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

GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

CEN20FA022

By
Michael Portman

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

February 24, 2020

Cockpit Voice Recorder

Group Chairman's Factual Report
By Michael Portman

1. EVENT SUMMARY

Location:	Chamberlain, South Dakota
Date:	November 30, 2019
Aircraft:	Pilatus PC-12, Registration N56KJ
Operator:	Private
NTSB Number:	CEN20FA022

On November 30, 2019, at 1233 central standard time (CST), a Pilatus PC-12/47E airplane, N56KJ, was destroyed during an impact with terrain near the Chamberlain Municipal Airport (9V9), Chamberlain, South Dakota. The pilot and eight passengers were fatally injured, and three passengers were seriously injured. The airplane was registered to Conrad & Bischoff, Inc. and operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 personal flight. Instrument meteorological conditions prevailed, and the flight was operated on an instrument flight rules flight plan. The flight originated from 9V9 shortly before the accident and was destined for Idaho Falls Regional Airport (IDA), Idaho Falls, Idaho. A solid-state Lightweight Data Recorder (LDR), which included cockpit voice recorder (CVR) data, was sent to the National Transportation Safety Board (NTSB) Vehicle Recorder Division for evaluation. The CVR group meeting convened on January 8, 2020 and a transcript was prepared for the 18-minute, 37-second digital recording (see attached).

2. GROUP

Chairman:	Michael Portman Aerospace Engineer – Recorder Specialist National Transportation Safety Board
Member:	Timothy Sorensen Investigator-In-Charge (IIC) National Transportation Safety Board
Member:	Eric West Air Safety Investigator Federal Aviation Administration
Member:	Martin Mendel Factory Test Pilot Pilatus/Swiss Transportation Safety Investigation Board

3. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Division received the following LDR:

Recorder Manufacturer/Model: **L-3 LDR**
Recorder Serial Number: **000891678**

3.1 CVR Carriage Requirements

The incident aircraft, N56KJ, was not required by regulation to carry a cockpit voice recorder or flight data recorder.

3.2 Recorder Description

This recorder, the L-3 Harris Technologies LDR, is capable of recording flight data and cockpit audio using solid-state flash memory as the recording medium. The LDR records, at a minimum, 120 minutes of digital audio stored on solid state memory modules. The audio is recorded and stored in 10-minute segments. Two channels are recorded: one channel for the pilot and front seat passenger combined, and one channel for the cockpit area microphone (CAM). The incident flight was recorded in two files: one full 10-minute segment, and one eight-minute, 37-second segment, for a total length of 18 minutes, 37 seconds.

3.3 Recorder Damage

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

3.4 Audio Recording Description

Each channel's audio quality is indicated in Table 1.[1]

Table 1: Audio Quality.

Channel Number	Content/Source	Quality	Duration
1	Pilot/Front Seat Passenger	Excellent	18 minutes, 37 seconds
2	CAM	Excellent	18 minutes, 37 seconds

3.5 Timing and Correlation

Timing on the transcript was established by correlating the LDR audio recording events to common events on the LDR flight data recording. Specifically, the last five radio transmissions that the aircraft made were correlated to the radio transmit microphone key parameter from the flight data. Each of the five radio transmissions acted as an anchor point for a linear interpolation between the remaining audio data events. Once a correlation between the two recorders was established, a reference to local time was determined.

[1] See attached CVR Quality Rating Scale.

3.6 Description of Audio Events

The recording began at 12:14:26 and the transcript began at 12:14:55. The engine was powered on at 12:19:02, taxi out began at 12:29:05, and the takeoff roll began at 12:31:59. The stall warning sounded shortly after, at 12:32:29. Sounds similar to impact were heard at 12:33:01. The recording ended shortly thereafter at 12:33:03.

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 L-3 Harris LDR solid-state cockpit voice recorder, serial number 000891678, installed on a Private Pilatus PC-12 (N56KJ), which impacted terrain shortly after takeoff from Chamberlain Municipal Airport (9V9) in Chamberlain, South Dakota.

