

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



GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

CEN11IA341

**By
Bill Tuccio**

WARNING

The reader of this report is cautioned that the transcription of a cockpit voice recorder audio recording is not a precise science but is the best product possible from a Safety Board group investigative effort. The transcript or parts thereof, if taken out of context, could be misleading. The transcript should be viewed as an accident investigation tool to be used in conjunction with other evidence gathered during the investigation. Conclusions or interpretations should not be made using the transcript as the sole source of information.

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, D.C. 20594

July 21, 2011

Cockpit Voice Recorder - 12

Group Chairman's Factual Report By Bill Tuccio

A. EVENT

Location: Denver, Colorado
Date: May 17, 2011, 0645 Mountain Daylight Time*
Aircraft: Hawker Beechcraft BE-1900D, N218YV
Operator: Great Lakes Airlines, Flight 5150
NTSB Number: CEN11IA341

B. GROUP

A group was convened on May 26, 2011.

Chairman: Bill Tuccio
National Transportation Safety Board

Member: Leah Yeager
Investigator in Charge
National Transportation Safety Board

Member: T.R. Proven
Air Safety Investigator
Federal Aviation Administration

Member: Heather Halverson
Director of Safety
Great Lakes Airlines

Member: Jeremy J. Lucin
Assistant Director of Safety
Great Lakes Airlines

* All times are expressed in mountain daylight time (MDT), unless otherwise noted.

C. SUMMARY

On May 17, 2011, approximately 0645 mountain daylight time (MDT), N218YV, a Hawker Beechcraft BE-1900D, operating as Great Lakes flight 5150, sustained minor damage when the left main landing gear collapsed during landing roll out on Runway 35L at Denver International Airport (DEN), Denver, Colorado. The airline transport pilot rated captain, commercial rated first officer and the nine passengers were not injured. The airplane was registered to Raytheon Aircraft Credit Corporation, Wichita, Kansas, and operated by Great Lakes Airlines, Cheyenne, Wyoming. An instrument flight plan was filed for the flight that originated at Pueblo Memorial Airport (PUB), Pueblo, Colorado, about 0607, and destined for DEN. Visual meteorological conditions prevailed for the scheduled passenger flight conducted under 14 CFR part 121. A tape cockpit voice recorder (CVR) was sent to the National Transportation Safety Board Vehicle Recorder Division's Audio Laboratory for readout. The CVR group meeting convened on May 26, 2011 and a partial transcript was prepared for the 29-minute, 59-second tape recording (see attached).

D. DETAILS OF INVESTIGATION

On May 18, 2011, the NTSB Vehicle Recorder Division's Audio Laboratory received the following CVR:

Recorder Manufacturer/Model: **Fairchild Model A-100A**
Recorder Serial Number: **56435**

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 of CVR operation. This model CVR, the Fairchild Model A-100A, records 30 minutes of analog audio on a continuous loop tape in a four-channel format: one channel for each flight crew, one channel for passenger cabin announcements, and one channel for the cockpit area microphone (CAM).

Recorder Damage

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

Audio Recording Description

The 30-minute recording consisted of four channels of useable audio information. Each channel's audio quality[†] is indicated in Table 1.

[†] See attached CVR Quality Rating Scale.

Table 1: Audio Quality

Channel Number	Content/Source	Quality
1	Captain	Excellent
2	Cabin Announcements	Excellent
3	CAM	Good
4	First Officer	Excellent

Timing and Correlation

Timing on the partial transcript was established using the time of landing at Denver, as supplied by the Investigator-In-Charge as 0632:39 MDT. The relative time of the CVR audio events were offset to reflect the local mountain daylight time of the landing by adding 0603:46.154 to CVR elapsed time.

Description of Audio Events

The recording began at 0604 as the aircraft started engines at the departure airport, Pueblo Memorial. The transcript began as the aircraft was descending into the Denver area at 0622:02 and continued until the end of the recording.

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. They declined the invitation.

