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

GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

DCA16LA100

By

Bill Tuccio, Ph.D.

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 a Safety Board group investigative effort. The transcript or parts thereof, if taken out of context, could be misleading. The transcript should be viewed as an accident investigation tool to be used in conjunction with other evidence gathered during the investigation. Conclusions or interpretations should not be made using the transcript as the sole source of information.

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division

June 19, 2017

Cockpit Voice Recorder

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

1. EVENT SUMMARY

Location:	St. Louis, Missouri
Date:	February 23, 2016
Aircraft:	Embraer EMB-145, Registration N856HK
Operator:	Trans States Airlines, Flight 4615
NTSB Number:	DCA16LA100

On February 23, 2016, at about 2325 central standard time (CST), TranStates flight number 4615, an Embraer EMB-145, registration N856HK, flight crew performed a missed approach into Lambert-St Louis International Airport (STL), St Louis, Missouri, due to strong gusting cross winds and landed without apparent incident. The crew, on post flight inspection noticed "scratches" on both wing tips. The crew believes the damage happened during the missed approach. The flight had departed from Chicago O'Hare International Airport (ORD), Chicago, Illinois and had 3 crew members and 30 passengers on board. No injuries were reported but further examination of the wings found damage to the right aileron that required its replacement. This finding makes the classification of damage to the airplane as substantial. The flight was operating under the provisions of Title 14 of the *Code of Federal Regulations* Part 121 as a scheduled domestic passenger flight from ORD to STL. 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 March 31, 2016, and a 27-minute partial transcript was prepared for the 2-hour, 4-minute digital recording (see attached).

2. GROUP

Chairman:	Dr. Bill Tuccio Aerospace Engineer NTSB
Member:	David Gerlach Accident Investigator Federal Aviation Administration
Member:	Cliff Simmons Regional Chief Pilot Trans States Airlines
Member:	Michael Neumann

Chief Accident Investigator
Air Line Pilots Association

3. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Division received the following CVR:

Recorder Manufacturer/Model: **Honeywell 6022**
Recorder Serial Number: **120-06900**

3.1 CVR Carriage Requirements

Per federal regulation, turbine engine powered aircraft operating under 14 CFR Part 121 must be equipped with a CVR that records a minimum of the last 2 hours of aircraft operation; this is accomplished by recording over the oldest audio data. When the CVR is deactivated or removed from the airplane, it retains only the most recent 2 hours of CVR operation.

3.2 Recorder Description

This model CVR, the Honeywell 6022, is a solid-state CVR that records 120 minutes of digital audio. Specifically, it contains a 2-channel recording of the last 120 minutes of operation and separately contains a 4-channel recording of the last 30 minutes of operation. The 120-minute portion of the recording is comprised of one channel that combines three audio panel sources and a second channel that contains the cockpit area microphone (CAM) source. The 30-minute portion of the recording contains four channels of audio information: one channel for each flight crew, one channel for a cockpit observer, and one channel for the CAM.

3.3 Recorder Damage

Upon arrival at the 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.

3.4 Audio Recording Description

For this report, only the 2-channel recording was used. Each channel's audio quality was excellent.[1] After the event, the CVR was powered on by maintenance personnel and 20 minutes of the oldest part of the recording was overwritten.

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, four radio transmissions the aircraft made were recorded on the CVR at 3177.2, 3435.6, 3443.2, and 3453.0 seconds CVR Elapsed Time (time from the start of the recording), and were correlated to the radio transmit microphone key parameter recorded on the FDR at 83941.1, 84200.1, 84207.1, and 84217.1 seconds past midnight, CST.

[1] See attached CVR Quality Rating Scale.

Each of the four radio transmissions acted as an anchor point for a linear interpolation between the remaining CVR events. Accordingly, 80,763.6 seconds was added to CVR Elapsed Time to convert to CST.

3.6 Description of Audio Events

The recording began at 2226:04 CST during the pushback from the gate at ORD. The aircraft taxied and departed ORD. The first officer was the pilot flying and the captain was the pilot monitoring. The crew expected an approach to runway 30L at STL.

The transcript begins at 2304:30 CST and continues until 2331:35 CST. The transcript describes the descent into STL, the first landing attempt, go-around, and subsequent landing. The transcript ends after the tower asked the crew to call the tower on the telephone.

