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

GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

DCA11MA076

By
Joe Gregor

WARNING

The reader of this report is cautioned that the transcription 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
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March 5, 2012

Cockpit Voice Recorder - 12

Group Chairman's Factual Report
By Joe Gregor

A. EVENT

Location:	Roswell, New Mexico
Date:	04/02/2011, 0934 Mountain Daylight Time [MDT] *
Aircraft:	Gulfstream G650, N652GD
Operator:	Gulfstream Aerospace
NTSB Number:	DCA11MA076

B. GROUP

A group was convened on April 18, 2011.

Chairman:	Joe Gregor National Transportation Safety Board
Member:	Tom Latson Air Safety Investigator National Transportation Safety Board
Member:	T. R. Proven Air Safety Investigator FAA
Member:	Randy Gaston VP, Flight Operations Gulfstream Aerospace

* All times are expressed in Mountain Daylight Time [MDT], unless otherwise noted.

C. SUMMARY

On April 2, 2011, about 0934 mountain daylight time, an experimental Gulfstream Aerospace Corporation GVI (G650), registration N652GD, serial number 6002, crashed during takeoff from runway 21 at Roswell International Air Center Airport (ROW), Roswell, New Mexico. The flight was being operated by the manufacturer as part of its G650 developmental field performance flight program. The two pilots and the two flight test engineers were fatally injured, and the airplane was destroyed. The flight was being conducted under 14 Code of Federal Regulations Part 91, and visual meteorological conditions prevailed at the time of the accident. A solid state cockpit voice recorder (CVR) was sent to the National Transportation Safety Board's Audio Laboratory for readout. A CVR group meeting convened on April 18, 2011 and a partial transcript was prepared for the 2-hour, 2-minute, 45-second digital recording (see attached).

D. DETAILS OF INVESTIGATION

On 04/06/2011 the NTSB Vehicle Recorder Division's Audio Laboratory received the following CVR:

Recorder Manufacturer/Model: **Universal**
Recorder Serial Number: **202**

Recorder Description

This model CVR, is a solid-state CVR that records 2 hours of 4-channel digital cockpit audio. The recorded audio data is separated by the download software into 4 separate audio data files The recording consists of one channel that contains audio information from the cockpit area microphone (CAM) and 3 channels that contain audio information from each of the individual flight crew positions.

Recorder Damage

Upon arrival at the audio laboratory, it was evident that the exterior of the CVR had sustained some heat damage. The outer case was removed and the interior crash-protected case did not appear to have any heat or structural damage (see figures 1 and 2). The memory board within the crash–protected case was checked for heat or structural damage and none was found. The digital audio was successfully downloaded from the memory board using a surrogate unit.

Figure 1. Damaged CVR recovered from G-650 aircraft.

