NATIONAL TRANSPORTATION SAFETY BOARD
Office of Research and Engineering
Washington, D.C.

June 21, 1999

Group Chairman's Factual Report – Cockpit Voice Recorder

A. ACCIDENT

DCA98RA013

Location	:	Palembang, Indonesia
Date	:	December 19, 1997
Time	:	About 1614 Local Time
Aircraft	:	Silk Air Flight MI-185, a Boeing B-737-36N, 9V-TRF

B. GROUP IDENTIFICATION

Chairman : James Cash
NTSB

Members: : Professor O. Diran,
IIC, Air Accident Investigation Commission, Indonesia

Captain Santoso Sayogo,
Deputy IIC, Air Accident Investigation Commission, Indonesia

Don Boston
Boeing Commercial Airplane Group

Kenneth Kell
Air Accident Investigation Commission, Australia

C. SUMMARY

The aircraft was equipped with an Allied Signal solid state 2-hour cockpit voice recorder (CVR) part number 980-6022-001 S/N unknown.

The crash memory module was recovered from the Musi River and transported to the NTSB laboratory immersed in water. The memory was removed from the crash case and an excellent quality 2 hour one minute and 11 second recording was obtained. The CVR contained about 29 minutes of the inbound flight and landing at Jakarta. The recording contained all of the ground operations and take off from Jakarta and about 30 minutes 25.4 seconds of the accident flight. The

recording stopped approximately 7 minutes and 48 seconds prior to the last recorded radar return prior to the aircraft impacting the ground.[1]

The CVR's underwater locator beacon (ULB) was found detached from the CVR at the accident site. The ULB was sent the Vehicle Recorder Division's laboratory, then forwarded to its manufacturer, RJE International, Inc. in Irvine, California for further examination, after the ULB failed a status test at the NTSB laboratory. A subsequent report from the manufacturer confirmed that the ULB did not operate due to "water intrusion damage" from broken end cap, from "apparent impact damage".

D: DETALS OF INVESTIGATION

The CVR crash case was badly dented and was impacted with mud and silt when it arrived in the laboratory. The crash module was not attached to the normal aircraft mounting chassis and electronics. The mating plug and cable were damaged as a result of the impact. The recorder was wet, but it appeared to have no heat or fire damage. Because the recorder was wet and the mating plug was damaged, the memory module was removed from the crash case prior to readout. The memory module was found to be wet but otherwise in good condition. There was no circuit board or memory chip corrosion or damage noted. A new connecting cable was mated to the accident memory board. The accident memory board was then connected to the Safety Board's Allied Signal readout chassis and electronics for playback. The memory board was downloaded and decompressed using Allied Signal's Playback and Test Station (PATS) hardware and software, version 2.05. The resulting download produced an excellent quality 30 minute 4 channel recording and an excellent quality 2 hour 1 minute an 11 second, 2 channel recording.

The maintenance section of the memory module was examined to determine if any memory or recorder faults were identified by the CVR during its normal operation. The memory log did not contain any faults but the memory did contain 2 BITE failures. The BITE or built in test log contained in the memory does not time stamp the errors so no determination could be made as to when the BITE failures were logged. The BITE failures that the memory contained were as follows:

1: E_PLUS_12 (43h)

2: Error 69h

The manufacture indicated that the 2 BITE faults are frequently encountered during normal operation and do not indicate any decrease in the reliability of the unit. In addition, the manufacturer noted the faults do not indicate a problem that would have resulted in the CVR quitting inflight. The recorder appeared to operate

[1] Aircraft impact time was established by correlating recorder ground radar data, performance data with the CVR/DFDR data.

normally throughout its 2-hour recording. There were no faults associated with bad or faulty memory or with the recorder's inability to record normal signals.

The Allied Signal 2hr recorder is organized as the following:

> The last 30 minutes of the recording is organized like a conventional 30-minute solid state or tape CVR recorder. CVR channel 1 is dedicated to the captain's hot microphone/radio/intercom selector panel. CVR channel 2 is dedicated to the co-pilot's hot microphone/radio/intercom selector panel. CVR channel 3, is normally connected to the 3rd officer's radio panel in a 3 crewmember aircraft. In the Silk Air B737, 2 crew aircraft, this 3rd channel is connected to the jump-seat intercom panel. The last channel, CVR Channel 4, is dedicated to the cockpit area microphone.
>
> The recording from time 30 minutes to 120 minutes is organized to contain 2-channels of audio data. The first channel contains the area microphone information. The second channel is a summation of the information from the 3 hot microphone/radio/intercom channels.

The Allied Signal solid state CVR contains an energy storage capacitor in its power supply. The purpose of this capacitor is to hold up the recorder's electrical power for about a 1/4 of a second after main electrical power is removed from the unit. This feature allows the unit to "ride out" any momentary electrical transients that are normally encountered on the aircraft. For instance when the crew transfers electrical power from one generator to another or from the auxiliary power unit to main engine generators, there is a momentary power loss to the CVR recorder. With the installed capacitor, the recorder "rides through" these momentary interruptions and it appears that there wasn't any electrical interruption when it is played back. This power capacitor also gives the recorder some extra time to "clean" up its memory management duties during a normal power down of the unit. If the unit was not equipped with this "hold up" capacitor the recorder would loose power immediately and it would not have time to record the necessary information that it uses for its normal housekeeping functions.

The Silk Air recording appeared to be operating normally throughout the entire 2-hr recording. There were several aircraft momentary power interruptions encountered during the recording that the recorder "rode through" without any observable anomalies. These momentary interruptions accrued when the aircraft was on the ground at Jakarta. The ship's electrical power was transferred from engine generators to the APU on shutdown resulting in a momentary loss. When the aircraft was again started and the electrical load was transferred back to the engine generators resulting in another momentary electrical loss. By reviewing the CVR recording it appeared that the recorder's internal power supply capacitor was operating normally by providing continuous recorder operation in spite of the momentary aircraft electrical power interruptions.

