Aviation Safety Council

Taipei, Taiwan

GE235 Occurrence Investigation
Factual Data Collection
Group Report

Flight Recorders Group

July 2, 2015

ASC-FRP-15-07-005

Contents

I. Team Organization

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3 JIH, Richard / Aviation Safety Council, Taiwan
4 CHEN, Martin / Aviation Safety Council, Taiwan
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II. History of Major Activities

Date	Activities
02/04	On scene tasks: 1. 1140 Go team launched. 2. 1220 Arrived at crash site. 3. 1250~1420 Performed site survey at Huan-Dong Blvd. 4. 1430~1530 Performed site survey at the main crash site. 5. 1540~1630 Retrieved both recorders from the tail section 6. 1630~1730 Arranged a ground vehicle and transported both recorders to ASC Lab. Lab tasks: 1. 1400~1500 Contacted Air Navigation and Weather Services for GE235 radar track data. 2. 1530~1630 Contacted TNA, and requested two serviceable recorders (FDR and CVR). 3. 1630~1700 Processed GE235 radar track and converted it into a KML format. 4. 1730~1800 Prepared L-3 AIK and golden chassis for readout 5. 1800~1930 Utilized high compression air and an oven to clean and dry the PCB, CMSU of both recorders. 6. 1930~2100 Utilized the L-3 AIK and a CVR chassis (2100-1020-02) to download the CVR raw data. 7. 2000~2100 Utilized the L-3 AIK and a FDR chassis (2100-4045-00) to download the FDR raw data. 8. 2100~2240 Readout and CVR and FDR data quality check. 9. 2240~2300 Wrap-up for the day and discussion.

02/05	On scene tasks: 1. 1000~1200 Observed, photographed and tagged wreckages on the site. 2. 1400~2000 Escorted the wreckage moving to trucks. 3. 2000~2100 Transported all wreckages to air force base at Songshan Airport. Lab tasks: 1. 0600~0800 Synchronized timing of CVR and FDR with ATC timing system 2. 0800~0900 Released confirmed FDR engineering data to IIC/ Deputy IIC and FlightOps group (noted as version 1) 3. 0900~1200 Cross-checked CVR audio and FDR VHF keys, confirmed the result of the timing system. 4. 0930~1000 Generated FDR data plots - Longitudinal, Lateral, Engine, and Electric related parameters. 5. 1000~1200 Presented the CVR/FDR readout findings to ARs 6. 1400~1800 Continued to confirm the reading parameters, cross-check flight paths 7. 1600~1800 Drafted CVR transcript. 8. 1800~2200 Meeting with IIC, Deputy IIC, BEA advisors.

02/06	On scene tasks: 1. 1330~1630 Worked together with TNA engineers to observe, photographed and tagged wreckages in the storage site. Brought both MFC computers back to ASC. 2. 1800~2200 Created a spreadsheet for wreckages database and keying the data into the database. Lab tasks: 1. 0600~0900 Cross-checked CVR warning sound and FDR data. 2. 0900~1100 Organizational meeting and recorder group meeting. 3. 1000~1100 Discussed engine autofeather issue with ARs. 4. 1100~1200 Prepared CVR summary for press conference. 5. 1300~1400 Prepared FDR summary for press conference. 6. 1500~1700 Press conference. 7. 1700~1800 CVR-FDR data cross-check and correction. Released the confirmed FDR engineering data to IIC/ Deputy IIC and FlightOps group (noted as version 2) 8. 1800~2130 Meeting with IIC, Deputy IIC, BEA advisors.

02/07	On scene tasks: 1. 1000~1230 Combined the site-survey data into the wreckage database. 2. 1300~1700 Added hyperlinks with the wreckage photos into the database. Lab tasks: 1. 0700~0900 Cross-checked the FDR DB and readout values. Released the confirmed FDR engineering data to IIC/ Deputy IIC and FlightOps group (noted as version 3) 2. 0900~1000 Progress meeting and flight recorders meeting. 3. 1000~1230 Drafted CVR transcript. 4. 1000~1500 Based on recorded Lat./Long. to generating Google Earth-based animation with event tags. 5. 1100~1500 Discussed with BEA investigators, to create the sequence of event for IIC/Deputy IIC. 6. 1340~1700 Drafted CVR transcript. (Last 4 min) 7. 1340~1700 Site-survey data mapping. 8. 1500~1700 Released the confirmed FDR engineering data (noted as version 4) 9. 1600~1730 Discussed with BEA investigators and IIC/Deputy IIC about dashcam video to check the anti-collision lighting in the last frame of the video.

02/08	On scene task: 1. 1330~1630 Assisted Airworthiness Group at the wreckage storage site to collect relevant on-board computers, and transported to ASC Lab. Lab tasks: 1. 0700~0900 Cross-checked FDR data, verified FDR DB and readout values. 2. 0900~1000 Progress meeting and flight recorders group meeting. Presented the CVR/FDR sequence of event to the investigation team. 3. 1000~1100 Discussed with ATR, BEA investigators about the ATPCS system logic and FDR recording parameters. 4. 1100~1200 Flushed and immersed MFCs & EECs in a clean water tank. 5. 1100~1330 Confirmed FSK time of CVR 6. 1300~1500 Checked the entire of FDR data. It contained 70 previous flights. Checked to see if any engine feather condition existed. 7. 1330~1600 Drafted CVR transcript. (Last 10 min) 8. 1100~1230 Finished the wreckage database with wreckage photos associated, and then submitted the result to the wreckage recovery group. 9. 1300~1630 Finished site-survey data mapping with lower resolution satellite image. 10. 1500~1730 Verified invalid recording data in the FDR, and consulted with ATR technical advisor.
02/09	Lab tasks: 1. 0900~1000 Progress meeting and flight recorders group meeting. 2. 1000~1830 Teardown, water cleaned and documented relevant NVMs: CAC-1, CAC-2, DU 1-5,MPC x1, MFC x2, ATPCS panel, target speed panel x 2. 3. 1100~1200 CVR sound and dashcam video superposition analysis 4. 1400~1800 CVR transcript verification. 5. 1630~2030 Observed and photographed AFU part.

02/10	Lab tasks: 1. 0900~1000 Progress meeting and flight recorders group meeting. 2. 1000~1200 Documentation of the NVMs, prepared shipping for further examination at TSB and BEA 3. 1000~1250 CVR transcript verification. (1051:12.7~1054:36.6) 4. 1300~1500 Photographed & documented the NVMs & ENG no.1, no.2 LRUS with Wreckege_ID & Examination Database. 5. 1500~1700 Joined the investigation team to discuss the function of ATPCS, along with FDR recorded data. 6. 1400~1700 Observed and photographed AFU part.
02/11	Lab tasks: 1. 0900~1000 Progress meeting and flight recorders group meeting. 2. 1000~1500 Drafted CVR transcript (first 10 minutes.) 3. 1000~1200 Assisted IIC to prepare factual information for CAAC team briefing. 4. 1000~1200 Amended the wreckage examination database, and packed examined items into pelican cases, and arranged them for shipping to BEA and TSB. 5. 1330~1500 Prepared official document to request DSM, DTM, and aerial photos. 6. 1330~1500 Used Dashcam videos to reconstruct GE235 flight track and attitudes. 7. 1500~1800 Packed the wreckage examination items.
02/12	Lab tasks: 1. 0900~1500 Used Dashcam videos to reconstruct GE235 flight track and attitudes. 2. 0900~1700 Packed the wreckage examination items. 3. 1000~1100 Visited NASC to request aerial photo and video information from two rescue helicopters.

02/13	Lab tasks: 1. 0830~1200 Prepared shipping document for wreckage examination. 2. 0900~1500 Used dashcam videos to reconstruct the impact sequence. 3. 1000~1700 Backuped all of the group's factual information, and collected all of data into DVDs. 4. 1330~1530 CVR transcript verification. (the first 10 min) 5. 1330~1500 Prepared the shipping document for wreckage examination. Packaged the engine components into pelican cases.
03/03 ~ 03/05	Lab tasks: 1. 0900~1500 Processed the precise digital terrain data and aerial photos to superposed with GE235 flight path.

III. Factual Description

1.11Flight recorders

Both Cockpit Voice Recorder (CVR) and Flight Data Recorder (FDR) of the occurrence aircraft were recovered by ASC investigators in Keelung River (Figure 1.11-1) at 1605 hrs on Feb. 4th. Upon the first inspection by ASC investigators, it was found that there was no external damage on both recorders but immersed with water. The photo of CVR and FDR was shown in Figure 1.11-2.

Both recorders were transported to the ASC Investigation Laboratory for disassembling and readout on Feb. 4th. The Crash Survival Memory Unit (CSMU) of CVR and FDR were in good condition. After cleaning and drying the CSMUs, data from both recorders were successfully downloaded for readout.