Bill Tuccio
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 Fairchild Model A-100A tape cockpit voice recorder, serial number 56435, installed on a Great Lakes Airlines Hawker Beechcraft BE-1900D (N218YV), which suffered a gear collapse on landing at the Denver International Airport (DEN) in Denver, Colorado.

LEGEND

CAM	Cockpit area microphone voice or sound source
HOT	Flight crew audio panel voice or sound source
RDO	Radio transmissions from N218YV
APR	Radio transmission from the Denver approach controller
TWR	Radio transmission from the Denver airport tower controller
AC	Radio transmission from an unidentified aircraft
OPS	Radio transmission from Great Lakes Denver operations
PA	Public address system
PAX	Voice of unidentified passenger
-1	Voice identified as the captain
-2	Voice identified as the first officer
-?	Voice unidentified
*	Unintelligible word
#	Expletive
()	Questionable insertion
[]	Editorial insertion

Note 1: Times are expressed in mountain daylight time (MDT).

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-COCKPIT COMMUNICATION CONTENT

06:03:46
START OF RECORDING

06:22:02
START OF TRANSCRIPT

06:22:13
HOT-1 runway three five left twelve thousand feet long one hundred fifty feet wide all the lights bells and whistles you could ever want on a runway.

06:22:18
HOT-1 it's this inside one right here. if not down first three thousand feet painted touchdown zone we'll do a go around.

06:22:24
HOT-2 localizer slowly coming alive.

06:22:26
HOT-1 ah it'll be left turn mike six mike seven controls same as always.

06:22:30
HOT-1 airport elevation five thousand four hundred thirty one feet. making the pattern at seven thousand. minimum safe altitude around the Denver V-O-R all sectors nine thousand two hundred feet.

TIME and SOURCE

AIR-GROUND COMMUNICATION CONTENT

06:22:02
RDO-1 hello approach Lakes Air one fifty. level one one thousand three two zero to intercept three five left localizer.

06:22:07
APR Lakes Air one fifty Denver approach expect runway three five left good morning.

06:22:11
RDO-1 mornin'.

**TIME and
SOURCE**

INTRA-COCKPIT COMMUNICATION CONTENT

06:22:37

HOT-1 I-L-S backup is one oh eight decimal five. three fifty two inbound.
DYMON at six point eight.

06:22:53

HOT-1 twenty thirty no ice no gusts.

06:22:57

HOT-1 * questions?

06:23:02

HOT-2 [prior call on the radio was to Lakes Air one fifty two] that was for us.

06:23:03

HOT-1 I thought he said one fifty two.

06:23:05

HOT-? [approach clears Lakes Air one fifty two for a visual approach] yep.

06:23:07

HOT-1 that's a different one.

06:23:07

HOT-2 oh.

06:23:10

HOT-2 no questions.

06:23:11

HOT-1 huh?

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION CONTENT

06:22:45

APR Lakes Air one fifty let me know when you pick up the field twelve o'clock
and three eight miles.

06:22:48

RDO-1 let you know when we have it Lakes Air one fifty.

**TIME and
SOURCE**

INTRA-COCKPIT COMMUNICATION CONTENT

06:23:12
HOT-2 did you ask me if I had any questions or anything?

06:23:13
HOT-1 yeh.

06:23:14
HOT-2 no I don't.

06:23:14
HOT-1 okay.

06:23:15
HOT-1 oh wrrrong thhhhhing.

06:23:17
HOT-1 descent checklist. ice protection.

06:23:19
HOT-2 ice protection standard three ahh alt static ignitors.

06:23:23
HOT-1 pressurization.

06:23:23
HOT-2 is set fer' Denver.

06:23:24
HOT-1 T-CAS.

06:23:25
HOT-2 is twenty and below.

06:23:26
HOT-1 altimeters.

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION CONTENT

**TIME and
SOURCE**

INTRA-COCKPIT COMMUNICATION CONTENT

06:23:27
HOT-2 ah twenty nine seven zero is set and cross checked.