The CVR recording ended unexpectedly with the aircraft still at 35,000 feet approximately 8 minutes prior to impact. From all indications on the CVR, everything appeared normal on the flight deck and with the aircraft at CVR shutdown. The recording had characteristics what would be expected of a normal electrical power shutdown of the CVR. There were no transients or identifiable signatures associated with the end of the recording. The downloaded data was re-examined to determine if all of the memory had downloaded correctly. It was verified that the readout software had downloaded all of the available memory contained in the accident CVR. There were no blocks of memory missing, hidden or corrupted during the download.

Flight – Ground Test Documentation

To better understand why the CVR stopped prior to the final impact, several tests were conducted to document the power down characteristics of the Allied Signal SSCVR recorder as installed on the Boeing 737-300 series aircraft. The Safety Board and Boeing developed several test plans and conducted 2 ground tests and one flight test on similar 737 aircraft. The first ground test was conducted on February 5, 1998. The second ground and in-flight test was conducted on May 14, 1998. (2 test plans and wiring schematics are attached as attachment 1) The purpose of the tests were to document how the CVR reacted to and how it recorded simulated electrical overloads, short circuits and manual pulls of the CVR circuit breaker in the cockpit. In the Boeing 737 aircraft, the CVR's electrical system is protected with a conventional 3-AMP cylindrical circuit breaker, number C107 located on the captain's circuit breaker panel behind the left cockpit seat. Several test locations were identified for the application of the simulated electrical overloads and shorts. One location was at the CVR box itself. The CVR is normally mounted in the Boeing 737 aft cargo compartment right side wall. Another location for the test was at junction box splice SP87. This splice is located in the electronics bay at aircraft station number 362 under the cockpit. The final location for the test was to connect to the rear of the CVR circuit breaker panel P-18 circuit breaker C107 in the cockpit.

From each of the 3 test locations both an immediate short circuit and an overload condition could be induced. The short circuit consisted of manually throwing a switch that connected the CVR's electrical power wire directly to an aircraft frame ground. The resulting high current overload should immediately blow the 3-amp cockpit circuit breaker. The overload condition was simulated by connecting the CVR power wire to ground through a 16 ohm resistive load. This resulted in approximately 7 amps of current to be drawn through the 3-amp cockpit circuit breaker. With this level of current, the cockpit breaker should trip is approximately 7-10 seconds.

Other conditions were considered that might do some intermediate damage to the CVR wiring that did not result in a direct short or a high current overload. The first condition considered was that the CVR electrical power wires experienced

a clean cut or disconnect. It was determined that pulling the circuit breaker in the cockpit simulated this condition because the end result was the same. The other conditions considered were some low current short or overload that ultimately popped the circuit breaker. It was felt that this condition was adequately represented in the 7-amp overload scenario.

During all of the tests an identical Allied Signal SSCVR 2-hr recorder was installed on the test aircraft to record all of the various test conditions. Several tests conditions were conducted both on the ground and airborne to document the recorded results. (See attachment 1) In addition to the electrical overload and short circuit tests, several manual pull tests were conducted. A person manually pulled the CVR's circuit breaker in the cockpit both on the ground and airborne. The manual pulls performed as both a "hard" pull and a "soft" pull condition. A hard pull allowed the circuit breaker to pop open with an audible click. On the soft pull the operator would slowly work the circuit breaker out between his two fingers trying to make minimal sound.

All 4 channels of the accident recording were digitized for analysis by the Safety Board's signal processing software. The last 8 seconds of the accident recording is shown in Chart 1. The traces are CVR channel 1, 2, 3, 4 top to bottom. The x-axis is elapse time in seconds and the y-axis is amplitude of the corresponding signals. The most active channel is CVR channel 4 or the area microphone channel. In chart-2 the amplitude of the quieter channel is exaggerated to show that the information on each of the channels all ended at about the same time. There are no unusual or distinctive sound signatures present before the recording ended. Test data shows that the CVR power supply capacitor is going to "hold up" or provide for continuous recording for approximately 1/4 of a second or 240 ms from where the electrical power was removed. Test data shows that whatever stopped the recorder probably happened back approximately 240 ms from the end of the recording. Chart 2 depicts nothing unusual at this time. Chart 3 is a frequency spectrogram representation of the cockpit area microphone signal of the last 2.5 seconds of the recording. It to shows no unusual sounds or clicks during the last 240 ms prior to the end of the recording.

To document the removal of electrical power and its effect on the CVR recordings, the accident recording was compared to several test recording made on identical Boeing 737 300 series aircraft. The test CVR recordings were digitized and displayed in an identical format as the accident recording. The following charts depict several test conditions from both the ground and the airborne tests:

February 5 1998 Ground test:

Chart 4	Test condition 008 ground test CVR overload at CVR
Chart 4 a	Test condition 008 ground test CVR overload at CVR spectrogram
Chart 5	Test condition 010 ground test CVR short at CVR
Chart 5 a	Test condition 010 ground test CVR short at CVR spectrogram

Chart 6	Test condition 004 ground test CVR Circuit Breaker manual spectrogram
Chart 7	Test condition 015 ground test CVR Circuit Breaker manual spectrogram

May 15 1998 Ground and Airborne tests:

Chart 8	Test condition 003 airborne test CVR overload at P18 Panel
Chart 8a	Test condition 003 CVR overload at P18 Panel spectrum
Chart 9	Test condition 006 airborne test CVR short circuit at P18 Panel
Chart 9a	Test condition 006 CVR short circuit at P18 Panel spectrum
Chart 10	Test condition 008 airborne test CVR overload at EE Bay
Chart 10a	Test condition 008 airborne test overload at EE Bay ch2 enlarged
Chart 11a	Test condition 011 airborne test CVR short at EE Bay
Chart 11b	Test condition 011 airborne test CVR short at EE Bay ch1, 4
Chart 11c	Test condition 011 airborne test CVR short at EE Bay ch2
Chart 11d	Test condition 011 airborne test short at EE Bay ch3 spectrogram
Chart 12	Test condition 015 airborne test CVR Circuit Breaker soft pull
Chart 13	Test condition 016.5 airborne test CVR Circuit Breaker hard pull

The three test cases will be examined and compared to the accident recording as follows: 1. The short circuit tests; 2. The overload tests; and finally the manual circuit breaker tests.

