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

GROUP CHAIRMAN'S FACTUAL REPORT OF INVESTIGATION

DCA13MA120

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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December 11, 2013

Cockpit Voice Recorder - 12

Group Chairman's Factual Report
By Joe Gregor

A. EVENT

Location:	San Francisco, California
Date:	July 6, 2013, 1128 Pacific Daylight Time [PDT] *
Aircraft:	Boeing 777, HL7742
Operator:	Asiana Airlines
NTSB Number:	DCA13MA120

B. GROUP

A group was convened on July 8, 2013 for three days, and on October 29, 2013 for two days:

Chairman:	Joe Gregor Electrical Engineer / CVR Specialist National Transportation Safety Board
Chairman:	Alice Park Electrical Engineer / Accident Reconstruction National Transportation Safety Board
Member:	Robert L. Drake Air Safety Investigator FAA
Member:	Captain Sam Goodwill Safety Pilot, Flight Technical & Safety Flight Services The Boeing Company
Member:	Jin Ho Kim Captain, Investigator, Safety Management Asiana Airlines

* All times in the transcript are expressed in Pacific Daylight Time [PDT], unless otherwise noted.

C. SUMMARY

On July 6, 2013 at 1128 am local time, a Boeing 777, registration HL7742, operated by Asiana Airlines as flight 214, struck the seawall short of runway 28L at San Francisco International Airport. The airplane was destroyed by impact forces and fire. Three of the 291 passengers were fatally injured and about 199 were transported to the hospital with injuries. One of the 4 flight crew and 10 of the 12 cabin crewmembers were injured. The flight was a regularly scheduled passenger flight from Incheon International Airport, Seoul, Korea, and was operated under the provisions of 14 Code of Federal Regulations Part 129. Visual meteorological conditions prevailed at the time of the accident.

D. DETAILS OF INVESTIGATION

On July 7, 2013 the NTSB Vehicle Recorder Division's Audio Laboratory received the following CVR:

Recorder Manufacturer/Model: **Honeywell 6022 (980-6022-001)**
Recorder Serial Number: **CVR120-07983**

Recorder Description

This model CVR is a solid-state CVR that records 2 hours of 2-channel digital cockpit audio, and 30 minutes of 3-channel digital cockpit audio. The recorded audio data is separated by the download software into 5 separate audio data files. The recording consists of one 2-hour long channel that contains audio information from the cockpit area microphone (CAM), one 2-hour long channel that contains audio information summed from all of the individual crew positions (HOT), and three 30-minute long channels that contain audio information from each of the individual flight crew positions (HOT).

Recorder Damage

Upon arrival at the audio laboratory, it was evident that the CVR had sustained no overt damage. The digital audio was downloaded from unit normally, and without difficulty.

Figure 1. CVR recovered from B-777 aircraft.

Audio Recording Description

The 2-hr, 2-minute, 45-second recording consisted of five channels of audio information. Each channel's audio quality[†] is indicated in Table 1.

Table 1: Audio Quality

Channel #	Content/Source[‡]	Quality
1	CAPT	Excellent
2	FO	Excellent
3	Other	Excellent
4	Combined	Good
5	CAM	Excellent

[†] 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 Flight Data Recorder (FDR). Specifically, multiple data points related to radio microphone keying events recorded on both the CVR and the FDR 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 ± 0.2 second. Times listed in the transcript portion of this report are given with 1/10 second precision, and are based on visual identification of the beginning of the waveform for each phrase as displayed by the NTSB transcription software. Reported PDT time is accurate to ± 1 second, based on correlation between the CVR recording and time data recorded on the FDR.

Description of Audio Events

The recording began at 0922:29 PDT, with the CVR recording sounds consistent with the aircraft in cruise flight. At approximately 0934:47 PDT, the pilots noted that the glide slope would not be available and discussed routine operational issues concerning the flight, approach, and landing. At approximately 0955:45 PDT, the pilot flying (PF) the approach into San Francisco entered the cockpit and the crew discussed routine operational issues concerning the flight, approach, and landing. At approximately 0955:45 PDT, there was a transfer of aircraft control to the PF. Approximately 6 minutes later, the crew discussed expectations for receiving radar vectors for a visual approach. At approximately 1033:51 PDT, the flight contacted Center and reported at FL390. At approximately 1038:50 PDT, the PF excused himself from the cockpit. At approximately 1040:19 PDT, the flight was given clearance to San Francisco using the Golden Gate 6 arrival via Point Reyes. At approximately 1040:41 PDT, the PF returned to the cockpit and resumed aircraft control.

The remainder of the CVR recording, starting at time 1042:27.8 PDT, was transcribed as shown starting on page 12-8. The recording ended at 1128:02 PDT.

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 Honeywell 6022 (980-6022-001) solid-state cockpit voice recorder, serial number CVR120-07983, installed on a Boeing 777 (HL7742), which crashed during landing in San Francisco, California.

