:43:25.3 **HOT-2**	let's stop a second at flight instruments and I'm gonna re-s bug us for ahm-		
23:43:28.3 **HOT-1**	for eight?		
23:43:29.4 **HOT-2**	yeah ah.		
23:43:29.5 **HOT-1**	'kay yeah I agree with that.		
23:43:34.5 **HOT-2**	okay flaps eight now.		
23:43:38.5 **HOT-2**	thirty six forty five fifty three.		
23:43:48.2 **HOT-2**	fifty three.		
23:43:51.1 **HOT-2**	flaps up speed changes to one seventy three if you wanna set it I don't know if you do that or not but?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:43:55.3 **HOT-1**	I usually do the two fifty for the climb.		
23:43:57.0 **HOT-2**	okay that'll work.		
23:43:59.2 **HOT-1**	long as you tell me when to put 'em up.		
23:44:01.0 **HOT-2**	'kay.		
23:44:03.0 **HOT-1**	'kay.		
23:44:03.9 **HOT-2**	ahm flight instruments?		
23:44:05.5 **HOT-1**	flight instruments I've got zero on the airspeed one thirty six forty five fifty three two fifty on the speed-bug and I'm in go-around and heading ah three zero two one on the altimeter's giving me two hundred feet zero on the VSI and I'm heading three three five one times two times three times four and five.		
23:44:26.0 **HOT-2**	'kay. ah standby horizon?		
23:44:29.6 **HOT-1**	is up and erect.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:44:30.8 **HOT-2**	anti-skid?		
23:44:31.7 **HOT-1**	anti-skid is on and the lights out.		
23:44:33.2 **HOT-2**	TCAS?		
23:44:34.0 **HOT-1**	TCAS let's see put it up on mine.		
23:44:37.7 **HOT-1**	traffic I think I was up wasn't I? ah I just turned it off.		
23:44:37.9 **HOT-2**	I think you were you were already up yeah.		
23:44:42.1 **HOT-1**	traffic and display we're good.		
23:44:44.9 **HOT-2**	hydraulic pressure gear and brake air?		
23:44:46.3 **HOT-1**	ah three green.		
23:44:47.5 **HOT-2**	emergency pressurization?		
23:44:49.1 **HOT-2**	tested earlier.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:44:49.4 **HOT-1**	ah that is tested.		
23:44:50.7 **HOT-2**	'kay I'm gonna get the AC on for a little bit ah fuel indicator fuel panel?		
23:44:55.4 **HOT-1**	is balanced as expected and plenty for the flight.		
23:44:57.9 **HOT-2**	and flaps are goin' to eight?		
23:44:59.8 **HOT-1**	I agree.		
23:45:01.6 **HOT-1**	indicating eight.		
23:45:02.9 **HOT-2**	'kay.		
23:45:04.5 **HOT-2**	trims?		
23:45:05.8 **HOT-1**	trims are one two and three and primary and the light's out.		
23:45:12.2 **HOT-2**	door?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:45:12.8 **HOT-1**	door's closed lights are out.		
23:45:14.3 **HOT-2**	seatbelt no smoking?		
23:45:15.5 **HOT-1**	is ah on.		
23:45:17.2 **HOT-2**	parking brake?		
23:45:17.8 **HOT-1**	parking brake is released.		
23:45:19.3 **HOT-2**	okay let me see here.		
23:45:20.8 **HOT-1**	* don't know what time the tower close(es) ah it's still open.		
23:45:26.0 **HOT-2**	and ah nineteen.		
23:45:27.0 **HOT-1**	thinkin' I wanna go out this way still or can I go straight out here?		
23:45:29.4 **HOT-2**	I think we can go straight nineteen five and twenty one nine.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:45:33.7 **HOT-2**	ah * which way do you use?		
23:45:35.7 **HOT-1**	I w- I use two.		
23:45:37.2 **HOT-2**	okay.		
23:45:37.8 **HOT-1**	yeah then I * put the departure frequency over here so I can see it. and.		
23:45:38.5 **HOT-2**	*.		
23:45:41.7 **HOT-2**	see I do it just the opposite or we do it yeah.		
23:45:43.2 **HOT-1**	* [sound of laugh] I don't care what you do just tell me.		
23:45:45.4 **HOT-2**	I don't either. * let me just get the ah what did you do with the flight plan?		
23:45:49.4 **HOT-1**	it's on the board there's a clipboard on your side there.		
23:45:50.9 **HOT-2**	'kay.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:45:52.3 **HOT-2**	let me just double check the frequency for that.		
23:45:56.0 **HOT-2**	thirty three four.		
23:45:57.5 **HOT-1**	and was that squawk right?		
23:45:58.1 **HOT-2**	yes it's ah huh thirty three four and ten oh three so no.		
23:45:59.3 **HOT-1**	I'm sorry okay.		
23:46:02.5 **HOT-2**	oh oops thirty three four we'll leave it there and ten zero three. one zero zero three.		
23:46:12.8 **HOT-1**	* *.		