Short Circuit Test

In each of the short circuit test, several distinctive signatures were recorded on the CVR. Charts 5 and 5a show this the best. When the CVR receives a direct short in its power supply leads a distinctive 400 Hz tone is recorded on one or more of the CVR channels. This tone is most likely an inductive coupling from the power supply wires of the aircraft into the signal wires of the CVR recorder. It could also be attributed to some inductive coupling inside of the CVR unit itself. The level of the 400 Hz tone is the loudest when the short is applied directly to the CVR in the rear of the aircraft (test condition 010) but it is also identifiable in the airborne tests 6 and 11 (Charts 9-9a, 11a-d). It doesn't seem to mater where the short is applied, an identifiable sound signature can be seen in all 3 short locations. The accident CVR recording was examined to determine if any of the sound signatures identified in the short circuit tests could be found on the accident recording. No corresponding signatures could be identified on the accident recording.

These same tests also illustrate the distinctive and identifiable snap sound that the circuit breaker makes when it is violently tripped by the short circuit. The same charts show the sounds that the area microphone picks up just after the short is applied. Again it should be noted that the CVR continues to run for about 240 ms after the circuit breaker pops. This 240 ms is more than enough time for the sound of the circuit breaker popping to be picked up by the cockpit microphone and be sent to the recorder before it runs out of power from the capacitor.

Assuming that the area microphone is approximately 6 feet from the circuit breaker and that sound travels about one foot a millisecond, it takes only 6 ms for the sound to reach the microphone.

The accident CVR recording was examined to determine if any of the sound signatures identified as originating from the sound of the violent popping of the CVR circuit breaker could be identified on the accident recording. No corresponding signatures could be identified on the accident recording.

Overload Circuit Test

The overload tests yielded similar results as the short circuit tests. As before the same 3 test locations were examined to document the sound signatures. The overload applied at the rear CVR location yielded a similar sound signature as the rear short circuit did (ground test condition 008 Chart 4, 4a). The only difference in the signatures was that there was a time delay of several seconds from when the overload was applied to when the circuit breaker tripped. Airborne condition 003 and 008 (Chart 8, 8a, 10, 10a). This time delay is due to the fact that the circuit breaker did not trip immediately when the overload was applied. In addition the sound of the circuit breaker snap was not as loud in the overload tests as it was in the short circuit tests. Even though the sound of circuit breaker snap was quieter, it was still identifiable in all of the overload tests that were examined. The accident CVR recording was examined to determine if any of the sound signatures identified in the overload tests could be identified on the accident recording. No corresponding signatures could be found on the accident recording

Manual Circuit Breaker Pulls

The last set of tests was to examine the sound signatures that were generated when the CVR cockpit circuit breaker was manually pulled. In the ground tests conditions 4, 15 (Charts 6, 7) depict the sounds made when the circuit breaker was pulled manually. Test 4 was a manual pull with the pilot and co-pilot sitting in their seats. Test 15 was made with the pilot standing between the circuit breaker panel and the area microphone. It can be seen in charts 6 and 7 that the sound of the snap is identifiable on the area microphone channel of the CVR. It should be noted that these two test conditions were made while the aircraft was on the ground with no engines or air conditioning fans running. To better validate whether the circuit breaker manual pull sounds could be heard above the normal in-flight cockpit sounds, the circuit breaker tests were repeated during the in-flight tests. Airborne test conditions 15, 16.5 were accomplished to document the sounds that were recorded on the CVR during a "soft" and "hard"

pull of the CVR circuit breaker. Charts 12 and 13 are spectrographs of the area microphone channel of the CVR several seconds prior to the CVR stopping. It can be seen from both charts that no identifiable sound signatures were recorded on the CVR. The addition of the background cockpit noise that is present during normal cruise is enough to obscure the sounds associated with the manual in-flight pulling of the cockpit circuit breaker. The end of the recording signatures recorded on the test tapes during the manual pull tests was identical with the signatures found on the accident CVR recording.

Summary

1. The solid state memory unit was wet and the exterior of the crash case was dented and scratched.
2. All of the information was extracted from the CVR memory unit. 30 minutes of excellent quality 4 channel information, 2 hr of excellent quality 2 channel information
3. The recording ended approximately 8 minutes prior to ground impact
4. When the recording ended, the cockpit sounds appeared normal, approximately 35,000 feet 250 knots cruise flight.
5. The Allied Signal SSCVR contains a power supply capacitor that powers the unit for about 240 ms after electrical power is removed from the unit.
6. The CVR internal power supply "hold up" capacitor appeared to be operating normally.
7. The CVR recording exhibited characteristics of what would be expected of a normal electrical power shutdown of the CVR.
8. There were no transients or identifiable signatures noted on the recording associated with anything but a normal end of the recording
9. The CVR recorder power supply runs long enough for the sound of the circuit breaker popping to be recorded.
10. During an overload and a short circuit, the sound of the circuit breaker popping is loud enough to be identified on the CVR's area microphone channel on the ground and in-flight.

11. During an overload and a short circuit, the CVR records unique and identifiable sound signatures on one or more of the channels both on the ground an in-flight.
12. During the manual pulls on the ground, the sound of the circuit breaker is loud enough to be identified on the CVR recording.
13. In cruise flight, normal cockpit background noise obscures the manual circuit breaker pull sounds.
14. There are no unique electronic identifying sound signatures recorded on the CVR that are associated with a manual pull of the electrical power circuit breaker.