LEGEND

CAM	Cockpit area microphone voice or sound source
INT	Intercom
FA	Flight attendant
HOT	Flight crew audio panel voice or sound source
RDO	Radio transmissions from HL7742
TWR	Radio transmission from the airport tower controller
-1	Voice identified as the Pilot Monitoring (PM)
-2	Voice identified as the Pilot Flying (PF)
-3	Voice identified as the jump seat
-?	Voice unidentified
*****	Unintelligible word
#	Expletive
@	Non-pertinent word
( )	Questionable insertion
[ ]	Editorial insertion
{ }	Translated from Korean

Note 1: Times are expressed in Pacific Daylight Time (PDT).

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
09:22:28.7	[start of recording]		
Start of Transcript			
10:42:27.9			
CAM-2	{I will give you a} approach briefing. {current weather is Juliet, variable is six, visibility is one zero mile cloud few is one thousand three hundred scattered is eighteen hundred, temperature seventeen Celsius, dew point is ten degree, and altimeter is twenty nine eighty two. Runway is twenty eight L, and I set approach with localizer. And I will fly through Point Reyes, Papa Yankee Echo, of Golden Gate Six Arrival and when close to San Francisco I will fly using radial three zero three to San Francisco. and when I receive vector of final turn twenty eight left or right. airport field elevation is thirteen feet and transition is one eight zero MSA. North of airport is five thousand one hundred and approach side is four thousand five hundred. Type of approach is localizer and MDA set at four hundred sixty. receiving visual approach at final, maintaining lateral, and I will descend using the V/S to keeping up with vertical when localizer captured. setting go-around altitude three thousand feet in case of missed-approach, and I will ascend following LNAV. it's not necessary for cold temperature and altitude correction. I will use autobrake two for landing and taxi. the landing distance is about six thousand three hundred feet. via Quebec or Kilo and Alpha or Bravo and taxiway Hotel, I will taxi at International Terminal between gate A one and gate A nine following diamond marks on center as I receive the gate number. There is no other information} approach briefing completed, sir.		
10:43:29.8			
CAM-1	{yeah.}		
10:43:37.1			
CAM-1	{yeah.}		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
10:45:09.0 **CAM-1**	{yeah.}		
10:45:10.6 **CAM-1**	{when you land on 28 left, usually, **exit to taxiway Delta or Tango.}		
10:45:12.9 **CAM-2**	{yeah.}		
10:45:20.5 **CAM-1**	{in normal landing condition, exit through Bravo, then exit to Hotel, Mike, but sometimes they give us direct to Mike.}		
10:45:26.3 **CAM-2**	{yeah.}		
10:45:42.7 **CAM-1**	{getting into Hotel, from Bravo to Hotel, we sometimes receive number two. then before entering Bravo, we need to contact ramp tower.}		
10:46:01.1 **CAM-2**	{understand.}		
10:46:01.3 **CAM-1**	{at that time, please monitor ground. before entering, we receive clearance from ramp tower. through number two, we go Alpha five. usually we are given Alpha five.}		
10:46:04.9 **CAM-2**	{yeah, I got it.}		
10:46:20.8 **CAM-1**	{sometimes, they give us Alpha six, then just follow the instructions.}		
10:46:31.2 **CAM-1**	{if you think you did not hear right or misunderstand ATC either in the air or ground. then you can confirm with ATC before setting MCP in air. when you read back, you are not sure of it, you can ask again to make sure and confirm on the ground. if you are not sure a hundred percent, then stop the aircraft, confirm again before you proceed.}		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
10:47:06.7 **CAM-2**	{yes, I will do it.}		
10:47:25.4 **CAM-1**	{I will proceed, descent checklist.}		
10:47:28.0 **CAM-2**	yes sir. descent checklist.		
10:47:29.8 **CAM-1**	recall and notes. check. autobrake two. landing data.		
10:47:35.1 **CAM-2**	VREF one three two, minimum four six zero.		
10:47:38.4 **CAM-1**	VREF one three two, minimum four six zero.		
10:47:46.3 **CAM-1**	approach briefing?		
10:47:47.4 **CAM-2**	completed.		
10:47:49.5 **CAM-1**	low visibility approach required?		
10:47:52.2 **CAM-2**	no.		
10:47:54.2 **CAM-1**	check list completed.		
10:48:58.6 **CAM-1**	{if you have sunglasses, why don't you wear them? but I don't wear them because of depth perception.}		
10:49:11.6 **CAM-2**	{I won't wear them also.}		
10:49:13.9 **CAM-1**	{we usually wear sunglasses to protect eyes.}		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
10:49:21.1 **CAM-1**	{I understand that people, who have many outdoor activities, are recommended to wear them to protect eyes. But I can't wear sunglasses. I usually use them while in cruise flight, but always take them off when on approach.}		
10:49:40.8 **CAM-2**	{I even take them off to focus when on approach.}		
10:49:44.3 **CAM-1**	{approaching with wearing sunglasses when I flew seven six seven, I felt a bit uneasy from flare, I don't wear them since then.}		
10:50:12.3 **CAM-1**	{I * *.}		
10:50:44.4 **CAM-2**	{I am wondering how captain @ had a detached cornea.}		
10:50:51.0 **CAM-2**	{Captain @ and other seven three seven captains were working under scorching sun without any problems without wearing sunglasses, and can read up to that old age.}		
10:51:02.7 **CAM-2**	{nowadays, kids are having weak eyes, even my nephew who is sophomore in high school has bad eye sight 0.5.}		
10:51:14.4 **CAM-1**	{my son had third grade of eye sight testing in physical.}		
10:51:21.8 **CAM-2**	{oh, can you get third grade because of eye sight?}		
10:51:25.6 **CAM-1**	{yeah, not exempted unless it is 0.01 like really bad.}		
10:51:27.4 **CAM-2**	{yeah.}		
10:51:33.6 **CAM-1**	{and lately there will be no exemption with only one item, especially bad eye sight, can't make it happen because eye glasses and so on are available.}		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
10:51:38.9 **CAM-2**	{aha.}		
