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

GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

Cockpit Voice Recorder

NYC03MA183

by

Douglass P. Brazy
Mechanical Engineer (CVR)

Warning
The reader of this report is cautioned that the transcription of a CVR tape is not a precise science but is the best product possible from an NTSB group investigative effort. The transcript, or parts thereof, if taken out of context, could be misleading. The attached CVR 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.

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October 3, 2003

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Group Chairman's Factual Report
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A. ACCIDENT

Location:	Yarmouth, MA
Date:	August 26, 2003
Time:	1540 Eastern Daylight Time
Aircraft:	Beech (Raytheon) 1900D, N240CJ
Operator:	Colgan Air Inc.

B. GROUP

Chairman:	Douglass P. Brazy Mechanical Engineer (CVR) National Transportation Safety Board
Member:	Stephen M. Demko Air Safety Investigator National Transportation Safety Board
Member:	L.I. "Lou" Johansen Engineering Test Pilot Raytheon Aircraft Company
Member:	Daniel P. Diggins Air Safety Investigator Federal Aviation Administration
Member:	LaDonn James Nunn VP Operations Colgan Air Inc.

C. SUMMARY

On August 26, 2003, at 1540 eastern daylight time, a Beech 1900D, N240CJ, operated by Colgan Air Inc. as flight 9446 (d.b.a. US Airways Express), was destroyed when it impacted water near Yarmouth, Massachusetts. The certificated airline transport pilot and certificated commercial pilot were fatally injured. Visual meteorological conditions prevailed for the flight that departed Barnstable Municipal Airport (HYA), Hyannis, Massachusetts; destined for Albany International Airport (ALB), Albany, New York. An instrument flight rules flight plan was filed for the repositioning flight conducted under 14 CFR Part 91.

The Cockpit Voice Recorder (CVR) contained approximately thirty-four minutes of audio. The first fifteen minutes of the recording contained some conversations amoung maintenance personnel and sounds consistent with maintenance work. Relatively loud banging sounds similar to hammering can be heard repeatedly throughout this portion of the recording. Subsequently, several sounds similar to electrical power interruptions occur, followed by the first conversations between the flight crew. The CVR group transcribed the latter half of the recording, beginning at the time the flight crew can first be heard, and continuing to the end of the recording. The transcript can be found in Attachment II.

D. DETAILS OF INVESTIGATION

Recorder Examination

The NTSB Vehicle Recorders Division received a Fairchild[1] model A100A, serial number 61870 magnetic tape CVR. The exterior of the CVR showed evidence of substantial structural damage.

[1] Fairchild is now known as L^3 Communications.

Recorder Disassembly, Tape Removal and Preparation

The recorder was disassembled using normal tools. An optional DC to AC inverter was found installed in the recorder chassis. The internal tape spool dustcover was easily removed, and the tape and spool were found to be intact and in good condition. The only notable damage inside the crash case was some corrosion of the various metallic parts. The tape and spool were found to be wet, but otherwise intact.

The tape spool cover was removed with normal tools. The endless tape was then cut with a scissors, adjacent to the tape head assembly on the “oldest data” side of the head assembly. The tape and spool were removed from the recorder. A leader tape was spliced to each end. The tape and spool were then immersed in a bath of distilled water for cleaning. While underwater, the tape was spooled to a conventional reel for use with the CVR lab’s tape playback equipment. After rinsing, the tape was removed from the water bath for further cleaning and drying. This process is done by manually spooling the tape back and forth between two reels while gently wiping the tape clean with a gauze cloth soaked in a cleaning solvent. During this process, a visual examination of the tape revealed no mechanical damage. Once cleaned and dried, the tape was played back normally and without difficulty using the CVR lab’s playback equipment.

Readout

The tape was played back at the nominal speed of 1-7/8 inches per second. Typically, a 400 Hz tone (and its harmonics) heard on many CVR recordings as “background noise” can be used to fine tune the playback speed in attempt to play back the tape back at a speed as close as possible to the speed at which it was recorded. This tone was not readily apparent on this recording, which is typical of recorders fitted with an optional DC to AC inverter, as this one was.

The audio on the tape was recorded to a digital computer based audio system, to preclude any undue wear on the original tape. This digital recording was then used for subsequent evaluation by NTSB staff and the CVR group.