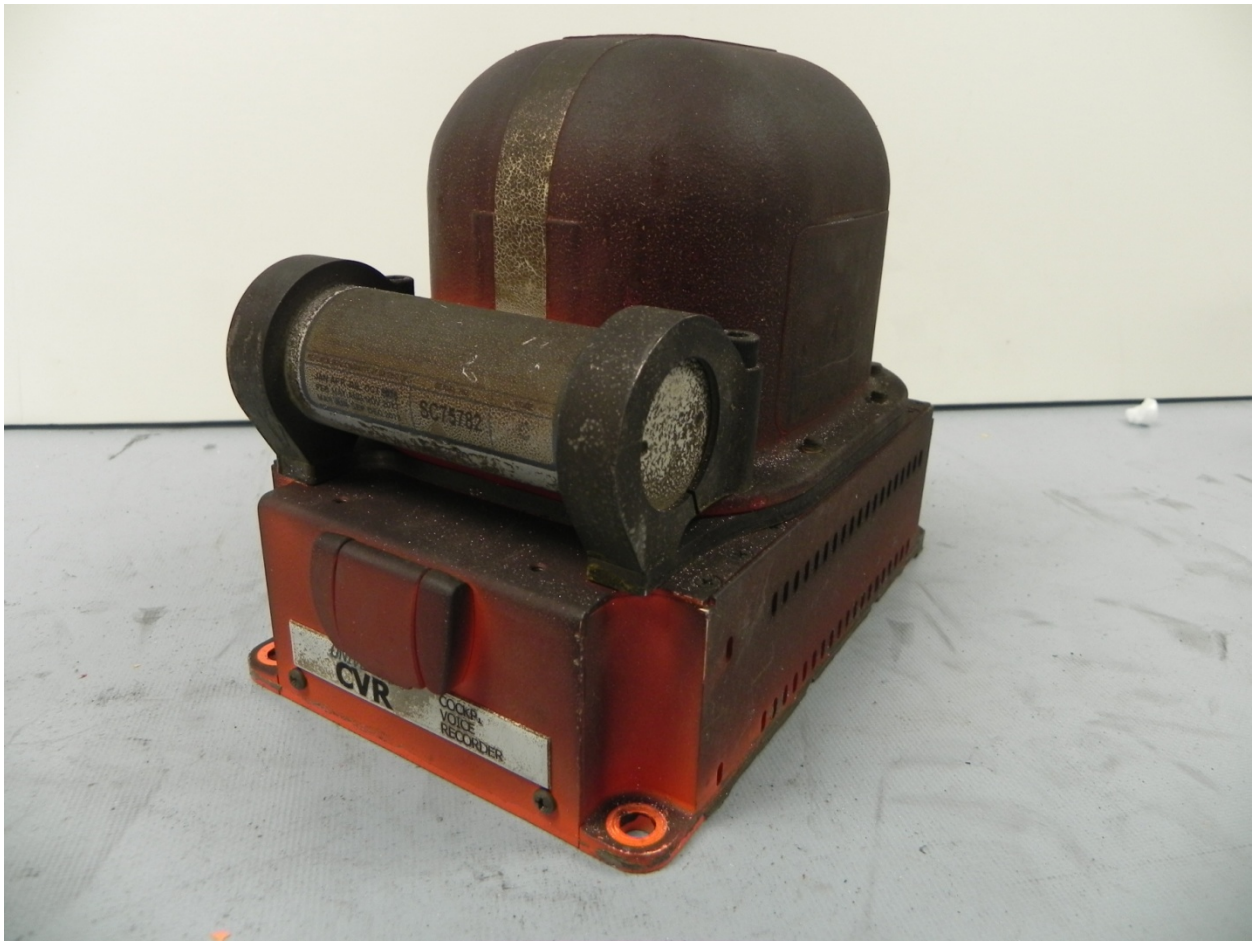


Figure 2. Memory Module from damaged CVR.

