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

GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

ERA11IA316

By

Bill Tuccio

WARNING

The reader of this report is cautioned that the summary of a cockpit voice recorder audio recording is not a precise science. 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
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October 3, 2011

Cockpit Voice Recorder - 12

Group Chairman's Factual Report
By Bill Tuccio

A. EVENT

Location:	Stewart International Airport, Newburgh NY
Date:	May 27, 2011, 9:28 Eastern Daylight Time (EDT)*
Aircraft:	Gulfstream 200, N749QS
Operator:	NetJets, Flight ExecJet 749
NTSB Number:	ERA11IA316

B. GROUP

A group was convened on June 30, 2011.

Chairman:	Bill Tuccio Aerospace Engineer National Transportation Safety Board
Member:	Dave Helson Air Safety Investigator National Transportation Safety Board
Member:	Harold (Bud) Ball, III Senior Production Test Pilot Gulfstream Aerospace Corporation
Member:	Captain Neil Chaney Union Safety Board Chairman NetJets Association of Shared Aircraft Pilots
Member:	Paul McClaskey Director, Aviation Safety NetJets Inc.

* All times are expressed in EDT, unless otherwise noted.

C. SUMMARY

On May 27, 2011, at 0928 eastern daylight time, a Gulfstream 200, N749QS, managed by NetJets Inc., operating as flight ExecJet 749, incurred minor damage when the right main landing gear collapsed during an emergency landing at Stewart International Airport (SWF), Newburgh, New York. The two certificated airline transport pilots and one passenger were not injured. The flight was conducted under the provision of 14 Code of Federal Regulations Part 91(k). Visual meteorological conditions prevailed and an instrument flight rules flight plan was filed for the flight destined to Westchester County Airport (HPN), White Plains, New York. The flight originated from Piedmont Triad International Airport (GSO), Greensboro, North Carolina, about 0800.

A solid-state cockpit voice recorder (CVR) was sent to the National Transportation Safety Board Vehicle Recorder Division's Audio Laboratory for readout. The CVR group meeting convened on June 30, 2011 and a partial summary report was prepared for the last 30 minutes, 10 seconds of the 2-hour, 6-minute, 35-second digital recording.

D. DETAILS OF INVESTIGATION

On June 3, 2011, the NTSB Vehicle Recorder Division's Audio Laboratory received the following CVR:

Recorder Manufacturer/Model: **Universal CVR-120**
Recorder Serial Number: **1779**

Recorder Description

Per Federal regulation, CVRs record 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 Universal CVR-120, 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 two audio sources: the captain's audio panel information and the first officer's audio panel information. The 30-minute portion of the recording contains 4 channels of audio data; one channel for each flight crew and one channel for the CAM audio information.

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.

Audio Recording Description

For the 2-hour portion of the CVR recording, the CAM channel recording contained fair quality[†] audio information, and the mixed flight crew channel contained excellent

[†] See attached CVR Quality Rating Scale.

quality audio information. As shown in the table below, the 30-minute portion of the recording consisted of three channels of useable audio information. Each channel's audio quality is indicated in Table 1. Notably, channel number one did not contain any audio information (nor was it required to by Federal regulations).

Table 1: Audio Quality

Channel Number	Content/Source	Quality
1	N/A	N/A
2	Captain (Pilot-in-Command)	Excellent
3	First Officer (Second-in-Command)	Excellent
4	CAM	Fair

Timing and Correlation

Timing on the partial transcript was established using the time of the incident, as supplied by the Investigator-In-Charge as 0928 EDT. This time was correlated to the associated event on the CVR at an elapsed time of 0030:22.675. The relative time of the CVR audio events were offset by 0857:37.325 to reflect the local EDT of the accident.

Description of Audio Events

The recording began at 0723:06 as the aircraft was taxiing for takeoff at GSO. The aircraft departed GSO at 0728 and climbed to flight level 390. The aircraft descended into the White Plains terminal area at about 0845.

The group summary began at 0859:29 as the aircraft was being vectored for a visual approach to runway 34 at HPN and the Pilot-in-Command (PIC) was the pilot flying (PF), and the Second-in-Command (SIC) was the pilot monitoring (PM). As checklist execution required pilot roles to change, all pilot references in this narrative will contain the pilot and the role, i.e., PIC/PF, PIC/PM, SIC/PF, SIC/PM.