10:52:06.6 **CAM-1**	{I don't know whether my son should do Lasik or * *. some recommend to perform and some not. But my nephew, who had really bad eye sight, just did it and he said his life style has been changed since.}		
10:52:23.6 **CAM-2**	{it really depends on how skilfully the doctor corrects the cornea; I mean how the doctor deals with the thickness of it. But it seems they are not operating well. That may be the reason pilots complained after the correction.}		
10:52:43.2 **CAM-2**	{I know it corrects the sight, but there's some risk also. and I was told that Lasik is not recommended to those who have thin corneas.}		
10:52:52.0 **CAM-1**	{humm.}		
10:52:54.2 **CAM-2**	{captain @ who moved to Air Busan had a blocked artery, has high eye pressure always because his cornea is 1.5 thicker than average people.}		
10:53:06.9 **CAM-1**	{aha.}		
10:53:07.5 **CAM-2**	{whenever his physical performed, his eye pressure is always high.}		
10:53:15.5 **CAM-1**	{I see captain @ is in Air Busan.}		
10:53:19.6 **CAM-2**	{yeah, he is a manager in safety management team in Air Busan.}		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
10:53:31.1 **CAM-1**	{the company offered him a choice of either staying at a hotel or rent a house. and he chose to rent. the company provided $100,000 deposit for the rental property to accommodate his staying.}		
10:53:47.4 **CAM-1**	{does he fly three two one?}		
10:53:49.5 **CAM-2**	{he had flown seven four seven then changed to three two one because he also had the rating.}		
10:54:08.1 **CAM-1**	{there's no particular reason to stay * * after age sixty.}		
10:54:17.5 **CAM-1**	{the condition is about same or worse.}		
10:54:23.0 **CAM-1**	{comparing Jeju Air and us, first, the physical is tougher. Jeju Air is a bit lenient on physical and give five year verbal extension contract immediately after passing the physical. However our company extends the contract annually, gives a new employee ID, start newly step one, sixty hours guaranteed, and no space available pass. literally everything accumulated is wiped out.}		
10:55:03.0 **CAM-1**	{zone fare at point seventy would not be available also.}		
10:55:08.9 **CAM-2**	{even we don't have that?}		
10:55:10.4 **CAM-1**	{the company says use the annually provided passes. after age sixty, we usually get eight passes annually, which is half of the number of the years we have served.}		
10:55:20.0 **CAM-2**	{eight passes annually?}		
10:55:23.6 **CAM-2**	{so it won't matter international or domestic?}		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
10:55:26.1 **CAM-1**	{so the benefit is dramatically diminished. But we still can use them in case we move to Jeju at sixty. we can use Jeju's and * *.}		
		10:55:42.2 **CTR**	Asiana two fourteen descend pilots discretion maintain flight level two four zero.
		10:55:47.4 **UNK**	(confirm Asiana two zero two.)
10:55:49.9 **CAM-1**	talk English.		
		10:55:51.7 **CTR**	negative, Asiana two one four, two fourteen descend pilots discretion maintain flight level two four zero
		10:55:58.0 **RDO-1**	descend flight level two four zero pilot discretion Asiana two one four
10:56:02.1 **CAM-2**	yes sir two four zero pilots discretion.		
10:56:05.8 **CAM-2**	{yes, you have control. I will make PA.}		
10:56:08.6 **CAM-1**	{yeah, wait a moment.}		
10:56:15.6 **CAM-1**	I have ATC and control.		
10:56:17.2 **CAM-2**	yes sir. you have ATC and control.		
10:56:24.9 **CAM-2**	{I will make thirty minutes of arrival time.}		
10:56:29.5 **CAM-1**	{yeah.}		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
		10:56:44.3 **RDO-1**	Asiana two one four leaving three niner zero for two four zero.
		10:56:50.6 **CTR**	Asiana two one four roger.
10:57:11.0 **INT-2**	{passenger announcement in Korean.}		
10:57:42.8 **INT-2**	ladies and gentleman, this is your captain speaking. we hope you had a pleasant flight. we are now approaching San Francisco International Airport we'll be landing in about thirty minutes around eleven thirty AM local time. the current weather in San Francisco International Airport is clear temperature is one seven degrees Celsius and sixty two degrees Fahrenheit. we thank you for flying Asiana Airlines member of Star Alliance. enjoy your stay in San Francisco. hope to see you again soon.		
10:58:24.4 **FA**	{passenger announcement in Korean} ladies and gentlemen in a few moments we will be closing our duty free shop to prepare safe landing. if you want to purchase a duty free item now or * flight please contact your cabin crew for more details. and now we end our entertainment system and we * - .		
10:58:28.7 **HOT-2**	I have control sir.		
10:58:30.4 **HOT-1**	you have a controls ahh. {I report to descent immediately as * *.}		
10:58:33.0 **CAM-1**	{then I will report we are descending two four zero. yes we are descending.}		
10:58:36.7 **HOT-2**	check sir.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
10:58:40.2 **HOT-1**	{closing speed window and let's descend VNAV eight two two nine zero.}		
10:58:45.8 **HOT-2**	yes sir.		
10:59:05.8 **CAM-1**	{when did captain @ leave the company?}		
10:59:13.5 **HOT-2**	{I think it's been only about a year.}		
10:59:13.7 **CAM-2**	{it's been about a year.}		
10:59:17.6 **HOT-1**	{coming to annual ground training long ago.}		
10:59:17.7 **CAM-1**	{they were at annual ground school with us.}		
10:59:17.7 **HOT-2**	{ah, at that time, the annual ground school was contracted for Air Busan and I met him there.}		
10:59:21.7 **CAM-2**	{they attended the school as Air Busan pilot. they attended Asiana annual ground school and I met them there while ago.}		
10:59:36.5 **CAM-1**	{captain @, @ -.}		
10:59:36.5 **HOT-1**	{long ago, the pre-selected.}		
		10:59:39.1 **CTR**	Asiana two one four contact Oakland Center one two five point eight five.
		10:59:43.1 **RDO-1**	two five eight five Asiana two one four good day.