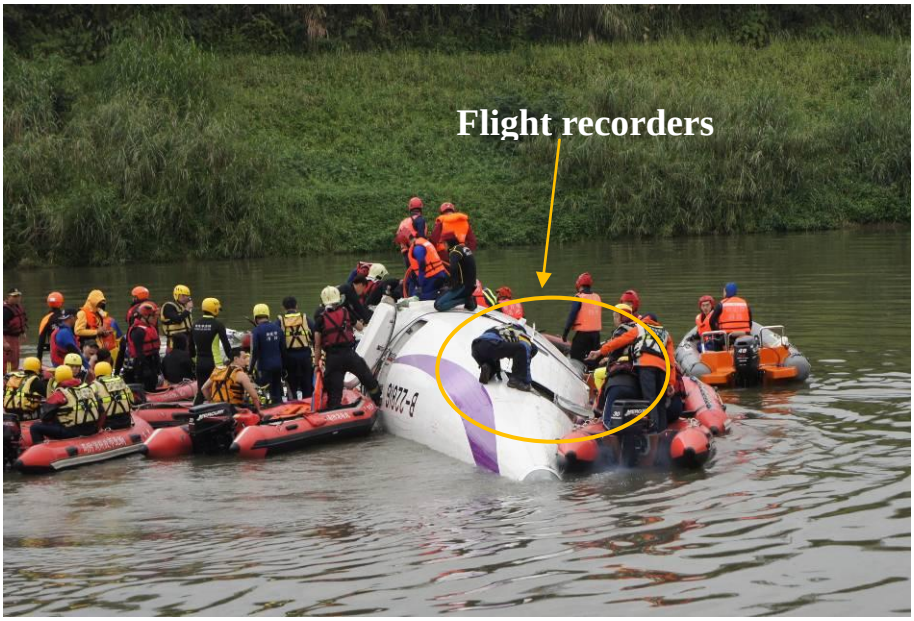

Figure 1.11-1 Flight recorders were recovered by ASC investigators

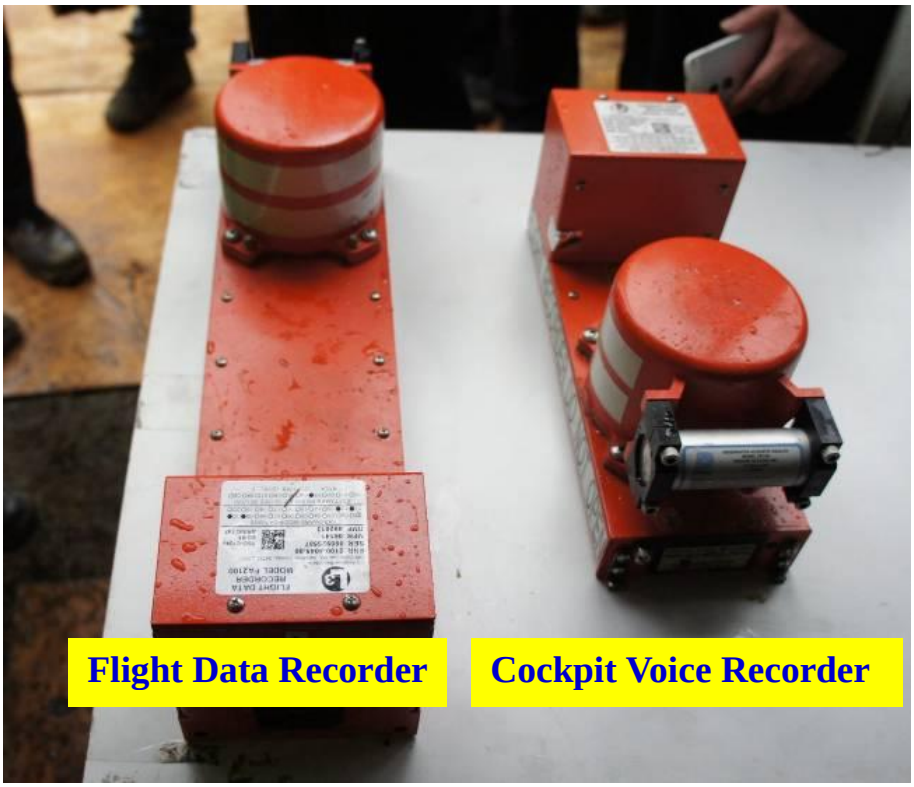

Figure1.11-2 External view of Cockpit Voice Recorder and Flight Data Recorder

1.11.1 Cockpit Voice Recorder

CVR Description

The aircraft was equipped with an L-3 Communications CVR, model FA2100. The CVR is capable of recording 2 hours of 4-channel high quality cockpit audio. The 4 channels of cockpit audio are comprised of two channels from each flight crew, one Cockpit Area Microphone (CAM) channel, and the fourth channel from public address system. The model, part number and serial number of the Solid-State Cockpit Voice Recorder (SSCVR, or CVR thereafter) as follows,

- ✓ Manufacturer: L-3 Communications
- ✓ Model: FA2100
- ✓ Part Number: 2100-1020-02
- ✓ Serial Number: 000706983
- ✓ Hardware Modification Number: 13

CVR Damage and Disassembly

The CVR was recovered by ASC go-team at the tail section of main wreckage at 1605 hrs on Feb. 4th. Upon the first inspection by ASC investigators, it was evident that the CVR did not have any punctures, fire, or other penetration traces, and was found in good condition.

After cleaning and drying process, ASC investigators utilized the L-3 Accident Investigation Kits (AIK) to download voice data according to L-3 FA2100 manual and ASC's download procedures, shown in Figure 1.11-3. The CVR data was downloaded, and contained 124 minutes 14.4 seconds of 4 channel audio data. The audio quality of each channel is either good or excellent, and the quality level are shown in the Table 1.11-1. Detailed definition of SSCVR audio quality is available in Appendix 1:

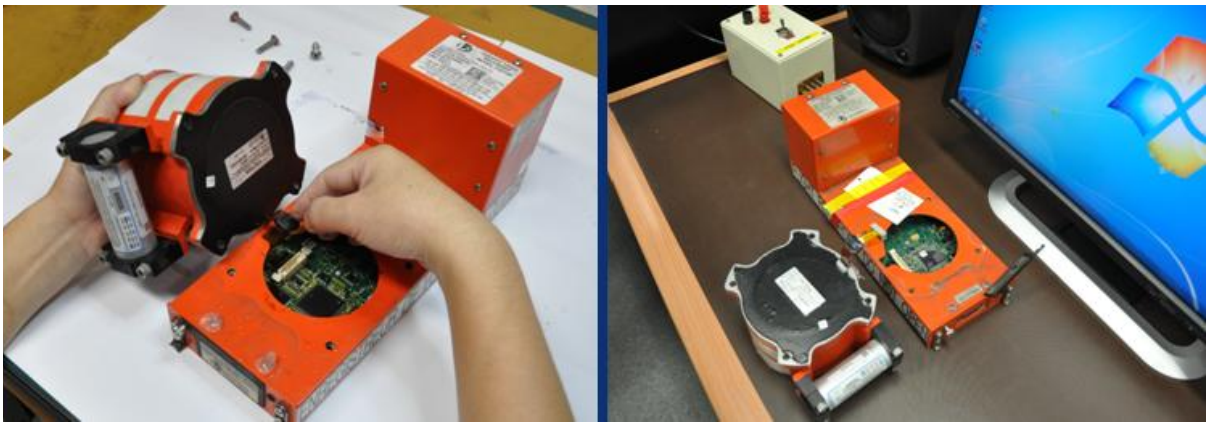

Figure 1.11-3 Connecting the CSMU of GE235 SSCVR to chassis

Table 1.11-1 SSCVR recording quality

Channel #	**Content/Source**	**Recording Quality**
1	Public Address, 3rd Crew Member	Excellent
2	Captain	Good
3	First Officer	Good
4	Cockpit Area Microphone	Excellent

1.11.1.1 Timing Synchronization and Correlation

Timing synchronization of the CVR recording was established by correlating

the CVR events to common events on the FDR, and then was correlated to the timing system of Songshan Tower. The entire air traffic equipment and surveillance radar timing system is based on GPS Time, whose source is provided by the National Time and Frequency Standard Laboratory, Telecommunication Laboratories, Chunghwa Telecom Co., Ltd[1].

Radio transmission made by the aircraft recorded throughout the flight were correlated to the radio transmit microphone key parameter of the FDR. There were two reference time on the FDR: (1) synchronization words no.1, no.2, no.3, and no.4 repeated every 4 seconds, the total number of synchronization words is called Signal Reference Number (SRN); and (2) SSFDR recorded parameter "UTC". With the common events of both recorders, such as the warning, the time correlation between CVR and FDR could be established, then CVR time was offset to synchronize with the FDR time. Usually the radio transmission events made by the aircraft are useful to correlate the recorders time to the air traffic control time system. A time synchronization event listing can be found in the Table 1.11-2:

Table 1.11-2 Time Synchronization

ATC Time (UTC+8)	FDR SRN	FDR UTC Time	CVR Time	Common Events
1052:38	26468	0252:38	1052:37.6	Communication with ATC *"one one niner seven transasia tree two five good day"*
N/A	26468	0252:38	1052:38.3	1st master warning
1053:35	26526	0253:36	1053:34.9	Communication with ATC *"tower transasia two tree five mayday mayday engine flame out"*
N/A	26584	0254:34	1054:34.4	2nd master warning

1 Website http://www.stdtime.gov.tw/english/e-home.aspx

1.11.1.2 Audio Spectrum

The whole SSCVR recording included the occurrence flight and two previous flights, GE231 from Taipei to Kinmen and GE232 from Kinmen to Taipei. The occurrence flight GE 235 began at 1041:15.4 hrs and ended at 1054:36.6 hrs. It covered from standing, pushback to the occurrence happened. The CVR transcript of the occurrence flight can be found in Appendix 2.

Figure 1.11-4 presents some selected CVR transcript and superposing with the relevant spectrogram that contains audio information from the CAM track between 1051:23.8 hrs and 1053:38.8 hrs. Both engines operated normally prior to 1052:39 hrs when the first sound of engine dropped off was heard. The trend matches the observation from FDR data that, engine no.2 propeller speed (denoted as NP) dropped immediately right after the autofeather of engine no.2. At 1052:43.0 hrs, Pilot Flying (denoted as PF) said that "*i will pull back engine one throttle";* and at 1053:06.4, PF said that "*pull back number one"*, FDR data indicated that no.1 engine NP dropped off immediately.

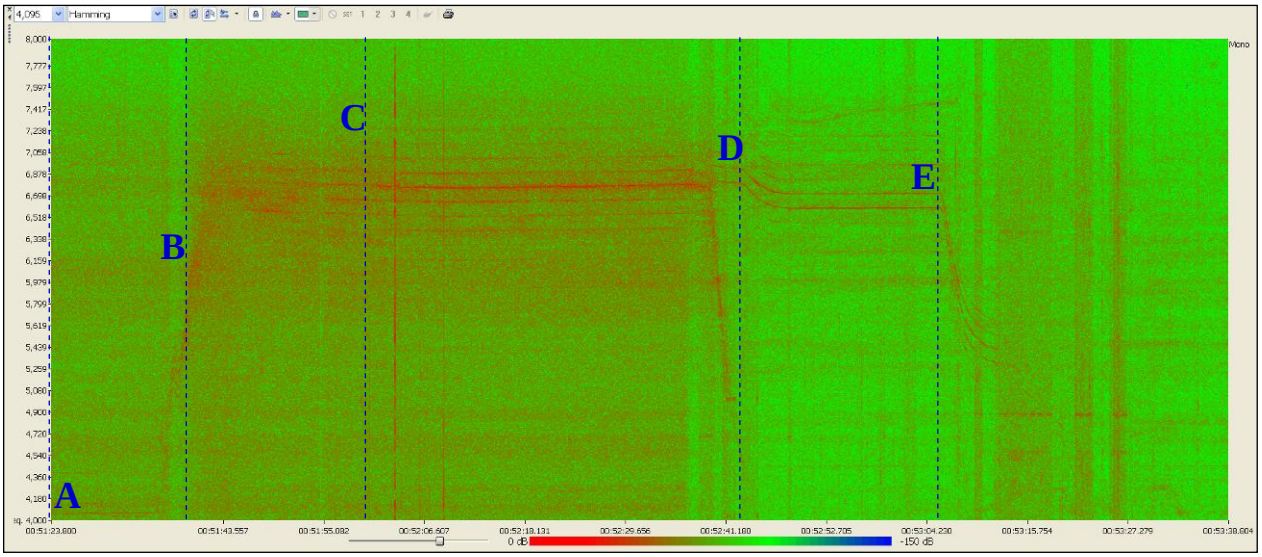

Figure1.11-4 GE235 Spectrogram of the CAM recording

Table 1.11-3 GE235 sequence of engine propeller speed dropped off

Item	Time	CVR Context
A	1051:23.8	PF : "*cleared for takeoff"*
B	1051:39.6	CAM : *(sound of engine spool up)*
C	1052:00.2	PF : "*rotate"*
D	1052:43.0	PF : "*i will pull back engine one throttle"*
E	1053:06.4	PF :" *pull back number one"* FDR data: engine no.1 torque dropped off

1.11.2 Flight Data Recorder

FDR Description

The aircraft was equipped with an L-3 Communications Solid-State Flight Data Recorder (SSFDR, or FDR thereafter). The model, part number and serial number of the FDR as follows,

- ✓ Manufacturer: L-3 Communications
- ✓ Model : FA2100
- ✓ Part Number: 2100-4045-00
- ✓ Serial Number: 00925587
- ✓ Hardware Modification Number: 12

FDR Damage and Disassembly

The FDR was recovered by ASC Go-team at the tail section of main wreckage at 1605 hrs on Feb. 4th. Upon the first inspection by ASC investigators, it was evident that the FDR did not have any punctures, fire, or other penetration traces, and was found in good condition. After cleaning and drying the CSMU and chassis, ASC investigators used normal procedure to download FDR raw data, shown as in Figure 1.11-5.