After the aircraft arrived at the gate and completed the shutdown checklist, the following activities occurred:

- The captain called STL tower and discussed the circumstances of the go-around.
- After the call, the captain explained to the first officer that the tower was required to make a report when a go-around occurred within a half mile of touchdown.
- The captain and first officer briefly discussed the decision to go-around and the captain's decision to pull the power levers back. The captain said he thought at first they needed to get the aircraft on the ground.
- The first officer left the cockpit to do the post-flight walk around and then returned, advising the captain of damage to the wingtips and ailerons.
- The captain apparently called Trans States dispatch and reported the go-around due to low level windshear and damage to both wingtips. The captain further advised that during the flare the aircraft drifted across the runway despite full aileron and rudder.
- During the call, the captain apparently was transferred to maintenance and reported the damage to both wing tips and the ailerons.
- The captain and first officer again discussed the event. The first officer said he had full left rudder and full right aileron and the aircraft was still drifting left. During the attempted landing sequence, the first officer decided to go-around.
- The captain called the tower back and reported the damage to the wingtips.
- The captain then spoke with maintenance again before the CVR was powered off at about 0007 CST.

After the CVR was powered off by the captain, the CVR was powered on again and operated for an additional 20 minutes while maintenance personnel were on the aircraft.

As part of the Safety Board's accident investigation process, the flight crew was invited to review the CVR transcript and suggest corrections or additions. On April 12, 2016, the captain and first officer reviewed the CVR transcript and agreed upon the following comments:

- The entry at 23:22:53.7 CDT, was by HOT-2 and was clarified to:
    - [spoken loudly] go.

- The entry at 23:22:54.3 CDT, was by HOT-2 and was clarified to:
    - [exhale] go around.
- The entry at 23:22:57.3 CDT, by HOT-2 was clarified to:
    - set thrust.
- The entry at 23:23:02.3 CDT, by HOT-1 was clarified to:
    - ah go-around. positive climb.

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 6022 solid-state cockpit voice recorder, serial number 120-06900, installed on an Trans States Airlines Embraer EMB-145 (N856HK), which contacted the ground during a go-around at Lambert-St Louis International Airport (STL) in St. Louis, Missouri.

LEGEND

CAM	Cockpit area microphone voice or sound source
HOT	Flight crew audio panel voice or sound source
INT	Flight crew intercom
PA	Passenger address system
RDO	Radio transmissions from N856HK
CTR	Radio transmission from center controller
APR	Radio transmission from the Saint Louis approach controller
TWR	Radio transmission from the STL airport tower controller
MISC-AC	Radio transmission from another aircraft
AWU	Aural Warning Unit
-1	Voice identified as the captain
-2	Voice identified as the first officer
-3	Voice identified as the flight attendant
-?	Voice unidentified
*****	Unintelligible word
#	Expletive
@	Non-pertinent word
( )	Questionable insertion
[ ]	Editorial insertion

Note 1: Times are expressed in central standard time (CST).

