

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



GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

ERA19FA071

**By
Charles Cates**

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

May 21, 2020

Cockpit Voice Recorder

Group Chairman's Factual Report
By Charles Cates

1. EVENT SUMMARY

Location: Atlanta, Georgia
Date: December 20, 2018
Aircraft: Cessna 560, Registration N188CW
Operator: Private
NTSB Number: ERA19FA071

On December 20, 2018, about 1210 eastern standard time, a Cessna C560, N188CW, was destroyed when it impacted a field after takeoff from Fulton County Airport-Brown Field (FTY), Atlanta, Georgia. The air transport pilot and three passengers were fatally injured. The airplane was owned and operated by Chen Aircrafts LLC. Instrument meteorological conditions prevailed, and an instrument flight rules flight plan was filed for the flight. The personal flight was conducted under the provisions of Title 14 *Code of Federal Regulations* Part 91 and had an intended destination of Millington-Memphis Airport (NQA), Millington, Tennessee. A tape cockpit voice recorder (CVR) was sent to the National Transportation Safety Board (NTSB) Vehicle Recorder Division for evaluation. The CVR group meeting convened on May 30, 2019 and a transcript was prepared for the 30-minute tape recording (see attached).

2. GROUP

Chairman: Charles Cates
Recorder Specialist
National Transportation Safety Board

Member: Dan J. Morris
Chief Pilot
Textron Aviation

3. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Division received the following CVR:

Recorder Manufacturer/Model: **Fairchild GA-100**
Recorder Serial Number: **01542**

3.1 CVR Carriage Requirements

Per federal regulation, multiengine aircraft with more than six passenger seats and requiring two pilots manufactured prior to April 7, 2010, and operated under 14 CFR 91, must be equipped with a CVR that records a minimum of the last 30 minutes of aircraft operation; this is accomplished by recording over the oldest audio data. The accident aircraft was manufactured in 1991. When the CVR is deactivated or removed from the airplane, it retains only the most recent 30 minutes of CVR operation.

3.2 Recorder Description

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

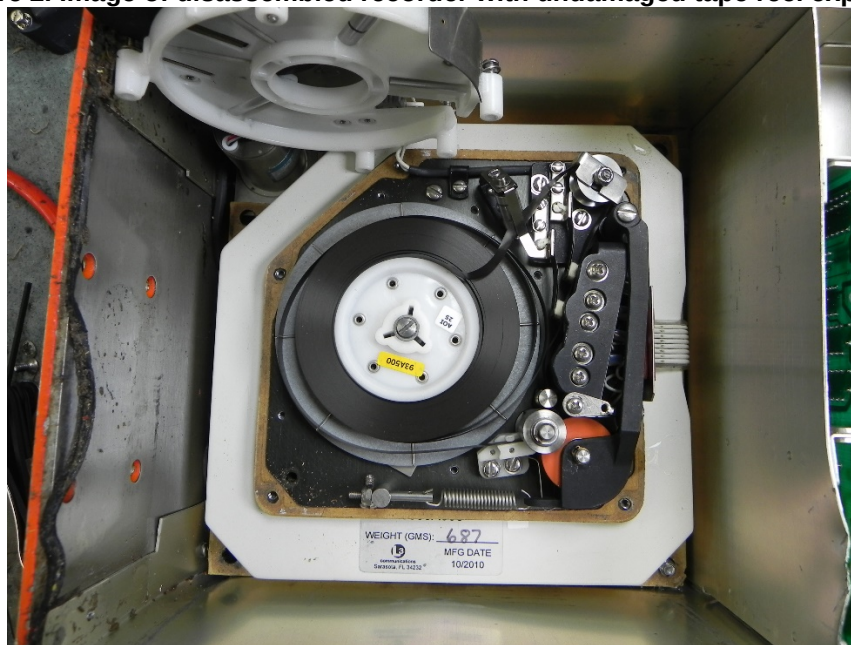
3.3 Recorder Damage

Upon arrival at the laboratory, it was evident that the exterior of the CVR had sustained impact structural damage and was contaminated with fuel residue. The outer case was removed and the interior crash-protected case did not appear to have any heat or structural damage (see Figures 1 and 2). The magnetic tape was retrieved from within the crash-protected case and was successfully read out.

Figure 1. Exterior of CVR showing impact structural damage.



Figure 2. Image of disassembled recorder with undamaged tape reel exposed.



3.4 Audio Recording Description

Each channel's audio quality is indicated in Table 1.¹ Channel number one did not contain any audio information (nor was it required by federal regulations).