Figure1.11-5 Connecting the CSMU of GE235 FDR to chassis

The FDR recording contained 67 hours 22 minutes and 56 seconds of data. The occurrence flight was the last flight of the recording and its duration was 13 minutes and 18 seconds. According to ATR readout document[2], FDR raw data was converted into engineering units and total number of the recording parameters were about 750. All the recorded parameters are listed in Appendix 3. Data plots for the entire occurrence flight are included in Appendix 4.

GE235 FDR began recording at 1041:18 hrs and continued recording to the crash of the flight, 1054:35.9 hrs. Summary of CVR and FDR readout is as follows:

1. Based on CVR transcript, flight crew said "*no a-t-p-c-s armed*" at 1051:43.3 hrs. About 8 seconds later, flight crew announced *"oh there it is a-t-p-c-s armed"*. The related FDR parameters are shown in Table 1.11-4:

Table 1.11-4 ATPCS related FDR parameters before take off

Time (mm:ss)	AIR/GND mode	PWR MGT Switch	PLA_no.1 (deg)	TQ_no.1 (%)	PLA_no.2 (deg)	TQ_no.2 (%)
51:43	GND	TO	74.9	83.8	74.2	84.7
51:52	GND	TO	74.9	89.9	74.2	90.3

2. At 1052:02 hrs, the aircraft took off. 14 seconds later (1052:16 hrs), the autopilot was engaged, power lever angle (denoted as PLA) of engine no.1 and no.2 were 74.9 and 74.2 degrees, respectively.

[2] ATR service letter no. ATR72-31-6010, V4.

3. Between 1052:16 and 1052:35 hrs, all of FDR recording parameters did not record any warning signals; at 1052:35 hrs, no.1 engine TQ started to increase towards 100% (the increase on engine 1 TQ in conjunction with the other parameters and according to timing , can be interpreted as an uptrim commanded by the ATPCS). Two seconds later, both torque and objective torque of no.1 engine increased to 100.9% and 99.9%. In the meantime, both torque and objective torque of no.2 engine maintained at 89.7% and 89.9%.
4. Between 1052:38 and 1052:40 hrs, master warning was triggered. No.2 engine flameout procedure was also displayed on Engine and Warning Display (EWD). During the three seconds, no.2 propeller started to move towards the feather position, beta angle increased from 28.3 degrees to 46.4 degrees; no. 2 engine TQ initially increased to 114.2% before dropping to 0% at 1052:42; fuel flow also dropped from 1,286 pph to 1,024 pph. The "ENG2 Flame Out at Take Off" procedure was also displayed on EWD at 1052:38 hrs, and stayed until the procedure was replaced by "After Take Off - 1EO" at 1054:30 hrs (6 seconds before the end of FDR recording).
5. At 1052:43 hrs, no.2 propeller was in the feather position, its beta angle at maximum position of 77 degrees, torque dropped to zero, and fuel flow dropped to 204 pph then maintained between 200 and 300 pph until 1054:31 hrs (5 seconds before the end of FDR recording).
6. Between 1052:41 and 1052:44 hrs, autopilot was manual disengaged by flight crew, no.1 engine PLA reduced from 74.9 to 66.4 degrees, no.2 engine PLA maintained in the notch position at74.2 degrees (takeoff position), and computed airspeed (denoted as CAS) decreased from 117 knots to 111 knots.
7. Between 1053:05 and 1053:07 hrs, no.1 engine PLA decreased from 66.4 to 49.2 degrees, no.2 engine PLA remained at 74.2 degrees, CAS decreased to 101~102 knots.
8. At 1053:10 hrs, the first stall warning[3] was triggered while right-hand side angle of attack[4] (denoted as AOA 2) was greater than 10.9 degrees, and the stick shaker (F/O side) was triggered for one second. At 1053:13 hrs, both stick shakers (Captain side and F/O side) were triggered and continued for 6 seconds. At 1053:17 hrs, AOA 2 was 13.9 degrees, and both stick pushers were triggered

[3] ATR-72-600 FCOM (Rev.DEC 13, Mod:5948) P.16, 1.02.10: Critical angle of attack detected by angle of attack probes leads to aural alert (cricket), stick shaker activation, and then stick pusher activation, stick shaker and stick pusher triggering thresholds at FLAP 15 configuration are AOA 10.9 and 14.1 degrees.

[4] There are two angle of attack recorded parameters in the FDR (denoted as “AOA 1” and “AOA 2”), the AOA values provided in the FCOM and mentioned in the factual report are "Reference AOA".

for two seconds, the aircraft pitch changed from +8.25 to -4.99 degrees nose down in three seconds. After no.2 engine was autofeathered until the end of FDR recording, the FDR recorded several activations of stick shakers and stick pushers, the relevant records are listed in Table 1.11-5:

9. Table 1.11-5 AOAs, CAS and RALT parameters with stall warning trigged

Time (mm:ss)	Stick Shaker (Capt)	Stick Shaker (F/O)	Duration (sec)	Stick Pusher	Duration (sec)	AOA 1 (deg)	AOA 2 (deg)	CAS (kt)	RALT (ft)
53:10	-	V*	1	-	-	9.6	11.1	100	1628
53:13	V	V	6	-	-	10.2	12.0	99	1610
53:14				-	-	10.8	12.0	100	1596
53:15				-	-	10.8	11.8	99	1501
53:16				-	-	11.4	12.4	100	1528
53:17				V	2	13.4	13.9	101	1531
53:18						13.1	11.8	101	1526
53:22	V	V	2	V	2	12.6	13.1	107	1445
53:23						9.3	8.5	107	1383
53:26	V	V	2	-	-	11.2	11.1	114	1267
53:27				-	-	8.9	9.1	114	1234
53:56	V	V	4	-	-	10.8	11.0	101	833
53:57				-	-	11.2	11.9	101	791
53:58				-	-	11.9	12.0	102	169
53:59				-	-	10.5	10.5	100	719
54:06	V	-	-	-	-	10.6	10.0	108	609
54:07		V	4	-	-	11.5	11.0	109	583
54:08				-	-	11.0	10.7	109	533
54:09				-	-	11.0	11.0	112	474
54:10				-	-	10.1	8.7	110	548
54:13	V	V	9	-	-	11.9	12.3	104	563
54:14				-	-	12.7	12.4	105	544
54:15				-	-	11.9	11.8	101	515
54:16				-	-	11.8	11.7	98	521
54:17				-	-	12.0	11.8	98	559
54:18				-	-	12.4	11.9	97	575
54:19				-	-	13.0	12.7	95	580
54:20				V	2	13.5	13.5	96	575
54:21						11.0	9.3	97	556
54:24	V	V	10	-	-	14.5	15.3	101	439
54:25				-	-	15.1	14.0	106	401
54:26				-	-	13.5	13.6	102	368
54:27				-	-	14.3	13.7	105	310
54:28				-	-	16.6	15.7	106	107
54:29				-	-	17.1	16.3	106	168
54:30				-	-	16.9	16.5	110	107
54:31				-	-	17.0	16.7	108	101
54:32				-	-	17.4	17.3	108	86
54:33				-	-	17.9	16.3	109	153

54:34				-	-	16.3	10.1	108	84
54:35				-	-	8.4	3.3	106	55

* V stands for activation of the stick shaker or stick pusher.

9. Between 1053:12 and 1053:17 hrs, no.1 engine PLA decreased from 49.2 to 34.5 degrees (flight idle) and no.2 engine PLA increased from 74.2 to 85.8 degrees (ramp). Both engines related parameters (NP, Torque and fuel flow) is shown in Table 1.11-6.

Table 1.11-6 Engine related parameters change during 1053:12 to 1053:17

Time (mm:ss)	No.1 Engine parameters				No.2 Engine parameters			
	PLA (deg)	NP (%)	TQ (%)	FF (pph)	PLA (deg)	NP (%)	TQ (%)	FF (pph)
53:12	49.2	95.1	24.4	518	74.2	14.3	0	265
53:17	34.5	88.3	13.8	386	85.8	15.2	0	265

10. Between 1053:22 and 1053:24 hrs, both stick shakers and stick pushers were triggered again for 2 seconds, Y/D (yaw damper) was disengaged, and CAS increased to 107 knots.
11. At 1053:25 hrs, the condition lever of no.1 engine was moved to the fuel shutoff position. Accordingly, no.1 propeller was feathered. Six seconds later (1053:31 hrs), beta angle reached the maximum position of 79.9 degrees, and the related parameters (NH, NP, torque) were declined to 0 %. And hydraulic blue pressure started to decrease from 3,000 psi and reached 0 psi until 3 seconds before the end of FDR recording.
12. Between 1053:31 and 1054:16 hrs, the aircraft glided with no engine torque output, and maintained CAS between 100 and 110 knots, AOA 1 and AOA 2 ranged between 10 to 13 degrees, and baro-corrected altitude declined from 1,326 to 643 ft.
13. At 1053:48 hrs, flight crew attempted to engage the autopilot. At 1053:56 hrs the stick shakers were activated and the autopilot was disengaged automatically.
14. At 1054:23 hrs, first EGPWS warning was triggered - “Too Low Gear” and then “Too Low Terrain”, ”Caution Terrain”, “Warning Terrain” while aircraft altitude kept decreasing.
15. Between 1054:16 and 1054:17 hrs, no.1 engine PLA increased from 34.5 to 38 degrees, after 4 seconds (1054:20 hrs) CLA fuel shut off parameter from "fuel SO" to "no FSO". After 5 seconds (1054:25 hrs), no.1 engine fuel flow increased from 17 to 114 pph, and continued increasing. From 1054:25 to 1054:31 hrs, no.1 engine PLA increased from 38.0 to 45.7 degrees and no.2

engine PLA decreased from 86.1 to 47.1 degrees where PLA had reached a position that ATPCS autofeather request was cancelled. With a feathered no.1 engine propeller, no.2 engine propeller went out of feathered position and propeller speed gradually increased from 15.6% to 17.7% as a result of beta angle increase. Parameters related to engines were listed in Table 1.11-7.

Table 1.11-7 Engine related parameters after engine restart sequence

Time (mm:ss)	No.1 Engine parameters					No.2 Engine parameters				
	PLA (deg)	NP (%)	TQ (%)	FF (pph)	Beta (deg)	PLA (deg)	NP (%)	TQ (%)	FF (pph)	Beta (deg)
54:16	34.5	0	0	0	79.0	86.1	15.3	0	283	77.2
54:20	38.0	0	0	17	79.5	86.1	15.3	0	283	77.3
54:25	38.0	0	0	114	79.8	86.1	15.7	0	283	77.2
54:30	49.2	0.4	0	122	80.0	47.8	15.3	0	282	77.3
54:31	45.7	1.0	0	131	80.1	47.1	15.6	0	309	71.5
54:33	45.7	1.9	0	157	80.2	42.5	17.7	35.4	345	56.2
54:35	33.4	3.0	0	209	78.8	32.0	25.4	27.9	433	43.7

16. At 1054:33 hrs, the aircraft began to bank left with pitch down and altitude dropped rapidly. EGPWS warning was triggered with “Pull Up” until the end of FDR recording. Parameters including attitude, altitude, CAS, AOA and pilot control inputs before the crash are listed in Table 1.11-8.