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

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

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

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
22:26:04 CST (00:00:00 CVR Elapsed Time) **START OF RECORDING**			
23:04:30 CST (00:38:26 CVR Elapsed Time) **START OF TRANSCRIPT**			
23:04:30.0 **HOT-2**	alright. it's gonna be a visual backed up by the I-L-S. one eleven point five. inbound. three oh two.		
23:04:36.8 **HOT-2**	M-S-A is two thousand eight hundred in our sector.		
23:04:43.3 **HOT-2**	ahh. it's gonna be MOIDD is final approach fix. and that's at twenty-one seventy glideslope intercept or twenty two hundred without it.		
23:04:53.2 **HOT-2**	runway is one- ten thousand eight hundred eighteen feet. left hand turn out. missed is gonna be a ah almost straight out up to three thousand hold as published or tower assigned. any questions?		
23:05:06.0 **HOT-1**	(no-ope).		
23:05:06.7 **HOT-?**	alright.		
23:05:30.0 **HOT-2**	we'll plan for. papa delta or quebec.		
23:05:35.6 **HOT-1**	okay.		
23:05:59.6 **HOT-1**	be off to ops.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:06:00.6 **HOT-2**	roger.		
		23:06:05.1 **RDO-1**	Saint Louis Operations this is forty six fifteen with you. ah in range about twenty minutes. no specials.
		23:06:28.3 **RDO-1**	Saint Louis Operations forty six fifteen is in range twenty minutes no specials.
23:06:54.8 **PA-1**	and folks from the flight deck we'll be starting our descent into Saint Louis shortly. we should have you there at the gate in about another twenty minutes. Latest weather there forty five degrees temperature. they've got some cloudy skies and gusty winds coming out of the northeast. ah we don't have any gate information at the moment but we do park on the A concourse. the alpha concourse. it's sure been a pleasure having you onboard this evening. we appreciate your business hope to see you again in the future on another United Express flight.		
		23:07:33.2 **CTR**	Waterski forty six fifteen descend at pilot's discretion. amend the altitude descend at pilot's discretion maintain one six thousand.
23:07:35.4 **HOT-1**	back.		
		23:07:41.0 **RDO-1**	ah pilot's discretion one six thousand. Waterski forty six fifteen.
23:07:46.7 **HOT-1**	alright. P-D sixteen.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:07:50.2 **HOT-2**	P-D to sixteen. yep.		
23:07:51.6 **HOT-1**	okay.		
23:07:52.6 **HOT-2**	I'll just start down when I was gonna start down anyways.		
23:07:54.7 **HOT-1**	alright.		
23:07:56.6 **HOT-1**	no gate information yet. couldn't get 'em.		
23:07:59.3 **HOT-2**	roger.		
23:08:55.0 **HOT-2**	two nine seven four.		
23:08:56.8 **HOT-1**	seven four. yeah.		
23:09:05.7 **HOT-2**	alright.		
23:09:06.9 **HOT-2**	you have no questions in-range checklist.		
23:09:09.2 **HOT-1**	alright.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:09:19.9 **HOT-1**	seatbelt sign is on. windshield heat's on. landing data bugs are in there. flaps forty five. I've got ah something in for the wind. it's a direct crosswind. ah so I put ten knots on there.		
23:09:32.4 **HOT-2**	roger.		
23:09:34.0 **HOT-1**	altimeters are two nine seven four. set. cross checked. pressurization set.		
23:09:42.4 **HOT-1**	approach briefing complete. seatbelts harness left right.		
23:09:45.0 **HOT-2**	on the right.		
23:09:45.2 **HOT-1**	in-range complete.		
23:09:47.8 **HOT-1**	I'll try ops again.		
23:09:48.9 **HOT-2**	alright. got one.		
		23:09:54.9 **RDO-?**	[modulation, no talk]
		23:10:08.1 **RDO-1**	United Operations Saint Louis this is forty six fifteen in range. about fifteen minutes no specials.
23:10:34.7 **HOT-1**	eh back with you.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:10:48.0 **HOT-2**	one to go.		
23:10:48.8 **HOT-1**	okay.		
23:10:56.8 **HOT**	[sound of 3 buzzers, similar to altitude alert]		
		23:11:24.8 **CTR**	Waterski forty six fifteen contact Saint Louis Approach one three two point one two. see you later.
		23:11:29.5 **RDO-1**	one three two one two Waterski forty six fifteen. good night.
23:11:33.3 **HOT-?**	[throat clearing]		
		23:11:39.1 **RDO-1**	Saint Louis Approach good evening this is Waterski forty six fifteen's with you. we're leveling one six thousand. november.
		23:11:52.6 **APR**	Waterski forty six fifteen Saint Louis Approach. proceed direct EXALE descend and maintain five thousand. expect a visual approach runway three zero right.
23:11:52.9 **HOT-?**	[throat clearing]		
		23:11:59.3 **RDO-1**	alright direct EXALE. five thousand. thirty right. Waterski forty six fifteen.

