NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Vehicle Recorder Division
Washington, DC 20594

GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

CEN17FA072

By
Christopher Babcock

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 17, 2017

Cockpit Voice Recorder

Group Chairman's Factual Report
By Christopher Babcock

1. EVENT SUMMARY

Location:	Cleveland, Ohio
Date:	December 29, 2016
Aircraft:	Cessna 525C, Registration N614SB
Operator:	Private
NTSB Number:	CEN17FA072

On December 29, 2016, at 2257 Eastern Standard Time (EST), a Cessna 525C, registration N614SB, was destroyed when it impacted Lake Erie shortly after takeoff from the Burke Lakefront Airport, Cleveland, Ohio. The pilot and five passengers were fatally injured. The airplane was registered to Maverick Air LLC, and was operated by a private individual under the provisions of 14 *Code of Federal Regulations* Part 91. Night visual meteorological conditions prevailed and an instrument flight rules flight plan was on file with an intended destination of the Ohio State University Airport, Columbus, Ohio. 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 February 22, 2017, and a transcript was prepared for the final 15 minutes and 53 seconds of the recording.

2. GROUP

Chairman:	Christopher Babcock Aerospace Engineer National Transportation Safety Board
Member:	Jay Boyle Senior Field Technical Advisor Williams International
Member:	Daniel Morris Manager/Chief Pilot Textron Aviation
Member:	Vincent Yerace Aviation Safety Inspector Federal Aviation Administration

3. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Division received the following CVR:

Recorder Manufacturer/Model:	**L-3/Fairchild FA2100-1025**
Recorder Serial Number:	**000729086**

3.1 CVR Carriage Requirements

Per federal regulation, multiengine aircraft with more than six passenger seats and requiring two pilots manufactured after April 7, 2010, and operated under Part 91, must be equipped with a CVR that records a minimum of the last 2 hours of aircraft operation. The accident aircraft was manufactured in 2012, but was certified such that it only required one pilot and therefore was not required to be equipped with a CVR. 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 L-3/Fairchild FA2100-1025, records a minimum of 120 minutes of digital audio stored on solid state memory modules. Four channels are recorded: the left audio panel, right audio panel, one spare channel, and the cockpit area microphone (CAM).

3.3 Recorder Damage

The CVR was submerged in Lake Erie for 8 days. Immediately after recovery, the CVR was packaged in fresh water and transported to the lab. The CVR exhibited minor impact damage (Figure 1). Upon arrival at the lab, the CVR was disassembled and the memory devices were inspected, cleaned, and dried (Figure 2). The memory device was connected to a laboratory surrogate unit and downloaded normally.

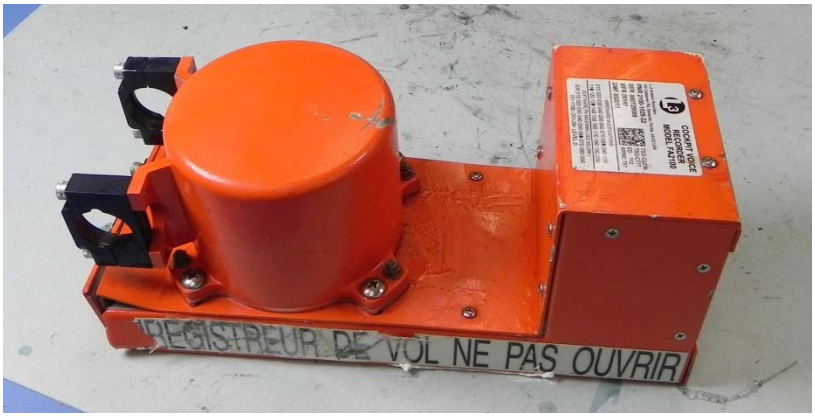

Figure 1. CVR upon arrival at laboratory.

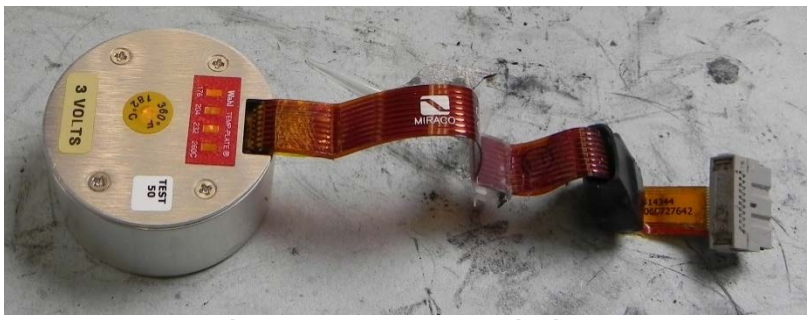

Figure 2. CVR memory device.