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
		10:59:58.4 **RDO-1**	NorCal control good morning Asiana two one four heavy descend flight level two four zero direct point Reyes.
		11:00:05.7 **CTR**	Asiana two fourteen heavy Oakland center cross LOZIT at or maintain one one thousand San Francisco altimeter two niner eight two.
		11:00:12.6 **RDO-1**	ah cross LOZIT one one thousand altimeter two niner eight two.
11:00:18.3 **HOT-2**	cross LOZIT one one thousand set.		
11:00:20.2 **HOT-1**	check sir.		
11:00:39.0 **CAM-1**	{captain @ and three people were good friends, might be an alumni.}		
11:00:39.3 **HOT-1**	{it was a captain @. three were like an alumni.}		
11:00:44.6 **CAM-2**	{do you mean captain @?}		
11:00:45.7 **CAM-1**	{ah is he @?, captain @, @, and there is one more person. right he move to Air Busan.}		
11:00:51.4 **CAM-2**	{they are @, and @ captain @ came to Airbus, Air Busan.}		
11:00:55.6 **HOT-2**	{captain @ move to Air Busan * *.}		
11:01:08.5 **HOT-2**	{captain @, @ had too much herb medicine and his liver numbers are too high.}		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:01:17.3 **CAM-1**	{It's absurd it works at Air Busan, but not in my company.}		
11:01:23.0 **HOT-2**	{* his physical had been done at SamSeong general hospital in Ilwon Dong, and he's been cleared there.}		
11:01:30.6 **HOT-1**	{so I mean why it is possible at Air Busan, but not at our company.}		
11:01:39.5 **HOT-1**	{it's really strange.}		
11:01:49.0 **CAM-1**	idle VNAV path.		
11:01:50.6 **CAM-2**	check sir.		
11:01:59.5 **CAM-1**	hold.		
11:02:00.6 **CAM-2**	check.		
11:02:01.5 **CAM-1**	{so, it means working condition of our company is that bad?}		
11:02:01.6 **CAM-1**	{our health gets better because the physical is so tough.}		
11:02:14.5 **CAM-1**	{if thinking the other way, they are passed even the physical condition is not as good at Air Busan.}		
11:02:35.7 **CAM-1**	{small size aircraft was allowed, but not large size aircraft long ago.}		
11:02:39.7 **CAM-2**	yeah.		
11:03:36.1 **CAM-1**	{Is this air ops?}		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:03:38.7 **CAM-2**	{Yeah, it is air ops.}		
11:03:39.5 **CAM-2**	I have ATC.		
11:03:40.1 **HOT-1**	{* *.}		
11:03:40.7 **CAM-1**	{I will try contact.}		
11:03:42.3 **CAM-2**	yes sir.		
11:03:42.8 **FA**	{* * * * to help the needy children throughout the world. we appreciate your contribution.}		
11:03:48.3 **CAM-1**	air ops.		
		11:03:49.4 **RDO-1**	good morning Asiana two one four.
		11:03:52.5 **OPS**	* * go ahead Asiana two one four.
		11:03:55.7 **RDO-1**	ETA San Francisco one eight three zero remaining fuel three three decimal one.
		11:04:03.7 **OPS**	copy I have you ETA one eight three zero you guys are going to gate Alpha four.
		11:04:09.7 **RDO-1**	Alpha four thank you.
11:04:19.2 **CAM-1**	{received Alpha four.}		
11:04:21.4 **HOT-2**	yes sir.		
11:04:28.0 **HOT-1**	{it is in the back.}		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:04:28.6 **CAM-1**	{this side.}		
11:04:28.6 **CAM-2**	{yeah.}		
11:04:31.5 **CAM-2**	{yes, it is in the back.}		
11:04:32.9 **CAM-1**	{yeah.}		
11:04:45.7 **HOT-1**	{when you enter, it looks a bit narrow, but it won't matter. there's center line *.}		
11:04:51.8 **HOT-2**	{acknowledged.}		
11:04:55.5 **HOT-1**	{before the center line, first at abeam * *, entering all the way over the * *. at the left side, it won't get caught.}		