At 0900:09, The PIC/PF called for flaps 20 and the SIC/PM confirmed the speed and set flaps 20. The SIC/PM then reported other aircraft traffic and the airport in sight. New York Approach cleared the aircraft for a visual approach to runway 34 and told the aircraft to contact White Plains Tower.

At 0901:45, the SIC/PM contacted White Plains Tower and was cleared to land on runway 34. The sound of mid-frequency repeating tone was heard shortly thereafter similar to the autopilot disconnect.

At 0902:15, the PIC/PF asked for the gear down and landing checks. The SIC/PM confirmed the speed, followed by a sound similar to the gear lever and an increase in noise similar to gear extension. The PIC/PF then requested flaps 40 and the SIC/PM responded, "speed checks flaps selected forty."

At 0902:28, the SIC/PM noted he was waiting for a gear down indication of three green, as the sound of three chimes similar to the master warning was recorded along with a continuous, mid-level tone, similar to the gear warning horn. The SIC/PM noted the gear problem to the PIC/PF and advised he level off. The mid-level tone continued for 25 seconds until the flaps were set to 20.

At 0902:36, the SIC/PM notified the tower of a gear not down light and requested radar vectors and 2,000 feet as the aircraft needed to run some checklists. White Plains Tower assigned runway heading and 2,000 feet, and the SIC/PM acknowledged. The SIC/PM then suggested flaps 20 and the PIC/PF agreed and asked the SIC/PM to keep the gear down and run "the" checklist. The SIC/PM asked the PIC/PF to be responsible for radio communications, and the PIC/PF agreed. The PIC/PF noted "still red," and the SIC/PM acknowledged.

At 0903:27, the SIC/PM read various headings in the quick reference handbook (QRH), including "brakes, flight controls," before announcing "landing gear. landing gear locked down indication failure, E-G-four." During this time, the PIC/PF made an observation regarding the autopilot followed by a sound similar to autopilot disconnect.

Throughout the execution of various checklists, New York Approach provided radar vectors to the aircraft that were acknowledged by the one of the pilots, usually the PF. Not all such communications are included in this narrative.

At 0903:58, the SIC/PM said, "emergency gear extension," and noted they should have had the tower look at their landing gear as they flew by.

At 0904:26, the SIC/PM read the landing gear lock down indication failure checklist on QRH page EG-4[‡]. The SIC/PM read the first note to the procedure, which indicated extension times may vary with temperature and cold soak conditions. He then read the bold face conditional, if during landing gear extension, normal in transit symbol or down indication down not appear. The SIC/PM then read checklist item number 1 regarding slat/Krueger/flap lever, then item number 2 regarding reducing airspeed to minimum for aircraft configuration, and then item number 3 regarding right hydraulic pressure. The SIC/PM noted there was a right hydraulic problem.

At 0904:45, the sound of a single chime similar to the master caution was recorded. The PIC/PF said, "right hydraulic overheat," and the SIC/PM concurred. The PIC/PF noted the temperature was 87 degrees Celsius on "this" page.

At 0905:03, the SIC/PM noted he could smell something burning, and the PIC/PF expressed the need to get the aircraft on the ground. The PIC/PF then advised New York Approach they were on the missed approach and they needed to run a checklist. The PIC/PF asked approach to keep the aircraft close to the airport, as they might need to land quickly.

At 0905:29, the SIC/PM said, "echo foxtrot seventeen…hydraulic system overheat." The SIC/PM then read from the QRH, page EF-17, the initial text of the hydraulic system overheat procedure. He read, "hydraulic overheat left right message indicates that hydraulic fluid temperature, respectively, is above limits." There is no recording of the three sentence note regarding causes of excessive temperature being read.

At 0905:41, the SIC/PM read item 1 of the QRH, page EF-17, "thrust lever affected engine…idle." The PIC/PF confirmed the statement with the SIC/PM. The SIC/PM then confirmed the hydraulic overheat was on the right engine and confirmed the right engine to idle. The sound of the autopilot disconnect was then heard followed by the PIC/PF noting he was turning the autopilot off.

At 0905:58, the SIC/PM then read QRH page EF-17 item number 2, regarding the monitoring of hydraulic fluid temperature; the bold face conditional item after item number 2, regarding rising temperature; item number 3, regarding a descent below

[‡] Checklists mentioned in this narrative can be found in the docket for this event titled "Excerpts from the QRH."