Table 1.11-8 Altitude, attitude and pilot control input parameters before crash

Time (mm:ss)	Baro. Alt. (ft)	CAS (kt)	AOA 1 (deg)	Pitch (deg)	Roll[5] (deg)	Vert. Accel. (g’s)	Ctrl Col. Pos. (deg)	Ctrl Wheel[6] (deg)
54:33	291	109	17.9	7.11	-22.8	0.8876	11.03	-28.3
54:34	245	108	16.3	4.15	-54.5	0.8143	6.77	-77.7
54:35	161	106	8.4	-2.25	-82.4	0.5190	13.19	-43.2
54:35.5	-	-	-	-8.38	-100.1	0.4709	1.64	-34.8

17. At 1054:35.9 hrs, FDR stopped recording, the relevant parameters are as follows:
    - FDR path, speed and attitudes: indicated airspeed 106 knots, ground speed 91 knots, baro-corrected altitude 161 ft, GPS position N25°3’46.576”, E121°37’1.291”; pitch nose down 12.2 degrees; left bank 100.1 degrees; magnetic heading 57.3 degrees.
    - No.1 engine: PLA 34 degrees, NP 3%, Torque 0%, fuel flow 209 pph, beta 79 degrees.
    - No.2 engine: PLA 34 degrees, NP 35.3%, Torque 27.9%, fuel flow 433 pph, beta 44 degrees.

[5] Plus(+) means right wing down.
[6] Plus(+) means bank left control.

For ATR 72-600 aircraft, there was a parameter called “Procedure Displayed ID (denoted as Proc Disp. ID)” recorded in FDR, which showed the displayed message on the Engine and Warning Display (EWD), relevant information of the occurrence flight was listed in Table 1.11-9:

Table 1.11-9 Procedure displayed in EWD during the accident flight

Time (mm:ss)	Proc Disp. ID	Procedure Displayed
51:10~52:02	178	Screen cleared (NO procedure displayed)
52:03~52:37	416	After Take Off
52:38~54:29	192	ENG 2 Flame Out at Take Off
54:30~54:33	417	After Take Off - 1EO
54:34~54:35	181	ENG 1 Fire in Flight

1.11.3 Other Flight Data and Radar Track Data

1.11.3.1 Quick Access Data

The damaged Quick Access Recorder (QAR) and its PCMCIA card of the occurrence flight were recovered by ASC investigators on Feb. 5th. There was no evidence of heat or fire damage on the exterior of the PCMCIA card. After utilizing compressed cool air to dry the PCMCIA card, all data were downloaded successfully. The last flight segment data was consistent with FDR readout data, except the QAR stopped recording at 1054:34 hrs of Taipei time. Detailed QAR data plot can be found in Appendix 4.

1.11.3.2 Secondary Surveillance Radar Data

Figure 1.11-6 shows GE235 radar track superposing with satellite image. There are three red triangular marks, which were predicted positions from radar system and they were invalid for future analysis. The original radar data indicated that the last valid data occurred at local time 1054:35.26 hrs, slant range between the aircraft to the runway 28 threshold of Songshan airport was 2.84NM and bearing angle was 98.1 degrees.

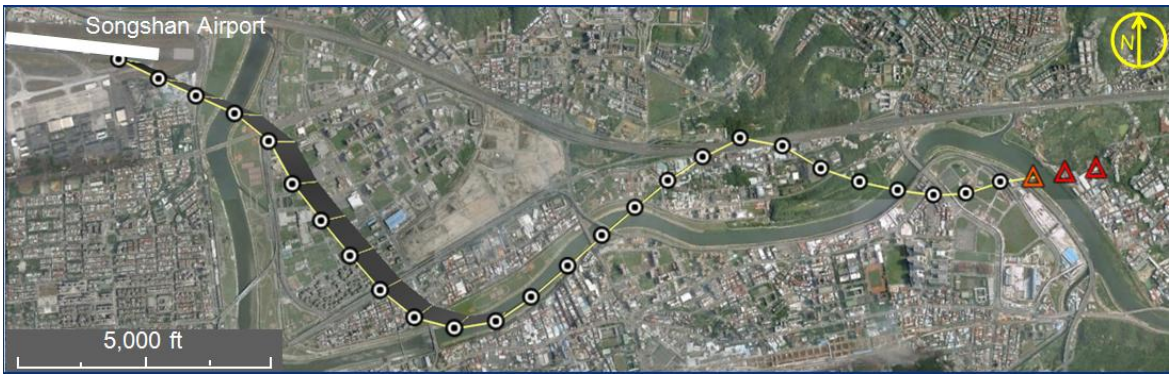

Figure 1.11-6 GE235 radar track

1.11.3 Flight Path Reconstruction

The flight path is determined by three recording parameters- GPS latitude, GPS longitude, and baro-corrected altitude, with sampling rate 1 Hz. At 1054:35 hrs, the last recorded position was N25°03’46.576”, E121°37’1.291”. Based on the CVR and FDR factual information, the sequence of events of GE235 is listed in Table 1.11-10. Figure 1.11-8 shows GE235 flight path and radar track, superposing with an aerial photo. Figure 1.11-9 also indicates ten place marks during 1053:07.7 hrs and 1053:59.7 hrs. Figure 1.11-10 presents GE235 flight path, satellite image and eight place marks during the last 23 seconds.

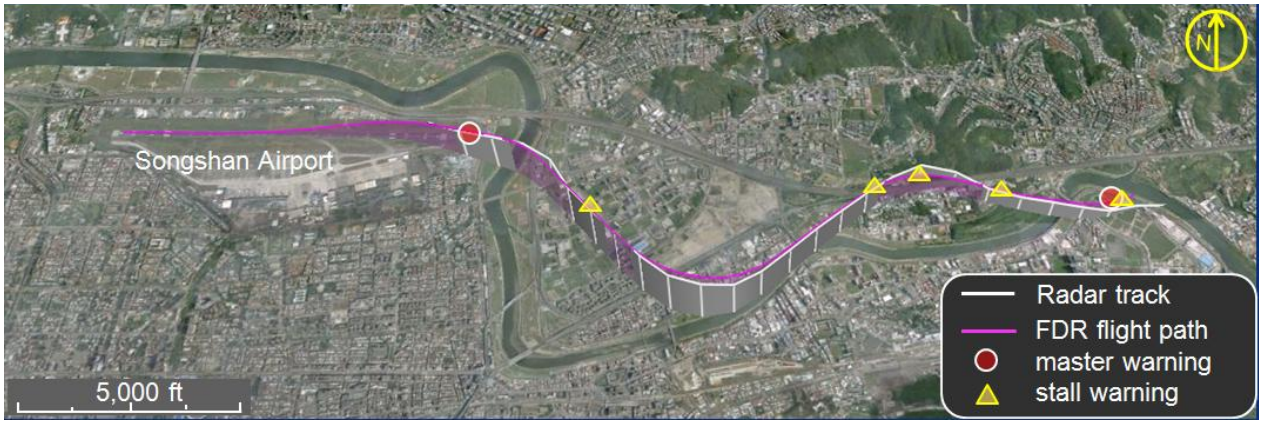

Figure 1.11-8 Superposing of GE235 flight path, radar track and warnings

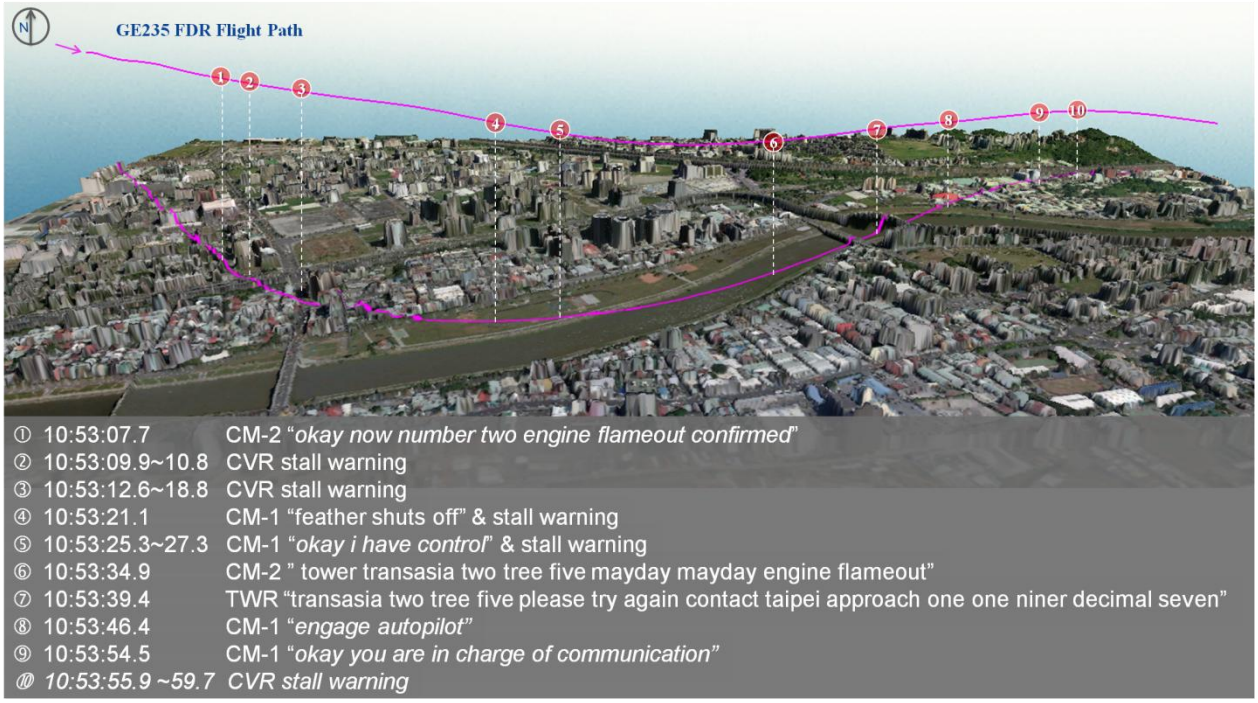

Figure 1.11-9 Superposing of GE235 flight path with an aerial photo and digital surface model between 1053:07.7 and 1053:59.7

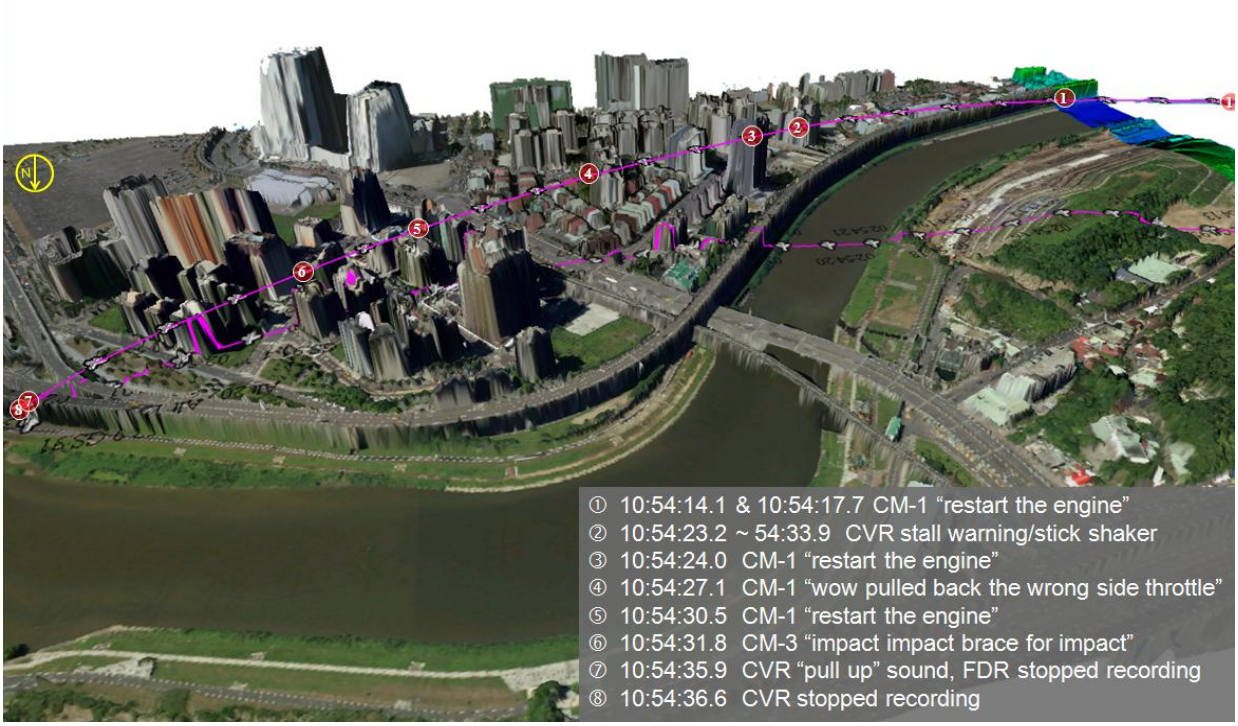

Figure 1.11-10 Superposing of GE235 flight path with an aerial photo and digital surface model during the last 23 seconds.