LEGEND

APT	Radio transmissions from the 9V9 airport manager
AWOS	Automated Weather Observing System (AWOS) transmissions
CAM	Cockpit area microphone voice or sound source
CAS	Crew Alerting System (CAS) annunciations
HOT	Flight crew audio panel voice or sound source
RDO	Radio transmissions from N56KJ
SW/SPS	Stall warning/stick pusher system annunciations
-1	Voice identified as the pilot
-2	Voice identified as the front seat passenger
-?	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 Communication	Time and Source	Over-the-Air Communication
1214:26.0 **START OF RECORDING** **START OF TRANSCRIPT**			
12:14:54.5 **CAM-?**	how we doin' @[pilot]?		
12:14:56.0 **CAM-1**	perfect...it was a lot of work but we got it.		
12:15:03.0 **CAM-?**	*** ya know?		
12:15:05.8 **CAM-1**	what's that? oh yeah I need that.		
12:15:09.3 **CAM-?**	this your hat?		
12:15:10.1 **CAM-1**	oh no that's not mine.		
12:15:11.7 **CAM-?**	huh?		
12:15:12.1 **CAM-1**	no that's not mine.		
12:15:20.9 **CAM**	[sound similar to seatbelt click]		
12:15:24.3 **CAM-1**	um...		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
12:15:39.8 **CAM-1**	here let me get my trash out of here - I think @'s comin' up here.		
12:15:43.5 **CAM-?**	oh okay.		
12:15:43.7 **CAM**	[sound similar to seatbelt click]		
12:15:43.8 **CAM-1**	um will you find out whose that is because it's not the one up here.		
12:15:45.1 **CAM-?**	yeah.		
12:15:45.9 **CAM**	[sound similar to seatbelt click]		
12:15:52.6 **CAM**	[sounds similar to stomping feet, similar to removing snow]		
12:15:58.1 **CAM**	[sounds similar to brushing feet, similar to removing snow]		
12:16:04.8 **HOT-1**	is there an iPad?		
12:16:06.0 **HOT-?**	we got your iPad.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
12:16:08.3 **CAM**	[sounds similar to stomping feet, similar to removing snow]		
12:16:19.9 **CAM**	[sound similar to switch actuating, sound similar to fan spooling up then turning off]		
12:16:21.0 **HOT-1**	alright.		
12:16:26.7 **HOT-?**	(the drops).		
12:16:27.6 **HOT-1**	oops.		
12:16:30.2 **HOT-1**	gotta let them drain. [sounds similar to shuffling, muttering under breath] - that'll get you wet.		
12:16:32.8 **CAM-?**	everybody in?		
12:16:34.1 **CAM-?**	yeah.		
12:16:56.8 **CAM**	[sound similar to passenger ladder folding, door closing and locking]		
12:17:07.3 **HOT-2**	how much ice was there this morning?		
12:17:08.9 **CAM-1**	oh there was a lot.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
12:17:10.2 **HOT-2**	come off okay or no?		
12:17:12.2 **CAM-1**	well --		
12:17:12.9 **CAM-?**	*** back here for ya if you want it? [asking the pilot a question]		
12:17:13.8 **CAM**	[sound similar to multiple squeaky hinge movements followed by slamming followed by squeaking]		
12:17:14.3 **CAM-1**	not right now.		
12:17:25.5 **CAM-?**	you ready?		
12:17:26.2 **CAM**	[multiple unidentifiable chugging sounds fading]		
12:17:26.2 **CAM-1**	yeah.		
12:17:27.4 **CAM**	[sounds similar to squeaking]		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
12:17:27.6 **CAM-?**	[passenger recites traveler's prayer] ** our Father in heaven we're grateful that we've been able to come out here to South Dakota and have a wonderful time with family we appreciate the blessings that we enjoy and we're thankful that we can be together on this Thanksgiving weekend we appreciate everything that God does for us especially providing us a savior and we appreciate Him very much. Father in Heaven we ask for a special blessing now that we take off in this not so great weather and that (Thy) will watch over and protect us. impress upon the mind of @ [pilot] that he might know how best to travel this course that we are about to do and we are thankful for this airplane and ask that You will watch over and protect us. *** (ensure the function of this aircraft) we say this in the name of Jesus Christ amen.		
12:17:33.4 **CAM**	[sounds similar to seatbelt clicks]		