CVR Channels

The recording consisted of four channels of audio information, with the quality of the audio ranging from Poor to Good[2]. One channel contained the cockpit area microphone (CAM) audio information. The CAM is mounted in the cockpit, in the overhead panel between the two pilots. It is designed to capture sounds and conversations in the cockpit area whenever the CVR system is powered. The CAM channel quality was Good.

Two of the channels contained audio information obtained from the Captain's and First Officer's audio panels, respectively. The audio panels are essentially an interface between the pilot's headsets (or the cockpit speaker) and the airplane's radio communication equipment. Radio transmissions (both transmitted and received), are captured on these channels. Additionally, "hot" microphone signals (when used) are captured through the audio panels on these channels. Hot microphones are the same microphones in the pilot's headsets that can be used for making radio transmissions. The "hot" means that they are intended to always be on and recorded by the CVR, whether or not a radio transmission is being made. However on this recording, it appears that the microphone signals captured by the CVR (from both the Captain's and First Officer's headsets) were voice activated. This is evident by the squelching of the hot microphone audio than can be heard (and seen in waveforms of the signal) numerous times after the pilots finish speaking a word or phrase. This is most noticeable whenever the background ambient noise is at a relatively low level.

Federal Aviation Administration regulations require that large turbine powered airplanes be equipped with CVR systems that record uninterrupted audio signals

[2] See Attachment I for a CVR Quality Ranking Scale.

received by boom microphones.[3] This CVR installation may not have been in compliance with those regulations.

The First Officer's channel was recorded at a much lower volume than the other 3 channels. No incoming radio transmissions could be heard on this channel, though the First Officer did communicate with the Air Traffic Control Tower. It appears that the Captain and First Officer were using an intercom, however the Captain's voice could not be heard at all on the First Officer's Channel. A CVR test tone that can be heard briefly on this channel when the Captain performs the CVR test at 1423:51. The volume of the tone is significantly lower on this channel than it is on the Captain's channel. The quality of this channel was rated Poor.

Low signal level (volume) for VHF radio – as recorded by the CVR – is a historical problem for the Beech (Raytheon) 1900 airplanes. In 1997, after experiencing a number of similar problems with B1900 airplanes, the NTSB issued a recommendation[4] to the Federal Aviation Administration (FAA) to address the problem. Additionally, Raytheon developed a Service Bulletin (S/B 23-3094) that outlined the replacement of an amplifier in the airplane's audio system. In 2000, the FAA issued Airworthiness Directive AD 2000-20-07, which required that all applicable B1900 airplanes comply with the tasks outlined in the Raytheon Service Bulletin.

According to the airplane's maintenance records, AD 2000-20-07, S/B 23-3094 was complied with on this airplane on December 19, 2002.

The audio from the Captain's channel was significantly louder than the audio from the First Officer's channel. The CVR test tone appeared normal. The hot mic signals and radio transmissions could both be heard relatively clearly except during the few times that they occur simultaneously. The First Officer could be heard on the Captain's channel as is typical when an intercom is used. The quality of this channel was rated as Good.

[3] See 14 CFR 121.359(g).The relevant portion of this regulation applies to airplanes manufactured after October 11, 1991. The accident airplane (serial number UE-40) was manufactured in March of 1993.
[4] NTSB Recommendation A-97-036 was Closed – Acceptable Action in January 2001

The fourth channel is typically wired to the airplane's Public Address System in the B1900. There were no PA announcements made by the crew. This channel contains some audio from both pilots' hot mics as well as incoming and outgoing radio transmissions. The volume of this audio is slightly lower than the audio on the Captain's Channel, but louder than any audio of the First Officer's Channel. The presence of this audio suggests that this CVR channel is possibly configured to capture audio from a 3rd audio panel, such as an observer's panel.

Group Activities

The CVR group convened on August 28, 2003. The group reviewed the tape and prepared a partial transcript of the recording. Each channel was reviewed individually as well as in combination with the other channels. There was little difficulty identifying the sources of each comment, and the group agreed on the content of each comment and characterization of each sound in the attached transcript.