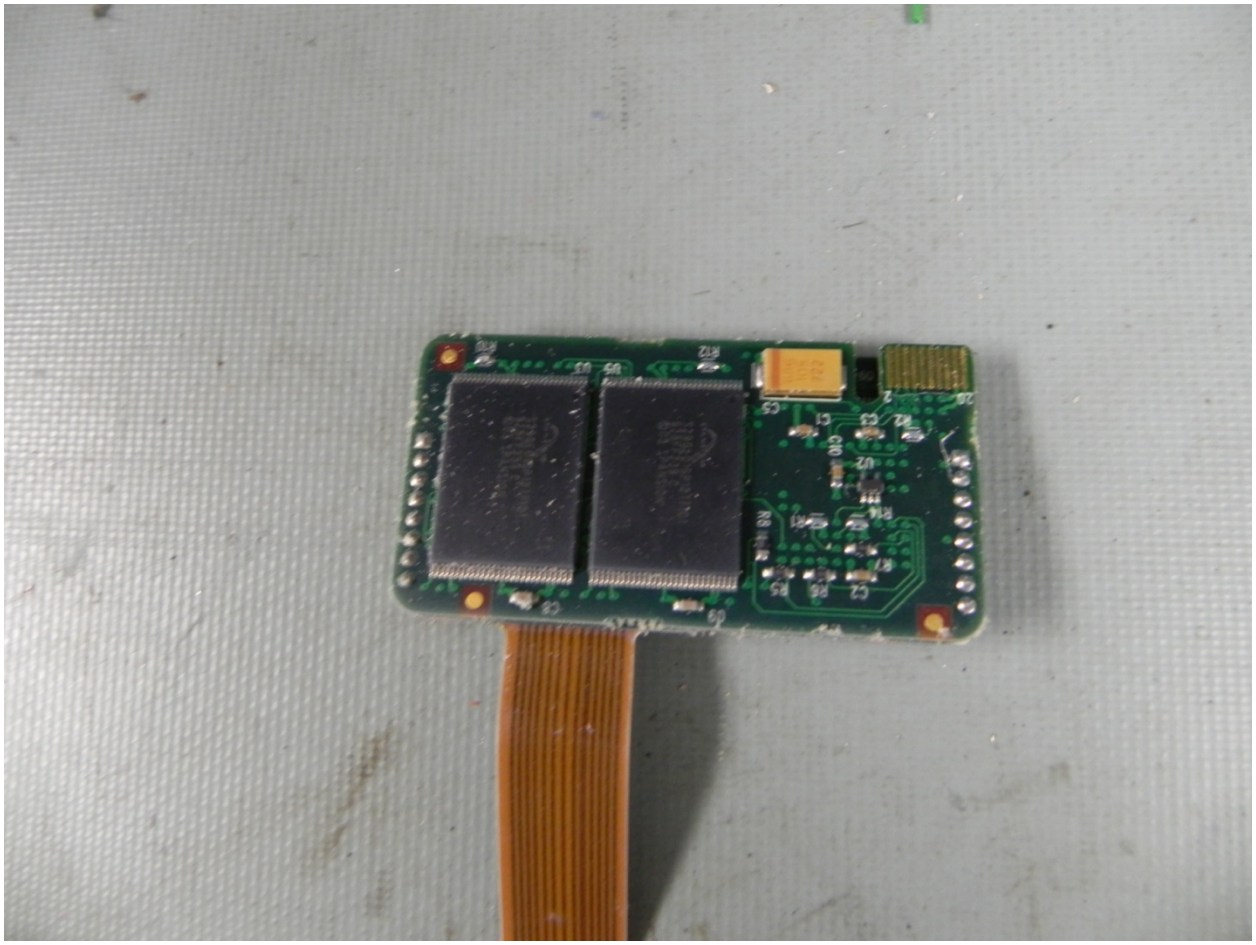
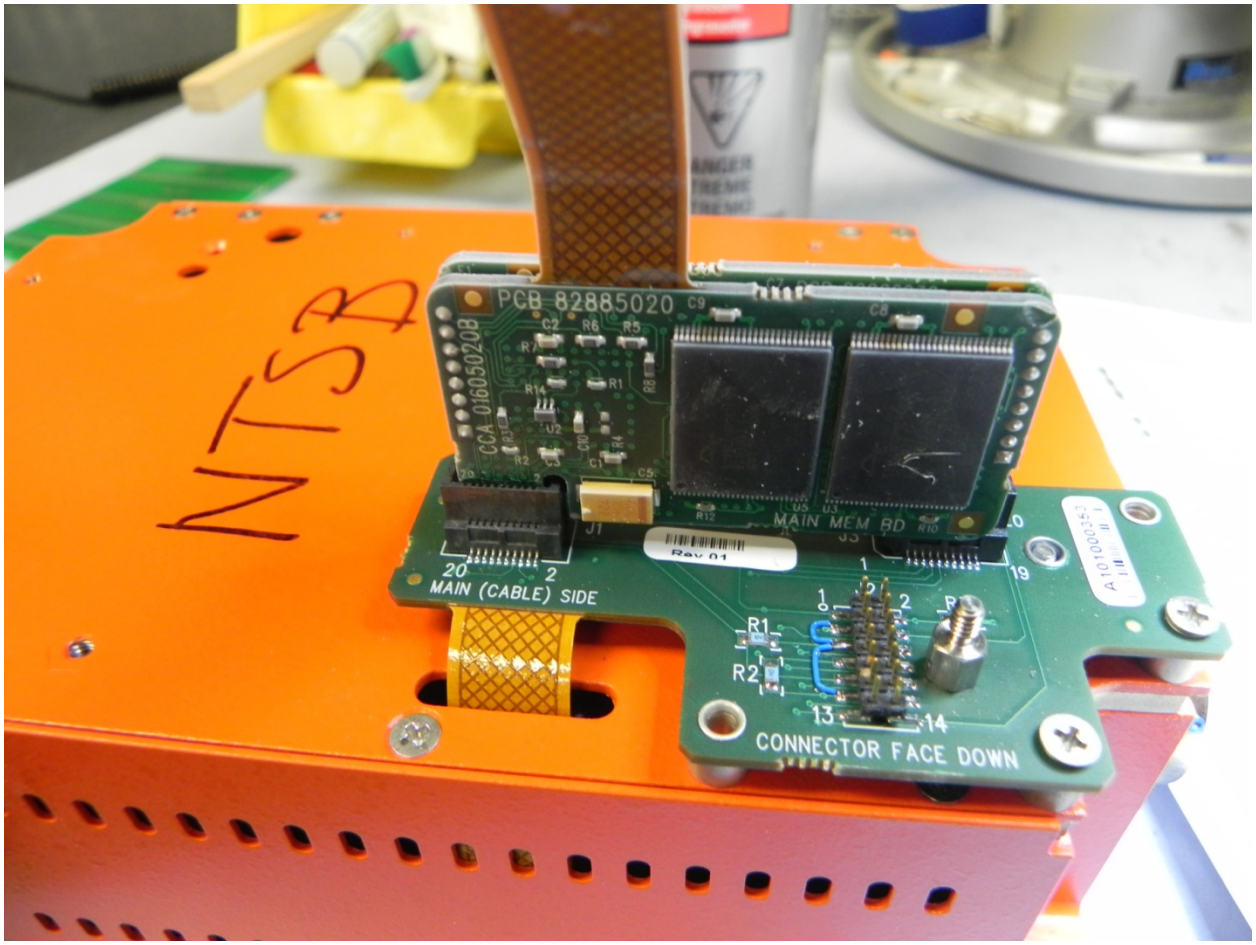