Table 1.11-10 GE235 CVR/FDR Sequence of Events

UTC 1	AP/YD	RALT	CAS	IAS1	Fact	Display EWD (PROC ID MSG)	Comment
					LNAV Armed – Selected speed 115 kt.	Before Take OFF	
02:51:34			-	-	increased PLA	No Procedure Displayed	TO sequence began
02:51:43.5			37	37	ATPCS not armed (CVR)		
02:51:59.4			114	114	V1 (CVR)		
02:52:00			116	116	Parameter discrete main gear=0 ALT armed – Selected altitude 5,000 ft		Airborne
02:52:03		6.4	123	127	highest CAS 134 kt	After Take off	
02:52:08	YD	91	133	135			
02:52:16	YD-AP LNAV IAS	361	129	130			
02:52:37	~	1,165	116	117	ENG 1 uptrimed ENG bleed VLV LH closed		ATPCS sequence began (52:35 ~ 52:37)
02:52:38	~	1,193	117	119	Master warning ENG 2 flame out		
02:52:39	~	1,246	117	119	ENG 2 feathering began	ENG 2 Flame Out at Take Off	ATPCS sequence: 2.15 s after trigger, feathering
02:52:40	YD LNAV IAS	1,283	117	117	AP disconnection		Manual disconnection
02:52:42	~	1,352	114	114	ENG 2 propeller feathering (beta angle 78 deg)		ATPCS sequence ended
02:52:50	YD HDG SEL IAS	1,470	106	104			
02:53:07	YD HDG SEL	1,582	102	99			ALT not armed: Vertical Speed below 80ft/min

UTC 1	AP/YD	RALT	CAS	IAS1	Fact	Display EWD (PROC ID MSG)	Comment
	PITCH HLD						
02:53:08	~	1,627	102	100	Two sec later, highest alt 1,661 ft (baro corrected)		
02:53:10		1,628	100	97	1st stick shaker F/O		
02:53:13	~	1,621	98	96	1st stick shaker CAPT		CAS: 98kt
02:53:14	~	1,596	100	96	PLA2 moved forward (86 deg)		Expected to be before or at the ramp position (theoretically value is 88 deg)
02:53:17	~	1,535	101	97	1st stick pusher		
02:53:21	HDG SEL PITCH HLD	1,470	102	101			
02:53:24	~	1,344	107	106	CLA 1 fuel SO		No.1 propeller was feathered and no1. Engine was shut off
02:53:49	YD – AP HDG SEL PITCH HLD	875	109	109			
02:53:57	YD HDG SEL PITCH HLD	791	101	98			AP Manual disconnection
02:54:08	HDG SEL PITCH HLD	533	112	108			
02:54:14	~	544	105	98	DC essential BUS 1 voltage dropped from 28V down to 18V		Engine 1 restart request
02:54:20	~	575	96	91	CLA1 no more fuel SO		Engine 1 restart cont'd
02:54:25	~	401	106	96	NH1 reached 30% increasing		Engine 1 restart cont'd
02:54:30	~	107	110	97	PLA2 decreased down to 48°	After Take Off - 1EO	ATPCS disarming condition
02:54:31	~	101	108	97	ENG2 left feather + MW ENG 2 flame out disappeared		

UTC 1	AP/YD	RALT	CAS	IAS1	Fact	Display EWD (PROC ID MSG)	Comment
02:54:33							
02:54:34	~	83.5	108	100	NH1 reached 50%	ENG 1 Fire in Flight	
02:54:35.9	~	55.1	106	103	End of recording –CVR (0254:36.6 sec) ; FDR (0254:35.9 sec)		

1.12 Wreckage and Impact Information

1.12.1 General

The impact mark made by GE235 indicated the aircraft impacted the Huan-Dong Blvd viaduct before crashing into Keelung Rive. Refer to Figure 1.12-1, there are several high buildings in the southern area of the Huan-Dong Blvd. Keelung River is at the north side of the Huan-Dong Blvd, and the water depth of the river is between one to two meters.

Figure 1.12-1 Aerial Photo of GE235 crash site

1.12.1.1 Wreckage mapping

The site survey was conducted by ASC investigators with a Trimble GEO XH GPS receiver and a Leica D510 laser ranger on the date of occurrence. When Go-team arrived at the occurrence site, IIC requested 3 investigators went to the Huan-Dong Blvd to find the first impact point. There were some small debris left on the Huan-Dong Blvd, and one light pole on the Huan-Dong Blvd was broken, and fell down to the river side. There were several debris of control surfaces located at the river side. The aircraft fuselage and the flight deck were in the middle of the

Keelung River.

Figure 1.12-2 shows the site survey data superposing with an aerial photo. The wreckage identification numbers and photos were shown in Figure 1.12-3, full database with detail information of site survey was listed in Appendix 5.

The height above ground level of the Huan-Dong Blvd was about 21 meters (its height above the ellipsoid was 48 meters and HAE of the ground was 27 meters), and the reference impact area on the Huan-Dong Blvd was about 20 meters by 10 meters. A scratch mark was found on the road surface, the total length of the scar was about 2.5 meters, and heading was about 60 degrees. Some wreckage debris was found near the impact point on the barrier with reference position N25^{o}3’46.45”, E121^{o}37’1.15”. The aircraft stroke a light pole, which was very close to the impacted barrier (on the right upper corner of Figure 1.12-1). The distance from the impacted barrier to main wreckage on the river was about 90 meters, and the distance from the impacted taxi to the impacted barrier was about 9 meters.

Main wreckage was nearly upside down in the middle of the Keelung River, and the reference heading was about 25 degrees. The reference position was N25^{o}3’48.54, E 121^{o}37’3.13”, the height above the ellipsoid was 20 meters, and the water depth was about one to two meters.

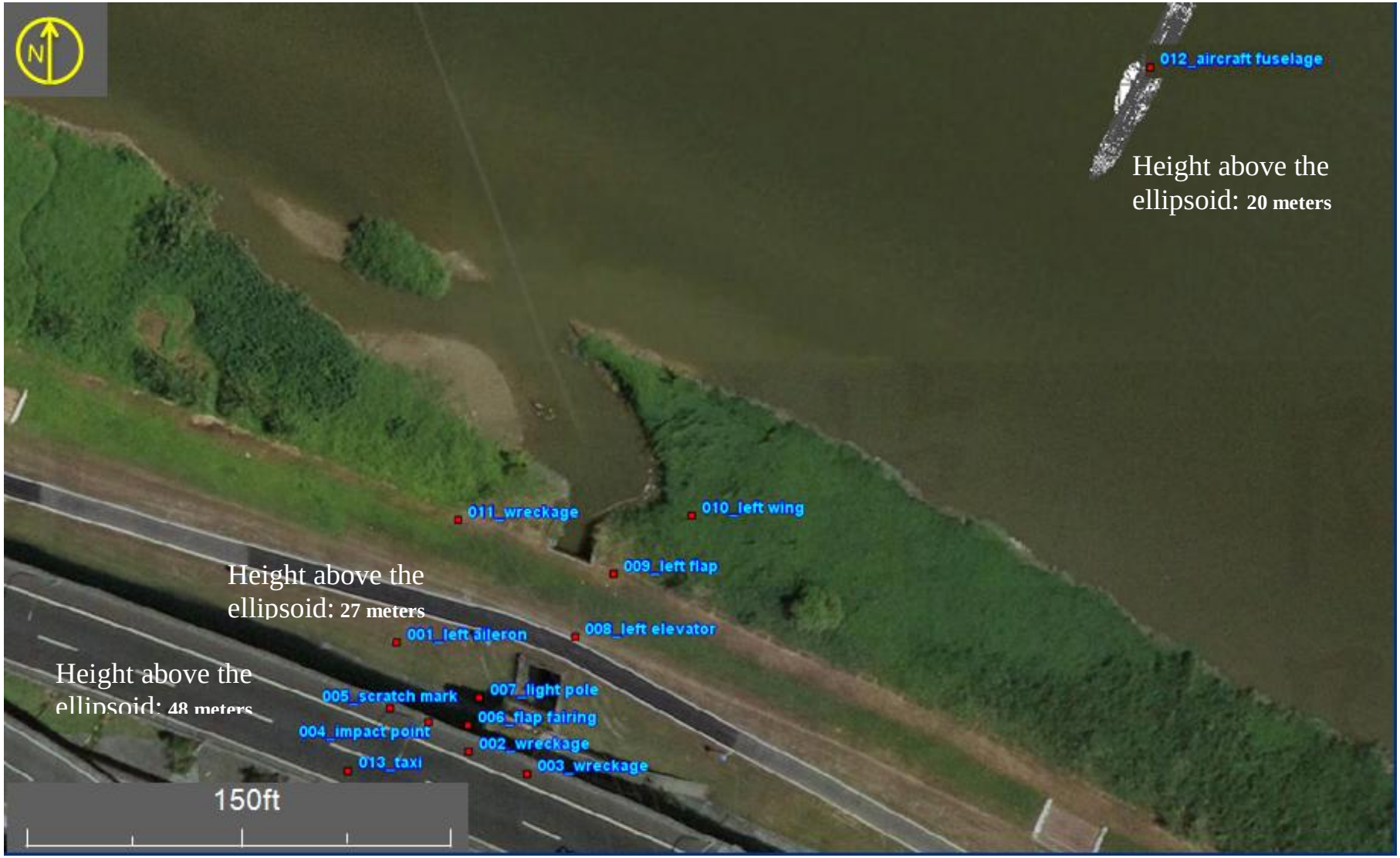

Figure 1.12-2 Site survey data superposing with an aerial photo

Figure 1.12-3 Site survey- wreckage identification numbers and photos.

1.12.1.2 LIDAR data

While ASC was conducting the site survey, the Criminal Investigation Bureau (CIB) performed parallel investigation and utilized its 3D LIDAR on the Huan-Dong Blvd to collect the impact information. CIB scanned the area near the first impact point, and provided ASC the survey result. The LIDAR data was recorded as three-dimensional point clouds. The height of street light were 7 meters, and the width of the Huan-Dong Blvd was 10 meters. There were some electrical power transmission lines above the Huan-Dong Blvd, over 20 meters high. Figure 1.12-4 shows the point clouds of the crash site, and the impacted barrier on the Huan-Dong Blvd was reconstructed by a LIDAR scanner. In addition, the

perspective view of the occurrence site was collected from Google 3D view browser in Figure 1.12-5.