12:17:35.4 **CAM**	[sound similar to two switches actuating]		
12:18:09.2 **CAM**	[multiple people] amen.		
12:18:11.5 **CAM**	[sound similar to switch actuating, sound similar to fan spooling up]		
12:18:18.4 **HOT-2**	yeah we got a lot of pheasants in only an hour.		
12:18:20.8 **HOT-?**	* yeah.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
12:18:25.0 **CAM**	[sounds similar to two seatbelt clicks]		
12:19:02.4 **CAM**	[sound similar to starter switch and engine start]		
12:19:06.9 **CAM**	[sounds similar to three clicks]		
12:19:52.9 **HOT**	[sound similar to click]		
12:19:53.4 **HOT**	[sounds similar to three CAS chimes]		
12:19:58.5 **HOT**	[sounds similar to two CAS chimes]		
12:20:00.3 **HOT**	[sounds of rattling]		
12:20:07.9 **HOT**	[sounds similar to two CAS chimes]		
12:20:14.5 **HOT**	[sounds similar to five CAS chimes]		
12:20:20.4 **HOT**	[sounds similar to three CAS chimes]		
12:21:27.3 **HOT**	[sounds similar to three CAS chimes]		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		12:22:29.7 **AWOS**	[Chamberlain AWOS-3 report] -ter two niner three zero. increased waterfowl and bird activity near the runway. Chamberlain municipal airport automated weather observation one eight two zero zulu weather wind zero one zero at seven visibility three quarters light snow ceiling five hundred overcast temperature one Celsius dewpoint one altimeter two niner three zero. increased waterfowl and bird activity near the runway. Chamberlain municipal airport automated weather observation one eight two zero zulu weather wind zero one zero at seven visibility three quarters light snow ceiling five hundred overcast temperature one Celsius dewpoint one altimeter two niner three zero. increased waterfowl and bird activity near the runway.
12:23:54.2 **HOT-1**	mkay [sound similar to yawn].		
		12:24:15.5 **APT**	got a copy on that Pilatus?
12:24:17.7 **CAM-1**	uh this is uh five six kilo juliet at uh nine victor nine Chamberlain South Dakota I'd like to pick up my I-F-R... [on cell phone]		
12:24:26.0 **CAM-1**	...clearance on request. [on cell phone]		
12:24:32.6 **CAM-1**	oh I'm sorry it's five six kilo juliet...yes...uh I'll be ready to go in about five minutes and I'll be taking runway three one that's the best runway (for me). [on cell phone]		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
12:25:02.5 **HOT**	[sound similar to click]		
12:25:03.4 **HOT**	[sound similar to four CAS chimes]		
12:25:08.2 **HOT**	[sound similar to two CAS chimes]		
		12:25:20.9 **APT**	you got a copy (on/of) that Pilatus?
		12:25:26.0 **APT**	(Chamberlain traffic.)
12:25:50.0 **HOT**	[sound similar to click]		
12:26:04.6 **HOT**	[sound of click, RPM increases]		
12:26:17.3 **HOT**	[sound similar to three CAS chimes]		
12:26:56.0 **CAM-1**	hello? [on cell phone]		
12:27:12.2 **CAM-1**	* ready to copy. [on cell phone]		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
12:27:39.5 **CAM-1**	okay...uh november five six kilo juliet is uh cleared from Chamberlain to india delta alpha via direct climb and maintain eight thousand contact Minneapolis Center one two five point one squawk three six five (three) clearance release until eighteen thirty five and it's currently eighteen twenty seven and a half...five six kilo juliet. [on cell phone]		
12:28:20.9 **CAM-1**	okay uh I'll try * once I get up...okay...thank you. [on cell phone]		
		12:28:53.6 **RDO-1**	Chamberlain area traffic Pilatus five six kilo juliet uh taxiing to runway three one going to backtaxi...five six kilo juliet...Chamberlain.
12:29:05.2 **HOT**	[sound similar to RPM increase]		
12:29:07.0 **HOT-1**	oh.		
12:29:15.2 **HOT**	[sound similar to iOS notification]		
12:29:21.2 **CAM**	[sound similar to RPM increase]		
		12:29:26.0 **APT**	hey you got a copy there?
		12:29:29.0 **RDO-1**	I got a copy I was gonna go down and backtaxi three one is that uh work good - work for you?