Timing and Correlation

The times reported in the attached CVR transcript are Eastern Daylight Time (EDT). The Flight Data Recorder Group Chairman provided the correlation of the CVR elapsed time with the Flight Data Recorder time. The Aircraft Performance Specialist provided the correlation of the Flight Data Recorder time with to the recorded radar data provided by the Federal Aviation Administration's Boston Air Route Traffic Control Center (ARTCC). The times in this report reflect the clock used by Boston ARTCC, converted to the local time zone.

The times represent the beginning of the phrase or sound, and were generally measured and reported to the nearest 1 second. However, certain comments or sounds, such as the microphone clicks heard before and after each outgoing radio transmission, were measured and reported to the nearest 1/10 of a second.

Douglass P. Brazy

Mechanical Engineer (CVR)

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.

Attachment II – Transcript

Partial transcript of a Fairchild A100A cockpit voice recorder (CVR), s/n 61870, installed on a Beech (Raytheon) B1900D, Registration N240CJ. The airplane was operated by Colgan Air Inc. as flight 9446 on a repositioning flight when it crashed off the coast of Yarmouth, MA on August 26th, 2003.

LEGEND

RDO	Radio transmission from accident aircraft, Colgan Air 9446
CAM	Cockpit area microphone voice or sound source
HOT	Hot microphone voice or sound source
	For RDO, CAM, and HOT comments: **-1** Voice identified as the Captain **-2** Voice identified as the First Officer -**3** Voice of unidentified ground personnel **-?** Voice unidentified
STN	Radio transmission from station agent
MX	Radio transmission from Colgan maintenance facility at Hyannis
GND	Radio transmission from ground control at Hyannis
TWR	Radio transmission from Air Traffic Control Tower at Hyannis
Ch1	Audio heard on the First Officer's CVR Channel
Ch2	Audio heard on the PA CVR channel
Ch3	Audio heard on the Captain's CVR channel
*	Unintelligible word
&	Third party personal name (see note 5 below)
@	Non-pertinent word
#	Expletive
- - -	Break in continuity or interruption in comment
( )	Questionable insertion

[ ] Editorial insertion

... Pause

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.

Note 5: Personal names of 3rd parties not involved in the conversation are generally not transcribed.

