NATIONAL TRANSPORTATION SAFETY BOARD
Vehicle Recorder Division
Washington, DC 20594

November 1, 2012

Cockpit Voice Recorder

Specialist's Factual Report
By Bill Tuccio

1. EVENT

Location:	Des Moines, Iowa
Date:	August 15, 2012
Aircraft:	Cessna 560XL, N108EK
Operator:	Elliott Aviation
NTSB Number:	CEN12IA554

2. GROUP

A group was not convened.

3. SUMMARY

On August 15, 2012, about 1000 central daylight time (CDT), a Cessna 560XL, N108EK, diverted to Des Moines International Airport (DSM), Des Moines, Iowa, following an altitude deviation during cruise at Flight Level (FL) 400. The two pilots and six passengers were not injured. The airplane sustained minor damage. The aircraft was registered to New Heights Aviation LLC and operated by Elliott Aviation under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed for the flight, which was operated on an instrument flight rules flight plan. The flight originated from Flying Cloud Airport (FCM), Flying Cloud, Minnesota, about 0925, with an intended destination of Arlington Municipal Airport (GKY), Arlington, Texas. A solid-state cockpit voice recorder (CVR) was sent to the National Transportation Safety Board's Audio Laboratory for readout.

4. DETAILS OF INVESTIGATION

The NTSB Vehicle Recorder Division's Audio Laboratory received the following CVR:

Recorder Manufacturer/Model:	**Fairchild A-200S**
Recorder Serial Number:	**01121**

4.1. Recorder Description

Per federal regulation 14 CFR 91.609, turbine engine powered, six-passenger or more aircraft operating under 14 CFR Part 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. When the CVR is deactivated or removed from the airplane, it retains only the most recent 30 minutes or 2 hours of CVR operation, depending on the CVR model. This model CVR, the Fairchild A-200S, is a solid-state CVR that records 2 hours of digital cockpit audio. Specifically, it contains a 2-channel recording of the last 2 hours of operation and separately contains a 4-channel recording of the last 30 minutes of operation. The 2-hour portion of the recording is comprised of one channel of audio information from the cockpit area microphone (CAM) and one channel that combines three audio sources: the pilot's audio panel information, the copilot's audio panel information, and the observer pilot's audio panel information. The 30-minute portion of the recording contains 4 channels of audio data; one channel for each flight crew, one channel for the CAM audio information, and a fourth channel for the third crewmember.

4.2. Recorder Damage

Upon arrival at the audio 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.

4.3. CVR Channels

The pertinent part of the recording consisted of two channels of audio information. One of the channels contained combined audio information from the pilot's and copilot's audio panels. The quality of this channel was good[1]. One channel contained the cockpit area microphone (CAM) audio information. The quality of this channel was good.

4.4. Timing and Correlation

The times used in this report are expressed as local time of the accident (CDT).

Timing of the transcript was aligned with timing information provided by ATC. Specifically, an ATC transmission at 1344:49 UTC was aligned with the same transmission on the CVR at 0049:05 CVR Elapsed Time (time from the beginning of the recording). After converting 1344:49 UTC to 0844:49 CDT, by subtracting 5 hours, the following relationship was established: CDT = CVR Elapsed Time + 0755:44.

4.5. Summary of Recording Contents

In agreement with the Investigator-In-Charge, a CVR group did not convene and only this summary report was prepared.

[1] See Attachment I for the CVR Quality Rating Scale

The recording began at 0756, as the aircraft was climbing out of 9,000 feet. The crew discussed deviations for thunderstorms during the climb. The copilot was the non-flying pilot.

At 0819:09, the copilot reported to air traffic control (ATC) the aircraft was passing flight level (FL) 380 for FL 400.

At 0820:06, a high pitched tone was followed by the copilot calling out "one to go you're armed."

