

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



SPECIALIST'S FACTUAL REPORT OF INVESTIGATION

CEN22LA130

By
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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 an NTSB 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.

NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division

May 10, 2022

Cockpit Voice Recorder

Specialist's Factual Report **By Kyle Garner**

1. EVENT

Location: Aspen, Colorado
Date: February 21, 2022
Aircraft: Raytheon Aircraft Company, Hawker 800XP
Registration: N99AP
Operator: Private
NTSB Number: CEN22LA130

A solid-state cockpit voice recorder (CVR) was sent to the National Transportation Safety Board (NTSB) Vehicle Recorder Division for evaluation.

2. GROUP

A CVR group was not convened.

3. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Division received the following CVR:

Recorder Manufacturer/Model:	Universal CVR-30B
Recorder Serial Number:	362

3.1 CVR Carriage Requirements

Per federal regulation, multiengine turbine-powered aircraft with more than six passenger seats and requiring two pilots manufactured before April 7, 2010, and operated under 14 *Code of Federal Regulations* Part 91, must be equipped with a CVR that records a minimum of the last 30 minutes of aircraft operation.

3.2 Recorder Description

This model CVR, the Universal CVR-30B, records a minimum of 30 minutes of digital audio stored on solid-state memory modules. There are four sources of audio input: one channel for each flight crew, one spare channel (i.e., for an observer), and one channel for the cockpit area microphone (CAM). The pilot, co-pilot, and spare channels are recorded independently for a minimum of 30 minutes.

3.3 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. The CVR, as received, is shown in Figure 1.



Figure 1. Universal CVR-30B, as received.

3.4 Audio Recording Description

Each channel's content, recording quality, and duration are indicated in Table 1.

Table 1. Audio Content, duration, and quality.¹

	Channel	Content/Source	Designed Duration	Actual Duration (hh:mm:ss)	Recording Quality
Cockpit Audio Input Channels	1	Spare/Observer	30 minutes	00:31:16	Good
	2	Co-Pilot			Good
	3	Pilot			Good
	4	CAM		00:31:31	Poor

3.5 Timing and Correlation

Timing on the transcript was established by correlating the CVR audio to common events in Automatic Dependent Surveillance-Broadcast (ADS-B) data. Once a correlation between the CVR audio data and the ADS-B data was established, a reference to Coordinated Universal Time (UTC) time was determined using the UTC timestamp on the

¹ See attached CVR Quality Rating Scale.

ADS-B data. UTC was then converted to local time, mountain standard time (MST), by subtracting seven hours. For the remainder of this report, all times are referenced as MST.

3.6 Description of Audio Events

In agreement with the Investigator-In-Charge, a CVR group did not convene. Table 2 provides a list of observations from the 30-minute cockpit audio input channels relevant to the investigation.

Table 2. Summary of CVR events.

MST of observation, hh:mm:ss	Detail of observation
11:01:46	<i>[Start of CAM (channel 4) recording. The CAM recording was of poor quality and no flight crew conversation before the start of the channel 1, 2, and 3 recordings was intelligible.]</i>
11:02:01	<i>[Start of channel 1, 2, and 3 recordings. The aircraft was on the ground at Aspen-Pitkin County Airport (ASE) in Aspen, Colorado.]</i> The recording began as the flight crew was completing a checklist, which included the following items: • V₂ speed - 131 knots • After takeoff - climb to 16,000 feet • Transponder - set • Main air valve - verified closed • Flaps set to zero - indicated zero • Air brakes - recycled • Trims 1, 2, and 3 - checked and set • Flight control check - free and clear • Harnesses - secure • Seat belt sign - on
11:02:40	The second-in-command (SIC) asked the pilot-in-command (PIC) if he was ready to taxi. The PIC stated he was ready to taxi.
11:02:46	The SIC called the Aspen ground controller and reported they were ready to taxi. The ground controller issued a taxi clearance to runway 33 via taxiway Alpha. The ground controller asked the flight crew to verify they had information Bravo. The flight crew acknowledged they had information Bravo.