10,000 feet, to which the SIC/PM noted “we’re there already”; the bold face item after item number 3, regarding impracticable descent; item number 4, regarding the engine shutdown; and item number 5, regarding engine restart. He concluded the checklist by noting they would keep the engine running.

At 0906:09, the SIC/PM advised the PIC/PF to check his speed. The PIC/PF responded that the aircraft slowed down when power was reduced, while noting further he was getting back on his heading.

At 0906:15, New York approach issued the aircraft a vector and advised them they could expect runway 34 when they returned to the airport. The SIC/PM advised New York Approach they had a hydraulic overheat, had to pull power back on one engine, they had no gear down light, and they needed to run some checklists. New York Approach encouraged the aircraft to take all the time they needed and asked if they wanted to stay within 5 miles of the field. On the intercom, the crew agreed to stay close to the airport, and the SIC/PM advised New York Approach of the desire to stay within 5 miles of the airport.

At 0906:46, the crew discussed shutting down the engine and agreed an engine shutdown was not required by the checklist. Throughout this period, the New York Approach radio frequency was congested. The SIC/PM said, “Jease’, too many friggin’…” He then noted he was marking the QRH page EF-17. The SIC/PM then noted the QRH checklist just required monitoring of hydraulic fluid temperature below 10,000 feet.

At 0907:21, New York Approach advised the aircraft they were in the process of clearing out the airport in anticipation of their return, while continuing to vector the aircraft.

At 0907:37, the SIC/PM returned to the QRH page EG-4 checklist (landing gear lock down indication failure checklist), and read item number 3, regarding the right hydraulic pressure check. He then read the bold face item following item number 3, if pressure indication is normal; then item number 4 and the bold face item following item number 4, “landing gear lever…up. monitor indication changes. after 30 seconds minimum---but it is not normal.”

At 0907:46, the PIC/PF said “it” is 1,670. The SIC/PM agreed. The PIC/PF then said, “so we are bad on hydraulics.” The SIC/PM then re-read the boldface item after item number 4, after 30 seconds minimum, followed by item number 5, regarding landing lever down and monitor indication changes. The SIC/PM then said, “note…okay.” There is no recording of the SIC/PM reading the three notes under item number 5, regarding the time it takes for gear down to appear, the possibility of one or more down indications, and flying in cold soak conditions.

At 0907:56, the SIC/PM began reading QRH page EG-5, the continuation of the landing gear down indication failure checklist. The SIC/PM said, “If hydraulic pressure is normal...repeat steps as necessary.” This statement by the SIC/PM was similar to QRH page EG-5, item number 6. The SIC/PM then read the boldface conditional following item number 6, regarding low right hydraulic and auxiliary hydraulic pressure; followed by item number 7, regarding the performance of the emergency gear extension procedure cross referenced to page EG-3.

At 0908:14, the SIC/PM started to read the emergency landing gear extension checklist on QRH page EG-3. The crew decided to switch roles due to the position of

cockpit controls. The crew performed a positive exchange of flight controls[§]. The SIC/PF noted the autopilot was off.

At 0908:32, the PIC/PM continued to read the emergency landing gear extension checklist on QRH page EG-3. Item number 1, regarding slats and flaps to 20 degrees, was first read. The PIC/PM then read item number 2, airspeed reduced to minimum for configuration of v-ref plus five. The crew agreed v-ref was 138 knots and the airspeed would be 143 knots. The PIC/PM then read item number 3, regarding gear lever down.

At 0908:50, the PIC/PM, then read QRH page EG-3, item number 4, regarding emergency gear handle, release, turn and lift. The PIC/PM, asked if the SIC/PF was ready. After the SIC/PF concurred, the sound of a click was recorded.

At 0909:08, the crew confirmed the nose was down, and the PIC/PM said, "come on'."

At 0909:19, the PIC/PM confirmed the handle was all the way up. The SIC/PF asked if they were supposed to turn or yaw the plane, and the PIC/PM confirmed no such action was in the checklist.

At 0909:29, the PIC/PM said, "caution…landing gear down and three green," similar to QRH page EG-3, item number 5, while noting they did not have three green.

At 0909:33, New York Approach asked the aircraft if they wanted a 360 degree turn or if they wanted to turn right towards the airport. On the intercom the crew discussed their desire to go to a longer runway after doing an airport overflight to check the gear.

At 0909:54, the PIC/PM asked New York Approach for an overflight to check if the gear was down and, after the overflight, they would go to an airport with a longer runway. New York Approach confirmed the request and provided initial vectors for the overflight.