Note6: At times, some sounds may be heard on more than one channel. For example, the CAM may also capture speech captured by a HOT microphone. Comments are generally annotated as coming from the source from which the comment was easiest to hear and discern.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
????:??	[Start of Recording – Due to electrical power interruption(s), neither the time of day nor the date could established prior to 14:23:30. The recording contained a total of approximately 15 minutes and 20 seconds of audio prior to this time. The nature of this audio was consistent with maintenance work occurring inside the airplane's cockpit and/or cabin.]		
1423:30	[Start of Transcript]		
1423:30 CAM	[sound similar to power interruption]		
1423:31 CAM	[sound of unidentified tone]		
1423:39 CAM-1	all right before start.		
1423:41 CAM-2	parking brake?		
1423:42 CAM-1	its set.		
1423:43 CAM-2	preflight's complete. cockpit scan complete.		
1423:45 CAM-1	complete.		
1423:46 CAM-2	oxygen system check?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1423:47 CAM-1	uhhh... it was checked.		
1423:48 CAM-2	circuit breakers check?		
1423:51 CAM-1	checked.		
1423:51 CAM-2	CVR tested?		
1423:51.5 Ch3	[sound similar to CVR test tone for 1.4 seconds seconds]		
1423:52 CAM-1	its tested.		
1423:52.8 Ch1	[sound similar to CVR test tone for 0.5 second, at signifcantly lower volume than the tone heard on channel 3]		
1423:53.3 Ch2	[sound similar to CVR test tone for 0.03 seconds at a volume comparable to the tone heard on channel 1]		
1423:53 CAM-2	FDR test and set?		
1423:55 CAM-1	test and set.		
1423:55 CAM-2	flight control rudder lock?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1423:57 CAM-1	removed.		
1423:58 CAM-2	maintenance log, release, checked the aircraft.		
1423:59 CAM-1	uhhhh. maintenance and release on aircraft.		
1424:02 CAM-2	fuel (quantity)?		
1424:04 CAM-1	uhhh. thirty two.		
1424:06 CAM-2	thirty two.		
1424:07 CAM-2	cabin signs on.		
1424:09 CAM-1	on.		
1424:09 CAM-2	seatbelts shoulder harnesses on.		
1424:11 CAM-1	uhhhh duh duh duh. (we have a little) F D R. ok flight data recorder... and make sure.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1424:21 CAM-1	it says flight data recorder's inop, I just wanna make sure...thirty one dash three... thirty one dash three A...uhhhh twenty seven...twenty eight...thirty one dash three. ok...up here. done.		
1424:46 CAM-2	ok.		
1424:47 CAM-1	(eighty) one seventy three... let me check that MEL number... eighty one seventy three is still open... * * open... item.		
1425:02 CAM-1	all right. clear on two?		
1425:04 CAM-2	clear on two with a cap.		
1425:05 CAM-1	all right. beacon is on. (put my master on) beacon is-		
1425:11 CAM-3	stay on the radios. [voice in background]		
1425:14 CAM-2	what did he say?		
1425:15 CAM-1	stay on the radio.		
1425:17 CAM-1	clear on two?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1425:18 CAM-2	clear on two with a cap.		
1425:20 CAM	[unidentified tone duration 0.27 second similar to tone heard when avionics master switch is operated]		
1425:21 CAM-1	well lets talk to 'em right now before we even spin up.		
		1425:29.3 RDO-1	hey &, how do you hear? [RDO or HOT]
1425:43 CAM-1	all right I got no radios over here... do you have anything out of your headset?		
1425:51 CAM-2	check check check.		
1425:53 CAM-1	all right, hold on.		
1425:54 CAM/ch3	[sound similar to altitude alerter]		
1425:55 CAM-2	check check check check check check check.		
1425:57 CAM/ch3	[sound similar to blowing breath] ok. MAN tie's closed.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
		1425:57.8 RDO-1	and Hyannis maintenance Colgan ninety four forty six.
1425:59 CAM-2	check check check check check check check check check check.		
1426:00 HOT-2	[sound similar to static] check check.		
		1426:08.0 RDO-1	Hyannis maintenance, ninety four forty six.
		1426:14.4 RDO-1	&, &, anybody in the office there?
		1426:20 STN	hey Scott I'll try to get a hold of them on the phone.
		1426:22.3 RDO-1	thanks &.
1426:25 HOT-1	all right clear on two.		
1426:27 HOT-2	with a cap.		
1426:28 ch3	[sound similar to engine igniter electrical noise]		