James R. Cash
Electronics Engineer

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0703:54	Start of Recording..		
0805:46 {01:52}	Start of Transcript		
0805:47 {01:53} CAM-1	Instrument, ASI is checked no flags, ADI checked no flags, one VOR is inop, one zero zero eight on the altimeters, forty feet seventy feet, stand-by ASI is checked, stand-by AI is set , clock zero eight zero five or zero six now, heading ah zero five five all places..		
0806:09 {02:15} CAM-2	*.		
0806:17 {02:23} CAM-1	* VSI zero no flags, *.		
0806:41 {02:47} CAM-1	some water?		
0806:45 {02:51} CAM-2	I got some here.		
0811:18 {07:24} CAM	((sound of knock on door)).		
0811:19 {07:25} CAM	((sound of door opening)).		
0811:20 {07:26} CAM-3	Captain.		
0811:21 {07:27} CAM-1	yeah.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0811:22 {07:28} CAM-3	actual zero fuel weight forty five point one Captain.		
0811:25 {07:31} CAM-1	okay.		
0811:27 {07:33} CAM	((sound of door closing)).		
0814:37 {10:43} CAM-1	the wind is very strong.		
0814:39 {10:45} CAM-2	okay.		
0814:40 {10:46} CAM-1	very warm, thirty four thirty five degrees.		
0814:42 {10:48} CAM-2	yeah.		
0814:59 {11:05} CAM-2	I don't know why they don't get these docking systems going.		
0815:03 {11:09} CAM-1	why, they try it's not working - correctly.		
0815:05 {11:11} CAM-2	yeah.		
0815:11 {11:17} CAM-1	I wonder this reason here is everybody want to go high tech but people are not, not ready for high tech.		
0815:20 {11:26} CAM-2	yeah.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0815:23 {11:29} CAM-1	went to KL and ah went to Malacca and are okay it feels beautiful shopping center but they couldn't maintain it with the air-con and all all gone to waste actually.		
0815:34 {11:40} CAM-2	yeah.		
0815:35 {11:41} CAM-1	put up but there's nobody maintaining everything go down the drain now so it's pure wasting of money I think.		
0815:39 {11:45} CAM-2	yeah.		
0815:46 {11:52} CAM-1	they have to be able to maintain it.		
0817:03 {13:09} CAM-2	call clearance.		
0817:10 {13:16} CAM	((sound of knock)).		
0817:12 {13:18} CAM	((sound of door opening)).		
		>0817:13 {13:19} RDO-2	delivery selamat soreh Silk Air one eight five.
		>0817:17 {13:23} CLR	good afternoon Silk Air one eight five soeta delivery go ahead.

INTRA-COCKPIT COMMUNICATION

TIME and SOURCE	CONTENT

0818:04 {14:10}
CAM-1 terimah kasiah.

0818:13 {14:19}
CAM ((sound of door closing)).

AIR-GROUND COMMUNICATION

TIME and SOURCE	CONTENT

>0817:21 {13:27}
RDO-2 ah Silk Air one eight five delta one one requesting flight level three five zero to Singapore.

>0817:36 {13:42}
CLR Silk Air one eight five three five zero is already occupied are you able to accept three nine zero.

>0817:42 {13:48}
RDO-2 ah negative flight level three one zero please.

>0817:49 {13:55}
CLR roger Silk Air one eight five you're cleared to Singapore via golf five seven nine level three one zero squawk two three four four expect Cengkareng two golf departure for runway two five right.

>0818:01 {14:07}
RDO-2 cleared to Singapore golf five seven nine flight level three one zero squawk two three four four Cengkareng two golf two five right, Silk Air one eight five.

>0818:09 {14:15}
CLR Silk Air one eight five that's correct when you start and push contact ground one two one decimal six, good day.