At 0910:19, the crew discussed concerns with the hydraulic problem. They noted no further smell of burning and that the power back on the right engine seemed "better." The PIC/PM read the final caution in the QRH emergency landing gear extension checklist on page EG-3, noting that once extended, the landing gear could not be retracted again. The PIC/PM noted he was at the end of the checklist and that he wanted to update the passenger on the issue. The crew decided it was an inappropriate time to divert attention talking to the passenger. The SIC/PF noted on the intercom he was correcting his altitude and verified the fuel was 4,000 pounds.

At 0910:51, the crew looked for, but did not find, a diagram containing hash marks in order to confirm the gear state.

At 0911:13, the PIC/PM advised he would resume flying and the crew performed a positive exchange of flight controls. The SIC/PM advised the PIC/PF to watch his airspeed as he was going to advise the passenger of the situation. The SIC/PM was then heard, in the background, advising the passenger of the gear problem and telling him to verify his seatbelt.

At 0912:02, New York Approach asked how low the aircraft would go, and the PIC/PF said 1,500 feet. New York Approach then asked how much fuel was on board

[§] Positive Exchange of Flight Controls is defined by the the FAA's, *Advanced Avionics Handbook* (FAA-H-8083-6) as when control of the aircraft is transferred between two pilots, it is important to acknowledge this exchange verbally. The pilot relinquishing control of the aircraft should state, "You have the flight controls." The pilot assuming control of the aircraft should state, "I have the flight controls," and then the pilot relinquishing control should restate, "You have the flight controls." Following these procedures reduces the possibility of confusion about who is flying the aircraft at any given time.

and the number of souls on board. The SIC/PM responded 4,000 pounds of fuel or 1.5 to 2 hours, and 3 souls on board. As the aircraft descended to 1,500 feet, the crew discussed alternative airports of Newark, Stewart, JFK, or Bradley on the intercom.

At 0912:46, New York Approach advised that White Plains Tower saw three gear extended and the SIC/PM acknowledged. After a brief discussion on the intercom, the crew agreed they needed a longer runway, the SIC/PM so advised New York Approach.

At 0913:36, the sound of a single chime similar to the master caution was heard, followed by a sound of clicking similar to the master caution reset being pressed. This sequence of a single chime followed by clicking, repeated every 20-30 seconds until approximately 0925 when the aircraft was on final approach at Stewart Newburgh.

At 0913:36, the crew discussed on the intercom which airport they would divert to and considered Stewart Newburgh. Their discussions included consideration of the weather conditions and runway lengths.

At 0914:12, New York Approach advised that Stewart was 25 miles away, as well as JFK. New York Approach asked if the aircraft wanted 2,000 or 3,000 feet for altitude, and the SIC/PM requested 2,000 feet if it was a safe altitude. He also asked for the weather at Stewart. New York Approach responded with a vector of 310 degrees, an altitude of 2,000 feet, and the availability of Stewart weather.

At 0914:59, New York Approach provided Stewart weather of wind from 150 degrees at 6 knots, visibility 15 miles, few clouds at 15,000 feet, temperature 22 degrees Celsius, and visual approaches to runway 9. The SIC/PM confirmed the weather and further asked for and received the altimeter of 30.01 inches of Mercury.

At 0915:26, the crew declared an emergency. New York Approach confirmed the aircraft wanted to go farther from the White Plains airport to Stewart and that the aircraft could accept runway 9 at Stewart. The SIC/PM requested runway 27 at Stewart, as it was a shorter distance, and New York Approach approved.

At 0916:10, the SIC/PM noted, following one of the single chimes that had started going off every 20-30 seconds at 0913:36, “that’s just because the temperature is going back and forth.” This statement was followed by the sound of a few rapid clicks, similar to the master caution reset being pressed multiple times. As previously noted, the single chime sound followed by a click continued every 20-30 seconds until 0925 when the aircraft was on final approach at SWF.

At 0916:28, the SIC/PM programmed the FMS for an ILS 27 at SWF. New York Approach issued a climb to 3,000 feet, advised the aircraft to expect a visual approach to runway 27, and that runway 16/34 was closed. The SIC/PM acknowledged. The PIC/PF asked the SIC/PM if there was any guidance on runway length for a hydraulic overheat and the crew decided there was no such guidance.

At 0917:28, the SIC/PM briefed that runway 27 was 11,000 feet in length and 150 feet wide, and had 9,818 feet remaining after the displaced threshold.