06:23:28
HOT-1 landing-logo-recognition lights.

06:23:30
HOT-2 are on.

06:23:30
HOT-1 autofeather.

06:23:31
HOT-2 armed.

06:23:32
HOT-1 anti-skid.

06:23:32
HOT-2 not installed.

06:23:33
HOT-1 descending through...eleven thousand.

06:23:35
HOT-2 sterile.

06:23:36
HOT-1 descent checklist is complete.

06:23:37
HOT-1 approach checklist. approach briefing.

06:23:38
HOT-2 complete.

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION CONTENT

TIME and SOURCE

INTRA-COCKPIT COMMUNICATION CONTENT

06:23:39
HOT-1 landing data bugs.

06:23:39
HOT-2 set n' checked.

06:23:40
HOT-1 interior lights.

06:23:41
HOT-2 are on...or partial on.

06:23:43
HOT-2 ah complete.

06:23:44
HOT-1 approach checklist.

06:23:44
HOT-2 complete.

06:24:04
HOT-2 what's Brickyard?

06:24:05
HOT-1 ahhh that's Republic.

06:24:08
HOT-2 the what?

06:24:08
HOT-1 Republic.

TIME and SOURCE

AIR-GROUND COMMUNICATION CONTENT

06:23:59
AC [aircraft call sign Brickyard talks to ATC]

TIME and SOURCE

INTRA-COCKPIT COMMUNICATION CONTENT

06:24:09

HOT-2 Republic.

06:24:10

HOT-1 so it'll either be the E-one seventy...E-one seventies E-one nineties or now the Q-fours are on their certificate too. so it'll be one of those three.

06:24:18

HOT-2 yeh.

06:24:34

HOT-? man it is hazy.

06:24:56

HOT-1 I think he just wants to know how far out you can get it. ***.

TIME and SOURCE

AIR-GROUND COMMUNICATION CONTENT

06:24:58

APR Lakes Air one fifty descend and maintain one zero thousand.

06:25:00

RDO-1 one zero thousand Lakes Air one fifty.

06:25:02

HOT-1 confirm one zero thousand.

06:25:03

HOT-2 one zero thousand confirmed.

06:25:04

HOT [sound of low pitch tone, similar to altitude alert]

06:25:04

HOT-1 one one thousand descending one zero thousand.

06:25:06

HOT-2 one one thousand descending one zero thousand.

**TIME and
SOURCE**

INTRA-COCKPIT COMMUNICATION CONTENT

06:25:27

HOT-1 that's some good haze.

06:25:28

HOT-2 yeh.

06:25:29

HOT-1 I know where the airport is. It's only twenty five miles away.

06:25:33

HOT-1 I can sort of make out the tents I think...

06:25:37

HOT-1 ...or some sort of white buildings.

06:25:42

HOT-2 oh yeh I see 'em...barely....good eye.

06:25:44

HOT-1 I don't see runway lights on though.

06:26:09

HOT-1 yeh they...they can turn their lights on so bright if they turn em on you can see them from...way out...but I'm lookin' for a runway...aw there it is it just came in. twenty four miles on the localizer....see it there....I think I see it....see it black.

06:26:30

HOT-2 ahhh.

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION CONTENT

06:25:55

APR Lakes Air one fifty airport twelve o'clock two four miles.

06:25:58

RDO-1 ah still lookin' Lakes Air one fifty we'll let cha' know.

TIME and SOURCE

INTRA-COCKPIT COMMUNICATION CONTENT

06:26:33
HOT-1 thought I had it.

06:26:35
HOT-1 yeh I think I got it there.

06:26:38
HOT-2 if you got it. go for it.

06:26:54
HOT-1 cleared for the visual.

06:26:54
HOT-2 where's CHOLA?

06:26:56
HOT-1 ah not sure just stay above the glideslope here...it's like sixteen point six...let me look.

06:26:58
HOT-2 alright.