Figure 3. Memory Module shown installed in surrogate unit for download.



Audio Recording Description

The 2-hr, 2-minute, 45-second recording consisted of four channels of audio information. Each channel's audio quality[†] is indicated in Table 1. Channel number two did not contain any additional audio information.

Table 1: Audio Quality

Channel Number	Content/Source[‡]	Quality
1	CAPT	Excellent
2	Other	Excellent
3	FO	Excellent
4	CAM	Poor/Unusable

[†] See attached CVR Quality Rating Scale.
[‡] CAPT: Captain, FO: First Officer, Other: Other, CAM: Cockpit Area Microphone.

Timing and Correlation

Timing on the transcript was established by correlating the CVR events to common events on the on-board flight test data acquisition system. Specifically, ten points related to microphone keying events recorded on both the CVR and the flight test data acquisition system were used. Each point acted as an anchor point for a linear interpolation between the remaining CVR events. The correlation resulted in agreement between the two recordings within ± 1 second. Times in the transcript portion of this report are reported to 1/10 second precision, and are based on visual identification of the beginning for each phrase as displayed by the NTSB transcription software. Times are accurate to ± 1 second, based on correlation between the CVR recording and time-stamped flight test data.

Description of Audio Events

The recording began at 0731:25 MDT, with the CVR recording sounds consistent with the aircraft in-flight and preparing to land. The aircraft landed and took off two more times, flying test card runs designated 2C3 and then 2C4. During the flight for test card 2C4, at approximately 0752:52, the CVR recorded sounds similar to the stick shaker, and the captain commented “little shaker.” The aircraft continued to perform takeoffs and landings while flying eight additional test card runs.

The remainder of the CVR recording, starting at time 0923:43 MDT, was transcribed as shown starting on page 12-11. The recording ended at 0934:10 MDT.

Joe Gregor
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.

Transcript of a Universal solid-state cockpit voice recorder, serial number 202, installed on an Gulfstream Aerospace Gulfstream G650 (N652GD), which crashed during takeoff in Roswell, New Mexico.

LEGEND

CAM	Cockpit area microphone voice or sound source
HOT	Flight crew audio panel voice or sound source
RDO	Radio transmissions from N652GD
TM	Radio transmission from the telemetry trailer
TWR	Radio transmission from the Roswell airport tower controller
-1	Voice identified as the Pilot
-2	Voice identified as the Co-pilot
-3	Voice identified as the Flight test engineer
-?	Voice unidentified
*****	Unintelligible word
#	Expletive
@	Non-pertinent word
( )	Questionable insertion
[ ]	Editorial insertion

Note 1: Times are expressed in Mountain Daylight Time (MDT).