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:12:34.3 **HOT-2**	five thousand feet.		
23:12:54.6 **HOT-2**	same inbound. it's one one one point three. missed is gonna be a right turn ah up to three thousand or tower assigned. hold as published. left turn out still. runway is nine thousand feet. we'll probably do a high speed.		
23:13:06.9 **HOT-1**	(okay).		
23:13:09.9 **HOT-1**	you got it.		
23:13:17.0 **HOT-2**	you chang(ing) mine?		
23:13:18.6 **HOT-1**	I changed yours. yeah.		
23:13:18.7 **HOT-2**	mine. oh.		
23:13:20.3 **HOT-2**	[chuckling] like did I have that set up.		
23:13:23.9 **HOT-1**	ahhh.		
23:13:36.5 **HOT-2**	you did it again [chuckling].		
23:13:37.5 **HOT-1**	yeah.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:13:38.1 **HOT-2**	oh man [chuckling].		
23:13:38.7 **HOT-1**	[chucking]		
23:13:39.5 **HOT-2**	[chuckling] every time I look away.		
23:13:42.5 **HOT-1**	I've been flyin' in and out of here for thirty years. thirty one years.		
23:13:48.3 **HOT-2**	too long huh.		
23:13:48.3 **HOT-1**	**.		
23:13:50.2 **HOT-1**	long time.		
23:14:08.5 **HOT-1**	oh Cardinal V-O-R hasn't been here thirty one years. but the other stuff has.		
23:14:17.2 **HOT-2**	are you a Cardinals fan?		
23:14:19.3 **HOT-1**	no not really.		
23:14:20.1 **HOT-2**	[laughter]		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:14:22.7 **HOT-1**	I've been to a couple of games.		
23:14:23.9 **HOT-2**	yeah I'm not into ah baseball either.		
23:14:32.0 **HOT-2**	are you soccer?		
		23:14:32.9 **APR**	Waterski forty one six- correction forty six fifteen. fly heading two one zero. vector traffic.
		23:14:38.6 **RDO-1**	heading two one zero Waterski forty six fifteen.
23:14:42.3 **HOT-1**	two one zero.		
23:14:44.2 **HOT-1**	ah I played it when I was in England. but I haven't really followed it since I've been here.		
23:14:51.6 **HOT-1**	I played uh. soccer in the winter. cricket in the summer. tennis as well.		
23:14:58.2 **CAM**	[sound of decreased wind noise, similar to speed reduction]		
23:15:04.7 **HOT-2**	yeah.		
23:15:10.4 **CAM**	[sound of single chime, similar to flight attendant call]		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:15:12.5 **INT-3**	hello.		
23:15:14.0 **INT-1**	hey @. * in sterile. about ten minutes.		
23:15:17.3 **INT-3**	okay. thank you.		
23:15:18.3 **INT-1**	alright. bye.		
23:15:18.8 **INT-3**	bye.		
23:15:20.1 **HOT**	[rustling]		
23:15:29.9 **HOT-1**	boom.		
23:15:34.7 **HOT-2**	I'm flyin'.		
23:15:38.8 **HOT-2**	holy cow.		
		23:15:51.6 **APR**	Waterski forty six fifteen descend and maintain three thousand.
		23:15:54.8 **RDO-1**	three thousand Waterski forty six fifteen.
23:16:00.4 **HOT-1**	three thousand.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:16:00.5 **HOT-2**	three thousand (seeing).		
23:16:06.9 **HOT-1**	that's it.		
23:16:12.5 **HOT-?**	*.		
23:16:27.4 **HOT-2**	we'll go ah flaps nine.		
23:16:33.2 **HOT-1**	shhh-elect.		
		23:16:59.3 **APR**	Waterski forty six fifteen turn right heading two seven zero. intercept the runway three zero right localizer.
		23:17:04.1 **RDO-1**	two seventy heading. intercept the right localizer. Waterski forty six fifteen.
23:17:09.4 **HOT-1**	two seventy. (intercept).		
		23:18:14.6 **APR**	Waterski forty six fifteen airport one o'clock one two miles.
23:18:17.2 **HOT-2**	in sight.		
		23:18:18.6 **RDO-1**	in sight Waterski forty six fifteen.