		11:05:04.3 **RDO-2**	{acknowledged.}
11:05:19.0 **HOT**	{ATIS information Echo.}		
11:05:50.7 **CAM**	[sound similar to electronic seat adjustment]		
11:05:58.5 **CAM**	[sound similar to electronic seat adjustment]		
11:07:04.0 **HOT-1**	{flying time is about same as to LA.}		
11:07:07.0 **HOT-2**	{yeah.}		
11:07:21.3 **HOT-1**	{I will give a signal first.}		
11:07:22.5 **HOT-2**	yes, sir. approach signal sir.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:07:38.5 **CAM-1**	transition.		
11:07:40.3 **CAM-2**	set QNH two niner eight two.		
11:07:43.0 **HOT-1**	two niner eight two inches set.		
11:07:45.3 **HOT-2**	check.		
11:08:06.7 **CAM-1**	standby.		
11:08:06.8 **CAM-2**	approach checklist sir.		
11:08:06.9 **HOT-1**	stand by ah.		
11:08:07.2 **HOT-2**	approach check * * two niner eight two set * *.		
11:08:08.8 **CAM-3**	approach signal * with altimeter.		
11:08:11.5 **FA**	{we will arrive at San Francisco international airport shortly. please put your seat belt on, and put the seat tray unfold. and please open the window curtain}		
11:08:13.8 **HOT-1**	two niner eight two.		
11:08:13.9 **CAM-1**	two niner eight two is set, checklist complete.		
11:08:16.0 **HOT-1**	checklist complete.		
11:08:17.2 **HOT-2**	check.		
11:08:19.6 **HOT-1**	{announcement sent out.}		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:08:20.4 **HOT-2**	yes sir.		
11:08:26.4 **INT**	{passenger announcement in Korean.}		
11:08:36.9 **FA**	we are now making our descent into San Francisco international airport * * leg rest and tray tables in the upright position and open the window shade * overhead bins * * * thank you.		
11:08:39.8 **CAM-1**	{it seems better to give approach signal earlier in long flight.}		
11:08:46.5 **HOT-1**	{long hours working * * * long flight * *.}		
11:08:46.6 **CAM-2**	{ah yeah.}		
11:08:47.9 **CAM-1**	{* * preparing hard and earlier, but it takes longer than thought. they want to start at ten thousand feet if possible in short distance travel because service should be provided.}		
11:09:01.3 **HOT-1**	{long distance has * *.}		
11:09:05.0 **HOT-2**	yeah.		
11:09:15.5 **CAM-1**	{as a beginner, flying small size aircraft, they rush even for making an announcement. it becomes their habit doing it that way. * * small size aircraft in long flight even though they can relax and slow down in the process.}		
11:09:36.7 **HOT-1**	{later it will become really busy when going Kansai or Fukuoka.}		
11:09:41.5 **HOT-1**	{it will be very busy.}		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:10:06.8			
CAM-1	{I turn off the weather radar.}		
11:10:08.6			
HOT-2	yes sir weather radar off.		
		11:10:52.7	
		CTR	Asiana two fourteen contact NorCal approach one three three point niner five.
		11:10:56.9	
		RDO-1	three three niner five Asiana two one four good day.
11:10:59.7			
HOT-2	* sir.		
		11:11:05.6	
		RDO-1	(NorCal) approach good morning Asiana two one four direct LOZIT one one thousand.
11:11:12.0			
CAM	[sound of double chime]		
		11:11:13.7	
		APR	Asiana two one four heavy NorCal approach depart San Francisco VOR heading one four zero vector visual approach two eight left.
11:11:16.3			
CAM	[sound of metallic clunks]		
		11:11:19.6	
		RDO-1	after San Francisco heading one four zero visual two eight left?
		11:11:25.6	
		APR	ah two eight left affirmative.
		11:11:27.1	
		RDO-1	thank you.
		11:11:28.6	
		RDO-2	yes sir heading one four zero San Francisco.