>0818:14 {14:20}
RDO-2 one two one six Silk Air one eight five good day.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
0818:17 {14:23} CAM-1	it's zero fuel forty five one, takeoff fifty one nine, four point seven, one oh four.		
0818:33 {14:39} CAM-1	let's close that.		
0818:35 {14:41} CAM-2	ah two three four four.		
0819:11 {15:17} CAM-2	fifty two four runway two five right.		
0819:14 {15:20} CAM-1	yeah.		
0819:15 {15:21} CAM-2	it's fifty three one reduced fifty two nine ah three seven, three seven, four three .		
0819:16 {15:22} CAM	((sound of door opening)).		
0819:16 {15:22} CAM-4	excuse me Captain, can I keep this knife with the chief purser Captain? because the knife on it to open the luggage Captain because the passenger's key is lost.		
0819:28 {15:34} CAM-1	it's okay so long as he doesn't stab me with it.		
0819:34 {15:40} CAM	((sound of door closing)).		
0819:43 {15:49} CAM-1	it's not a bomb eh?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
0819:45 {15:51} CAM-2	yeah.		
0819:50 {15:56} CAM-1	three seven three seven, four three, five eight, two ten.		
0819:57 {16:03} CAM-2	set.		
0819:58 {16:04} CAM-1	checklist then.		
0819:59 {16:05} CAM-2	cockpit preparation?		
0820:00 {16:06} CAM-1	complete.		
0820:00 {16:06} CAM-2	the oxygen and interphone?		
0820:02 {16:08} CAM-1	set.		
0820:02 {16:08} CAM-2	checked, IRS's?		
0820:03 {16:09} CAM-1	aligned and nav.		
0820:04 {16:10} CAM-2	yaw damper?		
0820:05 {16:11} CAM-1	on.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
0820:05 {16:11} CAM-2	instrument transfer switches?		
0820:06 {16:12} CAM-1	normal.		
0820:07 {16:13} CAM-2	fuel?		
0820:08 {16:14} CAM-1	seven thousand cross feed closed four pumps on.		
0820:10 {16:16} CAM	((sound of door opening)).		
0820:13 {16:19} CAM-5	sorry I don't know why they don't have, a security locker is it on this TRF.		
0820:19 {16:25} CAM-1	there isn't yeah yeah.		
0820:19 {16:25} CAM-5	no but um.		
0820:21 {16:27} CAM-1	where is the passenger when they can give it to you *.		
0820:24 {16:30} CAM-5	huh.		
0820:24 {16:30} CAM-1	why.		
0820:25 {16:31} CAM-5	no.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0820:26 {16:32} CAM-1	they want to protect you lah.		
0820:27 {16:33} CAM-5	I I was in the circular place except in TRE and TRB I think they got security, a security lock locker.		
0820:34 {16:40} CAM-1	okay.		
0820:35 {16:41} CAM-5	okay no mind I'm just ah -.		
0820:36 {16:42} CAM-1	so long as it's not a bomb.		
0820:37 {16:43} CAM-5	no it's not a knife on board huh.		
0820:39 {16:45} CAM-1	it's not a bomb right so it's okay you take and stab him lah.		
0820:44 {16:50} CAM-5	huh.		
0820:44 {16:50} CAM-1	you take and you stab him.		
0820:46 {16:52} CAM-1	okay.		
0820:48 {16:54} CAM-2	ah fuel?		
0820:49 {16:55} CAM-1	it's ah seven thousand cross feed closed four pumps on.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0820:51 {16:57} CAM	((sound of door closing)).		
0820:52 {16:58} CAM-2	emergency exit lights?		
0820:53 {16:59} CAM-1	armed.		
0820:53 {16:59} CAM-2	passenger signs?		
0820:55 {17:01} CAM-1	on.		
0820:56 {17:02} CAM-2	window heat?		
0820:56 {17:02} CAM-1	on.		
0820:57 {17:03} CAM-2	hydraulics?		
0820:57 {17:03} CAM-1	normal.		
0820:58 {17:04} CAM-2	gear pins?		
0820:59 {17:05} CAM-1	removed.		
0821:00 {17:06} CAM-2	air-con and press?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0821:01 {17:07} CAM-1	one pack bleeds on, set.		
0821:02 {17:08} CAM-2	nav switch?		
0821:02 {17:08} CAM-1	not installed.		
0821:03 {17:09} CAM-2	instruments?		
0821:04 {17:10} CAM-1	set and cross checked.		
0821:05 {17:11} CAM-2	cross checked, anti-skid?		
0821:05 {17:11} CAM-1	on.		
0821:06 {17:12} CAM-2	auto-brakes?		
0821:07 {17:13} CAM-1	RTO.		
0821:07 {17:13} CAM-2	radio, radar and transponder?		
0821:08 {17:14} CAM-1	set and stand-by.		
0821:09 {17:15} CAM-2	set stand-by, speed brake?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
0821:11 {17:17} CAM-1	down detent.		
0821:12 {17:18} CAM-2	parking brake and pressure?		
0821:13 {17:19} CAM-1	checked normal.		
0821:13 {17:19} CAM-2	start levers?		
0821:14 {17:20} CAM-1	cutoff.		
0821:15 {17:21} CAM-2	wheel well fire warning?		
0821:15 {17:21} CAM-1	checked.		
0821:16 {17:22} CAM-2	rudder and aileron trim?		
0821:17 {17:23} CAM-1	free and zero.		
0821:19 {17:25} CAM-2	papers.		
0821:21 {17:27} CAM-1	on board.		
0821:22 {17:28} CAM-2	briefings.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
0821:22 {17:28} CAM-1	complete.		
0821:23 {17:29} CAM-2	complete, FMC?		
0821:24 {17:30} CAM-1	checked.		
0821:24 {17:30} CAM-2	set, N-1 and IAS bugs.		
0821:26 {17:32} CAM-1	set.		
0821:27 {17:33} CAM-2	ah set, holding at doors.		
0821:35 {17:41} CAM-1	it's a pity as you said it should have installed this years ago but they don't want to use this.		
0821:39 {17:45} CAM-2	yeah.		
0821:40 {17:46} CAM-1	cause somebody said ah you gotta to install this and pay the money and then they install this and all this by by now they want to use it - .		
0821:46 {17:52} CAM	((sound of door opening)).		
0821:47 {17:53} CAM-4	all pax on board captain thank you.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
0821:48 {17:54} CAM	((sound of door closing)).		
0821:51 {17:57} CAM-1	ten minutes early?		
0821:53 {17:59} CAM-2	yeah.		
0821:55 {18:01} CAM-1	same with Malaysian install every corridor ah every where they put a air-con ah unit air-con there but sometimes when I went there they are not working *.		
0822:06 {18:12} CAM-2	yeah.		
0822:07 {18:13} CAM-1	doors is closed.		
0822:08 {18:14} CAM-2	closed.		
0822:08 {18:14} CAM-1	push and start.		
		>0822:13 {18:19} RDO-2	Soeta ground Silk Air one eight five selamat siang
>0822:15 {18:21} CAM-5	Ninty seven.		

INTRA-COCKPIT COMMUNICATION

TIME and SOURCE	CONTENT
>0822:17 {18:23} CAM-1	Okay thank you.
0822:40 {18:46} CAM-1	below the line thanks.
0822:42 {18:48} CAM-2	anti-collision lights?
0822:42 {18:48} CAM-1	on.
0822:43 {18:49} CAM-2	air-con air-con packs?
0822:45 {18:51} CAM-1	off.
0822:45 {18:51} CAM-2	start pressure?

AIR-GROUND COMMUNICATION

TIME and SOURCE	CONTENT
>0822:23 {18:29} RDO-2	Soeta ground Silk Air one eight five.
>0822:26 {18:32} GND	Silk Air one eight five go ahead.
>0822:28 {18:34} RDO-2	Selamat sore Silk Air one eight five delta one one request push back and start.
>0822:32 {18:38} GND	Silk Air one eight five cleared to push and start face to hotel.
>0822:37 {18:43} RDO-2	push and start facing hotel Silk Air one eight five.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0822:46 {18:52} CAM-1	forty.		
0822:47 {18:53} CAM-2	before start complete.		
0822:51 {18:57} INT-1	hay ground.		
0822:53 {18:59} INT-6	yes sir.		
0822:55 {19:01} INT-1	confirm ground checks complete?		
0822:56 {19:02} INT-6	yes all clear.		
0823:00 {19:06} INT-1	okay ready to push and start face hotel		
0823:07 {19:13} CAM	((sound similar to parking brake release)).		
0823:08 {19:14} INT-1	okay release off chocks two three.		
0823:12 {19:18} CAM-1	starting two okay starting two.		
0823:18 {19:24} CAM-2	yup.		
0823:37 {19:43} CAM-1	N-one.		

INTRA-COCKPIT COMMUNICATION

TIME and SOURCE	CONTENT
0823:38 {19:44} CAM-2	checks - pressure rising.
0823:42 {19:48} CAM-1	checked.
0823:54 {20:00} CAM-1	*.
0823:55 {20:01} CAM-2	*.
0823:59 {20:05} CAM	((sound similar to starter switch cutout)).
0824:00 {20:06} CAM-2	starter cutout.
0824:03 {20:09} CAM-1	okay checks.
0824:10 {20:16} CAM-1	stabilize.
0824:17 {20:23} CAM-1	starting one.
0824:32 {20:38} CAM-1	• N-one.
0824:38 {20:44} CAM-2	checks oil pressure rising.
0824:39 {20:45} CAM-1	check.