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
		23:18:21.6 **APR**	Waterski forty six fifteen cleared visual approach runway three zero right. contact Lambert Tower one one eight point five. good night.
		23:18:27.9 **RDO-1**	alright visual right side eighteen five. we'll see ya' now.
		23:18:35.1 **RDO-1**	Saint Louis Tower good evening it's Waterski forty six fifteen's with you on a visual for the right side.
		23:18:40.0 **TWR**	Waterski forty six fifteen Saint Louis Tower runway three zero right. cleared to land. the left's available if you want it. the wind zero two zero at two zero gust two five.
23:18:48.6 **HOT-1**	you want the left?		
23:18:49.4 **HOT-2**	sure.		
		23:18:49.9 **RDO-1**	yeah we'll take left Waterski forty six fifteen.
23:18:51.5 **HOT**	[sound of 3 buzzers, similar to altitude alert]		
		23:18:52.5 **TWR**	Waterski forty six fifteen change to cleared to land runway three zero left. the localizer is ah one one one point five. cleared to land runway three zero left.
23:18:57.8 **HOT**	[single chime, similar to caution chime]		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
		23:19:00.8 **RDO-1**	cleared to land thirty left Waterski forty six fifteen.
23:19:03.2 **HOT-2**	gear down.		
23:19:04.6 **CAM**	[sound of click and increased background noise, similar to landing gear handle being put in down position and gear extension]		
23:19:05.6 **HOT-1**	alright. you're setup for the left side then.		
23:19:13.0 **HOT-2**	flaps twenty two.		
23:19:16.2 **HOT-2**	ooh that's some wind. huh?		
23:19:16.4 **HOT-1**	*.		
23:19:17.8 **HOT-1**	oh yeah.		
23:19:20.4 **HOT-1**	rrreal breezy.		
23:19:23.0 **HOT-2**	and flaps forty five works with this?		
23:19:25.7 **HOT-1**	yep. that's the speeds.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:19:27.7 **CAM**	[sound of click]		
23:19:36.1 **HOT-1**	yeah it's pretty well a direct crosswind.		
23:19:40.9 **HOT-2**	and four thousand you can set for miss. uh once I.		
23:19:44.8 **HOT-1**	oh. yeah. let's see here.		
23:19:50.0 **HOT-1**	[low volume] left side. yeah. up to three. that's good.		
23:19:56.8 **HOT**	[sound of 3 buzzers, similar to altitude alert]		
23:20:18.5 **HOT-2**	flaps forty five.		
23:20:20.6 **HOT-1**	[sound of click] sh-elect.		
23:20:32.4 **HOT-2**	I see gear down. flaps forty five. before landing checklist.		
23:20:35.0 **HOT-1**	[spoken rapidly] and flight attendant (notified). * down. * *(down) forty five. speedbrake closed. crossfeed off. landing check is complete. you are cleared to land.		
23:20:46.8 **CAM**	[sound of clicks and snaps]		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:21:07.1 **HOT-1**	thousand above.		
23:21:26.2 **HOT-1**	(just) keep it round about...		
23:21:27.8 **HOT-2**	yes--		
23:21:27.9 **HOT-1**	...* sixty five or so should be fine. you've got little or no headwind component here. so.		
23:21:33.3 **HOT-2**	I know I ju-- it ju--		
23:21:34.9 **HOT-1**	yeah I know it--		
23:21:35.6 **HOT-2**	gustin' me so I--		
23:21:36.2 **HOT-1**	yeah.		
23:21:37.3 **HOT-2**	I don't want to stall.		
23:21:38.2 **HOT-1**	yeah.		
23:22:20.3 **HOT-1**	lookin' good.		
23:22:22.1 **AWU**	two hundred.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:22:23.2 **HOT-2**	yaw damps away.		
23:22:23.9 **HOT-1**	okay.		
23:22:32.0 **AWU**	one hundred.		
23:22:42.7 **HOT-1**	[low volume] * ease it. there-there you go.		
23:22:46.3 **HOT-1**	[low volume] put that wing down. (put that) rudder in. that's (it).		
23:22:50.1 **HOT-(2)**	(correcting).		
23:22:50.2 **HOT-(1)**	[spoken loudly] (I've got my c*).		
23:22:51.6 **HOT**	[sound of 3 chimes, similar to master warning]		
23:22:52.9 **AWU**	bank angle. bank angle.		
23:22:53.0 **AWU**	(takeoff). [simultaneous with prior "bank angle"]		
23:22:53.7 **HOT-?**	[spoken loudly] doh.		
23:22:54.3 **HOT**	[exhale] *.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:22:54.7 **AWU**	*.		
23:22:55.1 **AWU**	bank angle.		
23:22:55.8 **AWU**	bank angle.		
23:22:56.3 **HOT**	[sound of 3 chimes, similar to master warning]		
23:22:56.6 **HOT-(1)**	oh #.		
23:22:57.3 **HOT-2**	it's. (thrust).		
23:22:58.4 **HOT-?**	[sound of grunt, similar to physical exertion]		
23:22:60.0 **HOT-1**	okay...		
23:23:00.1 **HOT**	[sound of 3 chimes, similar to master warning]		
23:23:00.7 **HOT-(1)**	your (con)--.		
23:23:02.3 **HOT-1**	(ah go-round). positive climb.		
23:23:04.7 **HOT-2**	gear up. [sound of click, similar to gear handle]		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:23:05.7 **HOT**	[sound of 3 chimes, similar to master warning]		
23:23:06.3 **HOT-?**	*.		
23:23:07.2 **AWU**	landing gear.		
23:23:09.3 **HOT**	[sound of heavy breathing]		
23:23:010.0 **CAM**	[sound of thunk, similar to landing gear completing retraction sequence]		
23:23:15.6 **HOT-2**	alright your controls or mine?		
23:23:16.7 **HOT-1**	alright my controls.		
23:23:17.7 **HOT-2**	your controls.		
23:23:18.3 **HOT-1**	okay.		
		23:23:19.2 **RDO-2**	and tower Waterski forrrrty six fifteen's goin' around.
		23:23:23.0 **TWR**	Waterski forty six fifteen roger. do you require any assistance?