06:27:04
HOT-2 oh yeh I see the runway now.

TIME and SOURCE

AIR-GROUND COMMUNICATION CONTENT

06:26:41
RDO-1 Lakes Air one fifty has the airport in sight.

06:26:44
APR Lakes Air one fifty cleared visual approach runway three five left cross ah CHOLA at or above one zero thousand.

06:26:50
RDO-1 cleared visual three five left CHOLA at or above one zero thousand Lakes Air one fifty.

**TIME and
SOURCE**

INTRA-COCKPIT COMMUNICATION CONTENT

06:27:11
HOT-1 gotta' practice this for ah L-A-X right. yeh sixteen point six.

06:27:16
HOT-2 (ka-yah).

06:27:19
HOT-1 * when you hit the glideslope in Denver you're fine.

06:28:07
HOT-1 yeh I could just see the black strip in the middle of the white...I've seen it so many times you know that's probably...

06:28:12
HOT-2 yeh

06:28:12
HOT-1 ...that's why I picked it up.

06:28:13
HOT-2 if you're lookin' for it.

06:28:17
HOT-2 alright there's the glideslope I'm just gonna follow it down.

06:28:19
HOT-1 that's good.

06:28:26
HOT-1 what was it to DYMON?

06:28:27
HOT-2 oh one seventy or greater.

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION CONTENT

06:28:19
APR Lakes Air one fifty maintain one seven zero knots or greater to DYMON at DYMON contact tower one three three point three. good morning.

TIME and SOURCE

INTRA-COCKPIT COMMUNICATION CONTENT

06:28:51
HOT-1 cleared to land.

06:28:52
HOT-2 cleared to land.

06:28:53
HOT-1 mike six is closed it's gonna be your second high speed on the exit.

06:28:56
HOT-2 okay.

06:29:03
HOT [sound of high pitch tone, similar to gear warning horn]

06:29:04
HOT-2 thank you.

06:29:06
HOT [sound of alternating tones, similar to engine ignitors continue throughout parts of descent]

TIME and SOURCE

AIR-GROUND COMMUNICATION CONTENT

06:28:28
RDO-1 one seventy or greater to DYMON over to tower thirty three three Lakes Air one fifty. see ya.

06:28:37
RDO-1 hello tower Lakes Air one fifty visual three five left.

06:28:40
TWR one fifty Denver tower be advised mike six is closed. runway three five left cleared to land. wind two seven zero at one zero.

06:28:46
RDO-1 cleared to land three five left we'll plan at mike seven Lakes Air one fifty.

**TIME and
SOURCE**

INTRA-COCKPIT COMMUNICATION CONTENT

06:29:07
HOT-1 DYMON is six point eight.

06:29:11
PA [automated briefer landing announcement]

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION CONTENT

06:29:15
TWR Lakes Air one...Lakes Air one fifty Denver final monitor radio check.

06:29:19
RDO-1 loud and clear Lakes Air one fifty.

06:29:21
TWR and loud and clear. I have to do two more checks for our final monitors.
are you ah able to help me out there?

06:29:25
RDO-1 sure go ahead.

06:29:26
TWR roger thanks.

06:29:27
TWR Lakes Air one fifty switch to my tower frequency one two four point three.

06:29:46
RDO-1 Lakes Air one fifty with ya' on twenty four three.

06:29:48
TWR one fifty Denver final monitor radio check.

06:29:50
RDO-1 loud and clear Lakes Air one fifty.

06:29:52
TWR yeh you too thanks.

TIME and SOURCE

INTRA-COCKPIT COMMUNICATION CONTENT

06:30:07
HOT-2 ohhhh come on.

06:30:14
HOT-2 flaaaaapppppsssss seventeen.

06:30:18
HOT-1 speed checks. seventeen selected.

06:30:33
HOT-2 gear down. landing checks. props full forward.