AIR-GROUND COMMUNICATION

TIME and SOURCE	CONTENT

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
0824:56 {21:02} CAM	((sound similar to starter cutout)).		
0824:59 {21:05} CAM-2	starter cutout.		
0825:00 {21:06} CAM-1	checked.		
0825:14 {21:20} CAM-1	okay after start drills thanks.		
0825:24 {21:30} CAM-1	after start checklist thanks.		
0825:25 {21:31} CAM-2	electrical?		
0825:27 {21:33} CAM-1	generators on.		
0825:27 {21:33} CAM-2	pitot heat?		
0825:28 {21:34} CAM-1	on.		
0825:28 {21:34} CAM-2	anti-ice.		
0825:29 {21:35} CAM-1	off.		
0825:29 {21:35} CAM-2	air-con and press?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0825:31 {21:37} CAM-1	packs on ah.		
0825:32 {21:38} CAM-2	start levers?		
0825:34 {21:40} CAM-1	idle detent.		
0825:35 {21:41} CAM-2	recall.		
0825:36 {21:42} CAM-1	checked.		
0825:37 {21:43} CAM-2	holding at ground equipment.		
0825:39 {21:45} CAM-1	okay he's turning the thing so tight it's making cry *.		
0825:55 {22:01} INT-6	okay Captain push back has been completed parking brake set please.		
0826:00 {22:06} INT-1	parking brake set.		
0826:01 {22:07} INT-6	roger brakes set.		
0826:15 {22:21} INT-1	ah two good starts disconnect hand signals on the right side.		
		>0826:17 {22:23} GND	Silk Air one eight five are you able level three five zero?

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0826:20 {22:26} INT-6	okay good day have a nice flight Captain.		
		>0826:21 {22:27} RDO-1	one eight five affirmative.
		>0826:23 {22:29} GND	Silk Air one eight five for your level three five zero.
		>0826:26 {22:32} RDO-2	three five zero roger thank you Silk Air one eight five.
0826:29 {22:35} CAM-1	three five zero there three five zero there we didn't change any way lah we know we are going to get three five zero (sound of laugh) okay three five zero.		
0826:38 {22:44} CAM-2	yup.		
0826:38 {22:44} CAM-1	okay ground equipment clear • request taxi thanks.		
0826:51 {22:57} CAM-1	okay cleared Jakarta Singapore golf five seven nine Cengkareng two golf which is inside three five zero now which is there there there and squawk is two three four four.		
0827:02 {23:08} CAM-2	yup.		
0827:03 {23:09} CAM-1	okay.		

INTRA-COCKPIT COMMUNICATION

TIME and SOURCE	CONTENT
0827:12 {23:18} CAM-1	right clear, left clear flaps five thanks.
0827:21 {23:27} CAM-1	okay rudder's right.
0827:23 {23:29} CAM-2	full right.
0827:24 {23:30} CAM-1	rudder left.
0827:25 {23:31} CAM-2	full left.
0827:27 {23:33} CAM-2	flight controls.
0828:48 {24:54} CAM-1	okay.