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:23:26.2 **HOT-1**	negative.		
		23:23:26.8 **RDO-2**	negative ah. we just want ah go ah left traffic here.
23:23:27.0 **HOT-1**	** come back **.		
		23:23:30.5 **TWR**	Waterski forty six fifteen ah make left traffic for runway three zero left.
		23:23:36.6 **RDO-2**	alright left traffic for three zero left forty six fifteen.
23:23:39.7 **HOT-1**	okay.		
		23:23:39.9 **TWR**	Waterski forty six fifteen did you want to go back with approach or just stay in the pattern?
23:23:41.0 **HOT**	[sound of 3 buzzers, similar to altitude alert]		
		23:23:43.7 **RDO-2**	(I'll) just stay in the pattern forty six fifteen.
23:23:43.8 **HOT-1**	(pattern's fine).		
		23:23:45.8 **TWR**	Waterski forty six fifteen remain this frequency make left traffic for runway three zero left.

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:23:46.5 **HOT-2**	acceleration height.		
23:23:47.4 **HOT-1**	okay flaps zero. climb sequence.		
		23:23:51.1 **RDO-2**	left traffic for three zero left. forty six fifteen.
23:23:55.3 **HOT**	[sound of heavy breathing]		
23:24:04.3 **HOT-1**	okay. you alright.		
23:24:07.1 **HOT-2**	yeah.		
23:24:08.0 **HOT-1**	okay. no problem.		
23:24:15.9 **HOT-2**	takeoff checklist complete.		
23:24:17.4 **HOT-1**	alright thanks.		
23:24:19.7 **HOT-1**	let's just go with in-range checklist. make sure we have everything squared away there.		
23:24:30.3 **HOT-2**	seatbelt sign is on. windshield heat's on. landing data and bugs checked and set. seatbelts harness. primary and standby altimeter are two nine seven four. ah set crosschecked three times. pressurization is set. approach brief complete. seatbelts harness on right.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:24:46.6 **HOT-1**	okay. on the left.		
23:24:48.3 **HOT-2**	in-range checklist complete.		
23:24:49.4 **HOT-1**	okay.		
23:24:49.8 **HOT-2**	you uh forty five was too much.		
23:24:52.2 **HOT-1**	yeah. okay.		
23:24:54.9 **HOT-2**	it pulled it way too much.		
23:24:57.1 **HOT-2**	alright so. twenty two?		
23:24:58.6 **HOT-1**	yeah. twenty two's fine.		
		23:25:09.9 **TWR**	Waterski forty six fifteen did you want to come in to land or did you have some'n you wanted to work on?
23:25:14.9 **HOT-1**	if you're ready to come in we can come in.		
		23:25:17.0 **RDO-2**	uh we're ready to come in to land for ah forty six fifteen.