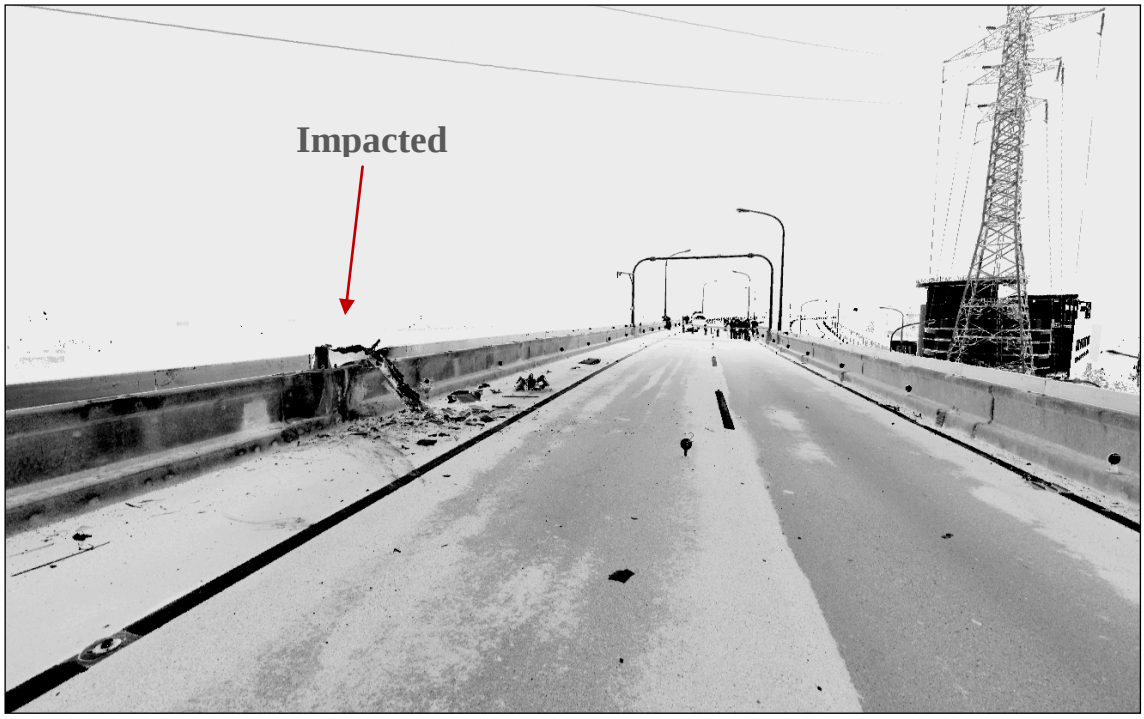

Figure 1.12-4 Perspective view of the point clouds at crash site (Huan-Dong Blvd.)

Figure 1.12-5 Perspective view of the Huan-Dong Blvd, which reconstructed by Google.

The Department of Urban Development of Taipei City Government provided

ASC a set of precise digital terrain data and aerial photos, and ASC created the surface models of the taxi, part of Huan-Dong Blvd, and street lights. Flight path and related ground building models were illustrated in Google Earth, shown in Figure 1.12-6. There are two building marks (denoted as A and B) equipped with video camera that captured last few moment of the flight, the relevant video frame presented at section 1.12.1.3. Figure 1.12-7 shows an aerial photo of the crash site taken from a rescue helicopter.

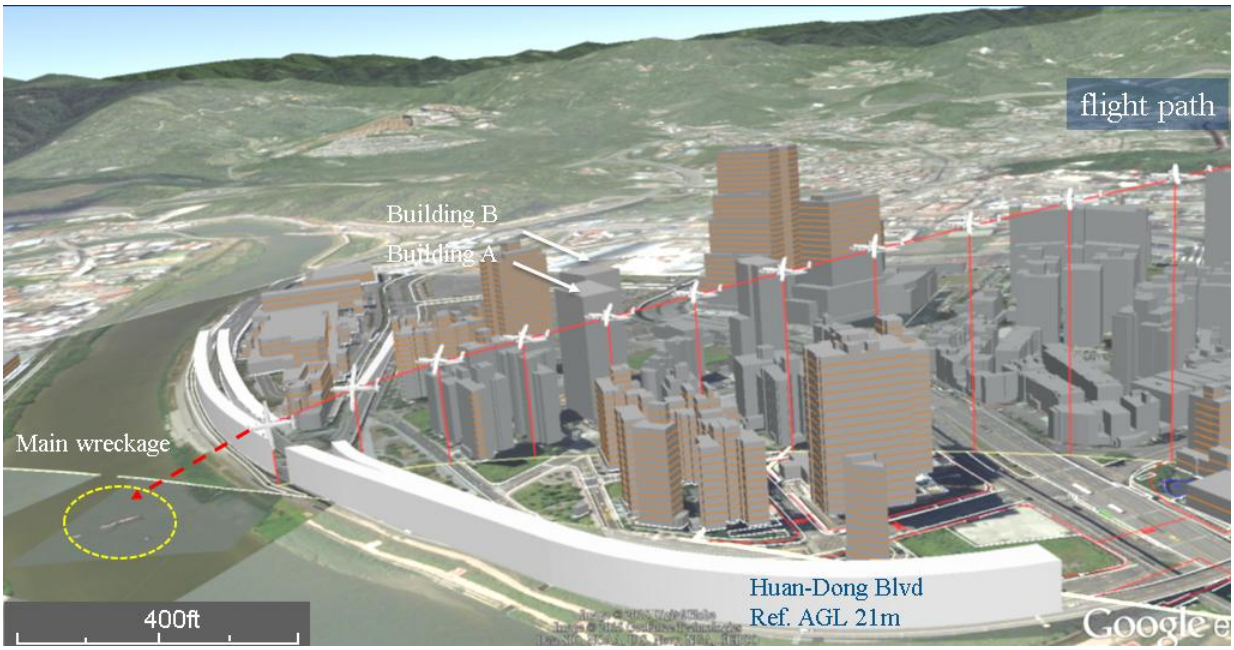

Figure 1.12-6 Perspective View of the crash site, mapping with FDR flight path

Figure 1.12-7 Aerial photo of crash site taken from a rescue helicopter

1.12.1.3 Video frame before crashing

After the occurrence, ASC investigators collected traffic surveillance video at Huan-Dong Blvd and several dashcam videos from nearby vehicles. Several videos showed that the aircraft hit a taxi, impacted the viaduct, and then crashed into Keelung River. All videos were examined during the investigation. When the occurrence happened, two ground vehicles (noted as black color and silver color) were traveling westbound on Huan-Dong Blvd. Their dashcam videos contained clear images and were helpful for the investigation. To correlate the time of video and flight recorders, the unidentified sound (1054:34.8 hrs) of CVR before aircraft crash was used to be the common event of the aircraft hitting the taxi and viaduct on the video. Relevant video snapshots of the silver car dashcam with CVR time are shown in Figure 1.12-8, the copyright of video was authorized by TVBS for public publication.

The video frame rate of the silver vehicle dashcam was 25 frames per second,

meaning that a frame equals to 0.04 second. Based on the dashcam video and the site survey data, the aircraft banked to left at about 90 degrees and the distance between the taxi and the barrier was about 9 meters. The aircraft flew 9 meters in 5 frames (0.2 seconds), shown in Figure 1.12-9 to Figure 1.12-11. Figure 1.12-11 showed that the aircraft impacted the north barrier of Huan-Dong Blvd, represented by the 19th frame of the video timing at 1107:07 hrs, which can be correlated to CVR time as 1054:34.76 hrs.

Figure 1.12-8 Dashcam video snapshots extracted from the silver car (authorized by TVBS)

Figure 1.12-9 The 14 th frame of dashcam videos of the silver car (CVR 1054:34.56 hrs)

Figure 1.12-10 The 17 th frame of dashcam videos of silver car (CVR 1054:34.68 hrs)

Figure 1.12-11 The 19 th frame of dashcam videos of silver car (CVR 1054:34.76 hrs)

ASC investigators also collected six surveillance videos from the buildings in Jingmao 2nd Rd. Positions of building A and building B are shown in Figure 1.12-6. The videos showed that the aircraft passed near building A before it impacted the Huan-Dong Blvd. Three surveillance video clips were clear, some of video snapshots were shown in Figure 1.12-12 to Figure 1.12-14. Figure 1.12-15 showed surveillance videos location at the roof of building A and the flight path was on its western side. The height above ground of building A was 74 meters. The HAE at the roof of building A was 107 meters, and the HAE on ground near building A was 33 meters.