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
07:31:25.2	[start of recording]		
Start of Transcript			
		09:23:43.5 **TWR**	Gulftest three one ah one eighty approved wind one seven zero at seven runway two one right seventy correction ah right ninety left two seventy approved cleared for takeoff.
		09:23:55.5 **RDO-2**	cleared for takeoff on two one with the teardrop Gulftest three one.
09:23:59.8 **HOT-3**	okay this time we're gonna be doin' a the (card) seven ah Alpha which is the max takeoff power to ah idle on the right engine.		
09:24:03.1 **HOT-2**	card seven.		
09:24:03.4 **HOT-?**	one hundred.		
09:24:04.0 **HOT-1**	engine out, engine out?		
09:24:06.0 **HOT-2**	right?		
09:24:11.5 **HOT-3**	at ah V-1 minus twenty so.		
09:24:12.5 **HOT-1**	(do) we use ah-		
09:24:14.6 **HOT-1**	let's just use a hundred knots for that that's just V-1 minus twenty we just round it off five and so a hundred knots will be (V-E-F).		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:24:15.9 **HOT-2**	okay.		
09:24:18.3 **HOT-?**	* * * hundred * * one twenty eight, one thirty six rotate will be one trims are the same.		
09:24:19.9 **HOT**	on runway two one [electronic voice].		
09:24:24.6 **HOT-3**	trims (is) eight point oh.		
09:24:27.4 **HOT-1**	trims are the same.		
09:24:28.7 **HOT-2**	this is slower accel- just call it right at the number?		
09:24:30.6 **HOT-3**	yeah.		
09:24:32.0 **HOT-3**	yeah that's all- * good.		
09:24:33.8 **HOT-1**	let's do that.		
09:24:35.1 **HOT-2**	so rotate's one twenty eight's the call.		
09:24:37.9 **HOT-3**	you're lookin' for one thirty six *.		
09:24:38.3 **HOT-1**	card seven.		
09:24:38.9 **HOT-2**	airspeed one thirty six we're settin' in there.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:24:42.7 **HOT-1**	thirty six is V-2.		
09:24:43.8 **HOT-2**	six.		
09:24:45.6 **HOT-2**	speeds spoilers armed.		
09:24:47.7 **HOT-1**	and ah let’s see your engine cut * is ah * is about one hundred nice round number.		
09:24:52.6 **HOT-2**	flaps are ten. 's good.		
09:24:54.7 **HOT-2**	still want the trim at eight correct?		
09:24:56.6 **HOT-3**	that's correct.		
09:24:56.9 **HOT-1**	yeah.		
09:24:57.8 **HOT-2**	set, this is M-T-O.		
09:24:59.7 **HOT-1**	fuel remaining we got thirty two seven.		
09:25:02.1 **HOT-1**	(we're) eighty eight point two now.		
09:25:04.8 **HOT-2**	so we're doing the M-T-O correct, seven Alpha?		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:25:07.0 **HOT-3**	that's correct seven Alpha we I don't have a pull-back for the other ones.		
09:25:10.5 **HOT-2**	okay.		
09:25:11.1 **HOT-3**	roger *.		
09:25:11.7 **HOT-1**	M-T-O to throttle chop right, okay.		
09:25:13.4 **HOT-2**	yup.		
09:25:14.0 **HOT-1**	okay.		
09:25:15.2 **HOT-3**	get this one good I'll give you a banana.		
09:25:15.2 **HOT-1**	* *.		
09:25:17.1 **HOT**	[sound of laughter].		
09:25:17.3 **HOT-1**	I already have one.		
09:25:20.1 **HOT-1**	a banana all right.		
09:25:21.7 **HOT-1**	okay you're gonna you're gonna get that at one one hundred * * this here and then give me a little bit of a lead on the rotate.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:25:24.8 **HOT-2**	a hundred one twenty eight, and I have one thirty six.		
09:25:29.8 **HOT-2**	when you're targeting nine on the pitch just a pause during liftoff.		
09:25:31.0 **HOT-1**	yeah actually no lead on the V-R just tell me V-R * cause it's more (anemic). all right you ready? okay configuration's good there we go.		
09:25:44.9 **HOT-1**	okay we're cleared?		
09:25:45.8 **HOT-2**	power's set we are cleared.		
09:25:47.3 **HOT-1**	you guys ready?		
09:25:48.5 **HOT-3**	ah ready in the back.		
09:25:49.0 **HOT-1**	okay brake release twenty five fifty here we go.		
09:25:49.6 **HOT-3**	ready.		
09:25:55.3 **HOT-2**	power's set.		
09:25:58.2 **HOT-2**	airspeeds alive.		
09:25:58.7 **HOT-1**	okay my yoke.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:26:05.1 **HOT-2**	eighty knots.		
09:26:05.9 **HOT-1**	okay.		
09:26:10.5 **HOT-2**	right throttle's back.		
09:26:19.5 **HOT-2**	stand by rotate, ah.		
09:26:25.1 **HOT-1**	(straight)?		
09:26:31.4 **HOT-2**	if the brake fails (stop) we're gonna have to recycle the circuit breakers.		
09:26:34.8 **HOT-2**	still climbing target one thirty six.		
09:26:37.3 **HOT-3**	'kay check the trim for me at ah V-2?		
09:26:43.5 **HOT-1**	* still on the ground is that why it didn't want to come up or what?		
09:26:45.5 **HOT-2**	yeah yeah it took that long.		
09:26:46.7 **HOT-1**	oh it did okay there's ah trim is ah trim is good.		
09:26:51.2 **HOT-3**	okay.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:26:51.7 **HOT-1**	ah think that's fine I mean I I'm within a few knots of it I mean it's less that ah probably less than ten pounds of pull there it is, it's about fifteen degrees.		
09:26:59.4 **HOT-2**	all right.		
09:27:59.8 **HOT-1**	I think we're good * gear's comin' up.		
09:27:00.1 **HOT**	[sound similar to altitude pre-selector warning tone].		
09:27:02.2 **HOT-?**	okay.		
09:27:02.4 **HOT-3**	test point's done?		
09:27:03.2 **HOT-2**	we gotta cycle the circuit breakers.		
09:27:05.2 **HOT-1**	on the brake by wire yeah that's on the overhead.		
09:27:08.4 **HOT-2**	'kay.		
09:27:14.4 **HOT-2**	pull, one two three in. brake by wire failure is gone.		
09:27:24.3 **HOT-1**	it's rescinded.		
09:27:24.9 **HOT-2**	* good.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:27:26.8 **HOT-1**	I'll get below one sixty we'll get the flaps they seem to like that better for some reason.		
09:27:37.3 **HOT-1**	okay flaps twenty.		
09:27:38.4 **HOT-2**	okay twenty comin'.		
09:27:50.9 **HOT-1**	gear down landing checklist.		
09:27:53.2 **HOT-2**	gear's comin'.		
09:28:02.7 **HOT-2**	three down 'n locked flaps are twenty ground spoilers armed.		
09:28:05.0 **HOT**	[sound of single chime].		
09:28:06.6 **HOT-2**	nose-wheel steering is on.		
09:28:07.6 **HOT-1**	it's on still on.		
09:28:09.3 **HOT-2**	brakes are good.		
09:28:11.2 **HOT-2**	no CAS * messages are inhibit.		
09:28:11.6 **HOT**	[sound similar to altitude pre-selector warning tone].		
09:28:14.2 **HOT-2**	just flaps to go.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:28:15.3 **HOT-1**	roger that.		
09:28:23.1 **HOT-1**	okay landing flaps.		
09:28:24.3 **HOT-2**	okay comin'.		
09:28:29.4 **HOT-2**	*.		
09:28:34.0 **HOT-1**	they're not moving?		
09:28:35.6 **HOT-2**	well the lever's lifting up but it's not comin' down.		
09:28:39.1 **HOT-2**	looks like it's.		
09:28:41.8 **HOT-2**	* * nice handle isn't it.		
09:28:42.2 **HOT-1**	yeah * got ah got a bad flap lever. *.		
		09:28:44.2 **TWR**	Gulftest three one wind one niner zero at seven runway three cleared to land.
09:28:45.8 **HOT-?**	*.		
		09:28:49.6 **RDO-2**	cleared to land runway three Gulftest three one.
09:28:52.5 **HOT-2**	all right flaps in transit.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:28:53.9 **HOT-1**	they movin' now?		
09:28:54.6 **HOT-2**	yup.		
09:28:55.2 **HOT-1**	what do you think it was?		
09:28:56.6 **HOT-2**	I don't know. just didn't feel- just *. yeah.		
09:28:57.2 **HOT-1**	little ah W-D forty of something. well we di- that's an issue that's an issue on some of the airplanes. not sure we're real fond of that flap lever.		
09:29:05.9 **HOT-2**	(ground) flaps spoilers we're cleared to land.		
09:29:09.3 **HOT-1**	cleared to land.		
09:29:16.5 **HOT-2**	still a little heavy.		
09:29:18.6 **HOT-1**	yup. roger that.		
09:29:20.7 **HOT-1**	little quartering tailwind.		
09:29:21.2 **HOT**	minimums [electronic voice].		
09:29:23.2 **HOT**	approaching zero three [electronic voice].		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:29:28.2 **HOT-1**	what are you guys showin' for winds.		
09:29:29.8 **HOT**	three hundred [electronic voice].		
09:29:31.0 **HOT-3**	four knots at ah one fifty four.		
09:29:32.9 **HOT-1**	okay. that's not bad.		
09:29:36.6 **HOT**	two hundred [electronic voice].		
09:29:42.7 **HOT**	one hundred [electronic voice].		
09:29:45.8 **HOT**	fifty [electronic voice].		
09:29:46.9 **HOT**	forty [electronic voice].		
09:29:48.1 **HOT**	thirty [electronic voice].		
09:29:49.2 **HOT**	twenty [electronic voice].		
09:29:50.6 **HOT**	ten [electronic voice].		
09:29:56.4 **HOT-2**	good spoilers.		
09:29:58.9 **HOT-2**	there's one thirty.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:29:59.4 **HOT-1**	one thirty. okay.		
09:30:01.8 **HOT-2**	good, good T-R's.		
09:30:16.3 **HOT-2**	seventy knots.		
09:30:18.6 **HOT**	six thousand remaining [electronic voice].		
09:30:26.5 **HOT-2**	so what y'all wanna do next.		
09:30:27.7 **HOT**	five thousand remaining [electronic voice].		
09:30:28.6 **HOT-3**	well. what did they think of that run in the trailer?		
09:30:32.9 **HOT-3**	we were a little fast at V-2 but ah.		
09:30:35.2 **HOT-1**	well we can do another one and just less of a pause we just almost a continual maneuver then.		
09:30:37.3 **HOT-?**	less of a pause.		
09:30:37.4 **HOT**	four thousand remaining [electronic voice].		
09:30:41.0 **HOT-1**	yep I can do that. target nine and just keep going I'm mean its ah.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
		09:30:41.9 **TM**	standby.
09:30:46.1 **HOT-2**	yeah.		
09:30:46.6 **HOT-1**	I don't know how else we're gonna do it.		
09:30:46.9 **HOT-3**	seemed like we're kinda hangin' there for a little bit.		
09:30:48.5 **HOT**	three thousand remaining [electronic voice].		
09:30:49.1 **HOT-1**	well we we're pausing 'cause we're trying to do this capture and I think we're getting ah too focused on that. yeah I.		
09:30:53.5 **HOT-3**	wrapped on that.		
09:30:55.9 **HOT-1**	I think it's a target and then ah because if you have a real engine failure the guys aren't gonna be lookin' at nine degrees they're gonna be looking at trying to get V-2 they're not payin' any attention to that. so, what I think.		
09:31:01.6 **HOT**	two thousand remaining [electronic voice].		
		09:31:04.3 **RDO-2**	and tower Gulftest three one like to do a one eighty at the end and takeoff on two one teardrop return.
09:31:07.9 **HOT-1**	it's an abnormal.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
		09:31:09.0 **TM**	* (target) * (V-2) *.
09:31:09.1 **HOT-2**	yeah.		
		09:31:11.0 **TWR**	* three one one eighty approved runway two one right ninety left two seventy approved cleared for takeoff wind one seven zero at niner.
		09:31:19.6 **RDO-2**	* approved cleared for takeoff runway two one Gulftest thirty one.
09:31:23.3 **HOT-2**	all right flaps comin' back up.		
09:31:26.3 **HOT-2**	run your trim up to eight.		
09:31:30.7 **HOT-3**	eighty seven so.		
09:31:35.0 **HOT-1**	eight still good?		
09:31:35.2 **HOT-2**	go with the same V-speeds?		
09:31:36.2 **HOT-3**	one twenty five one twenty seven one thirty five so a knot off.		
09:31:40.3 **HOT-2**	okay.		
09:31:41.0 **HOT**	one hundred remaining [electronic voice].		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:31:44.7 **HOT-2**	twenty seven.		
09:31:49.0 **HOT-2**	one thirty five.		
09:31:50.4 **HOT-1**	one thirty five.		
09:31:51.1 **HOT-1**	why don't you set that for me. yup.		
09:31:52.0 **HOT-2**	one thirty five there.		
09:31:55.5 **HOT-2**	* three flaps are ten (ground) spoilers are armed nose-wheel steering hydraulics.		
09:31:59.0 **HOT-3**	trim is eight.		
		09:32:00.5 **TM**	winds are starting to pick up.
09:32:02.7 **HOT-1**	yeah wha- what ya got now @ for winds?		
09:32:06.1 **HOT**	on runway two one [electronic voice].		
		09:32:07.2 **TM**	one five six at five right now but I've seen it up to eight.
09:32:11.6 **HOT-1**	oh really? okay I think we're still okay with where we're at.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:32:16.5 **HOT-2**	yeah the airspeed on that one you could you could tell it really paused it paused like it was kinda rollin' like it had a couple seconds couple seconds then it just jumped. it just like went.		
09:32:22.2 **HOT-3**	yeah yeah boom.		
09:32:26.7 **HOT-3**	yeah I think this is probably the last takeoff then.		
09:32:28.8 **HOT-1**	right okay.		
09:32:30.1 **HOT-3**	and then we'll eh so you could start rounding the fuel truck up.		
09:32:35.2 **HOT-2**	this is seven-A-two?		
09:32:37.1 **HOT-3**	yeah.		
09:32:37.5 **HOT-2**	seven Alpha two.		
09:32:38.7 **HOT-1**	did you guys hear that back there we'll go ahead and think about the fuel truck. here I'll give 'em a call on mobile.		
		09:32:45.1 **RDO-1**	and Gulftest three one ah mobile looks like ah we're gonna do another run and we'll be ah looking for the fuel truck.
09:32:54.7 **HOT-1**	don't know if they can see us down there or not, all right guys ready. same deal we got ten we got eight.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:32:57.8 **HOT-?**	yup.		
09:32:58.4 **HOT-?**	yeah.		
09:33:00.9 **HOT-2**	okay cleared for takeoff.		
09:33:02.3 **HOT-1**	here we go.		
09:33:07.8 **HOT-1**	a ah it's gonna be card seven and your gonna have that one at hundred knots.		
09:33:11.4 **HOT-2**	seven * two chop at a hundred. one twenty seven rotate one thirty five speed.		
09:33:13.7 **HOT-1**	you guys ready?		
09:33:15.4 **HOT-1**	okay and we're cleared right?		
09:33:16.3 **HOT-2**	yes sir.		
09:33:16.9 **HOT-1**	okay thirty three seventeen is brake release.		
09:33:22.2 **HOT-2**	power set.		
09:33:25.5 **HOT-1**	airspeed's alive I got the yoke.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:33:27.0 **HOT-2**	'kay.		
09:33:32.3 **HOT-2**	eighty knots.		
09:33:37.8 **HOT-2**	chop.		
09:33:41.4 **HOT**	[sound of bump].		
09:33:45.7 **HOT-2**	standby, rotate.		
09:33:50.8 **HOT-1**	* (going on).		
09:33:52.1 **HOT-2**	oh whoa whoa whoa whoa.		
09:33:52.8 **HOT-1**	whoa whoa.		
09:33:52.8 **CAM**	[sound of increased background noise].		
09:33:53.6 **HOT**	bank angle, bank angle [electronic voice].		
09:33:54.3 **HOT-1**	power power power.		
09:33:55.2 **HOT-2**	power power power's up.		
09:33:56.6 **HOT-1**	power power power.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
09:33:57.4 **HOT-2**	no no no no. *.		
09:33:58.5 **HOT**	bank angle, bank angle [electronic voice].		
09:34:00.0 **HOT-1**	ah sorry guys.		
09:34:02.4 **HOT**	[sound similar to triple chime alarm].		
09:34:04.7 **HOT-?**	* * *.		

End of Transcript

09:34:10.3 [end of recording]