AIR-GROUND COMMUNICATION

TIME and SOURCE	CONTENT
>0827:04 {23:10} RDO-2	Silk Air one eight five taxi.
>0827:06 {23:12} GND	taxi runway two five right via hotel and alpha.
>0827:09 {23:15} RDO-2	hotel alpha two five right Silk Air one eight five.
>0828:42 {24:48} GND	Silk Air one eight five you are number two after aircraft Fokker twenty eight out lima and using alpha for runway two five right.
>0828:49 {24:55} RDO-2	Silk Air one eight five copy.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0828:51 {24:57} CAM-1	turning right, skidding left yaw damper's checked heading is increasing passing zero three zero.		
0828:58 {25:04} CAM-2	checked.		
0828:59 {25:05} CAM-1	ADF tracking, this guy's still too far away.		
0829:06 {25:12} CAM-2	yeah.		
0829:16 {25:22} CAM-1	before takeoff checklist down the line thanks.		
0829:20 {25:26} CAM-2	APU?		
0829:21 {25:27} CAM-1	is off.		
0829:22 {25:28} CAM-2	flight controls?		
0829:23 {25:29} CAM-1	checked.		
0829:24 {25:30} CAM-2	checked, flaps?		
0829:25 {25:31} CAM-1	five degrees, green light.		
0829:28 {25:34} CAM-2	five green, rudder, aileron stab trim?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
0829:29 {25:35} CAM-1	zero, zero and four point seven units checked.		
0829:35 {25:41} CAM-2	zero zero four point seven checked, takeoff briefing.		
0829:37 {25:43} CAM-1	complete.		
0829:38 {25:44} CAM-2	it's complete to the line.		
0829:40 {25:46} CAM-1	okay.		
0829:50 {25:56} CAM	((sound of door opening)).		
0829:51 {25:57} CAM-1	all set.		
0829:52 {25:58} CAM-5	yeah just give me one one five seconds to put on the infant seatbelt you know.		
0829:57 {26:03} CAM-1	never mind lah you can take quite some time you can take up to 3 seconds.		
0829:59 {26:05} CAM-5	okay.		
0830:00 {26:06} CAM-1	(sound of laugh) five seconds (sound of laugh) • • give me five seconds to put -.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0830:03 {26:09} CAM	((sound of door closing)).		
		>0830:44 {26:50} GND	Silk Air one eight five continue taxi on alpha contact tower one one eight point seven five.
		>0830:48 {26:54} RDO-2	one one eight seven five Silk Air one eight five.
		>0831:34 {27:40} RDO-2	Tower selamat sore Silk Air one eight five on alpha.
		>0831:38 {27:44} TWR	Silk Air one eight five number two for departure two five right.
		>0831:41 {27:47} RDO-2	Silk Air one eight five.
		>0834:00 {30:06} TWR	Silk Air one eight five line up and wait two five right.
		>0834:03 {30:09} RDO-2	line up and wait Silk Air one eight five.
0834:06 {30:12} CAM-1	sit the girls thanks, below the line.		
0834:09 {30:15} PA-2	cabin crew take off positions please.		
0834:17 {30:23} CAM-2	cabin announcement complete, engine start switches?		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
0834:20 {30:26} CAM-1	on.		
0834:21 {30:27} CAM-2	transponder?		
0834:22 {30:28} CAM-1	TA only.		
0834:23 {30:29} CAM-2	strobe lights?		
0834:25 {30:31} CAM-1	on.		
0834:26 {30:32} CAM-2	holding at takeoff clearance.		
0834:28 {30:34} CAM-1	thank you.		
0835:22 {31:28} CAM-1	*.		
0835:25 {31:31} CAM-2	sorry?		
0835:28 {31:34} CAM-1	this guy is also going papa lima bravo.		
0835:30 {31:36} CAM-2	yeah.		
0835:32 {31:38} CAM-1	Sempati is turning right.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0835:37 {31:43} CAM-1	we're waiting for him to cross before he can let us go.		
0835:40 {31:46} CAM-2	yeah.		
0835:55 {32:01} CAM-2	they turned around that triple seven fast.		
0835:57 {32:03} CAM-1	yeah.		
0835:59 {32:05} CAM-2	that SQ one.		
>0836:30 {32:38} CAM-1	come on.		
		>0836:35 {32:41} TWR	Silk Air one eight five cancel SID after airborne turn right direct papa lima bravo cleared for takeoff.
		>0836:41 {32:47} RDO-2	airborne right turn papa lima bravo cleared for takeoff Silk Air one eight five.
0836:44 {32:50} CAM-2	takeoff clearance.		
0836:45 {32:51} CAM-1	obtained.		
0836:47 {32:53} CAM-2	before takeoff checklist's complete.		
0836:48 {32:54} CAM	((sound of increasing engine noise)).		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
0836:50 {32:56} CAM-1	ninety one five.		
0836:55 {33:01} CAM-2	ninety one five thrust is set.		
0836:58 {33:04} CAM-2	eighty knots.		
0836:59 {33:05} CAM-1	my control.		
0837:00 {33:06} CAM-2	you have control.		
0837:12 {33:18} CAM-2	V-one rotate.		
0837:14 {33:20} CAM-2	V-two.		
0837:17 {33:23} CAM-2	positive climb.		
0837:18 {33:24} CAM-1	gear up thanks.		
0837:28 {33:34} CAM-1	heading select right turn three three zero yeah.		
0837:32 {33:38} CAM-2	it's all clear.		
0837:33 {33:39} CAM-1	okay.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0837:36 {33:42} CAM-1	N-one, two ten, flaps one.		
		>0837:48 {33:54} TWR	Silk Air one eight five contact departure one one nine seven five.
		>0837:52 {33:58} RDO-2	one one nine seven five Silk Air one eight five terima kasih pak.
		>0837:55 {34:01} TWR	•.
		>0837:58 {34:04} RDO-2	ah arrival Silk Air one eight five airborne one thousand six hundred.
		>0838:09 {34:14} RDO-2	Jakarta approach Silk Air one eight five.
0838:10 {34:16} CAM-1	flaps up.		
		>0838:12 {34:18} DEP	Silk Air one eight five identified on departure climb to three five zero turn right heading three four zero report passing one five zero.
		>0838:21 {34:27} RDO-2	climb three five zero right turn heading three four zero Silk Air one eight five roger.
0838:27 {34:33} CAM-2	flaps are up.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0838:32 {34:38} CAM-1	V-Nav thanks.		
0838:47 {34:53} CAM-2	TCAS twenty.		
0838:48 {34:54} CAM-1	okay it's set.		
0839:15 {35:21} CAM-1	((sound of humming)).		
0839:21 {35:27} CAM-1	request high speed thanks.		
		>0839:24 {35:30} RDO-2	Silk Air one eight five request high speed climb.
		>0839:27 {35:33} DEP	Silk Air one eight five approved.
		>0839:29 {35:35} RDO-2	thank you.
0839:30 {35:36} CAM-1	okay delete th- start switches off, seatbelt sign off, after takeoff checklist thanks.		
0839:43 {35:49} CAM-2	transponder TA-RA twenty miles, air-con and pres is set climbing start switches off, landing gear up and off, flaps up no lights, landing lights on until ten thousand, fasten belt's off, after takeoff complete.		
0839:56 {36:02} CAM-1	thank you.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	**CONTENT**	**TIME and SOURCE**	**CONTENT**
0840:50 {36:56} CAM-1	V-Nav heading select.		
0840:51 {36:57} CAM-2	checks.		
0840:52 {36:58} CAM-1	auto-pilot A engaged.		
0840:59 {37:05} CAM-1	we probably get direct Pardi eh probably.		
		>0841:15 {37:21} DEP	Silk Air one eight five take up heading three three zero.
		>0841:20 {37:26} RDO-2	heading three three zero Silk Air one eight five.
0841:31 {37:37} CAM-1	ten thousand checked one zero one three and ah.		
0841:38 {37:44} CAM-2	set.		
0841:53 {37:59} CAM-1	forty miles.		
0843:20 {39:26} CAM-1	*.		
0843:21 {39:27} CAM-2	yeah.		
0843:22 {39:28} CAM-1	* for the next two days *.		

INTRA-COCKPIT COMMUNICATION

TIME and SOURCE	CONTENT
0843:40 {39:46} CAM-1	I'll be off here.
0844:05 {40:11} CAM-2	want direct Pardi.
0844:06 {40:12} CAM-1	huh.
0844:06 {40:12} CAM-2	direct Pardi.
0844:10 {40:16} CAM-1	call two four zero.

AIR-GROUND COMMUNICATION

TIME and SOURCE	CONTENT
>0843:35 {39:41} RDO-2	Silk Air one eight five pass one five zero.
>0843:38 {39:44} DEP	control one two four three five.
>0843:43 {39:49} DEP	Silk Air one eight five contact one two four three five.
>0843:46 {39:52} RDO-2	twenty four three five Silk Air one eight five.
>0843:53 {40:00} RDO-2	ah Jakarta control Silk Air one eight five climbing three five zero.
>0844:00 {40:06} CTRL	Silk Air one eight five maintain heading climb three five zero report passing two four zero.