Table 1: Audio Quality.

Channel Number	Content/Source	Quality	Duration
1			<<30 min>>
2	HOT/RDO	Excellent	<<30 min>>
3	HOT/RDO	Excellent	<<30 min>>
4	CAM	Excellent	<<30 min>>

3.5 Timing and Correlation

The timing of this transcript is in tape elapsed time. No correlation was performed to establish the relationship of elapsed time to the local time of the accident.

3.6 Description of Audio Events

The transcribed events of the recording began at 15 minutes and 3 seconds (15:03) into the recording. The transcription began with the pilot checking the Fulton County Airport ATIS information. Conditions were reported as winds 060 at 10, visibility four miles, with light rain and mist. Ceilings were reported as broken at 800 feet and overcast at 1,400 feet. The pilot radioed Fulton County Ground and picked up a clearance to NQA (Millington-Memphis Airport).

¹ See attached CVR Quality Rating Scale.

The pilot talked to a passenger sitting in the flight deck over the headset and stated several checklist items before calling the tower to begin taxi.

The pilot was cleared for takeoff at 30:31 and a sound similar to an engine rpm increase for takeoff occurred at 31:15. The pilot announced "airspeed alive" at 31:34. About 34 seconds later, at 32:08 a sound similar to a reduction in engine speed was recorded.

At 32:21 a sound similar to the stick shaker was recorded. Ten seconds later the sound similar to the stick shaker restarted and continued for the remainder of the recording. Two and a half seconds later a GPWS automated sink rate warning was recorded, followed by four automated pull up warnings spaced about 1.8 seconds apart.

The recording ended shortly thereafter.

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 Fairchild GA-100 tape cockpit voice recorder, serial number 01542, installed on a Cessna 560 (N188CW), which crashed after takeoff from Fulton County Airport Brown Field in Atlanta, Georgia.

LEGEND

CAM	Cockpit area microphone voice or sound source
HOT	Flight crew audio panel voice or sound source
RDO	Radio transmissions from N188CW
ATIS	Radio transmission from the Fulton County Airport automatic terminal information service (ATIS)
GPWS	Ground proximity warning system warning or callout
GND	Radio transmission from the Fulton County Airport ground controller
TWR	Radio transmission from the Fulton County Airport tower controller
-1	Voice identified as the pilot
-2	Voice identified as the right seat passenger
-?	Voice unidentified
*	Unintelligible word
#	Expletive
@	Non-pertinent word
()	Questionable insertion
[]	Editorial insertion

Note 1: Times are expressed in recorder elapsed time (the time since the beginning of the tape).

Note 2: Generally, only radio transmissions to and from the accident aircraft were transcribed unless there was information relevant to the accident flight.

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
0000:00.0			
START OF RECORDING			
START OF TRANSCRIPT			
00:15:03.7	[Begin transcription]		
		00:16:09.8 RDO-ATIS	fulton county tower information sierra one six five three zulu winds zero six zero at one zero visibility four light rain mist. ceiling eight hundred broken one thousand four hundred overcast. temperature eight dewpoint eight. altimeter two niner five seven. i l s approach in use arriving and departing runway eight. notice to airmen runway eight i l s outer marker and flight locator outer marker decomissioned. centerline and hold short markings on taxiway juliet between runway two six and taxiway india missing. use caution for wildlife on and in the vicinity of the airport. readback all runway hold short instructions. advise on initial contact you have sierra.
		00:16:44.3 RDO-1	fulton county ground t b m one ze- uh its a citation one eight eight charlie whiskey request clearance to november quebec alpha.
		00:16:52.3 RDO-GND	citation one eight eight charlie whiskey fulton county ground cleared to november quebec alpha airport as filed. maintain three thousand. expect flight level two eight zero one zero minutes after departure. departure frequency one two one point zero. squawk five seven zero three.
		00:17:11.8 RDO-1	t b m one uh citation one eight eight charlie whiskey cleared to november quebec alpha as filed. depart at three thousand. expect two eight zero one zero minutes. departure * one two one point zero zero. squawk * five seven zero three.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		00:17:27.2 RDO-GND	citation eight charlie whiskey all correct information sierra is current on the atis advise when you're ready to taxi.
		00:17:33.1 RDO-1	* * * sierra. and will advise eight charlie whiskey.
00:21:45.7 HOT-1	you uh you uh hear me ok? i don't hear you hold on. uh you hear(ing) ok?		
00:21:53.5 HOT-2	*		
00:21:53.9 HOT-1	yeah good good good good goood.		
00:22:24.6 HOT-1	[sound of 2700 Hz ding]		
		00:22:58.2 RDO-TWR	medevac seven tango tango latest pirep from a king air fourteen minutes ago landed and reported the bases at thirteen hundred m s l.
00:23:09.4 HOT-1	three thousand.		
00:24:22.1 HOT-1	i just uh put all those in together ok.		
00:24:25.4 HOT-2	got it.		
00:24:27.1 HOT-1	* * set one oh five.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
00:24:51.1 HOT-1	* * with you watch out for those things.		
00:24:55.3 HOT-1	engine instruments its good good good all good. fuel quantity i'm good three thousand pound. inverter test already got it. flight instruments check alright here here good. and uh avionics check. set one two one point seven. autopilot che- autopilot here good. and uh electric trim check.		
00:25:24.4 HOT-1	i should be able.		
00:25:25.4 HOT-2	yup.		
00:25:36.5 HOT-1	ok trim test.		
00:25:47.0 HOT-1	thrust rever- check pressurization set equal to two * eight hundred.		
00:25:53.6 HOT-1	two eight zero deice system * (well well well).		
00:26:00.9 HOT-1	let me call that guy and make sure he's uh know i'm coming		
		00:26:19.0 RDO-1	fulton county ground t b m one uh citation one eight eight charlie whiskey out of uh hill aircraft ready for taxi with uh sierra.