3.4 Audio Recording Description

Each channel's audio quality is indicated in Table 1.[1] Channel number three did not contain any audio information (nor was it required by federal regulations in this installation).

Table 1. Audio Quality.

Channel Number	Content/Source	Quality	Duration (hh:mm:ss)
1	Pilot	Excellent	02:04:30
2	Right Seat Passenger	Excellent	02:04:30
3	Spare	NA	02:04:30
4	CAM	Good	02:04:30

3.5 Timing and Correlation

Timing on the transcript was established by correlating the air traffic control recording transmission time to the corresponding CVR event. Specifically, the CVR time of the final radio transmission from N614SB was linked to the corresponding ATC local time, and all CVR events were offset to reflect the local EST of the accident.

3.6 Description of Audio Events

The recording and transcript of the accident flight began at 2242:00 EST. The recording contained events from the preflight, taxi, and takeoff, and ended when the aircraft impacted the lake at 2257:53. CVR events at 2257:30.8 and 2257:39.7 appeared to be transmissions to air traffic control, however they were not present on the ground-based air traffic control recording.

[1] See attached CVR Quality Rating Scale.

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/Fairchild FA2100-1025 solid-state cockpit voice recorder, serial number 000729086, installed on a Cessna 525C (N614SB), which crashed after takeoff from Burke Lakefront Airport in Cleveland, Ohio.

LEGEND

CAM	Cockpit area microphone voice or sound source
HOT	Flight crew audio panel voice or sound source
RDO	Radio transmissions from N614SB
CLR	Radio transmission from Burke clearance controller
GND	Radio transmission from the Burke ground controller
TWR	Radio transmission from the Burke airport tower controller
ATIS	Radio transmission from Burke Automatic Terminal Information Service
TAWS	Terrain Awareness and Warning System
-1	Voice identified as the pilot
-2	Voice identified as the cockpit passenger
-?	Voice unidentified
*****	Unintelligible word
[ ]	Editorial insertion

Note 1: Times are expressed in eastern standard time (EST).

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	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
22:42:00.6	**START OF RECORDING** **START OF TRANSCRIPT**		
22:42:02.1			
CAM	[sound similar to occupant(s) moving around in the cockpit]		
22:42:38.0			
CAM	[sound similar to engine start]		
22:43:02.7			
CAM-2	do you always start the right engine first?		
22:43:04.8			
CAM-1	no I alternate them.		
22:43:09.7			
CAM	[sound of three triple beeps]		
22:43:39.8			
CAM	[sound similar to engine start]		
22:43:47.8			
CAM	[sound of unintelligible background conversation]		
22:43:56.9			
CAM-1	we win?		
22:44:00.4			
CAM-2	they were up four with eight seconds left— eight and a half seconds left when we walked out the door so I think so.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
22:44:13.9 **HOT**	[sound of tone]		
22:44:17.3 **CAM**	[sound of chime, similar to master caution]		
22:44:29.2 **CAM**	[sound of unintelligible background conversation]		
		22:46:09.6 **ATIS**	Burke Lakefront Tower information mike zero two five three zulu observation. wind two six zero at two six gust three four. visibility one zero. ceiling two thousand one hundred broken. two thousand eight hundred broken six thousand five hundred overcast. temperature zero one. dewpoint minus two. altimeter two niner seven two. remarks peak wind two seven zero at three four observed at zero two four eight zulu. expect the I-L-S approach runway two four right. landing and departing runway two four. use caution for birds on and around the airport. use caution for cranes and ship masts in the harbor. all V-F-R aircraft remain outside Cleveland class bravo airspace. upon initial contact advise A-T-C you have information mike.
22:46:55.4 **CAM**	[sound of unintelligible background conversation]		
		22:46:59.9 **ATIS**	Burke Lakefront Tower information mike zero two five three zulu observation. wind two six zero at two six gust three four. visibility one zero. ceiling two thousand one hundred broken. two thousand eight hundred broken six thousand—