At 0822:27, the copilot noted "awe it's not keepin' up with it. Identified and cancelled." The copilot then said he would look at the checklist, noting the checklist would probably say "have you turn it off, retrim it, turn it back on." The copilot then mentioned "R-five."

At 0822:53, a 1-second, high pitched tone (about 3,000Hz) was recorded, simultaneous with the sound of a thunk and rustling sounds.

At 0822:55, a high pitched tone (about 3,700Hz) sounded for 1.7 seconds as one of the pilots said, "Jesus."

At 0823:00, the copilot asked "you got it?"

As the pilot was responding, "yep," at 0823:01, another high pitched tone (about 3,000Hz) sounded for 0.9 seconds.

At 0823:03, a beeping tone, similar to the overspeed warning, began and continued for 40 seconds.

At 0823:08, the copilot said he was going to put the airbrake out, and the pilot agreed.

At 0823:11, the copilot declared an emergency to ATC. After acknowledgement of the emergency from ATC, the copilot advised ATC the aircraft was out of trim, overspeeding, and descending in uncontrolled flight though control was starting to be regained.

At 0823:32, the copilot told the pilot he was manually retrimming.

At 0823:34, ATC directed the aircraft to descend and maintain FL 240.

The copilot then informed ATC the airspeed was slowly coming back, and they needed to find the nearest airport at which to land. ATC suggested Des Moines which was 52 miles to the south.

At 0824:21, the pilot directed the copilot to check on the passengers. The CAM recorded the copilot verifying the passengers were okay.

At 0824:31, the copilot advised the captain he was stowing the airbrake.

At 0824:35, the copilot advised ATC the aircraft had an autopilot malfunction, which caused a rapid loss of pitch control, and the aircraft would like to divert to Des Moines.

At 0825:42, the copilot asked the captain if the "red button" was pressed all the way, and pilot confirmed it was.

The copilot then further informed ATC that the loss of pitch control was related to an electric pitch runaway.

At 0826:37, the pilot and copilot discussed the event. They noted prior to the event the airspeed was not near any speed limitations, adding "we've had that before." The copilot then noted the checklist he had been using "flew back there" during the upset, and he could no longer reach it. The crew further

discussed that during the upset event, light control inputs were made to avoid overstressing the aircraft.

During the descent, the crew further briefed the passengers on the event and the diversion to Des Moines. The crew also discussed they would not use the autopilot or electric trim and would manually trim.

At 0833, the crew received ATIS information Hotel at Des Moines. The ATIS reported the 1254 Zulu weather at Des Moines as few clouds at 14,000 feet, winds from 180 degrees at 7 knots, visibility 10 miles, and runway 23 in use.

At 0836, ATC asked the crew for fuel and souls on board. The copilot responded 8 souls were on board with 3 hours of fuel or 4000 pounds of fuel.

The aircraft was vectored for a visual approach to runway 23. During the descent the crew discussed concerns over flap configuration changes to the aircraft due to possible damage. Included in the discussion was the possibility of a less than full flap landing and the 9,000 foot runway allowing for this reduced flap setting.

At 0841, the aircraft was cleared for a visual approach to runway 23. The crew executed the approach checklist and briefed speeds of 115 and 122 knots for the approach. Shortly thereafter, the crew extended flaps to 7 to verify aircraft control, and then extended approach flaps.

At 0842, the aircraft was cleared to land and the crew extended the landing gear. The crew then executed the landing checklist.

At 0843, the crew applied full flaps.

At 0843:48, an automated voice called out “five hundred.”

The aircraft touched down at about 0844:27.

After touchdown, the crew noted the aircraft had sat in the rain prior to departure, and perhaps that was related to the upset.

Power was interrupted to the CVR at about 0849:23.

The remaining 1 hour and ten minutes of the recording contained 7 power cycles of the CVR amidst varied voices recorded on the CAM. The voices and conversations were consistent with mechanics working on the aircraft.

Bill Tuccio
Vehicle Recorder Division

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.