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
		23:25:21.0 **TWR**	Waterski forty six fifteen runway three zero left. cleared to land. the wind now zero two zero at two one gust two six.
		23:25:28.1 **RDO-2**	alright three zero left cleared to land. Waterski forty six fifteen.
23:25:31.9 **HOT-1**	okay.		
23:25:32.4 **HOT-1**	you wanna take it?		
23:25:33.7 **HOT-2**	uh--		
23:25:33.9 **HOT-1**	I'm-I'm happy for you to take it.		
23:25:36.2 **HOT-2**	I. blaaah.		
23:25:38.1 **HOT-2**	I [mumbles, trails off]		
23:25:38.6 **HOT-1**	it's up to you.		
23:25:39.1 **HOT-2**	* I'm worked up right now (so).		
23:25:40.7 **HOT-1**	eh. okay. that's fair enough.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:25:43.7 **HOT-1**	[low volume] oh I'm *.		
23:26:13.8 **HOT-2**	what was it gusting to before?		
23:26:16.6 **HOT-1**	oh it was sayin'. fifteeeeen. or twenty two gusting thirty.		
23:26:29.6 **HOT-2**	I had-I had the full rudder and I had full aileron in.		
23:26:32.7 **HOT-1**	uh huh.		
23:26:35.5 **HOT-2**	I guess we should have came in with a little more speed.		
23:26:40.6 **HOT-2**	oh sorry.		
23:26:41.3 **HOT-1**	that's alright. don't worry about it.		
23:26:48.2 **HOT-1**	oh I guess I got used to doing flaps thirty uhm.		
23:26:52.5 **HOT-1**	[low volume] yeah. *.		
23:26:57.6 **HOT-1**	yeah. I do-do that. you know even in those winds. uhm.		
23:27:04.8 **HOT-1**	[low volume] but. anyway.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:27:14.0 **HOT-1**	yeah. just set me approach mode (on the ah).		
23:27:18.2 **HOT**	[sound of 3 buzzers, similar to altitude alert]		
23:27:19.8 **HOT-2**	flaps--		
23:27:20.0 **HOT-1**	set flaps nine.		
23:27:40.1 **HOT-1**	and gear down.		
23:27:41.4 **HOT**	[sound of click and increased background noise, similar to landing gear handle being put in down position and gear extension]		
23:27:50.2 **HOT-1**	flaps twenty two.		
23:28:04.7 **HOT-1**	ah gear down. twenty two. before landing check please.		
		23:28:05.2 **TWR**	wind zero one zero at two zero gust two six and Saint Louis alimeter two niner seven two.
23:28:10.1 **HOT-2**	flight attendant notified. landing gear down. flaps forty five. speed brake closed. crossfeed off. before landing checklist complete.		
23:28:15.2 **HOT-1**	okay.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:28:20.2 **HOT-2**	[low volume] flaps set twenty two.		
		23:28:26.6 **RDO-2**	and ah confirm forty six fifteen's cleared to land three zero left.
		23:28:30.3 **TWR**	Waterski forty six fifteen affirmative runway three zero left cleared to land. the wind zero one zero at two zero gust two six.
		23:28:37.4 **RDO-2**	alright cleared to land three zero left. forty six fifteen.
23:29:20.4 **HOT-2**	within a thousand.		
23:29:21.4 **HOT-1**	okay.		
		23:29:29.5 **MISC-AC**	[tower Delta 1997 turning left base 30R]
		23:29:34.6 **TWR**	[runway 30R cleared to land. wind 010 at 23 gust 30. runway 30L available if you like it.]
		23:29:44.7 **MISC-AC**	[Delta 1997 stays on runway 30R]
23:30:08.2 **AWU**	two hundred.		
23:30:16.7 **AWU**	one hundred.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
23:30:24.5 **HOT-2**	twenty feet.		
23:30:25.0 **HOT-1**	[low volume] okay.		
23:30:32.9 **CAM**	[sound of thunk, similar to touchdown]		
23:30:40.1 **CAM**	[sound of woosh, similar to reverse thrust]		
23:30:44.5 **HOT-2**	fifty knots. my tops.		
23:30:46.5 **HOT-1**	okay. your tops.		
		23:30:58.1 **TWR**	Waterski forty six fifteen turn left at quebec and taxi via quebec charlie to the ramp. remain this frequency.
		23:31:04.3 **RDO-2**	quebec charlie to the ramp with you forty six fifteen.
23:31:08.5 **PA-3**	[unintelligible flight attendant announcement]		
23:31:20.4 **HOT-1**	clear left.		
23:31:21.9 **HOT-2**	clear right.		

TIME and SOURCE	INTRA-AIRCRAFT CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
		23:31:28.8 **TWR**	and Waterski forty six fifteen when you get a chance give me a call on the phone if you don't mind. company will have the number or I can give it to you.

END OF TRANSCRIPT
23:31:35 CST (01:05:31 CVR Elapsed Time)

END OF RECORDING
02:04:53 CVR Elapsed Time