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:11:31.3 **HOT-1**	after San Francisco.		
11:11:33.1 **HOT-2**	yes sir.		
11:11:36.4 **CAM-1**	{you don't get rest, do you?}		
11:11:50.4 **CAM-1**	clear left visual approach.		
11:11:52.4 **HOT-2**	yes sir two eight left approach.		
11:12:23.9 **HOT-1**	VNAV ALT.		
11:12:25.4 **CAM-2**	check.		
11:12:33.7 **HOT-1**	{FO @, monitoring well please in the back.}		
11:12:39.6 **CAM-3**	{yes sir.}		
11:12:40.3 **HOT-1**	{let us know immediately if anything strange shows. and we received Alpha four.}		
11:13:05.9 **CAM-1**	{ah, I can see well San Francisco.}		
11:13:10.3 **CAM-1**	{Ahh, well.}		
11:13:12.3 **CAM-1**	{ah. that bridge leads to Oakland.}		
11:13:16.7 **HOT-2**	{is that the Golden Gate?}		
11:13:18.6 **CAM-1**	{the Golden Gate is over there.}		
11:13:20.1 **HOT-2**	yeah.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:13:21.5 **CAM-1**	{this is to Oakland, and it leads to Sacramento, which is capitol of California, and location of University of Berkley.}		
11:13:23.8 **HOT-2**	yeah.		
11:13:30.9 **HOT-2**	ah *		
11:13:36.1 **CAM-1**	{Golden Gate is that side, but can't see it because of clouds.}		
11:13:53.4 **HOT-1**	{the water in the lake.}		
		11:13:55.1 **APR**	Asiana two one four heavy reduce speed to two one zero.
		11:13:57.7 **RDO-1**	ah speed a two one zero Asiana two one four.
11:13:59.7 **HOT-2**	yes sir two one zero set.		
11:14:01.5 **HOT-1**	check.		
11:14:03.6 **CAM-1**	(check two one * set.)		
11:14:07.9 **HOT-1**	{it's the water source of San Francisco.}		
11:14:10.3 **HOT-2**	ah yeah.		
11:14:13.2 **HOT-1**	{there's a golf course over there, which is Crystal Spring golf course. It's pretty good, but we can't get a car nowadays.}		
11:14:16.7 **HOT-2**	yeah.		
11:14:23.9 **HOT-2**	yeah.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:15:13.9 **HOT-1**	{wow, there's no airplane.}		
11:15:20.5 **HOT-1**	{there's no plane on taxiway.}		
11:15:22.5 **HOT-2**	yeah.		
11:15:24.3 **CAM-1**	{they are landing. there is one on two eight left on final, short final.}		
11:15:31.4 **CAM-1**	{one land at two eight right, and the other land at two eight left.}		
11:15:35.5 **HOT-2**	yeah.		
11:15:51.1 **CAM-1**	{that's Oakland.}		
11:15:52.4 **CAM-2**	{yeah.}		
11:16:08.9 **CAM**	[sound similar to electronic seat adjustment]		
11:16:23.3 **HOT-2**	one four zero preset.		
11:16:24.5 **HOT-1**	check.		
11:16:42.6 **CAM-2**	heading select.		
11:16:44.0 **CAM-1**	heading select.		
11:16:48.9 **HOT-1**	San Fran-.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT
11:17:07.4 **HOT-2**	yes sir.
11:17:11.6 **HOT-1**	{did I say two five?}
11:17:29.7 **HOT-2**	sir nine thousand flight level change.
11:17:31.6 **HOT-1**	check sir.
11:18:02.3 **CAM-2**	descend * *.

TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:16:50.3 **APR**	Asiana two one four heavy descend and maintain niner thousand contact approach one three five point sixty five good day.
11:16:57.7 **RDO-1**	ah descend nine thousand one two five six five Asiana two one four good day.
11:17:03.0 **APR**	ah just verify one three five point six five.
11:17:05.8 **RDO-1**	thirty five sixty five thank you.
11:17:07.5 **APR**	thank you have a good day.
11:17:15.1 **RDO-1**	approach good morning Asiana two one four heading one four zero nine thousand speed two one zero.
11:17:21.4 **APR**	Asiana two one four heavy NorCal approach caution wake turbulence you'll be following a heavy Boeing triple seven.
11:17:26.9 **RDO-1**	* Asiana two one four.

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:18:04.8 **CAM-1**	{setting at this, I will keep * *.}		
11:18:05.7 **HOT-1**	*.		
11:18:07.2 **HOT-2**	{thank you.}		
11:18:20.8 **CAM-2**	one zero thousand all lights on sir.		
11:18:23.0 **CAM-1**	check (all lights).		
11:18:51.5 **CAM-1**	speed alt sir.		
11:18:52.5 **CAM-2**	check.		
11:19:05.0 **CAM**	[sound similar to a click]		
11:19:16.5 **HOT-1**	{it's there.}		
11:19:19.6 **HOT-2**	traffic in sight.		
		11:19:25.0 **APR**	Asiana two one four heavy descend and maintain six thousand turn left heading one zero zero.
11:19:29.4 **CAM**	[sound similar to a click]		
		11:19:29.5 **RDO-1**	heading one zero zero descend six thousand Asian two one four.
11:19:31.3 **CAM**	[sound similar to a click]		
11:19:31.7 **CAM**	[sound similar to a click]		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:19:32.9 **CAM**	[sound similar to a click]		
11:19:33.1 **HOT-2**	one zero zero six thousand flight level change.		
11:19:35.1 **HOT-1**	check.		
11:19:41.0 **HOT-1**	hold flight level change speed.		
11:19:42.9 **HOT-2**	check.		
11:20:01.3 **HOT-?**	{*.}		
11:20:03.4 **HOT-1**	{I will set it.}		
11:20:05.8 **HOT-2**	{thank you.}		
11:20:31.2 **CAM**	[sound similar to electronic seat adjustment]		
11:20:38.8 **HOT-1**	{they are coming from both sides same time.}		
		11:20:57.0 **APR**	Asiana two one four heavy descend and maintain four thousand turn left heading zero three zero.
		11:21:01.0 **RDO-1**	heading zero three zero descend four thousand Asiana two one four.
11:21:04.4 **HOT-2**	yes sir zero three zero four thousand.		
11:21:06.3 **CAM-1**	check.		
11:21:06.7 **CAM-2**	speed brake.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:21:11.8 **CAM-1**	heading select.		
11:21:13.3 **CAM-2**	yes, sir.		
		11:21:49.0 **APR**	Asiana two one four heavy San Francisco airport nine or ten o'clock one seven miles do you have it sight?
11:21:53.3 **HOT-2**	yes sir runway in sight.		
11:21:55.1 **HOT-1**	in sight?		
11:21:55.5 **HOT-2**	yes sir runway in sight.		
		11:21:56.2 **RDO-1**	okay runway in sight.
		11:21:57.8 **APR**	Asiana two one four heavy turn left heading three one zero cleared visual approach runway two eight left.
		11:22:02.7 **RDO-1**	cleared heading three one zero cleared visual two eight left Asiana two one four.
11:22:06.5 **HOT-2**	yes three one zero ID normal {I am intercepting} localizer.		
11:22:09.0 **HOT-1**	yes.		
11:22:12.7 **HOT-1**	localizer armed.		
11:22:14.2 **HOT-2**	check, cleared visual approach.		
11:22:17.2 **HOT-1**	check.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:22:45.6 **HOT-2**	{next, three thousand one hundred.}		
11:22:47.1 **CAM-2**	cleared visual approach.		
11:22:48.4 **CAM-1**	check.		
11:22:53.8 **HOT-1**	{since we did not receive HEMAN, but receive DUYET, let's descend slowly to one thousand eight hundred feet, and it's visual.}		
11:22:56.8 **HOT-2**	{yes} yes sir {I will set to one thousand eight hundred.}		
11:23:03.1 **HOT-1**	{because} clear visual {is given.}		
11:23:04.0 **HOT-1**	yes sir.		
11:23:05.2 **HOT-1**	localizer capture.		
11:23:06.5 **HOT-2**	check, flaps one sir.		
11:23:08.9 **HOT-1**	speed check flaps one set.		
11:23:16.4 **HOT-2**	speed one nine two set.		
		11:23:17.3 **APR**	Asiana two one four heavy reduce speed to one eight zero maintain that till five mile final there's traffic behind and to the right that does have you in sight.
		11:23:23.7 **RDO-1**	localizer speed one eighty * final five mile * * Asiana two one four.