INTRA-COCKPIT COMMUNICATION

TIME and SOURCE	CONTENT
0844:29 {40:35} CAM-1	I'll be off the air for a while.
0844:37 {40:43} PA-1	good afternoon ladies and gentleman this is your Captain my name is Tsu Wai Ming on the flight deck this afternoon with me is first officer Duncan Ward we'd like to welcome you aboard and ah we are now climbing through nineteen thousand feet we'll be cruising today at thirty five thousand heading towards the north west tracking initially towards the eastern cost of Sumatra towards the town of Palembang before turning right towards Singapore flight time one hour twenty minutes you can expect ah to arrive at Singapore at about six o'clock in the evening Singapore time which is one hour ahead of Jakarta time, time in Singapore is now four forty five in the afternoon this is about five minutes ahead of schedule. weather conditions clear skies out of Jakarta very hot afternoon and at the moment we are still in good weather however toward Singapore we can expect a bit of showers thunderstorm towards the southern part of Singapore arrival at Singapore should be fine with a temperature of about twenty eight degrees Celsius the seatbelt sign is now off feel free to move around the cabin however while seated for your own safety have your seatbelt fastened sit back and relax enjoy the services provided today on Silk Air one eight five and I'll get back to you just before our descent into Singapore with a updated weather forecast thank you.

AIR-GROUND COMMUNICATION

TIME and SOURCE	CONTENT
>0844:10 {40:17} RDO-2	flight level three five zero wilco Silk Air one eight five request direct Pardi.
>0844:15 {40:21} CTRL	all right stand-by.

INTRA-COCKPIT COMMUNICATION

TIME and SOURCE	CONTENT
0846:04 {42:10} CAM-1	I'm back with you.
0846:05 {42:11} CAM-2	okay.
0847:50 {43:56} CAM-1	*.

AIR-GROUND COMMUNICATION

TIME and SOURCE	CONTENT
>0847:01 {43:08} RDO-2	Silk Air one eight five passing two four zero.
>0847:07 {43:13} CTRL	Silk Air one eight five contact Jakarta upper one three two decimal seven.
>0847:13 {43:19} RDO-2	one three two seven Silk Air one eight five.
>0847:21 {43:28} RDO-2	Jakarta Silk Air one eight seven climbing passing two five five two four five correction.
>0847:30 {43:36} CTRH	Silk Air one eight five confirm.
>0847:31 {43:38} RDO-2	affirm Silk Air one eight five climbing three five zero requesting direct Pardi.
>0847:38 {43:44} CTRH	one eight five stand-by direct Pardi direct papa lima bravo report three five zero.
>0847:43 {43:49} RDO-2	direct Palembang wilco Silk Air one eight five.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
0847:52 {43:58} CAM-5	• would you like to have some sandwich.		
0847:55 {44:01} CAM-1	drinks ah.		
0847:56 {44:02} CAM-5	*.		
0847:57 {44:03} CAM-1	tau hueh chui. ((soya drink))		
0847:57 {44:03} CAM-5	tau hueh chui.		
0847:59 {44:05} CAM-2	I'll have a ice lemon tea.		
0848:00 {44:06} CAM-5	ice lemon tea do you want the sandwich too.		
0848:03 {44:09} CAM-2	what kind.		
0848:04 {44:10} CAM-5	we have egg mayonnaise and chicken •.		
0848:08 {44:14} CAM-2	just a couple thanks nice clear day.		
0848:12 {44:18} CAM	((sound of door closing)).		
0848:16 {44:22} CAM-1	yeah.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
0848:33 {44:39} CAM-1	((sound of singing).		
0848:49 {44:55} CAM-1	some water you want?		
0848:51 {44:57} CAM-2	ah fine thanks.		
0849:48 {45:54} CAM-1	just go level change and get up.		
0849:50 {45:56} CAM-2	yup.		
0849:51 {45:57} CAM-1	so we can go direct Pardi.		
0850:17 {46:23} CAM-2	thirty for thirty five.		
0850:52 {46:58} CAM-1	on speaker.		
0852:18 {48:24} CAM-1	a thousand to three five zero.		
0852:40 {48:46} CAM-1	*.		
0852:49 {48:55} CAM	((sound of altitude alert tone)).		
0853:08 {49:14} CAM-1	*.		

INTRA-COCKPIT COMMUNICATION

TIME and SOURCE	CONTENT
0853:51 {49:57} CAM-1	that's him behind us.
0853:52 {49:58} CAM-2	yup.
0853:53 {49:59} CAM-1	very fast.
0857:25 {53:31} CAM-1	he'll be ahead of us arriving in Singapore.
0857:28 {53:34} CAM-2	yeah.
0857:28 {53:34} CAM-1	he is he is speeding, shit.
0857:35 {53:41} CAM-1	at least point eight *.
0857:52 {53:58} CAM-2	he'll be above the weather as well.
0900:48 {56:54} CAM	((sound of door opening)).

AIR-GROUND COMMUNICATION

TIME and SOURCE	CONTENT
>0853:15 {49:22} RDO-2	Silk Air one eight five maintaining three five zero.
>0853:20 {49:26} CTRH	silk one eight five maintain three five zero cleared direct to Pardi report abeam papa lima bravo.
>0853:25 {49:31} RDO-2	three five zero direct Pardi wilco Silk Air one eight five.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
0900:51 {56:57} CAM-5	tau huey chui.		
0900:56 {57:02} CAM-1	thanks.		
0901:01 {57:07} CAM-5	I was so busy I keep two pieces of sandwich for him then this coming in as well (sound of laugh).		
0901:12 {57:18} CAM	((sound of door closing)).		
0904:09 {00:15} CAM	((sound of rustling papers)).		
0904:55 {01:01} CAM-1	go back for a while, finish your plate.		
0904:56 {01:02} CAM-2	I am.		
0905:00 {01:06} CAM-1	some water.		
0905:01 {01:07} CAM-	((sound of several metallic snap)).		
0905:03 {01:09} CAM	((sound of snap)).		
0905:05 {01:11} CAM-2	no thanks.		
0905:13.6 {01:19.6 C	(end of recording)		