23:46:12.8 **HOT-2**	okay initial altitude is ah four thousand expect forty in ten.		
23:46:16.5 **HOT-1**	okay perfect.		
23:46:17.3 **HOT-2**	okay well that's good.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:46:19.1 **HOT-2**	so here we go you ready?		
23:46:20.9 **HOT-1**	I'm ready.		
23:46:21.9 **HOT-2**	what's the name of this joint?		
23:46:23.3 **HOT-1**	oh # I f- Columbia.		
23:46:24.8 **HOT-2**	Columbia.		
23:46:25.6 **HOT-1**	* I keep forgetting where we are on the way in.		
		23:46:29.9 **RDO-2**	Columbia ground Lear triple nine Lima Juliet Columbia aviation with the ATIS taxi.
		23:46:38.1 **GND**	calling ground say it again please?
		23:46:41.2 **RDO-2**	it's Lear ah triple nine Lima Juliet Columbia aviation Victor taxi.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
		23:46:45.1 **GND**	Lear triple nine Lima Juliet Columbia ground ah roger taxi to runway two niner via taxiway Uniform actually the wind zero seven zero at seven gust one six altimeter three zero two one you wanna go out to runway one one?
23:47:01.1 **HOT-2**	whaddya want?		
23:47:01.5 **HOT-1**	gust to two one?		
		23:47:02.5 **RDO-2**	yeah we better do that.
		23:47:04.4 **GND**	roger taxi to runway one one via Uniform cross the approach end of two three to taxiway November to taxiway Alpha and ah taxi runway one one via Alpha.
		23:47:16.7 **RDO-2**	okay Uniform November Alpha ah to one one ah triple nine Lima Juliet.
23:47:21.1 **HOT-1**	and hold short of two two I think it was.		
23:47:24.0 **HOT-2**	I think he said * we could cross it Uniform November Alpha to one one.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:47:24.9 **HOT-1**	oh did he?		
23:47:29.5 **HOT-1**	and we're going right outta here, correct?		
23:47:31.4 **HOT-2**	ah well I think we have to go left outta here don't we?		
23:47:35.6 **HOT-1**	oh if we're going back over the end of that runway yeah, yeah.		
23:47:36.8 **HOT-2**	we're go- we're gonna go back to the runway we landed on.		
23:47:40.3 **HOT-2**	so. alright where'd it go here it is.		
23:47:51.0 **HOT-2**	alright. let's go ah.		
23:47:52.0 **HOT-1**	*.		
23:47:54.7 **HOT-1**	ready?		
23:47:55.2 **HOT-2**	ah huh.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:47:59.7			
HOT-2	so we go straight out here into Uniform and make a left.		
23:48:28.8			
HOT-2	my head's down here.		
23:48:30.3			
HOT-1	okay. doin' left on Uniform here.		
23:48:33.8			
HOT-2	yeah.		
23:48:37.8			
HOT-2	this is Uniform.		
23:48:49.2			
HOT-2	Uniform November Alpha.		
23:48:51.4			
CAM	[sound similar to thrust reverse lever actuation].		
23:48:51.4			
HOT-1	(two unlocks) two deploys.		
		23:49:19.1	
		GND	Learjet ah I think did you ah oh I think you're on Uniform there you need to go the other way on Uniform ah and cross the approach end of two three actually ah yeah you'll need to you'll need to make a ah hundred and eighty degree turn looks like you're on Uniform goin' out towards two nine.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
		23:49:36.5 **RDO-2**	yeah we are on Uniform so one eighty on Uniform and back Uniform November Alpha right?
		23:49:42.1 **GND**	and I'll tell ya what just hold your position there I'm gonna see if I can back-taxi on ah runway two nine to one one actually we can ah you ready to ready to go?
23:49:46.6 **HOT-2**	stop here.		
		23:49:51.6 **RDO-2**	ah that's affirmative.
		23:49:52.7 **GND**	alright you can back taxi the whole way down runway one one and once you get ah to the west ah end of runway one one then make a hundred and eighty degree turn ah turn right heading one five zero and runway one one you're cleared for takeoff.
		23:50:07.2 **RDO-2**	okay we'll back taxi ah the full length one one then cleared for takeoff ah one five zero d- degree heading on departure ah nine Lima Juliet.
23:50:15.3 **HOT-2**	#.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:50:24.8 **HOT-1**	alright light me up please.		
23:50:27.3 **HOT-2**	we are as much as we can with this thing.		
23:50:35.9 **HOT-2**	okay right turn all the way down one eighty and back cleared for takeoff at the other end you have brakes and steering I see.		
23:50:45.4 **HOT-1**	yup (I'm gonna).		
23:50:46.0 **HOT-2**	reversers you did.		
23:50:47.2 **HOT-1**	stay off the lights right here yeah reversers are done.		
23:50:50.9 **HOT-2**	'kay.		
23:51:02.9 **HOT**	[unidentified mechanical noise].		
23:51:04.8 **HOT-2**	'kay one one eighty six hundred feet long.		