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:23:30.7 **CAM-2**	speed one eight zero.		
11:23:31.8 **CAM-1**	check.		
11:23:32.9 **HOT-2**	flaps five.		
11:23:36.0 **HOT-1?**	{* *.}		
11:23:42.4 **CAM-2**	flaps five sir.		
11:23:43.5 **CAM-1**	speed check.		
11:23:44.7 **CAM-1**	flaps five.		
11:23:46.7 **CAM-1**	set.		
11:23:47.8 **HOT-2**	check.		
11:23:49.5 **CAM-1**	{* *.}		
11:23:53.2 **HOT-2**	{yeah, I am descending now.}		
11:23:54.4 **HOT-1**	yeah.		
11:23:58.0 **HOT-1**	V/S.		
11:23:58.8 **HOT-2**	one thousand.		
11:24:00.9 **HOT-1**	check.		
11:24:32.2 **CAM-3**	to one eight zero five miles.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:24:34.3 **CAM-1**	{Uhh?}		
11:24:34.4 **HOT-1**	ah ah ah one eight zero.		
11:24:35.0 **CAM-3**	one eight zero five miles.		
11:24:36.0 **CAM-2**	huh?		
11:24:36.8 **CAM-3**	* one eight zero.		
11:24:37.9 **HOT-2**	okay one eight zero five miles.		
11:24:50.6 **HOT-2**	okay gear down sir.		
11:24:52.0 **HOT-1**	gear down.		
11:24:53.1 **CAM-1**	{this seems a little high.}		
11:24:53.3 **CAM**	[sound of increased background noise]		
11:24:55.2 **CAM-2**	{yeah.}		
11:24:55.6 **CAM-1**	{this should be a bit high}		
11:24:58.9 **HOT-2**	{do you mean it's too high?}		
11:24:59.6 **HOT-1**	*.		
11:25:02.0 **CAM-2**	{I will descend more.}		
11:25:13.1 **FA**	[passenger announcement made in Korean]		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:25:23.0 **CAM-1**	{* * *.}		
11:25:29.0 **CAM-1**	ok.		
11:25:31.2 **CAM-1**	one thousand.		
		11:25:36.1 **APR**	Asiana two one four heavy contact San Francisco tower one two zero point five.
		11:25:39.4 **RDO-1**	* * * five Asiana two one four good day.
11:25:43.4 **HOT-2**	(missed) approach three thousand * *.		
11:25:50.3 **CAM-?**	(down flaps five).		
		11:25:56.0 **RDO-1**	ah tower good morning Asiana two one four final seven miles south two eight left.
11:26:01.1 **HOT-2**	flaps (twenty).		
11:26:02.2 **CAM-1**	flaps five ahh.		
11:26:04.9 **CAM-1**	flaps twenty.		
11:26:05.9 **CAM-2**	yeah.		
11:26:12.6 **CAM-2**	flaps thirty.		
11:26:14.8 **CAM-1**	speed check flaps thirty (sir).		
11:26:15.1 **HOT-1**	check.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:26:21.2 **HOT-1**	{* * speed. speed one three seven.* * one thousand speed. speed one three seven.}		
11:26:21.2 **CAM-1**	speed * *.		
11:26:24.6 **CAM**	[sound of click]		
11:26:27.6 **CAM**	[sound of click]		
11:26:28.3 **CAM-1**	flaps thirty.		
11:26:29.5 **HOT-2**	* sir *.		
11:26:32.5 **CAM-1**	flight director.		
11:26:34.0 **CAM-2**	check.		
11:26:35.7 **CAM-1**	speed.		
11:26:36.8 **CAM-2**	target speed one three seven.		
11:26:40.4 **CAM-2**	flight director off.		
11:26:41.3 **CAM-1**	okay.		
11:26:43.4 **CAM**	[sound of knock]		
11:26:44.0 **CAM-1**	{it's high.}		
11:26:52.2 **CAM-1**	one thousand.		
11:26:54.2 **CAM-2**	check.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:26:58.6 **CAM-3**	sink rate sir.		
11:26:59.1 **HOT-2**	yes sir.		
		11:26:59.5 **RDO-1**	tower Asiana two one four short final.
11:27:05.1 **CAM-3**	sink rate sir.		
11:27:06.1 **HOT-1**	cleared to land {?}		
11:27:07.3 **CAM-?**	{(sink rate.)}		
		11:27:07.5 **TWR**	Asiana two one four heavy San Francisco tower runway two eight left cleared to land.
11:27:10.7 **CAM**	* * * *.		
		11:27:10.8 **RDO-2**	cleared to land two eight left Asiana two one four.
11:27:14.3 **CAM-1**	okay.		
11:27:15.5 **CAM**	five hundred. [electronic voice]		
11:27:16.6 **HOT-2**	landing checklist.		
11:27:16.8 **CAM**	minimums, minimums. [electronic voice]		
11:27:17.5 **CAM-1**	landing checklist complete cleared to land.		
11:27:19.8 **HOT-1**	on glide path sir.		
11:27:21.2 **CAM-2**	check.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:27:32.3 **CAM**	two hundred. [electronic voice]		
11:27:33.6 **CAM-1**	{it's low.}		
11:27:34.8 **CAM-2**	yeah.		
11:27:36.0 **HOT-?**	*		
11:27:38.2 **CAM**	[sound similar to electronic seat adjustment]		
11:27:39.3 **CAM**	[sound of quadruple chime]		
11:27:41.6 **CAM**	one hundred. [electronic voice]		
11:27:42.8 **CAM-1**	speed.		
11:27:44.0 **CAM-?**	speed * *.		
11:27:45.8 **CAM**	fifty. [electronic voice]		
11:27:46.4 **CAM**	[sound similar to stick shaker lasting for approximately 2.24 seconds]		
11:27:46.6 **CAM**	forty. [electronic voice]		
11:27:47.3 **CAM**	thirty. [electronic voice]		
11:27:47.8 **HOT-1**	oh # go around.		
11:27:48.6 **CAM**	twenty. [electronic voice]		
11:27:49.5 **HOT-2**	go around.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
11:27:49.6 **CAM**	ten. [electronic voice]		
11:27:50.3 **HOT-?**	oh.		
11:27:50.3 **CAM**	[sound similar to impact]		
11:27:51.9 **HOT**	[sound similar to telephone dial tone]		
11:27:54.3 **CAM**	[sound of quadruple chime]		
11:27:55.4 **INT-?**	ah what's happening over there?		
11:27:55.9 **CAM**	[sound of quadruple chime]		
11:27:57.8 **CAM**	[sound of quadruple chime]		
11:28:00.2 **CAM**	{sound of quadruple chime]		

End of Transcript

11:28:01.9 [end of recording]