06:30:35
HOT [sound of click, similar to gear handle movement]

06:30:36
CAM [sound of high pitch tone (approx 800Hz), similar to hydraulic motor pump running for 5.8 seconds]

06:30:39
CAM [sound of increased propeller noise]

06:30:42
CAM [sound of increased high pitched tone (800Hz increases to steady 970Hz), similar to hydraulic motor pump running, for 9.8 seconds]

06:30:46
HOT-1 #.

TIME and SOURCE

AIR-GROUND COMMUNICATION CONTENT

06:29:53
TWR Lakes Air one fifty we are done with those frequencies. so you are cleared to land three five left. we appreciate you accommodating us on that.

06:29:58
RDO-1 no problem. cleared to land three five left Lakes Air one fifty.

**TIME and
SOURCE**

INTRA-COCKPIT COMMUNICATION CONTENT

06:30:50

HOT-1 gear.

06:30:52

HOT-2 the three green.

06:30:55

HOT [sound of click]

06:30:58

HOT-1 that is three green we've got right left nose.

06:31:02

HOT-1 ahhhhhh.

06:31:04

HOT-1 flaps.

06:31:05

HOT-2 seventeen.

06:31:05

HOT-1 propellers.

06:31:06

HOT-2 full forward.

06:31:07

HOT-1 holding on final checks.

06:31:07

HOT-2 final checks.

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION CONTENT

TIME and SOURCE

INTRA-COCKPIT COMMUNICATION CONTENT

TIME and SOURCE

AIR-GROUND COMMUNICATION CONTENT

06:31:08

HOT-1 flaps are seventeen. yaw damper off. is complete. three green. cleared to land by the (tower). * down buckled brief. we've got an in transit light but we've got right hand nose and L which means we've got a locked left gear.

06:31:21

HOT-2 we've got wind two six zero at seven.

06:31:23

HOT-1 roger.

06:31:51

GPWS five hundred.

06:31:58

HOT-1 ref plus (ten).

06:32:04

HOT-1 visual inspection also shows it down and locked.

06:32:07

HOT-2 okay.

06:32:10

HOT [sound of alternating high pitch tone, similar to landing gear warning horn continues for 9.0 seconds]

06:32:12

HOT-1 that's considered because of the horn.

06:32:19

HOT [alternating high pitch tone stops]

06:32:23

HOT [sound of alternating high pitch tone, similar to landing gear warning horn continues for 2.8 seconds]

TIME and SOURCE

INTRA-COCKPIT COMMUNICATION CONTENT

06:32:24
HOT-2 sorry.

06:32:24
HOT-1 ref plus five.

06:32:28
HOT-1 V ref.

06:32:37
CAM [sound of decreasing background noise, similar to power reduction]

06:32:39
CAM [sound of clunk]

06:32:39
HOT [sound of high pitch tone, similar to stall warning, continues until end of recording]

06:32:40
HOT-? oh #.

TIME and SOURCE

AIR-GROUND COMMUNICATION CONTENT

06:32:44
RDO-1 Denver tower Lakes Air one fifty emergency gear collapse on the runway.

06:32:48
TWR say again.

06:32:50
RDO-1 Lakes Air one fifty we have an emergency gear collapse on the runway. roll the trucks.

06:32:57
TWR Lakes Air one fifty roger. I show three five left a closed runway and we are responding to you now.

**TIME and
SOURCE**

INTRA-COCKPIT COMMUNICATION CONTENT

06:33:09
CAM [sound of decrease in engine noise]

06:33:09
HOT-1 get that right brake in.

06:33:18
CAM [sound of further decrease in engine noise]

06:33:23
PAX did a good job boys.

06:33:45
**END OF TRANSCRIPT
END OF RECORDING**

**TIME and
SOURCE**

AIR-GROUND COMMUNICATION CONTENT

06:33:01
RDO-1 roger.

06:33:03
TWR ops eight Denver tower.

06:33:04
RDO-1 Denver ops one fifty we had an emergency on the runway.

06:33:11
OPS did somebody call ops.

06:33:16
TWR *** continue to stand by.