1426:29 HOT-1	what a cluster.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1426:31 HOT-2	[sound of laughter]		
1426:36 CAM	[sound similar to engine noise increasing in speed]		
1426:40 HOT-2	whats our weight?		
1426:41 HOT-1	uhhh. I calculated lets see we got thirty two hundred, and we weigh ten seven, so uh fourteen thousand.		
1426:49 HOT-2	thirteen for landing?		
1426:50 HOT-1	uhhh, burn yeah, fourteen thirteen's fine.		
1427:01 CAM	[sound similar to altitude alerter]		
		1427:03.2 RDO-1	and Hyannis maintenance Colgan ninety four forty six.
1427:19 CAM	[GPWS] bank angle.		
		1427:27 MX	* * *.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
		1427:28.4 RDO-1	hey &, uh & told me keep my radios on... uh just per normal or per uh, I mean... uh. I mean does he want us to communicate the whole way or what's going on.
		1427:40 MX	& might call ya and turn you back cause they did find a problem but I don't know for sure, he doesn't know either, *.
		1427:46.8 RDO-1	ok tell ya what I'll be monitoring ARINC, I'll check in with Providence OPS also and LaGuardia OPS on the way and uh Bradley OPS that's not a problem. so I'll keep checkin in with company tell them. hey &, uh just to make sure I don't get anything on your pickup truck, you wanna come over and move her over so I don't uh scratch your paint with any dust or anything?
		1428:03 MX	uh I'll come out.
		1428:04.6 RDO-1	allrighty.
1428:21 HOT-2	they might turn us back, huh?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1428:31 CAM-1	hey * its Scott * I got &'s message about just keeping in touch with you guys as we're heading to Albany on this ferry flight in case they wanna turn us back, so I'm gonna I'm gonna check in with uh, uh, obviously I'm gonna * check in as (long) as I can here, then I'll check in with Providence * * check in uh with Bradley, and Hartford on and on ok? [appears to be a cellular telephone conversation]		
1428:56 CAM-1	well uh we got so many stations along the route that's not a problem. I'll just have to call down on the phone and just uh say ninety four forty seven or-ninety four forty six continue to Albany or you know, go back. All right, see ya *, bye. [appears to be a cellular telephone conversation]		
1429:15 HOT-2	[sound of cough]		
1429:23 HOT-1	all right, beacon's on door lights out, avionics master's off clear on one, starting one.		
1429:29 HOT-2	did that old man say he has a King Air one hundred?		
1429:32 HOT-1	yeah... that one's what a two or three?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1429:35 HOT-2	that's a three fifty.		
1429:36 HOT-1	ok, but he also has a King Air one hundred.		
1429:39 HOT-2	that's his?		
1429:40 HOT-1	uh, he's the chief pilot for 'em.		
1429:42 HOT-2	ahhh, now that'd be a good job.		
1429:44 HOT-1	I guess, I don't know, this company's based out of Bedford, or New Bedford, wherever that is around here. but they let him fly up and put an extra flight cycle on him because he want's to live here. So apparently-		
1429:55 HOT-2	ohhh.		
1429:56 HOT-1	-the company's like-		
1429:57 CAM	[sound similar to altitude alerter]		
1430:00 HOT-1	-I mean he's driving the blue Vette over there so somethin's goin right.		
1430:04 HOT-1	all right, after start.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1430:07 HOT-2	external power?		
1430:08 HOT-1	it is removed.		
1430:09 HOT-2	CWPs checked?		
1430:10 HOT-1	checked.		
1430:10 HOT-2	ice protection?		
1430:11 HOT-1	uhhhoh level one.		
1430:15 HOT-2	EFIS standby attitude indicator on?		
1430:16 HOT-1	on.		
1430:17 HOT-2	TCAS (tested) standby?		
1430:18 HOT-1	on.		
1430:19 HOT-2	after start checklist complete.		
1430:21 HOT-1	yeah I think he's a member of the QB's that's why he's got the license plate like that.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1430:31 HOT-1	all right we're ready to taxi with HOTEL.		
1430:39 HOT-1	interesting.		
		1430:42.8 RDO-2	ground Colgan uh, ninety four forty six ready to taxi, HOTEL, goin to Albany.
1430:50 HOT-2	we goin VFR or IFR?		
1430:53 HOT-?	(IFR). [on captains channel, obscured by radio transmission]		
1430:54 HOT-1	that's our clearance.		
		1431:05 GND	and Colgan ninety four forty six say it again you were stepped on.