At 0917:57, the PIC/PF asked if there was any guidance for the loss of right hydraulics. The SIC/PM responded there was no guidance. The SIC/PM then noted the fuel pump was on, and the PIC/PF responded the fuel was imbalanced. The crew then discussed their concern over the right hydraulic system. They noted the right hydraulic temperature was staying at 85 degrees Celsius and was not “out of control.”

At 0919:06, the aircraft was handed off to the next sector of New York Approach, and was given a vector for the visual approach to runway 27. The PIC/PF asked the SIC/PM to look up the right hydraulic failure since the system was degraded. The SIC/PM noted the hydraulic diagram was EF-2 in the QRH.

At 0919:54, the SIC/PM began to read QRH page EF-9, the right main hydraulic system failure checklist. The SIC/PM noted the aircraft would lose: right thrust reverser, normal brakes, parking brakes, normal landing gear extension, flight inboard airbrakes, nosewheel steering, Krueger flaps, stick pusher. The SIC/PM then read the notes for this checklist: maintain below 250 knots; what to do if both left and right hydraulic systems fail; and the bold face conditional statement about right hydraulic level low. The SIC/PM noted they did not have a hydraulic level low light. The PIC/PF noted the hydraulic system was just degraded on pressure, to which the SIC/PM concurred.

The SIC/PM then began reading on QRH page EF-10, item number 1, directing auxiliary hydraulic pump, off. This was followed by the sound of switch, a single chime, and the sound of two clicks, similar to the master caution reset.

At 0920:41, the SIC/PM read the conditional statement at the top of the EF-10 (before item number 1), "if right hydraul—but that's—I'm gonna bring that back on cause that says if right hydraulic level is low…which it is not." The PIC/PF agreed, noting they still have the system.

At 0920:50, the SIC/PM noted the "hydraulics quantity" and said "yes." The SIC/PM then noted if the right hydraulics level is low it says bring it off. He noted it was low. This was followed by the SIC/PM reading QRH page EF-10, item number 2, regarding the auxiliary pump circuit breaker, check in. The SIC/PM noted all the circuit breakers were in. He then read QRH page EF-10, item number 3, auxiliary pump switch to override. A single chime was recorded once during the item number 2 statements and another time during the item number 3 statements.

At 0921:11, the SIC/PM, then twice read the note following QRH page EF-10 item number 3, directing if the pressure stays below 1200 psi, turn the auxiliary hydraulic pump off and proceed to step 10. The SIC/PM then noted the pressure did not fall below 1200 psi.

At 0921:19, the SIC/PM then read QRH page EF-10, the boldface conditional, if pressure rises to normal, auxiliary pump motor thermal protection may have been previously activated. The SIC/PM then noted "which it has." He then read QRH page EF-10, item number 4, regarding auxiliary hydraulic pump switch, auto. At this point an automated voice from the radio altimeter said "radio altimeter."

At 0921:31, the SIC/PM noted "it" dropped back down and "somethin' is going on back there." He then re-read the boldface conditional statement following item number 3, regarding a normal pressure rise. He noted the pressure didn't rise normally, but stayed low.

Between 0921:46 and 0921:56, the SIC/PM partially read through QRH page EF-10, starting at the boldface conditional following item number 4, regarding before extension of Krueger flaps. He then skipped down to the bold face heading following item number 6, and he said "final approach." He then read item number 7, regarding auxiliary hydraulic pump switch, override. This was followed by a reading of the bold heading "After aircraft has stopped clear of runway." He then read items number 8 and 9, regarding auxiliary hydraulic pump switch to auto and emergency brake lever to emergency, respectively.

At 0921:57, the PIC/PF noted they would likely need a tow in, and SIC/PM agreed. The SIC/PM then continued with QRH page EF-10, reading the bold face conditional following item number 9, regarding pressure staying below 1200 psi. He read item number 10, regarding emergency landing gear extension, noting it was already performed. He then read through items A through E, subordinate to item 10, regarding

the steps for the emergency gear extension. He then continued reading QRH page EF-11, item number 11, regarding setting the parking/emergency brake lever to emergency on final approach. The SIC/PM read the note subordinate to item number 11, regarding emergency brake operational procedures, through the first paragraph up to "…emergency brake lever in emer position--." At this point, New York Approach advised the airport was 11 miles ahead. The SIC/PM acknowledged the airport was in sight to New York Approach.