23:51:18.8 **HOT-2**	okay so brake steering reversers you did just a crew briefing.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:51:22.3			
HOT-1	okay ah we've got plenty of runway so we'll abort for anything below eighty knots after V-one and before V-two engine failure fire malfunction loss of directional control all the big things after V-two we'll go ahead and take it into the air treat it as an in-flight emergency I think this is probably a pretty good option to come back to unless we have like a complete a hydraulic failure or something and ah then we'll look for a longer runway nearby probably Charleston ahm after takeoff it was heading one five zero up to four thousand.		
23:51:53.8			
HOT-2	correct.		
23:51:54.0			
HOT-1	correct? any questions comments concerns?		
23:51:56.6			
HOT-2	ah just it's ah wha- reference the ah between eighty and ah V-one you're only ah aborting for the fire failure loss of directional control?		
23:52:06.0			
HOT-1	yes.		
23:52:06.6			
HOT-2	'kay ah alrighty we're ah.		
23:52:09.8			
HOT-1	or an inadvertent thrust- ah T-R deployment.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:52:12.4 **HOT-2**	'kay.		
23:52:14.6 **HOT-2**	that will reverse in the rev- that will ah cause the loss of directional control I guess.		
23:52:18.5 **HOT-1**	exactly hah they go together.		
23:52:25.8 **HOT-1**	which I think kinda like what you're talking about * any red light that can be so many things ya know?		
23:52:31.4 **HOT-2**	well eh if the runway is long I abort but if it's short I kinda do different briefing depending on the what the length of the runway is but we're pretty heavy so it's probably not a bad idea.		
23:52:41.3 **HOT-1**	yeah.		
23:52:47.0 **HOT-2**	you know what I mean?		
23:52:47.8 **HOT-1**	yeah.		
23:53:40.4 **HOT-2**	* here we are.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:53:57.8 **HOT-1**	do your brakes squeak like this?		
23:53:59.6 **HOT-2**	it's not the brakes it's the, the air being released so yes most- they all do.		
23:54:07.5 **HOT-2**	I'm gonna reach over here and do this for ya.		
23:54:09.5 **HOT-1**	thanks I appreciate it.		
23:54:13.5 **HOT-2**	okay we're cleared for takeoff cabin air is on transponder on anti-collision rec lights on and on ignitions pitot heats auto-spoilers on on armed ah anti-ice not required warning panels are normal for the conditions APR on the roll cleared for takeoff.		
23:54:26.7 **HOT-1**	okay would you get me a wind check again real quick?		
		23:54:29.0 **RDO-2**	nine Lima Juliet wind check?
23:54:29.2 **HOT-1**	do you remember what it was?		
23:54:32.4 **CAM-1**	guys all set?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
		23:54:32.8 **GND**	wind zero seven zero at eight gust one four.
		23:54:35.2 **RDO-2**	thank you sir.
23:54:36.5 **HOT-1**	zero one zero at eight?		
23:54:37.7 **HOT-2**	ah huh.		
23:54:38.4 **HOT-1**	'kay. so pretty much straight down.		
23:54:47.9 **HOT-2**	'kay ah takeoff detent.		
23:54:49.5 **CAM**	[sound of increasing background noise].		
23:54:50.8 **HOT-2**	power's set.		
23:54:53.7 **HOT-2**	two good engines airspeed's alive both sides APR is armed.		
23:55:00.1 **HOT-2**	eighty knots. crosscheck.		
23:55:02.1 **HOT-1**	check.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:55:10.5 **HOT-2**	V-one.		
23:55:12.0 **CAM**	[beginning of loud broadband rumbling].		
23:55:12.4 **HOT-2**	go.		
23:55:12.8 **HOT-1**	*?		
23:55:13.0 **HOT-2**	go go go.		
23:55:13.7 **HOT-2**	[sound similar to metallic click].		
23:55:14.0 **HOT-1**	go?		
23:55:14.6 **HOT-2**	no? ar- alright. get ah what the # was that?		
23:55:15.1 **HOT-2**	[sound similar to metallic click].		
23:55:17.0 **HOT-1**	I don't know. we're not goin' though.		
23:55:18.4 **CAM**	[sound similar to metallic click].		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:55:19.5 **HOT-1**	pull out.		
23:55:20.3 **CAM**	[high frequency sound consistent with brake pedal application].		
23:55:21.6 **HOT**	[sound similar to nose-wheel steering disconnect warning tone].		
23:55:27.7 **HOT-1**	#.		
23:55:28.7 **HOT-2**	shut 'em off.		
23:55:29.5 **CAM-?**	what is goin' on here?		
23:55:30.8 **CAM**	[unintelligible vocalizations].		
23:55:32.4 **HOT-2**	they're shut off they're shut off.		
23:55:35.5 **HOT-1**	#.		
		23:55:36.0 **RDO-2**	roll the equipment we're goin' off the end.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
23:55:38.5 **HOT-1**	how many?		
23:55:39.5 **[end of transcript]**			
23:55:41.1 **[end of recording]**			