Figure 1.12-12 Surveillance videos snapshot of channel 19 in building B

Figure 1.12-13 Surveillance video snapshot of channel 26 in building A

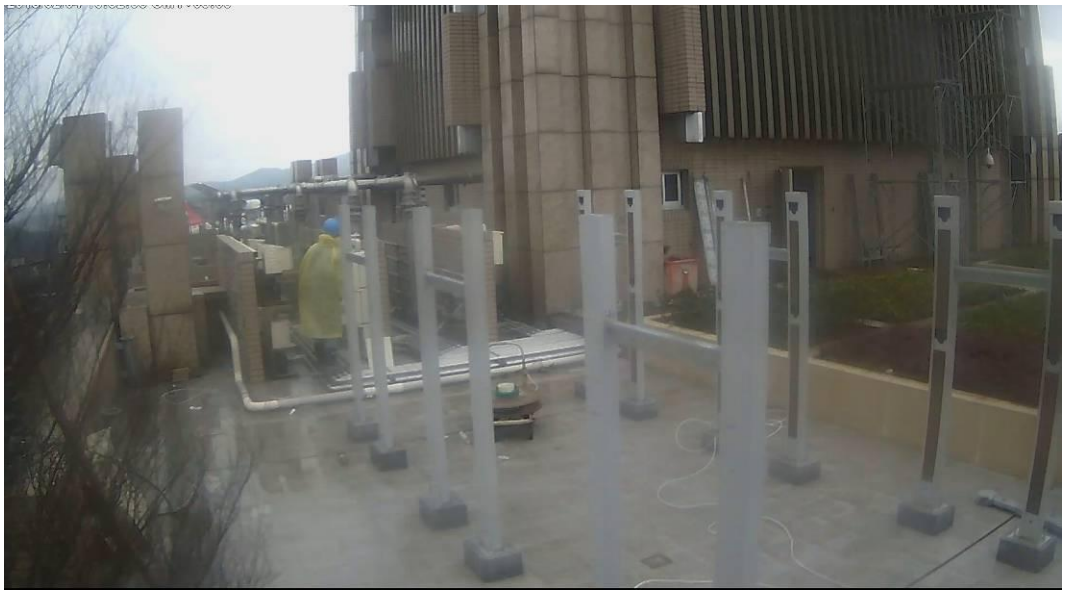

Figure 1.12-14 Surveillance video snapshot of channel 32 in building A

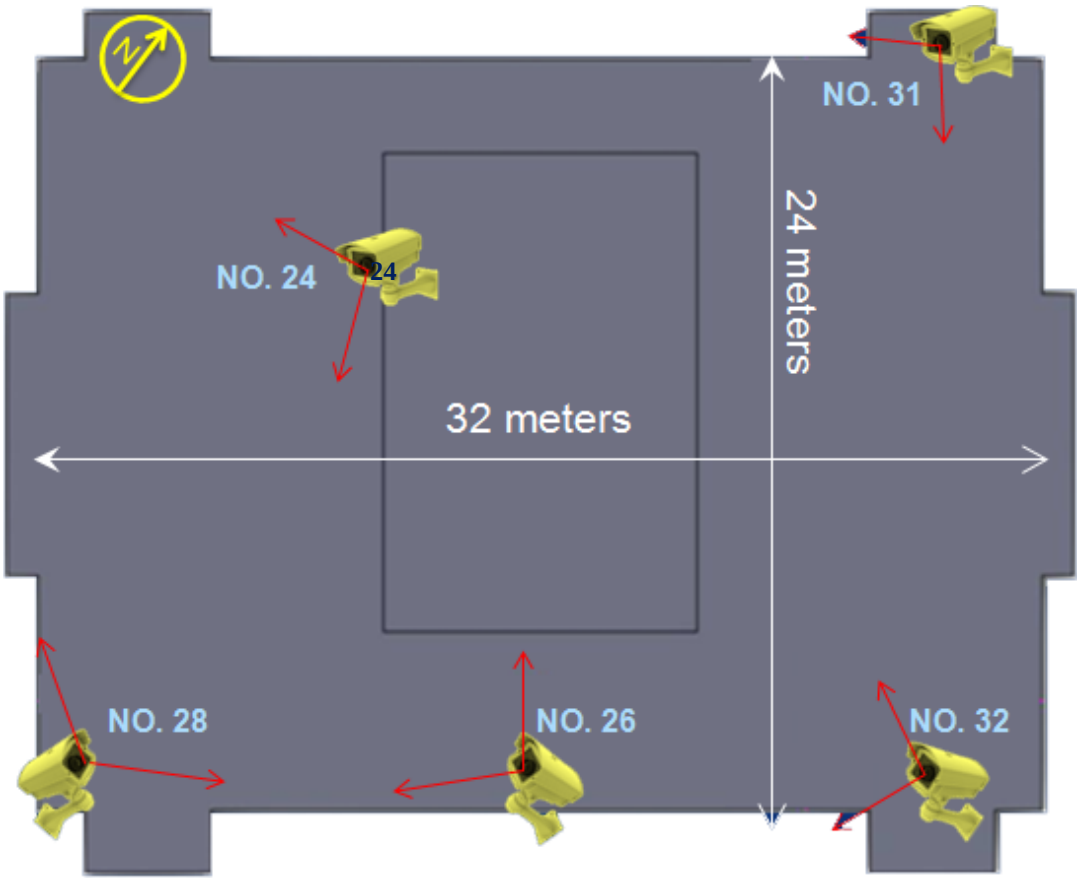

Figure 1.12-15 Surveillance video locations at roof of building A

1.16 Tests and Research

1.16.1 Non Volatile Memory Related Information

There are 66 items of wreckage including avionic devices and wire harnesses that have been collected for further examination, detailed information can be found in appendix 6. To preserve the evidence, there are 14 avionic devices contained the NVMs being immersed in clear water before examination, including- MFC 1/ MFC 2 (each has 11 PCBs), CAC 1/ CAC 2 (each has 5 PCB), DU 1/ DU 2/ DU 3/ DU 4/ DU 5, MPC, EEC 1 / EEC 2, PEC 1/ PEC 2.

Because of the cockpit instrument panel was seriously deformed, investigators used electrical tools, such as grinder and drill, to remove these DUs. The external case of both MFC were slightly deformed. All PCBs were cleaned with water and removed from MFC before shipping to BEA, photo shown as Figure 1.16-1. Each device was tagged and photo documented into the wreckage database. Those devices were then packaged into water proof hard cases for shipping to BEA or TSB.

Figure 1.16-1 PCBs teardown from CAC rack

Twenty-five devices were shipped to BEA for NVM readout, including AFU

cables from both engines, MPC and PCBs from MFC 1/MFC 2. Twenty-two devices were shipped to TSB for readout and further examination, including AFUs, DCUs, FEUs, TQ Sensors, NL Sensors, NH Sensors, NP Sensors, EECs and PECs from both engines. There are five DUs and PCBs from CAC 1/ CAC 2 stored in ASC for examination if necessary.

IV. Section Summary

According to the collected factual information, the group concludes a sectional summary into three categories: flight recorders, time synchronization and site survey.

Flight Recorders:

1. CVR stopped recording at local time 1054:36.6 hrs; FDR stopped recording at local time 1054:35.9 hrs.
2. CVR related findings:
   - Right after the throttle was advanced for takeoff, flight crew mentioned "*no a-t-p-c-s armed*".
   - The flight crew called ATPCS back to armed during takeoff roll around seventy knots.
   - After the first master warning, PF said he would like to reduce power on no.1 engine.
   - While PF mentioning to retard power lever of no.1 engine, the PM confirmed no.2 engine flameout.
   - From 1054:05 to 1054:07, flight crew realized they lost both engines.
   - From 1054:09.2 to the end of recording, PF called out "*restart the engine*" 8 times.
3. FDR related findings:
   - Based on CVR/FDR factual information, the group has drafted a sequence

of events. (Table 1.11-10)

- At 1052:35 hrs, no.1 engine started to uptrim, its objective TQ changed from 90% to 100%; two seconds later, both torque and objective torque of no.1 engine increased to 100.9% and 99.9%. In the meantime, both torque and objective torque of no.2 engine maintained at 89.7% and 89.9%.
- Between 1052:38 and 1052:40 hrs, master warning was triggered. No.2 engine flameout procedure was also displayed on the EWD. During the three seconds, no.2 propeller started to move towards the feather position.
- Based on the FDR database document, several recorded parameters were invalid (true heading 1&2, true track Angle 2, latitude 2, longitude 2, GPS Alt 2, Radio Alt 2, temperature gauge 1&2, Ground Speed 2, Selected speed 2, Vert. Accel., AHRS 1&2, Fuel Quantity 1&2_KPH, Fuel Quantity 1&2_PPH, vertical rate 1 &2, FCU status).

Time synchronization:

1. FSK time of CVR was recorded in GMT time. FDR time was found closely matching to TSA's tower time. CVR GMT time = FDR UTC 1 time - 1 second

Site survey:

1. Based on the site survey data and the dashcam videos, the aircraft banked to left about 90 degrees, hit a taxi and a barrier of the Huan-Dong Blvd., then crashed into Keelung River.
2. Available evidence indicated the first impact of the aircraft was on the taxi.

V. **Appendix**

Appendix 1 CVR Quality Rating Scale

Appendix 2 GE235 CVR Transcript

Appendix 3 FDR recording parameters list

Appendix 4 Flight Data Plots

Appendix 5 Site Survey Database

Appendix 6 Wreckage Examination Database

Appendix 1 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.

Appendix 2 GE235 CVR Transcript

CVR Transcript

RDO : Radio transmission from occurrence aircraft
CAM : Cockpit area microphone voice or sound source
INT : Interphone
PA : Cabin announcement
(RDO, CAM, INT, PA)-1 : Voice identified as captain
(RDO, CAM, INT, PA)-2 : Voice identified as first officer
(RDO, CAM, INT, PA)-3 : Voice identified as observer
(RDO, CAM, INT, PA)-4 : Voice identified as cabin crew
TWR : Songshan Tower
GND : Songshan Ground
OTH : Communication from other flights
GC : Ground crew
… : Unintelligible
( ) : Remarks
[ ] : Translation
* : Communication not related to operation / expletive words

hh[7]	mm	ss	Source	Context
10	41	14.6		(GE235 CVR 錄音開始) *[GE235 recording begins]*
1041:15.4 ~ 1054:36.6				
10	41	15.4	PA	(客艙安全廣播) *[cabin safety announcement]*
10	41	15.6	CAM-2	oil pressure
10	41	16.4	CAM-1	check
10	41	19.4	CAM-2	forty five starter off
10	41	20.3	CAM-1	start lights off
10	41	21.4	CAM-1	i-t-t 六 七 零三 走 watch down *[i-t-t six seven zero three go watch down]*
10	41	22.3	CAM-2	六 七 零一 *[six seven zero one]*
10	41	24.2	CAM	(發動機啟動聲響) *[sound of engine start]*
10	41	29.8	CAM-1	許可後推 *[pushback granted]*
10	41	30.6	CAM-2	許可

[7] 本抄件時間以 TWR 時間作為基準。

hh[7]	mm	ss	Source	Context
				[granted]
10	41	31.2	INT-1	ground 外電拆除 煞車收 鼻輪轉向 off 許可後推 么洞跑道 *[ground external power off brake release nose wheel steering off pushback granted runway one zero]*
10	41	35.7	GC	拆外電源 *[external power off]*
10	41	37.1	CAM-1	好 before propeller rotation checklist *[okay before propeller rotation checklist]*
10	41	38.5	CAM-2	okay c-d-l-s
10	41	40.5	CAM-1	on
10	41	41.3	CAM-2	f-m-s takeoff data
10	41	42.5	CAM-1	confirmed
10	41	43.2	CAM-2	confirmed 了 *[confirmed]*
10	41	44.1	CAM-2	tail trims 一點零 *[tail trims one point zero]*
10	41	45.2	CAM-1	一點零 *[one point zero]*
10	41	46.2	CAM-2	check
10	41	46.9	CAM-2	他 trim 那裏可以同時 這邊的 trim 跟這邊的 trim 在看 … 知道看兩邊了喔 *[if it is trimmed to there they can be simultaneously watch trim here and here ... you know to watch both side right]*
10	41	51.0	CAM-3	我有我有看到 剛剛就看這個 前面都有 show 出來 *[i did i did see it i just saw it a moment ago it was shown]*
10	41	53.7	CAM-2	對 好 *[yes okay]*
10	41	54.6	CAM-2	tail prop
10	41	55.2	CAM-1	in sight
10	41	55.8	CAM-2	doors
10	41	56.3	CAM-1	closed
10	41	56.9	CAM-2	seatbelt
10	41	57.4	CAM-1	on
10	41	58.0	CAM-2	beacon on
10	41	58.1	GND	(與其他航機通話)

hh[7]	mm	ss	Source	Context
				[communication with other aircraft]
10	41	58.6	CAM-1	on
10	41	58.9	CAM-2	procedure complete
10	42	00.0	CAM-1	是 *[yes]*
10	42	01.7	INT-1	ground 可以後推了 *[ground we can pushback now]*
10	42	03.4	OTH	(其他航機與地面席對話) *[communication between other aircraft and ground]*
10	42	03.8	GC	教官稍等一下 等等車子撤離 *[sir wait a second wait until cars left]*
10	42	03.9	CAM-3	這個與那個 *[this and that]*
10	42	05.1	CAM-2	你在看甚麼 *[what are you looking at]*
10	42	05.4	CAM-3	b-t-c 都看得出來 *[b-t-c both are shown]*
10	42	07.6	INT-1	喔車子 謝謝 *[oh cars thank you]*
10	42	08.2	CAM-2	你再按一次 *[you can push it again]*
10	42	09.6	GC	謝謝教官喔 我要後推了 麻煩鬆煞車 么洞跑道 *[thank you sir i am going to push you back please release the brake runway one zero]*
10	42	12.0	INT-1	好 謝謝 解二號 *[okay thank you number two good to go]*
10	42	12.0	CAM-3	對對對 *[right right right]*
10	42	13.1	CAM-2	但是我現在還沒開完車 我們還不會轉 *[but i have not finished engine start up yet it is not turning]*
10	42	14.0	GC	好教官解二號來 *[okay sir number two good to go]*
10	42	15.5	CAM-2	我把二號一號開完 d-c 再按一次啊 *[let me start number two number one reconnects d-c once again]*
10	42	15.6	CAM-3	喔喔 okay 還有 d-c 的 d-c 的 *[oh oh okay there is d-c d-c]*