At 0922:40, New York Approach cleared the aircraft for the visual approach and advised the aircraft to contact tower on 121.0. The SIC/PM read the frequency back.

At 0922:57, the PIC/PF said on short final he would put the emergency brakes to emergency, to which the SIC/PM agreed. The crew then planned their turn to final approach.

At 0923:25, the SIC/PM then read the QRH page EF-11, item A subordinate to item number 11, regarding parking/emergency brake lever to emergency; followed by reading item B, regarding wheel brakes, apply cautiously. He then read the caution subordinate to item B, regarding the anti-skid system. He then read the first part of the note subordinate to item B, regarding the calculation of landing distance up to the bold "…50 feet tables…" There was no recording of reading the remainder of the sentence regarding increasing the AFM landing distance by 100%. He then read item number 12, regarding no Krueger flaps, noting the Krueger flaps were already out. There was no recording of the reading of the four notes and text subordinate to item number 12.

At 0923:55, the SIC/PM attempted to check in with Stewart Tower. After correcting the frequency entered on the radio, the SIC/PM reported a left base for runway 27. Stewart Tower reported winds calm and cleared the aircraft to land. The SIC/PM responded to the tower by confirming cleared to land, advised the main gear may not stay up, and that the aircraft had a hydraulic overheat so the aircraft did not have normal braking and would have to use emergency braking. He further advised they would not be able to move aircraft off the runway after landing and would require assistance from the FBO (fixed based operator) to be towed off the runway.

At 0925:06, the tower responded by asking for the fuel on board. The SIC/PM responded with 3,500 pounds of fuel or about 1.5 hours. The tower cleared the aircraft to land on runway 27, noting the trucks were standing by. During this transmission, a tone similar to the altitude alert was recorded.

At 0925:22, the PIC/PF noted the temperature was "coming up," and the crew agreed the priority was getting the aircraft on the ground.

At 0925:39, the crew then called for flaps 40, followed by the sound of a switch. This was followed by the sound of a triple chime, similar to a master warning, and the sound of a continuous, mid-level tone, similar to the landing gear warning. The landing gear warning continued until the end of the recording. The crew noted this warning could not be silenced.

The steps associated with QRH page EF-12 (before landing with right hydraulic system failure), the normal before landing checklist, and QRH page EG-6 (landing with gear up) were not recorded.

At 0926:01, the SIC/PM could be heard, off headset, advising the passenger they were landing at Newburgh and that the landing gear might not stay up. The crew then discussed the runway length and touchdown planning.

At 0926:50, the crew noted they were on short final and set the emergency brake. The sound of a switch was recorded.

At 0926:58, the PIC/PF noted he would brake cautiously. The SIC/PM advised they were good on the speeds, and the PIC/PF noted the yaw damper was off.

At 0927:05, the radio altimeter automated voice reported “one thousand.”

At 0927:10, the PIC/PF told the SIC/PM he would not taxi off the runway. The tower advised all the gear appeared to be down. The SIC/PM told the tower while the gear may appear down, cockpit indications did not indicate the gear was down.

At 0927:22, an automated voice warned, “too low gear,” and continued until 0927:48, coincident with the twenty foot automated “twenty” annunciation.

At 0927:34, the SIC/PM confirmed the speed was good. At 0927:48, as an automated voice annunciated “twenty,” the SIC/PM said, “there’s ref,” followed by an automated voice annunciating “ten.”

At 0927:55, a sound similar to touchdown was recorded.

At 0927:58, the SIC/PM said, “brakes brakes…one of your gear collapsed…just hold ‘er on the runway.” The PIC/PF said, “yep.”

At 0928:03, the SIC/PM said, “you got her. you got her. you got her. your good. you got it good. got your nosewheel steering. go to nosewheel steering. lookin' good. seventy knots.”

At 0928:18, the SIC/PM then noted the speed of 50 knots. The PIC/PF advised the crew would need the evacuation checklist.

At 0928:37, the crew noted on the intercom they would shut down the engines and run the evacuation checklist. The tower then advised the vehicles were on the way.

At 0928:48, sounds of clicks and doors opening were recorded, coincident with the engine spooling down and various chimes.

The recording ended at 0929:41 as the crew was looking for the evacuation checklist.

As part of the Safety Board’s accident investigation process, the flight crew was invited to review the CVR transcript and suggest corrections or additions. They have not responded to the invitation.

Bill Tuccio
Vehicle Recorder Division

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.