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
		00:26:26.8 RDO-GND	citation one eight eight charlie whiskey fulton county ground from the hill ramp runway eight taxi via juliet and india cross runway three two at india.
		00:26:38.3 RDO-1	juliet india cro- uh cross runway three two through at uh india eight charlie whiskey umm.
00:26:57.5 HOT-1	[sound similar to engine rpm increase and decrease]		
00:27:41.5 HOT-1	[sound of three clicks]		
00:27:47.7 HOT-1	[sound of two clicks]		
00:29:30.8 HOT-1	alright everything good? everything good?		
00:29:33.8 HOT-2	yup all good. this is gorgeous.		
00:29:36.3 HOT-1	yeah.		
00:30:04.4 HOT-1	uh you put the seatbelt on?		
00:30:05.8 HOT-2	yup.		
00:30:12.9 HOT-2	got the seatbelt where's the other one? oop there it is thanks.		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
00:30:19.1 HOT-1	alright?		
		00:30:24.2 RDO-1	tower citation one eight eight charlie whiskey at the runway eight ready for takeoff.
		00:30:31.1 RDO-TWR	citation one eight eight charlie whiskey fulton county tower turn left heading three one zero runway eight cleared for takeoff.
		00:30:38.6 RDO-1	left heading of three one zero runway eight cleared for takeoff eight charlie whiskey.
00:30:45.7 HOT-1	[sound similar to engine power increase and decrease]		
00:30:48.7 HOT-1	[sound of two clicks]		
00:31:15.8 HOT-1	[sound similar to engine rpm increase]		
00:31:34.2 HOT-1	airspeed alive.		
00:32:08.7 HOT-1	[sound similar to engine rpm decrease]		
00:32:09.4 HOT-1	[sound of beep]		
00:32:18.6 HOT-1	[sound of beep]		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
00:32:21.3 HOT-1	[sound similar to stick shaker]		
		00:32:23.7 RDO-TWR	citation eight charlie whiskey left turn to three o- [transmission ended abruptly]
00:32:28.8 HOT-1	[sound of grunt]		
00:32:30.0 HOT-1	[sound of heavy breathing]		
00:32:31.4 HOT-1	[sound similar to stick shaker]		
00:32:32.9 HOT-1	[sound of beep]		
00:32:33.9 GPWS	sink rate [electronic voice]		
00:32:35.2 GPWS	pull up [electronic voice]		
00:32:36.7 GPWS	pull up [electronic voice]		
		00:32:36.9 RDO-TWR	citation eight charlie whiskey contact atlanta departure.
00:32:38.5 GPWS	pull up [electronic voice]		
00:32:40.3 GPWS	pull up [electronic voice]		

Time and Source	Intra-Aircraft Communication	Time and Source	Over-the-Air Communication
00:32:41.2 HOT-1	[sound of scream]		
00:32:41.5 HOT-1	[sound of impact]		
00:32:41.5	end of recording		
0032:53.2 END OF TRANSCRIPT END OF RECORDING			