		1431:07.9 RDO-2	uh yeah we're ready to taxi with information HOTEL.
		1431:12 GND	ok where are you?
1431:13 HOT-1	north ramp.		
		1431:12.7 RDO-2	uhh we're over at the north ramp.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
		1431:15 GND	roger runway two four taxi hold short one five, Colgan ninety four forty six.
		1431:19.2 RDO-2	taxi to two four hold short of one five, Colgan ninety four forty six.
1431:34 HOT-1	basically Providence... and uh it'll be out of Providence..... Providence, GALES, one fifty one Providence, four ninety five Bradley, one thirty four Albany.		
1431:52 HOT-2	Providence , GALES, you said?		
1431:54 HOT-1	uhh, yeah. GALES is the one fifty four radial off of Boston... its nineteen miles but we won't get that.		
1432:01 HOT-2	we're gonna get the Victor one six seven, right?		
1432:03 HOT-1	yes, (you'll) get Providence, and then, on course.		
1432:06 HOT-2	ok.		
		1432:08 GND	(Colgan) ninety four forty six cross runway one five.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
		1432:11.5 RDO-2	cross runway one five, Colgan ninety four forty six.
1432:16 HOT-2	watch out for the sandwich box.		
1432:17 HOT-1	yeah.		
1432:22 HOT-1	cross one five crossing-		
1432:23 HOT-2	crossing one five, clear right.		
1432:25 HOT-1	clear left.		
1432:28 HOT-2	speeds are gonna be one oh four, one oh four, one fourteen, one fourteen.		
1432:32 HOT-1	four fourteen fourteen fourteen me I guess uh... or do you want the one with the rig problems coming back?		
1432:37 HOT-2	oh uhhh I prefer not to fly something if its broken... and I'd rather you do it because you're the pilot-in-command.		
1432:47 HOT-1	all right.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1432:48 HOT-2	and a broken airplane I wouldn't wanna... screw it up.		
1432:57 HOT-1	well it'll be a standard Colgan if it gets spooky on the runway abort it un-		
1433:00 HOT-2	yeah.		
1433:01 HOT-1	-tuh.		
1433:03 HOT-2	its up to you it really doesn't matter to me.		
1433:05 HOT-1	I'll drive up.		
1433:06 HOT-2	ok.		
1433:11 HOT-1	like I said, as long as its * up on the prop governor none of these airplanes get spooky, I don't think.		
1433:16 HOT-2	uuuh es you know. just a matter of take it easy, go slow.		
1433:21 HOT-1	pretty much.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
HOT-1	these things have been blowin a lot lately I had to reset one on uh... L V... Uniform last night.		
1433:42 HOT-2	oh really?		
1433:44 HOT-1	cause they're spiking, so.		
1433:46 HOT-2	I thought it was cause people keep on switchin it you know MAN cool, back to AUTO.		
1433:51 HOT-1	eh. well. &'s thing says ten minutes or less taxi you don't even (bother with it).		
1434:15 HOT-1	Bradley OPS is one thirty point zero also, isn't it? I believe.		
1434:20 HOT-1	* from memory.		
1434:20 HOT-2	thirty nothing... that sounds familiar.		
1434:22 HOT-1	yeah. *.		
1434:24 HOT-2	I've never actually flown in there.		
1434:27 HOT-1	oh. ok.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1434:29 HOT-1	yeah.		
1434:48 HOT-1	all right, run the checklist. [sound similar to belch] oh my.		
1434:52 HOT-2	ok takeoff data brief... we got the speeds, and I guess-		
1434:56 HOT-1	it'll be me, standard Colgan red light and emergency speeches we've done many times before, questions, comments additions?		
1435:02 HOT-2	no.		
1435:02 HOT-1	all right-		
1435:02 HOT-2	complete.		
1435:03 HOT-1	-complete.		
1435:03 HOT-2	altimeter set to... two nine eight seven?		
1435:08 HOT-2	set?... set and cross checked. flight instruments radios set checked.		
1435:13 HOT-2	auto feather?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1435:14 HOT-2	flaps are zero indicating zero, three trims are set.		
1435:18 HOT-1	roger.		
1435:18 HOT-2	cabins ready PA not required. taxi check complete.		
1435:24 CAM-1	*.		
1435:26 HOT-2	nice airplane.		
1435:28 HOT-1	yup. somebody's got money.		
1435:31 HOT-2	Lear thirty one?		
1435:33 HOT-1	not my color, but.		
1435:35 HOT-2	no.		
1435:35 HOT-1	I woulda gone a dark blue, but, oh well.		
1435:37 HOT-2	I'd still fly it.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1435:38 HOT-1	oh yeah, I'd still own it too but... oh well.		
1436:12 HOT-1	that's not a forty five?		
