

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA22LA148

COCKPIT VOICE RECORDER

Specialist's Factual Report

December 5, 2023

WARNING

The reader of this report is cautioned that the summary of a cockpit voice recorder audio recording is not a precise science but is the best product possible from a National Transportation Safety Board group investigative effort. The summary or parts thereof, if taken out of context, could be misleading. The summary 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 summary as the sole source of information.

TABLE OF CONTENTS

A. ACCIDENT.....	3
B. COCKPIT VOICE RECORDER SPECIALIST	3
C. FEDERAL CARRIAGE REQUIREMENTS.....	3
D. DETAILS OF THE INVESTIGATION	3
1.0 RECORDER DESCRIPTION.....	3
1.1 Recorder Damage	3
1.2 Audio Recording Description.....	4
1.3 Timing and Correlation	4
1.4 Description of Audio Events.....	4
APPENDIX A. CVR QUALITY RATING SCALE.....	5
APPENDIX B. CVR SUMMARY	6

A. ACCIDENT

Location: Middle River, Maryland
Date: March 7, 2022
Time: 1045 eastern standard time (EST)
Airplane: Cessna 525B, Executive Flight Services LLC, N22AU

B. COCKPIT VOICE RECORDER SPECIALIST

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C. FEDERAL CARRIAGE REQUIREMENTS

The accident airplane, N22AU, was operating under the provisions of Title 14 *Code of Federal Regulations* (CFR) Part 135. The event airplane was manufactured in 2009 and was required to be equipped with a cockpit voice recorder (CVR) that records a minimum of the last 30 minutes of airplane operation.

D. DETAILS OF THE INVESTIGATION

A CVR group was not convened. The NTSB Vehicle Recorder Division received the following CVR:

Recorder Manufacturer/Model: L3Harris FA2100-1020
Part Number: 2100-1020-02
Recorder Serial Number: 547199

1.0 Recorder Description

This model CVR, the L3Harris FA2100, records a minimum of 120 minutes of digital audio stored on solid-state memory modules. Four channels are recorded: one channel for each flight crew, one channel for a cockpit observer, and one channel for the cockpit area microphone (CAM).

1.1 Recorder Damage

Upon arrival at the 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.

1.2 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	3 rd Crew/Spare	Good	02:04:14
2	Co-pilot	Good	02:04:14
3	Pilot	Good	02:04:14
4	CAM	Good	02:04:14

1.3 Timing and Correlation

Timing in the summary was established by correlating timing information in Automatic Dependent Surveillance-Broadcast (ADS-B) data with common events on the CVR. The relationship between CVR elapsed time and local time, EST, is given by the following expression:

$$\text{CVR Local time (EST)} = \text{CVR elapsed time} + 08:45:36.6$$

Timing in the summary is expressed in local time, EST, unless otherwise noted.

1.4 Description of Audio Events

In agreement with the Investigator-In-Charge, a CVR group did not convene. A summary of events from the CVR is provided in Appendix B, Table 2.

Submitted by:

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¹ Appendix A comprises the CVR Quality Rating Scale.

APPENDIX A. 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.

APPENDIX B. CVR SUMMARY

The first approximately 90 minutes of the recording contained audio from the flight before the accident flight, from Teterboro Airport (TEB) to Washington Dulles International Airport (IAD), which was uneventful. The summary, in Table 2, begins with the airplane on the ground at IAD as the flight crew prepared for the accident flight leg, IAD to Martin State Airport (MTN).

Table 2. CVR summary².

Time, EST	Observation
10:18:27.8	The flight crew briefed the departure.
10:18:50.2	The flight crew listened to the automatic terminal information service (ATIS) for IAD.
10:19:57.8	The flight crew performed a before-engine start checklist.
10:20:33.7	Sounds consistent with engine start were noted.
10:22:19.5	The flight crew performed a before-taxi checklist.
10:22:45.7	The flight crew radioed the IAD ground controller and reported they were ready to taxi. The IAD ground controller cleared the airplane to taxi to runway 19L.
10:23:36.6	The flight crew performed a before-takeoff checklist. The pilot indicated he would be pilot flying (PF) on this leg. The copilot would be pilot monitoring (PM).
10:29:09.0	The flight crew received a takeoff clearance for runway 19L. Sound consistent with an increase in engine thrust was noted.
10:29:30.2	The flight crew called out "positive rate gear up" and sounds consistent with the landing gear retracting were noted thereafter.
10:30:44.0	The flight crew performed an after-takeoff checklist.
10:32:07.3	A departure controller cleared the airplane to WOOLY and then direct to MTN. The controller informed the flight crew to expect the visual approach for runway 15 at MTN.

² In the table, [] denotes an editorial insertion.

Time, EST	Observation
10:34:08.9	The flight crew listened to the ATIS for MTN. The ATIS, issued at 0954 EST, indicated the following: • Winds out of 180 degrees at 16 knots, gusting to 23 knots • Visibility of 10 statute miles • No clouds under 12,000 feet (clear) • Localizer approach runway 15 in use
10:36:06.4	The departure controller cleared the airplane to descend to 3,000 feet and informed them to expect vectors for the final approach.
10:37:53.4	The flight crew checked in with the approach controller and reported they were at 3,800 feet, descending to 3,000 feet.
10:38:09.7	The flight crew performed a descent checklist.
10:38:45.9	The flight crew discussed the aircraft's landing weight, which included configuring the airplane for landing earlier than normal to burn off additional fuel and reduce the landing weight.
10:43:07.0	The approach controller cleared a descent to 2,500 feet. The flight crew reported they had the field in sight. The approach controller cleared the airplane for a visual approach to runway 15.
10:43:45.5	The flight crew checked in with the MTN tower controller and reported they were on the visual approach for runway 15.
10:43:51.3	The tower controller cleared the airplane to land on runway 15 and asked the flight crew to "make best speed to the numbers."
10:44:07.9	The flight crew discussed how they enjoyed that the airplane was equipped with speedbrakes. The PF indicated he would be using speedbrakes for a while longer in the approach and asked the PM to remind him of that as they continued to descend.
10:44:37.9	The flight crew performed an approach checklist.
10:45:14.7	The flight crew performed a before-landing checklist.
10:46:20.0	The PF remarked, "a little bit above the vee-ref [V_{REF}]. might be right on it actually."
10:46:35.9	An electronic voice stated, "five hundred."

Time, EST	Observation
10:47:30.9	The PF stated, "ground flaps."
10:47:32.5	Sounds consistent with landing gear touchdown were noted.
10:47:39.4	The PF asked, "why are the brakes not working?"
10:47:50.0	The PF asked, "where's the ee-mer [emergency] brake?" Additional conversation between the flight crew indicated they continued to search for the emergency brake as the airplane traveled toward the end of the runway.
10:48:11.7	An increase in ambient noise on the CAM was noted, consistent with the airplane departing the paved runway surface.
10:48:23.3	The tower controller asked the flight crew if they had departed the paved runway surface. The flight crew replied that they had, and the tower controller noted they would roll the crash vehicles.
10:49:02.3	The PM stated, "I have no idea where the ee-mer [emergency] brakes are."
10:49:16.6	The PF stated, "here it [emergency brake] is."
10:49:17.4	The PM stated, "there it is right there. well...what do you do?"
10:49:50.6	The recording ended.