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		12:29:34.4 **APT**	it don't look good to me I don't know what you guys are thinkin'.
		12:29:37.6 **RDO-1**	uh is the runway in good condition?
		12:29:40.3 **APT**	I would say I can't hardly keep up.
		12:29:43.2 **RDO-1**	aright I'll be okay...five six kilo juliet.
		12:29:46.6 **APT**	what's that?
		12:29:47.8 **RDO-1**	uh we're gonna be just fine...uh I'll go uh backtaxi three one and we'll uh take off outta here...six kilo juliet.
		12:29:54.4 **APT**	'kay * the runway is not clear.
		12:29:57.8 **RDO-1**	oh I thought you had the - oh - uh let me - let me backtaxi down and look at it then I'll be back.
		12:30:06.2 **APT**	(why) you guys are crazy...I got berms on this thing - I gotta get the snow outta here.
12:30:25.0 **HOT-1**	(wonder) what he's been doin' for the last two hours.		
		12:30:28.2 **APT**	that don't look good to me.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		12:30:32.4 **RDO-1**	I think we're gonna be just fine right down this uh one track you've made six kilo juliet.
		12:30:50.2 **APT**	guys don't mind (problems with/plowin' through) some drifts.
12:30:55.7 **HOT-1**	he's been out here for two hours...in my pickup I coulda had it done in like thirty minutes.		
12:31:03.7 **HOT-1**	oh that's a nice track right there we're fine...this thing will take off so fast.		
12:31:08.7 **HOT-2**	how much space do you need?		
12:31:10.7 **HOT-1**	I need most of the runway but uh I-I'm-I'll be good.		
12:31:15.3 **HOT-1**	if he gave us a decent place to turn around down here.		
12:31:30.9 **CAM**	[sound similar to RPM increase then decrease]		
12:31:32.4 **HOT-1**	uh oh...(#).		
12:31:35.4 **CAM**	[sound similar to RPM increase then decrease]		
12:31:40.8 **CAM**	[sound similar to RPM increase then decrease]		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
12:31:42.7 **HOT-1**	okay can you hold that?		
12:31:49.7 **HOT-1**	'kay we're set...probes on...condition lever.		
12:31:58.8 **CAM**	[sound similar to RPM increase]		
12:32:07.7 **CAM**	[sound of approximately 680 Hz tone between 12:32:07.7 and 12:32:28.1]		
12:32:29.3 **SW/SPS**	stall stall stall. [automated voice]		
12:32:34.1 **SW/SPS**	stall. [automated voice]		
12:32:36.2 **SW/SPS**	stall stall. [automated voice]		
12:32:39.5 **SW/SPS**	stall stall stall stall stall stall. [automated voice]		
12:32:48.0 **HOT-?**	[sound of heavy breathing]		
12:32:49.4 **HOT-1**	oh no.		
12:32:50.7 **SW/SPS**	stall. [automated voice]		
12:32:51.9 **HOT-?**	[sounds of rapid/heavy/shaky breathing]		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
12:32:52.9 **SW/SPS**	stall stall stall stall stall stall. [automated voice]		
12:32:55.0 **HOT-?**	(#./[sound of heavy breathing])		
12:32:59.0 **HOT-?**	(ohhh/hold on).		
12:33:00.9 **CAM**	[sound of thud]		
1233:03.2 **END OF TRANSCRIPT** **END OF RECORDING**			