1436:13 HOT-2	no.		
1436:41 HOT-2	actually..... maybe it is.		
1436:52 HOT-1	I can't tell 'em apart.		
1436:53 HOT-2	I can't remember how many windows the thirty one has.		
1437:17 HOT-1	all right. forty six is ready * *.		
1437:25 HOT-1	bottom's check.		
1437:26 HOT-2	top's check.		
1437:28 CAM-1	ice protection (level 1).		
1437:30 HOT-2	props forward condition levers set transponder and TCAS are on, environmentals and bleeds are off, CWP's checked.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1437:36 HOT-1	*.		
1437:37 HOT-2	external lights? holding.		
1437:40 HOT-1	hold on the lights.		
1437:43 HOT-2	eighteen-		
1437:44 HOT-1	nineteen five.		
1437:45 HOT-2	-nineteen five.		
		1437:48.1 RDO-2	tower Colgan uh ninety four forty six, ready to go, two four.
		1438:04 TWR	Colgan ninety four forty six after departure fly heading two seven zero, runway two four cleared for takeoff.
1438:08 CAM	[sound similar to increase in engine/ propeller speed]		
		1438:08.4 RDO-2	cleared for takeoff two four Colgan... ninety four forty six two seventy on the heading.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1438:35 HOT-1	and... set the power.		
1438:35.6 HOT-2	power's set.		
1438:37.3 HOT-2	eighty knots.		
1438:40.4 HOT-2	V1... rotate.		
1438:46.3 HOT-1	* we got a hot trim, Steve.		
1438:48 HOT-1	kill the trim kill the trim kill the trim.		
1438:50.6 HOT-1	roll back Steve roll back roll back roll back roll back-		
1438:53 HOT-2	I got it.		
1438:54 HOT-1	-(pull) back		
1438:54 HOT-2	hold on- hold on.		
1438:55 HOT-1	she's heavy buddy.		
1438:56 HOT-1	roll it back * roll my trim Steve.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1439:00 HOT-1	do the electric trim disconnect... hold-		
1439:02 HOT-1	-all right, Steve.		
1439:04 HOT-1	hold back Steve.		
1439:04.7 HOT-1	no. go on the controls with me Steve.		
1439:06 HOT-2	I got it.		
1439:07 HOT-1	all right.		
1439:11 HOT-1	all right.		
1439:13 HOT-1	all right.		
1439:14 HOT-1	put our gear up.		
1439:14.8 CAM	[sound similar to landing gear motor noise, duration 5.5 seconds]		
1439:16 HOT-1	all right.		
1439:18 HOT-1	gimme flaps up.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1439:19 HOT-2	flaps are up.		
1439:20 HOT-1	flaps are up.		
		1439:21.7 RDO-1	ninety four forty six requestin' uh...'mergency back sir, we got a... runaway trim.
		1439:28 TWR	Colgan ninet * * six roger, right or left downwind your choice, and report midfield.
1439:33 HOT-2	you want power back?		
		1439:32.6 RDO-1	(midfield). [HOT or RDO]
1439:33.9 HOT-1	pull the power back. pull the power back.		
1439:36 HOT-2	slowly.		
1439:36.4 ch2	[sound similar to decrease in engine/propeller speed]		
1439:40 HOT-1	all right, were gonna need both of us on this Steve.		
1439:48 HOT-2	(could) I pull the breaker?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1439:49 CAM	[sound similar to altitude alerter]		
1439:49 HOT-1	pull the breaker Steve.		
1439:51 HOT-1	pull the breaker.		
1439:53 HOT-1	I got it if you've got the trim baby.		
1439:54 HOT-2	where is it?		
1439:56 HOT-1	find it *.		
1439:58 HOT-1	look left of the silver thing, Steve. look left of the silver thing.		
1440:02 HOT-2	left of the silver thing?		
1440:03 HOT-1	left of the silver thing Steve.		
1440:05 HOT-1	don't let go of the st- control Steve, just stay with me.		
1440:17 HOT-1	you pull back for all your worth, baby.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1440:28 HOT-1	just keep (pulling/holding) back for all your worth.		
		1440:31.0 RDO-1	* ninety four forty six is requesting three three sir.
1440:34 HOT-1	Steve (pull/hold) back.		
1440:35 HOT-2	ahhh.		
		1440:35 TWR	* * four forty six sir, roger-
1440:36 HOT-1	(pull/hold) back.		
		1440:37 TWR	-runway three three-
1440:37 HOT-1	ahhh.		
		1440:38 TWR	-uh * cleared to land
1440:39 ch3	[GPWS] terrain terrain. * pull up.		
1440:42 HOT-1	Steve keep-		
1440:42 HOT-2	I'm pullin.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
1440:44 HOT-2	#.		
1440:45 HOT-1	Steve, hold on.		
1440:46 HOT-2	uhh.		
1440:46 HOT-1	oh no.		
1440:47 HOT-1	[sound similar to scream]		
1440:47 ch3	[GPWS woop woop pull up pull-]		
1440:47.4 CAM	[end of recording]		

[End of Transcript]