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
22:47:25.0 **CAM**	[sound of unintelligible background conversation]		
22:47:41.5 **HOT-1**	at least no more's coming down right now.		
		22:47:51.7 **RDO-1**	Burke uh Clearance Citation six one four sierra bravo I-F-R to uh oscar sierra uniform.
		22:47:57.9 **CLR**	** four sierra bravo Lakefront Ground cleared to the O-S-U airport via radar vectors HERAK hotel echo romeo alpha kilo WAAHU whisky alpha alpha hotel uniform Appleton alpha papa echo direct. climb maintain two thousand expect one two thousand one zero minutes after departure. departure control frequency one two five point three five. squawk five seven four four.
		22:48:38.4 **RDO-1**	that's uh O-S-U radar vectors HERAK WAAHU Appleton. two thousand. one two thousand in ten. one three five five five. and five seven four four on the squawk for four sierra bravo.
		22:48:50.2 **CLR**	Citation four sierra bravo readback correct except it's uh departure control frequency is one two five point three five. twenty five thirty five.
		22:48:58.5 **RDO-1**	twenty five thirty five four sierra bravo.
22:49:12.2 **CAM**	[sound similar to engine power increase]		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
		22:49:53.1 **RDO-1**	clearance can I have the phonetic for WAAHU again?
		22:49:56.3 **CLR**	WAAHU is whisky alpha alpha hotel uniform.
		22:50:02.0 **RDO-1**	thanks.
22:50:09.2 **CAM**	[sound of unintelligible background conversation]		
		22:50:52.7 **RDO-1**	ground six one four Citation— Citation six one four sierra bravo's uh at uh Signature ready to taxi.
		22:50:59.7 **GND**	Citation six * four sierra bravo Lakefront Ground two four right taxi via golf hotel.
		22:51:07.2 **RDO-1**	two four right golf hotel. six one four sierra bravo.
22:51:12.9 **CAM**	[sound similar to engine power increase]		
22:51:36.3 **CAM**	[sound of chime, similar to master caution]		
22:51:49.6 **CAM**	[sound similar to engine power increase and decrease]		
22:52:09.2 **CAM**	[sound similar to engine power increase and decrease]		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
22:52:54.7 **CAM-?**	[sound of cough]		
22:53:25.6 **CAM**	[sound of unintelligible background conversation]		
22:55:10.7 **HOT-1**	two three trim. let's see.		
22:55:20.7 **HOT-1**	hydraulic. battery amps are less.		
22:55:33.6 **HOT-1**	pitot heat's comin' on.		
22:55:34.6 **HOT**	[sound of chime, similar to master caution]		
		22:55:48.5 **RDO-1**	Lakefront Tower Citation six one four sierra bravo holding short of two four right read— ready for takeoff.
		22:55:54.0 **TWR**	Citation six one four sierra bravo Lakefront Tower at two four right turn right heading three three zero. maintain two thousand. cleared for takeoff.
22:56:01.0 **HOT-1**	right turn to three three zero six one four sierra bravo.		
22:56:05.1 **CAM**	[sound similar to engine power increase]		
22:56:07.6 **HOT-1**	clear.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
22:56:16.4 **HOT-1**	that's when it's nice to have more thrust then you need.		
22:56:30.5 **CAM**	[sound of unintelligible background conversation]		
22:56:33.8 **CAM**	[sound similar to engine power increase]		
22:56:49.3 **CAM**	[sound similar to landing gear handle movement]		
22:57:09.4 **HOT**	altitude. [automated voice]		
22:57:23.4 **HOT**	altitude. [automated voice]		
22:57:25.3 **CAM**	[sound similar to engine power decrease]		
22:57:27.2 **TAWS**	bank angle. bank angle.		
		22:57:28.6 **TWR**	six one four sierra bravo contact departure. safe flight.
22:57:30.8 **HOT-1**	to departure six one four sierra bravo.		
		22:57:37.1 **TWR**	six one four sierra bravo Lake—
22:57:39.1 **TAWS**	sink rate. sink rate.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
22:57:39.7 **HOT-1**	six one four sierra bravo.		
22:57:41.4 **CAM**	[sound of increasing air noise]		
22:57:43.6 **TAWS**	pull up.		
22:57:45.2 **TAWS**	pull up.		
22:57:46.2 **HOT**	[sound similar to overspeed warning until end of recording]		
22:57:46.8 **TAWS**	pull up.		
22:57:48.4 **TAWS**	pull up.		
22:57:50.0 **TAWS**	pull up.		
22:57:51.6 **TAWS**	pull up.		
22:57:53.1 **TAWS**	pull up.		
22:57:53.8 **END OF TRANSCRIPT** **END OF RECORDING**			

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT