NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Vehicle Recorder Division
Washington, DC 20594

GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

CHI08MA270

By
Christopher Babcock

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
Vehicle Recorder Division
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September 11, 2008

Cockpit Voice Recorder - 12

Group Chairman's Factual Report
By Christopher Babcock

A. EVENT

Location:	Columbus, Ohio
Date:	September 1, 2008, 12:06 Eastern Daylight Time (EDT)[1]
Aircraft:	Convair 580, N587X
Operator:	Air Tahoma, Flight 587
NTSB Number:	CHI08MA270

B. GROUP

A group was convened on September 10, 2008.

Chairman:	Christopher Babcock Aerospace Engineer National Transportation Safety Board
Member:	Al Furneaux Convair Chief Pilot Kelowna Flightcraft
Member:	Bob Hendrickson Air Safety Investigator Federal Aviation Administration
Member:	Kathy Rude Director of Safety and Security Air Tahoma, Inc.
Member:	Jim Silliman Air Safety Investigator National Transportation Safety Board

[1] All times are expressed in local Eastern Daylight Time, unless otherwise noted.

C. SUMMARY

On September 1, 2008, a Convair 580, registration N587X operated by Air Tahoma, crashed following takeoff from the Rickenbacker International Airport in Columbus, Ohio. The aircraft was destroyed and the crew of three was killed. A tape cockpit voice recorder (CVR) was sent to the National Transportation Safety Board's Audio Laboratory for readout. The CVR group meeting convened on September 10, 2008, and prepared a full transcript of the 33-minute, 11-second recording (see attached).

D. DETAILS OF INVESTIGATION

On September 3, 2008, the NTSB Vehicle Recorder Division's Audio Laboratory received the following CVR:

Recorder Manufacturer/Model: **Sundstrand Model AV-557C**
Recorder Serial Number: **566**

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 of CVR operation. This model CVR, the Sundstrand Model AV-557C, records 30 minutes of analog audio on a continuous loop tape in a four-channel format: one channel for each flight crew and one channel for the cockpit area microphone (CAM).

Recorder Damage

Upon arrival at the audio laboratory, it was evident that the exterior of the CVR had sustained some heat and structural damage. The outer case was removed and the interior crash-protected case did not appear to have any heat or structural damage.

Audio Recording Description

The 33-minute, 11-second recording consisted of three channels of useable audio information. Each channel's audio quality[2] is indicated in the table. Notably, channel number four did not contain any audio information (nor was it required by Federal regulations).

Table 1 Audio Contents and Quality

Channel	Content/Source	Quality
1	Captain	excellent
2	1st Officer	excellent
3	CAM	good
4	N/A	N/A

[2] See attached CVR Quality Rating Scale.

Timing and Correlation

Timing on the transcript was established by correlating the air traffic control recording transmission time to the corresponding CVR event. Specifically, the CVR time of the final radio transmission from N587X was linked to the corresponding ATC local time, and all CVR events were offset to reflect the local EDT of the accident.

Description of Audio Events

The recording and transcript begin at 1132:47 and cover the preflight, taxi, takeoff, and accident events. The recording and transcript end at 1205:58.

Christopher Babcock
Aerospace Engineer
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 Sundstrand Model AV-557C tape cockpit voice recorder, serial number 566, installed on an Air Tahoma Convair 580 (N587X), which crashed after takeoff while attempting to return to the Rickenbacker International Airport in Columbus, Ohio.

LEGEND

CAM	Cockpit area microphone voice or sound source
HOT	Flight crew audio panel voice or sound source
RDO	Radio transmissions from N587X
GND	Radio transmission from the Rickenbacker ground controller
TWR	Radio transmission from the Rickenbacker airport tower controller
-1	Voice identified as the captain
-2	Voice identified as the first officer
-3	Voice identified as the jumpseat passenger
-?	Voice unidentified
*****	Unintelligible word
#	Expletive
@	Non-pertinent word
( )	Questionable insertion
[ ]	Editorial insertion

Note 1: Times are expressed in EDT.

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.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:32:47 **START OF RECORDING** **START OF TRANSCRIPT**			
		11:32:53 **ATIS**	...weather wind one one zero at four visibility seven clear below one two thousand temperature two seven Celsius dewpoint one eight altimeter three zero one niner remarks density altitude two thousand one hundred expect ILS runway five right or ILS runway five left approach landing and departing runway five right and runway five left.
11:33:03 **CAM-1**	* can you mark it? you got two number two.		
		11:33:25 **ATIS**	Columbus Rickenbacker International Airport automated weather observation one five three three zulu. weather wind one one zero at five visibility seven clear below one two thousand temperature two seven Celsius dewpoint one eight altimeter three zero one niner remarks density altitude two thousand one hundred expect ILS runway five right or ILS runway five left approach landing and departing runway five right and runway five left.
11:33:34 **CAM-1**	can I borrow your pen? do you have a pen? *.		
		11:34:04 **ATIS**	Columbus Rickenbacker International Airport automated weather observation one five three four zulu. weather wind one three zero at six visibility seven clear below one two thousand temperature two seven Celsius dewpoint one eight altimeter three zero one niner remarks density altitude two thousand one hundred expect ILS runway five right or ILS runway five left approach landing and departing runway five right and runway five left.
		11:34:43 **ATIS**	Columbus Rickenbacker International Airport automated weather observation one five three five zulu. weather wind one four zero at six visibility seven clear below one two thousand temperature two seven Celsius dewpoint one eight altimeter three zero one eight remarks density altitude two thousand one hundred expect ILS runway five right or ILS runway five left approach landing and departing runway five right and runway five left.
11:34:48 **CAM-2**	three zero one niner.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:34:50 **CAM-1**	three zero one nine.		
11:34:56 **CAM-2**	okay.		
11:34:57 **CAM-1**	three zero one niner all right set		
11:34:58 **CAM-2**	three zero one nine set and crosschecked.		
11:35:00 **CAM-1**	now one second this is comm one in this aircraft. comm one okay.		
11:35:06 **CAM-2**	okay.		
11:35:06 **CAM-1**	okay and you have comm two and that's it. like this here okay.		
11:35:11 **CAM-2**	okay...and uh...all right.		
11:35:14 **CAM-1**	usually on all the other aircraft this is comm three here.		
11:35:18 **CAM-2**	okay.		
11:35:19 **CAM-1**	here's comm one.		
11:35:21 **CAM-2**	one two and uh I guess this is nav one here and that's nav two?		
11:35:25 **CAM-1**	exactly. on this aircraft.		
11:35:32 **CAM-1**	DME is extra here etcetera on all the aircraft it's always here somewhere. okay?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:35:38 **CAM-2**	okay.		
11:35:39 **CAM-1**	all right so we got this all right go on.		
11:35:47 **CAM-2**	okay let's see where are we?		
11:35:53 **CAM-2**	okay we got the altimeters...airspeed selectors.		
11:35:58 **CAM-1**	high speed. put this on high speed you see here high or low speed. just turn this one here. can you— no this one you cannot. so leave it on high speed please. [sound of laughter]		
11:36:08 **CAM-2**	okay I'll I'll leave it where it is.		
11:36:10 **CAM-1**	when the zero fuel weight is below forty five thousand or above...the panel doesn't work. so...		
11:36:13 **CAM-2**	forty five.		
11:36:20 **CAM-2**	so we leave it where it is.		
11:36:21 **CAM-1**	high speed all right.		
11:36:23 **CAM-2**	okay uhhh...fuel and oil quantities? uhh...		
11:36:31 **CAM-1**	we have about over nine thousand in there. here you see? fuel.		
11:36:36 **CAM-2**	yup okay.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:36:37 **CAM-1**	and the oil quantity. minimum dispatch is remember limitations.		
11:36:42 **CAM-1**	one gallon showing here.		
11:36:43 **CAM-2**	one gallon. showing yeah on the gauges either up here or down there.		
11:36:47 **CAM-1**	right down is much more here here should be one in the cockpit okay. all right.		
11:36:48 **CAM-2**	and so it will give you four point five.		
11:36:54 **CAM-?**	**.		
11:36:56 **CAM-1**	huh? they're not accurate okay so we have more than nine thousand.		
11:37:02 **CAM-3**	okay.		
11:37:02 **CAM-2**	I think he was looking at the balance.		
11:37:02 **CAM-1**	the best thing— yeah you look under the wing on this or make a dipstick.		
11:37:07 **CAM-2**	yeah.		
11:37:08 **CAM-1**	and then you know how much. this one is just—.		
11:37:10 **CAM-2**	it's a reference.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:37:12 **CAM-1**	right. never count on this one exactly.		
11:37:14 **CAM-2**	oh okay...okay...parking brakes?		
11:37:22 **CAM-1**	it's set here and we have a little pressure right here.		
11:37:25 **CAM**	[sound similar to DC emergency hydraulic pump]		
11:37:30 **CAM-2**	it's going up.		
11:37:35 **CAM-1**	make sure you have pressure when you start the engines when they take the chocks out. and usually it's okay but after a long stand you like overnight.		
11:37:44 **CAM-2**	yeah * now right.		
11:37:45 **CAM-1**	okay yeah it's good this will come up okay.		
11:37:48 **CAM-2**	okay uhhh trim tabs?		
11:37:52 **CAM-1**	one two three set.		
11:37:56 **CAM-2**	uhh beacon?		
11:37:57 **CAM-1**	beacon let's go where is the beacon somewhere beacon— no no no always on manual. auto is on ground it's off in flight it's on. we want it on ground on. always in manual.		
11:38:08 **CAM-2**	auto in flight.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:38:10 **CAM-1**	no no no always manual. you can turn it on auto on ground it's off in flight it's on. we don't want that so always on manual okay.		
11:38:11 **CAM-2**	manual always on manual.		
11:38:21 **CAM-3**	* in order to work right.		
11:38:23 **CAM-2**	pressure control?		
11:38:24 **CAM-1**	we have to start the GTC.		
11:38:34 **CAM-1**	how bout we get the clearance first...can you ask for a clearance please?		
11:38:39 **CAM-2**	okay.		
11:38:41 **CAM-1**	it's Tahoma Tahoma five eight seven.		
11:38:48 **CAM-1**	do you have a headset?		
11:38:49 **CAM-2**	no.		
11:38:50 **CAM-1**	there's one here up here.		
11:38:53 **HOT-1**	ah okay can you here me? can you hear me? can you? this is talk. the hot mike is on.		
11:39:04 **CAM-2**	yeah.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:39:09 **HOT-2**	uh okay.		
11:39:12 **HOT-1**	okay?		
11:39:14 **HOT-2**	yeah can you hear me?		
11:39:15 **HOT-1**	yeah.		
11:39:15 **HOT-3**	I can hear everybody.		
11:39:16 **HOT-1**	oh all right good. all right.		
11:39:19 **HOT-2**	and...		
11:39:20 **HOT-1**	I think it's ground frequency here. you understand them better than I do.		
11:39:24 **HOT-3**	one twenty one eight five.		
11:39:25 **HOT-1**	I guess so yeah that's here.		
11:39:26 **HOT-2**	twenty one eighty five.		
11:39:27 **HOT-1**	it's on. make sure comm one button is in there.		
11:39:31 **HOT-2**	comm one is up.		
11:39:31 **HOT-1**	no the button on top.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:39:33 **HOT-2**	yeah on top it's—.		
11:39:35 **HOT-1**	no— it's in in yeah that one the push button no right on top of the switch yeah this one in now you talk okay.		
11:39:42 **HOT-2**	okay.		
11:39:43 **HOT-1**	but now you have to have this one is I think this way here. hold on. yeah. to the right. this one to the right. to the left is intercom. okay?		
11:39:55 **HOT-2**	and we're who?		
11:39:57 **HOT-1**	Tahoma five eight seven. and we're going to uh Mansfield.		
		11:40:10 **RDO-2**	and ground Tahoma five eight seven to Mansfield.
		11:40:15 **GND**	Tahoma five eighty seven ground.
		11:40:20 **RDO-2**	yeah Tahoma five eight seven looking for a clearance up to Mansfield.
		11:40:24 **GND**	Tahoma five eighty seven I show round robin Rickenbacker via Mansfield and that's as filed. three thousand four thousand one zero minutes after departure and departure one one niner point one five squawk six six four two.
		11:40:38 **RDO-2**	okay the round robin via Mansfield as filed three thousand four thousand one zero after departure one one niner point five six six four two.
		11:40:47 **GND**	departure frequency nineteen fifteen one one niner one five advise ready to taxi.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
		11:40:51 **RDO-2**	okay one one niner one five and we'll give you a call ready to taxi.
11:40:55 **HOT-1**	the squawk was what? six six—.		
11:40:57 **HOT-2**	six six four two.		
11:40:59 **HOT-1**	four...two.		
11:41:04 **HOT-3**	can you hear me?		
11:41:05 **HOT-1**	yeah sure all right okay.		
11:41:08 **HOT-1**	so now the uh start arm switches has to go right.		
11:41:13 **HOT-2**	okay.		
11:41:14 **HOT-1**	okay.		
11:41:17 **HOT-2**	and start arm is start.		
11:41:18 **HOT-1**	all right so we are ready okay.		
11:41:24 **HOT-1**	one...oh yeah okay good...# okay one first okay.		
11:41:31 **HOT-2**	okay.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:41:33 **HOT-1**	uh on the marks. I do that quickly okay. two in uh that's low speed okay low speed in...cargo door cargo door closed door lights...battery fuel number one...and the fuel switch okay...boost pump fuel switch...and then one's going on okay?		
11:42:04 **CAM**	[sound similar to engine start]		
11:42:07 **HOT-1**	it's turning we look here. we go through the start procedure later.		
11:42:19 **HOT-1**	fuel flow and light off. now you look for the PFPF light here.		
11:42:25 **HOT-2**	it's on.		
11:42:36 **HOT-1**	okay it's on now. you call PFPF light. five thousand two oil.		
11:42:45 **HOT-1**	and then you call PFPF light off when it goes off.		
11:42:54 **HOT-1**	okay starter off.		
11:42:56 **HOT-2**	and PFPF is off.		
11:42:57 **HOT-1**	okay and stable. okay.		
11:43:42 **HOT-1**	can you hear okay? it's okay?		
11:43:47 **HOT-2**	yeah.		
11:43:49 **HOT-1**	through fifteen years of herc I'm deaf or almost. [sound of laughter]		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:43:59 **HOT-1**	okay.		
11:44:01 **HOT-2**	okay...and they say we're clear on two.		
11:44:05 **HOT-1**	okay. now I have to watch the pressure here. should be one seventy five or below.		
11:44:12 **HOT-2**	okay.		
11:44:12 **HOT-1**	okay if you have one seventy five or above and you go in high speed it goes over the limit here over two fifty.		
11:44:19 **HOT-2**	okay.		
11:44:19 **HOT-1**	if it's below one seventy five it's okay. all right.		
11:44:22 **HOT-2**	okay.		
11:44:23 **HOT-1**	so we go up...now make sure we have brake pressure.		
11:44:29 **HOT-2**	we have brake pressure.		
11:44:29 **HOT-1**	three thousand okay good. all right number two is clear and the cap is on on top?		
11:44:36 **HOT-2**	yup. number two is clear.		
11:44:38 **HOT-1**	clear on the marks and cap on you say. the cap you know the fuel cap.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:44:42 **HOT-2**	okay oh okay. yes.		
11:44:45 **HOT-1**	okay all right so on the marks one in battery fuel ignition and two is on.		
11:44:57 **HOT-1**	all right it's turning you should take the time...there goes twenty two fuel flow and light off. you say fuel flow I say light off.		
11:45:03 **CAM**	[sound similar to engine start]		
11:45:11 **HOT-2**	okay.		
11:45:11 **HOT-1**	I call twenty two okay that's when the speed sense switch comes in.		
11:45:15 **HOT-2**	and we do have oil pressure.		
11:45:17 **HOT-1**	okay and the EDC light is off...and it's slow that start. and at five thousand two oil pressures. PFPF light is on.		
11:45:44 **HOT-1**	geez that's very slow...starter off.		
11:45:52 **HOT-2**	and PFP is off.		
11:45:58 **HOT-1**	and stable okay. after start checklist.		
11:46:02 **HOT-2**	okay after start uh GTC?		
11:46:07 **HOT-1**	here going off.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:46:11 **HOT-2**	uh battery switch and generators?		
11:46:14 **HOT-1**	in and the generators you check here. the right generator left generator and the lights. okay check.		
11:46:22 **HOT-2**	uh autofeather?		
11:46:24 **HOT-1**	feather going on we say this one here two lights armed two lights.		
11:46:28 **HOT-2**	okay. uh start arm? to normal.		
11:46:30 **HOT-1**	yup normal right.		
11:46:34 **HOT-2**	uh pressure control is—.		
11:46:36 **HOT-1**	that's set.		
11:46:37 **HOT-2**	as required.		
11:46:37 **HOT-1**	* come down on the EDC. yeah that one *.		
11:46:42 **HOT-2**	auto.		
11:46:43 **HOT-1**	two yeah yeah in auto one and two yes. now we should have some airflow here should have.		
11:46:50 **HOT-2**	no.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:46:51 **HOT-1**	yeah a little bit. it's coming.		
11:46:53 **HOT-2**	how bout?		
11:46:54 **HOT-1**	it's coming.		
11:46:55 **HOT-2**	what about the switch down here? oh that's for the heater.		
11:46:58 **HOT-1**	oh yeah just leave that off.		
11:46:59 **HOT-2**	right we don't need that.		
11:47:00 **HOT-1**	okay. all right.		
11:47:02 **HOT-2**	um...and AC hydraulic pump?		
11:47:09 **HOT-1**	yup it's on. okay you see we have a lights now.		
11:47:10 **HOT-2**	it's on.		
11:47:13 **HOT-2**	okay.		
11:47:14 **HOT-1**	now it's on.		
11:47:14 **HOT-2**	and the after taxi's complete.		
11:47:16 **HOT-1**	let's call for taxi.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:47:31 **HOT-1**	it's too big this checklist I know. we'll change that. [sound of laughter]		
11:47:35 **HOT-2**	okay.		
11:47:36 **HOT-1**	okay.		
11:47:36 **HOT-2**	I forgot to write down who we are.		
11:47:39 **HOT-1**	what?		
11:47:39 **HOT-3**	we're Tahoma.		
11:47:40 **HOT-1**	we're Tahoma five eight seven. you know the tail number five eight seven.		
11:47:42 **HOT-2**	five eight seven.		
11:47:43 **HOT-3**	five eight seven.		
11:47:46 **HOT-2**	okay there it is I just found it.		
11:47:48 **HOT-1**	always for training we use the tail number. Tahoma. not Air Tahoma just Tahoma.		
11:47:52 **HOT-2**	right...and where do they call this. is this the hangar er?		
11:47:57 **HOT-1**	this is at hangar area. he knows where we are anyway. he sees us there.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:47:59 **HOT-2**	yeah.		
		11:48:03 **RDO-2**	Tahoma five eight seven is ready to taxi from the hangar.
		11:48:06 **GND**	Tahoma five eight seven taxi to five left alpha to bravo.
11:48:10 **HOT-1**	okay five left to bravo okay yeah.		
		11:48:13 **RDO-2**	Tahoma five eight seven five left alpha to bravo.
11:48:26 **HOT-1**	okay it's clear right.		
11:48:33 **HOT-2**	and clear right.		
11:48:35 **HOT-1**	okay and what we have the time. forty eight...fifteen forty eight okay.		
11:48:54 **HOT-1**	all right.		
11:48:59 **HOT-2**	I'm glad you got the taxi chart because I don't. [sound of laughter]		
11:49:03 **HOT-1**	you got the time there please?		
11:49:05 **HOT-2**	yeah I've got the out at fifteen forty eight.		
11:49:07 **HOT-1**	okay.		
11:49:13 **HOT-1**	all my hercs here look all A models here. they modify them with glass cockpits. can you believe that? for firebombers.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:49:21 **HOT-2**	yeah.		
11:49:23 **HOT-3**	okay you're— you're in low speed now right?		
11:49:25 **HOT-1**	yeah. only the right one. the left one not the left one is high speed. we usually taxi with one in high speed. I don't know why.		
11:49:38 **HOT-1**	we can both go in low speed...save some gas. okay.		
11:49:50 **HOT-3**	okay we got low oil pressure light on number on number—.		
11:49:52 **HOT-1**	yeah this one should be on too. now which way do we go here?		
11:49:57 **HOT-3**	we got to make a right.		
11:49:59 **HOT-1**	yeah we'll have to go around here.		
11:50:01 **HOT-3**	go around and make a right.		
11:50:02 **HOT-1**	yeah.		
11:50:07 **HOT-1**	we cannot— this is parking area. we cannot cut through here this one and then yeah. okay.		
11:50:14 **HOT-2**	okay.		
11:50:15 **HOT-1**	yeah.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:50:18 **HOT-3**	**.		
11:50:20 **HOT-1**	oh boy look at that.		
11:50:32 **HOT-1**	oh because uh let's see if we go up with this one here.		
11:50:36 **HOT-2**	uh that's right.		
11:50:36 **CAM**	[sound similar to engine shifting to high speed]		
11:50:38 **HOT-3**	there you got oil pressure back.		
11:50:39 **HOT-1**	yup.		
11:50:40 **HOT-2**	that would be the culprit I hope.		
11:50:43 **HOT-1**	**.		
11:50:54 **HOT-1**	you know what's wrong? you have a pen?		
11:50:57 **HOT-2**	yeah.		
11:50:58 **HOT-1**	okay write. right hand artificial horizon left hand flight director on. the bars don't go away...uh for the time being okay.		
11:51:28 **HOT-1**	you know what we do if you agree. we take it in the air with that one okay because we have VFR. all right? but we are not doing really training. I cannot do that. okay? we just see what else is wrong okay? then we come back here. all right?		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:51:34 **HOT-2**	okay...right...yeah.		
11:51:46 **HOT-1**	all right now taxi checklist. I say flaps fifteen here are flaps fifteen and you start the taxi checklist yeah.		
11:51:56 **HOT-2**	**.		
11:51:58 **HOT-1**	all right yup that's good.		
11:52:00 **HOT-2**	flaps fifteen.		
11:52:01 **HOT-1**	all right taxi check.		
11:52:02 **HOT-2**	okay brakes and steering turn and bank?		
11:52:06 **HOT-1**	check left here you know brakes are checked. yeah and right. checked right.		
11:52:11 **HOT-2**	checked right.		
11:52:12 **HOT-1**	okay.		
11:52:13 **HOT-2**	and let's see...flaps are fifteen.		
11:52:22 **HOT-1**	flaps fifteen yeah. make sure that the captain confirms it. I want it this way. I think nobody else does it but I want it.		
11:52:29 **HOT-2**	right.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:52:29 **HOT-1**	that when the copilot says flaps fifteen that the captain looks there—.		
11:52:34 **HOT-2**	and says flaps fifteen.		
11:52:35 **HOT-1**	I took once off without flaps. you know I hardly made it at the end of the runway. [sound of laughter] not with this one. earlier. so just make sure the captain confirms flaps fifteen.		
11:52:45 **HOT-2**	correct...okay.		
11:52:46 **HOT-1**	okay.		
11:52:47 **HOT-3**	all right.		
11:52:48 **HOT-2**	sync control? center.		
11:52:51 **HOT-1**	center. yeah.		
11:52:53 **HOT-2**	and instrument panel AS?		
11:52:58 **HOT-1**	now we have to slave it. it's uh two thirty two something and slaving.		
11:53:04 **HOT-2**	I'm lookin'. two twenty eight and slaving.		
11:53:06 **HOT-1**	same as down here you see. all right. how much is it here?		
11:53:13 **HOT-2**	it's two bout two twenty eight two twenty five.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:53:16 **HOT-1**	yeah yeah.		
11:53:19 **HOT-2**	uh takeoff briefing?		
11:53:21 **HOT-1**	all right I do the takeoff flaps fifteen. nine thirty two TIT. any malfunction before V one you call out or I call out we abort. after V one it's emergency in flight. we just make VFR return to this runway.		
11:53:35 **HOT-2**	okay.		
11:53:37 **HOT-1**	**.		
11:53:42 **HOT-2**	and the taxi check is complete.		
11:53:45 **HOT-1**	okay.		
11:53:49 **HOT-1**	find any circuit breakers on this one? I don't know where it is really.		
11:53:55 **HOT-3**	for the...		
11:53:57 **HOT-1**	the horizon.		
11:53:58 **HOT-3**	the horizon.		
11:53:59 **HOT-1**	I think it's up front here...it's not good.		
11:54:17 **HOT-1**	did he give us the departure?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:54:19 **HOT-3**	uh...no he didn't.		
11:54:22 **HOT-2**	no he did not.		
11:54:25 **HOT-1**	to Mansfield maybe.		
11:54:29 **HOT-2**	he just gave us as filed.		
11:54:31 **HOT-1**	zero four two okay.		
11:54:33 **HOT-2**	and climb to three thousand.		
11:54:35 **HOT-1**	yeah.		
11:55:10 **HOT-1**	there's a heat switch in the back there somewhere. can you hold it to cold? you see it there?		
11:55:17 **HOT-2**	okay there's an off an auto—.		
11:55:19 **HOT-1**	no not that one.		
11:55:22 **HOT-2**	normal in.		
11:55:25 **HOT-1**	no.		
11:55:26 **HOT-2**	cool.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:55:26 **HOT-1**	no. no no leave that one. it's— I don't know exactly where this one is. somewhere hot and cold. temperature control.		
11:55:36 **HOT-2**	okay yeah I see it.		
11:55:37 **HOT-1**	hold it to cold please.		
11:55:38 **HOT-2**	okay.		
11:56:18 **HOT-1**	all right now we'll close the windows okay?		
11:56:24 **HOT-2**	still the only thing coming out's hot air.		
11:56:27 **HOT-1**	it takes ten minutes about on this aircraft I think. just hold it to cold as long as you can.		
11:56:33 **HOT-2**	okay.		
11:56:49 **HOT-2**	runway heading should be about zero five zero.		
11:56:52 **HOT-1**	yeah.		
11:56:56 **HOT-1**	let's hold here for a little while until we do the checklist.		
11:57:03 **HOT-1**	all right. the before takeoff.		
11:57:06 **HOT-2**	and before takeoff. anti-skid?		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:57:08 **HOT-1**	that's not installed.		
11:57:11 **HOT-2**	okay RPM and bleeds?		
11:57:13 **HOT-1**	okay lets go high here...both are high okay...high and closed I say. all right.		
11:57:24 **HOT-2**	engine heat?		
11:57:25 **HOT-1**	off. these are these two here.		
11:57:27 **HOT-2**	alternators?		
11:57:28 **HOT-1**	alternators are— you check here. okay.		
11:57:29 **HOT-2**	check.		
11:57:31 **HOT-1**	not much you can check. and here okay good.		
11:57:38 **HOT-2**	uh transponder?		
11:57:39 **HOT-1**	uh transponder this one comes on here. we got the code.		
11:57:42 **HOT-2**	okay.		
11:57:44 **HOT-2**	six six four two.		
11:57:46 **HOT-1**	okay.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:57:46 **HOT-3**	four two.		
11:57:47 **HOT-2**	and TCAS?		
11:57:49 **HOT-1**	TCAS is on automatically. that's com— combined same switch. all right.		
11:57:51 **HOT-2**	okay...okay on and TA RA.. okay.		
11:57:58 **HOT-2**	pitot heat and windshield heat?		
11:58:01 **HOT-1**	leave em off today. it's so hot out there.		
11:58:04 **HOT-2**	okay.		
11:58:04 **HOT-1**	we're not going high.		
11:58:05 **HOT-2**	and controls?		
11:58:07 **HOT-1**	all right you hold it. yeah. okay. I do the bottom here. bottom free and you do the top. all right.		
11:58:08 **HOT-2**	I have it.		
11:58:18 **HOT-2**	they're free.		
11:58:19 **HOT-1**	yup.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:58:22 **HOT-2**	okayyy...annunciator?		
11:58:27 **HOT-1**	should be four up six green four amber. they're all here.		
11:58:28 **HOT-2**	six green four amber.		
11:58:32 **HOT-2**	and landing lights?		
11:58:34 **HOT-1**	taxi light will be on. no we don't need any lights now.		
11:58:38 **HOT-2**	and then we're down—.		
11:58:39 **HOT-1**	usually we take off with the taxi light during the day.		
11:58:42 **HOT-2**	okay and then we're down to uh runway heading and compass.		
11:58:47 **HOT-1**	okay. compass is slaving is good. the runway heading will be. okay.		
11:58:51 **HOT-2**	okay and windows. mine's closed.		
11:58:55 **HOT-1**	maybe it's okay. let's see how it's doing in the air.		
11:58:58 **HOT-2**	and it's sort of like a # over here.		
11:59:02 **HOT-1**	[sound of laughter] very slow there okay.		
11:59:04 **HOT-2**	okay and then how do you switch—...just push the uh.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:59:08 **HOT-3**	uh * there you go.		
11:59:10 **HOT-1**	that switch that's on there. okay then change here. the lower one. okay.		
11:59:18 **HOT-2**	okay departure control.		
11:59:20 **HOT-1**	you're on uh—. no this is—. we're on this one here now. that's tower or ground and this is departure nineteen point one five.		
11:59:26 **HOT-2**	okay.		
11:59:27 **HOT-1**	okay.		
11:59:28 **HOT-2**	and then uh I'm looking at tower at one two zero point zero five if we were on ground.		
11:59:34 **HOT-1**	did he switch you?		
11:59:36 **HOT-3**	yeah one.		
11:59:37 **HOT-1**	he didn't switch you did he?		
11:59:38 **HOT-3**	no he didn't.		
11:59:38 **HOT-2**	no he did not.		
11:59:39 **HOT-1**	probably it's only one man here. the same. just call it. we are ready.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
11:59:42 **HOT-2**	okay.		
11:59:44 **HOT-1**	are you ready?		
11:59:45 **HOT-3**	yeah I'm ready.		
11:59:46 **HOT-1**	huh you are ready?		
11:59:47 **HOT-2**	I think so.		
11:59:48 **HOT-1**	okay.		
		11:59:52 **RDO-2**	uh Rickenbacker Tahoma five eight seven is ready on uh five left.
		12:00:01 **GND**	say again please?
		12:00:03 **RDO-2**	Tahoma five eight seven is ready for takeoff five left.
		12:00:06 **GND**	five eight—. five eighty seven hold short of the runway and then tower one two zero zero five.
		12:00:10 **RDO-2**	one two zero zero five.
12:00:11 **HOT-1**	okay wait now. we have his— yeah okay. we have it switched one two zero what is it? five five?		
12:00:17 **HOT-2**	one two zero zero five.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
12:00:19 **HOT-3**	zero five.		
12:00:19 **HOT-2**	yeah one two zero zero five.		
12:00:22 **HOT-1**	okay. all right.		
		12:00:27 **RDO-2**	and Rickenbacker uh Tahoma five eight seven is ready for takeoff five left.
		12:00:39 **TWR**	Tahoma five eighty seven Rick tower runway five left wind one two zero at seven fly heading zero seven zero and cleared for takeoff.
		12:00:47 **RDO-2**	okay zero seven zero and cleared for takeoff Tahoma five eight seven.
12:00:51 **HOT-1**	zero seven zero okay we do that to the right okay. all right. clear?		
12:00:58 **HOT-2**	and clear right.		
12:01:02 **HOT-1**	let's see how that thing is flying. ah.		
12:01:17 **HOT-1**	let's make a little runup at first. see how the power is.		
12:01:19 **HOT-2**	okay.		
12:01:32 **HOT-1**	that's a long runway here.		
12:01:52 **HOT-1**	okay let's see the power.		
12:01:54 **CAM**	[sound similar to increasing engine RPM]		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
12:02:07 **HOT-1**	eh...where is this one going? that's the maximum...eight seventy.		
12:02:22 **HOT-2**	yup.		
12:02:23 **CAM**	[sound similar to decreasing engine RPM]		
12:02:31 **HOT-1**	let's switch this one to null...let's try that again.		
12:02:39 **CAM**	[sound similar to increasing engine RPM]		
12:02:52 **HOT-1**	oh that's better. okay.		
12:02:54 **CAM**	[sound similar to decreasing engine RPM]		
12:02:58 **HOT-1**	write uh left TD on takeoff. eight seventy. left TD takeoff eight seventy.		
12:03:12 **HOT-3**	got it.		
12:03:13 **HOT-1**	okay.		
12:03:14 **HOT-3**	got it.		
12:03:14 **HOT-1**	ready. we cleared for takeoff? yeah.		
12:03:17 **HOT-3**	yeah.		
		12:03:18 **RDO-2**	and Tahoma five eight seven is rolling now.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
		12:03:22 **TWR**	roger.
12:03:23 **HOT-1**	okay let's see...uhh nine thirty two. or something like that.		
12:03:28 **CAM**	[sound similar to increasing engine RPM]		
12:03:34 **HOT-2**	okay.		
12:03:34 **HOT-1**	it's okay...* more...that's one oh one.		
12:03:41 **HOT-1**	now eighty.		
12:03:42 **HOT-2**	eighty knots.		
12:03:44 **HOT-1**	ninety my control. I got it.		
12:03:46 **HOT-2**	*. okay. you got it.		
12:03:50 **HOT-2**	V one.		
12:03:50 **HOT-1**	V one rotate. oh yeah.		
12:03:52 **HOT-2**	rotate.		
12:03:52 **HOT-1**	ohh yeah.		
12:03:55 **CAM**	[sound similar to trim wheel motion]		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
12:03:55 **HOT-1**	[sound of grunt] oh #.		
12:03:58 **HOT-1**	oh yah yah yah. pull pull pull.		
12:03:58 **HOT-2**	**.		
12:03:58 **CAM**	[sound similar to trim wheel motion]		
12:04:02 **HOT-1**	pull.		
12:04:03 **CAM**	[sound similar to trim wheel motion]		
12:04:04 **HOT-3**	want me to help?		
12:04:05 **HOT-1**	pull.		
12:04:08 **HOT-1**	let's go *. we have to go back. pull pull.		
12:04:10 **HOT-2**	okay.		
12:04:11 **HOT-?**	[sound of heavy breathing]		
		12:04:13 **RDO-2**	and Tahoma five eight seven's got to come back.
12:04:16 **HOT-1**	pull.		
		12:04:17 **TWR**	five eighty seven right or left traffic?

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
		12:04:19 **RDO-2**	left traffic Tahoma five eighty seven.
		12:04:21 **TWR**	alrighty.
12:04:23 **HOT-1**	pull.		
12:04:23 **HOT-?**	*.		
12:04:29 **HOT-?**	[sound of heavy breathing]		
12:04:32 **HOT-1**	pull.		
12:04:33 **HOT-2**	pull.		
12:04:34 **HOT-1**	pull.		
12:04:37 **HOT-1**	pull.		
12:04:38 **HOT-2**	pulling.		
12:04:39 **HOT-3**	come back on the trim?		
12:04:40 **CAM**	[sound similar to trim wheel motion]		
12:04:41 **HOT-1**	there's nothing anymore on the trim.		
12:04:44 **HOT-?**	[sound of heavy breathing]		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
12:04:48 **HOT-1**	pull...pull you pull two pull.		
		12:04:49 **TWR**	Tahoma five eighty seven check wheels down the wind's zero seven zero at four and cleared to land.
		12:04:54 **RDO-2**	clear to land Tahoma five eighty seven.
12:04:55 **HOT-?**	[sound of heavy breathing]		
		12:04:59 **TWR**	need any equipment or anything?
12:05:00 **HOT-1**	no no.		
		12:05:01 **RDO-2**	uh negative.
		12:05:03 **TWR**	okay.
12:05:04 **HOT-1**	pull.		
12:05:10 **HOT-?**	[sound of heavy breathing]		
12:05:15 **HOT-1**	pull.		
12:05:16 **HOT-2**	[sound of grunt]		
12:05:18 **HOT-1**	let's go on the left side.		
12:05:21 **HOT-1**	pull.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
12:05:23 **HOT-3**	I got it I'm pulling.		
12:05:24 **HOT-1**	pull...left left left.		
12:05:29 **HOT-1**	pull.		
12:05:31 **HOT-1**	[sound of heavy breathing]		
12:05:32 **HOT-2**	[sound of grunt]		
12:05:38 **HOT-2**	[sound of grunt]		
12:05:38 **HOT-1**	pull.		
12:05:39 **HOT-2**	Jesus.		
12:05:42 **HOT-1**	pull.		
12:05:45 **HOT-1**	pull.		
12:05:46 **HOT-1**	pull.		
12:05:47 **HOT-2**	[sound of grunt]		
12:05:48 **HOT-1**	[sound of grunt]		
12:05:50 **HOT-1**	pull pull.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
12:05:53 **HOT-1**	[sound of scream]		
12:05:58 **HOT-3**	God help us.		
12:05:58 **CAM**	[sound of impact]		
12:05:58 **END OF TRANSCRIPT** **END OF RECORDING**			