MST of observation, hh:mm:ss	Detail of observation
11:04:58	The flight crew began a takeoff briefing, which included the following items: • PIC was the pilot flying, and SIC was the pilot monitoring. • Anything unusual below 80 knots - abort per PIC callout. • Abort between 80 knots and V₁ for engine fire, engine failure, loss of pressure control, inadvertent deployment of thrust reversers. • If above V₁ and the need to abort arises - continue takeoff and land at the nearest suitable airport. • Weather was not a factor. • The aircraft was slightly over maximum landing weight if a diversion was necessary, however, the aircraft would likely be under the maximum landing weight by the time they reached their diversion airport. • Departure procedure per the FMS. • Wind was a factor. The PIC asked the SIC to see if a flaps 15° takeoff, instead of a flaps 0° takeoff, would reduce the required runway length for takeoff.
11:06:38	[The takeoff briefing was interrupted by the ground controller clearing the aircraft into the de-icing area for staging.]
11:07:13	The SIC told the PIC that a flaps 15° departure would reduce the required runway length for takeoff by about 800 feet. The PIC then indicated his preference to perform a flaps 15° takeoff and asked the SIC to set flaps 15°.
11:07:25	The PIC asked the SIC to compute new V speeds. The SIC started to read off the calculated V speeds as 110, 121, 128 ² [the remaining dialogue was inaudible due to a radio transmission].
11:10:16	The flight crew continued the takeoff briefing, which included the following items: • Engine anti-ice, not required • Transponder, set • Flaps 15, indicate 15 • Airbrakes, shut • Trims, set three times • Speeds, set • Pressurization, set

² It is likely, based on known performance data, that V₁ = 110 knots, V_R = 121 knots, and V₂ = 128 knots; however, the flight crew did not verbalize the specific V speed corresponding to each number on the recording.

MST of observation, hh:mm:ss	Detail of observation
11:13:17	[Aspen tower cleared a different aircraft for takeoff on runway 33 and reported the winds as 170 at 15, gust 11, continuous 160 at 10.]
11:16:46	[Aspen tower cleared a different aircraft to land on runway 15 and reported the winds as 160 at 15, gust 22.]
11:18:33	[Aspen tower cleared a different aircraft to land on runway 15 and reported the winds as 160 at 15, gust 22.]
11:18:54	The Aspen tower controller indicated to the flight crew that it would be about 15 minutes before they could depart due to a bank of incoming arrivals.
11:20:59	[Aspen tower cleared a different aircraft to land on runway 15 and reported the winds as 170 at 15, gust 24.]
11:25:23	[Aspen tower cleared a different aircraft to land on runway 15 and reported the winds as 160 at 11, gust 24.]
11:31:23	The Aspen tower controller cleared the aircraft to line up and wait.
11:31:29	The flight crew started a before takeoff checklist, which included the following items: • Engine ignitions • Strobes • Master warning • Transponder • Flaps 15 • Airbrakes • Trims
11:31:54	The Aspen tower controller cleared the aircraft for takeoff on runway 33. The controller reported the winds as 160 at 16, gust 25, and instantaneous wind 180 at 10. The flight crew acknowledged the takeoff clearance.
11:32:00	The PIC indicated to the SIC that he would be performing a static takeoff.
11:32:26	Sounds similar to engine thrust increasing were noted.

MST of observation, hh:mm:ss	Detail of observation
11:32:30	The PIC indicated that takeoff power had been set. The SIC stated that he was arming APR ³ .
11:32:38	The SIC commented that airspeed was alive.
11:32:47	The SIC called out 80 knots.
11:32:54	The SIC called out V ₁ .
11:32:58	The SIC called out rotate.
11:33:05	Sounds similar to engine thrust decreasing were noted.
11:33:09	The PIC indicated he was aborting takeoff and asked the SIC to inform the tower controller.
11:33:10	The SIC informed the tower controller they were aborting takeoff.
11:33:15	Sounds similar to the aircraft departing the paved surface were noted. The recording ended shortly thereafter. <i>[End of recording.]</i>

³ APR - Automatic Performance Reserve - allows an automatic increase in engine performance in the event of an engine failure or transient fault during takeoff, or during a go-around following a single-engine approach.

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.