hh[7]	mm	ss	Source	Context
10	42	19.5	CAM-2	在這邊 *[it is here]*
10	42	20.2	CAM-1	rotation 開一號 *[rotation start number one]*
10	42	20.4	CAM-3	啊 d-c 的啊 *[ah it is d-c]*
10	42	24.1	GC	教官…來 *[sir ...]*
10	42	27.0	CAM-1	start lights on
10	42	27.8	CAM-2	starter on
10	42	28.8	CAM-1	n-h rising
10	42	29.9	CAM	(single chime)
10	42	30.2	CAM-1	time
10	42	30.8	CAM-2	timing
10	42	31.2	CAM-2	fuel open
10	42	31.9	CAM-1	check
10	42	32.4	CAM-2	ignition
10	42	33.5	CAM-1	check
10	42	41.1	CAM-2	oil pressure 上升 *[oil pressure rising]*
10	42	42.0	CAM-1	check
10	42	42.7	CAM-2	forty five
10	42	43.3	CAM-1	start lights off
10	42	44.4	CAM-2	cut off
10	42	47.6	CAM-2	那個 有的時候那個 com hatch 太早關 *[that sometimes com hatch is closed too early]*
10	42	50.6	CAM-1	是 *[yes]*
10	42	50.9	CAM-2	會那個 一推上來的時候 那個衝得很 很大 *[it will when it goes up that will jump really really high]*
10	42	54.6	CAM-1	yah
10	42	54.9	CAM	(single chime)
10	42	55.6	CAM-2	是等它 啊穩定後再關 把 condition 推到 auto 之後再關這樣 *[wait until it stable then close it close it after you push condition to auto]*
10	42	59.4	CAM-1	穩定後 兩個 *[after stable two]*
10	43	02.6	CAM-1	是

hh[7]	mm	ss	Source	Context
				[yes]
10	43	08.7	CAM-3	這已經在放 com 的地方… *[it is already at com…]*
10	43	10.0	CAM-2	好 *[okay]*
10	43	11.8	CAM-2	好現在… 在這邊 這裡是 d-c 跟 a-c 的電 *[okay now … here here is d-c power and a-c power]*
10	43	16.0	CAM-1	對 *[yes]*
10	43	16.9	CAM-2	auto 推 推上去 好 你現在幫我看 hydraulic system page *[push to auto push it up okay now you help me check hydraulic page]*
10	43	21.2	CAM-2	再另外這個對 … *[and then another …]*
10	43	44.1	CAM-3	那個 com hatch 那個那個那邊可以顯示 *[and that that com hatch where is it shown]*
10	43	47.9	CAM-2	這邊沒辦法顯示要看那邊 *[it is not shown here you have to check there]*
10	43	49.7	CAM-3	只有看那邊是吧 那沒有辦法顯示 *[it only can check from there that cannot be shown]*
10	43	50.4	CAM-2	嗯對 沒有辦法 沒有 *[hmmm yes it cannot no]*
10	43	52.6	CAM-3	我那一邊 上了當著了道 那沒有關 我們看不到 (笑聲) *[i take the bait and get possessed if that is not closed then we will not see it (laughing)]*
10	43	56.3	CAM-2	對啊 *[right]*
10	43	56.7	GC	報告教官 飛機完成 請煞車 *[sir aircraft is ready please brake]*
10	43	58.1	INT-1	好 煞車煞上 安全銷拆除 人員撤離 下午見 *[okay brake on safety pin off staff off see you in the afternoon]*
10	44	01.8	GC	…撤離完成 麻煩看我們手勢回頭見 *[… staff off complete please watch our gesture see you]*
10	44	03.4	CAM-2	好 single channel 二號

hh[7]	mm	ss	Source	Context
				[okay single channel number two]
10	44	04.9	CAM-1	check
10	44	09.7	CAM-2	一號 *[number one]*
10	44	10.3	CAM-1	check
10	44	14.3	CAM-2	low pitch
10	44	14.8	CAM-1	check
10	44	17.4	CAM-2	low pitch 二號一號 *[low pitch number two number one]*
10	44	17.9	CAM-1	check
10	44	21.8	CAM	(發動機轉速提高聲響) *[sound of engine spool up]*
10	44	22.3	CAM-2	好 b-t-c 接上 *[okay connect b-t-c]*
10	44	24.0	CAM-1	check before taxi procedure
10	44	25.3	CAM-2	before taxi procedure
10	44	29.0	CAM	(single chime)
10	44	30.8	CAM-2	before taxi procedure complete
10	44	30.9	CAM	(single chime)
10	44	32.4	CAM-1	before taxi checklist
10	44	33.7	CAM-2	好 recall 了 對 *[okay it is recalled right]*
10	44	36.9	CAM-2	好 f-w-s *[okay f-w-s]*
10	44	37.8	CAM-1	recall
10	44	38.3	CAM-2	propeller brake
10	44	39.0	CAM-1	off
10	44	39.5	CAM-2	cockpit com hatch
10	44	40.3	CAM-1	closed
10	44	40.8	CAM-2	condition lever 一二 *[condition lever one and two]*
10	44	41.6	CAM-1	auto
10	44	42.2	CAM-2	anti icing
10	44	42.4	OTH	(與 GND 通話) *[communication between other aircraft and ground]*
10	44	42.9	CAM-1	not required
10	44	43.7	CAM-2	anti skid
10	44	44.1	CAM-1	test
10	44	44.7	CAM-2	flaps

hh[7]	mm	ss	Source	Context
10	44	45.0	CAM-1	fifteen
10	44	45.7	CAM-2	nose wheel steering
10	44	46.6	CAM-1	on
10	44	47.0	CAM-2	procedure complete
10	44	47.6	GND	(與其他航機通話) *[communication with other aircraft]*
10	44	47.9	CAM-1	謝謝 *[thank you]*
10	44	53.7	OTH	(與 GND 通話) *[communication between other aircraft and ground]*
10	44	56.7	CAM	(sound of cabin call)
10	44	57.9	INT-1	嗨 *[hello]*
10	44	58.2	INT-4	教官 cabin ready *[sir cabin ready]*
10	44	58.9	RDO-2	songshan ground transasia two tree five request taxi
10	44	59.0	INT-1	好知道了謝謝 *[okay roger thank you]*
10	45	01.8	GND	transasia two tree five runway one zero taxi via whisky
10	45	05.1	RDO-2	taxi via whisky to runway one zero transasia two tree five
10	45	07.7	CAM-2	好 whisky 到么洞 右邊 clear *[okay whisky to one zero right side is clear]*
10	45	09.8	CAM-1	左邊 clear *[left side is clear]*
10	45	17.0	CAM-1	taxi procedure please
10	45	18.1	CAM-2	taxi procedure
10	45	19.7	CAM-2	好 *[okay]* f-m-s f-m-s heading select l-nav i-a-s autospeed taxi procedure complete
10	45	26.1	CAM-1	好 *[okay]* taxi checklist
10	45	27.1	CAM-2	taxi checklist taxi takeoff lights
10	45	29.1	CAM-1	on
10	45	29.9	CAM-2	brakes
10	45	30.4	CAM-1	check
10	45	31.0	CAM-2	f-g-c-p f-m-a
10	45	32.0	CAM-1	heading selected i-a-s f-d left side l-nav blue one five magenta

hh[7]	mm	ss	Source	Context
10	45	36.3	CAM-2	好 check *[okay check]*
10	45	37.1	CAM-2	takeoff configuration test okay
10	45	42.8	CAM-2	takeoff briefing
10	45	43.8	CAM-1	好 muzha two quebec 離場 initial 五千加速高度一千一 complete *[okay muzha two quebec departure initial five thousand acceleration altitude one thousand one hundred complete]*
10	45	46.6	CAM-2	roger 是 thank you procedure complete *[roger yes thank you procedure complete]*
10	45	51.6	CAM-3	還是叫 procedure… 按… *[is it still called procedure… push…]*
10	45	52.4	GND	transasia two tree five contact tower one one eight decimal one good day
10	45	55.5	RDO-2	contact tower one one eight one transasia two tree five good day
10	46	05.5	RDO-2	songshan tower good morning transasia two tree five taxi with you
10	46	10.4	TWR	transasia two tree five songshan tower due to initial separation hold short runway one zero for landing traffic
10	46	15.7	RDO-2	hold short runway one zero transasia two tree five
10	46	17.9	CAM-2	好 hold short runway *[okay hold short runway]*
10	46	18.3	OTH	(與 TWR 對話) *[communication between other aircraft and tower]*
10	46	19.3	CAM-1	是 跑道外等待 *[yes hold short runway]*
10	46	20.3	CAM-2	喔 *[oh]*
10	46	23.5	TWR	(與其他航機對話) *[communication with other aircraft]*
10	46	24.8	CAM-2	跑道外等 *[hold short runway]*
10	46	26.7	CAM-1	是 *[yes]*
10	46	33.7	OTH	(與 TWR 對話) *[communication between other aircraft and tower]*

hh[7]	mm	ss	Source	Context
10	46	39.9	CAM-3	*教官這落地了以後啊 把 f-m-s 就放在 f-m-s *[sir after landing put f-m-s at f-m-s]*
10	46	44.3	CAM-2	喔它嗯它 調整 f-m-s 喔 *[oh it yes it adjust f-m-s]*
10	46	47.0	CAM-3	對對對 *[right right right]*
10	46	47.6	CAM-2	是 *[yes]*
10	46	47.9	CAM-3	這樣在 f-m-s *[at f-m-s like this]*
10	46	49.0	CAM-2	是 *[yes]*
10	46	49.3	CAM-3	先配合到它的步伐 *[in coordination with its pace]*
10	46	51.2	CAM-2	對啊 *[yes]*
10	46	54.1	CAM-2	它只是 先把提前做 下一步的動作這樣 可是剛它開始不熟來不及 所以 就保持 v-o-r 靠擋後弄也可以… *[it just reacts in advance the next step but if not too familiar while it is new so remain at v-o-r then do it later is fine too…]*
10	47	02.6	CAM-3	對啊對啊其實我看它那 *[right actually i see it]*
10	47	04.8	CAM-2	因為他熟了當然知道怎麼做 *[because he is so used to it he know what to do]*
10	47	06.9	CAM-3	對啊下一步要幹甚麼呢 *[yes and what to do next]*
10	47	09.1	CAM-2	嗯 他不熟的就先一步步 先把 *[hmm if not familiar with it then do it step by step first]*
10	47	10.8	CAM-3	因他扭那個動作好像都 連你這個這個 都不知道轉過去啊 *[because he turned it as if and even you do not know to turn it]*
10	47	14.6	CAM-2	喔 *[oh]*
10	47	15.0	CAM-3	(笑聲) *[(laughing)]*
10	47	16.7	CAM-2	我們這個都是太快了 因為你 剛剛開始 使

hh[7]	mm	ss	Source	Context
				用這個最精準 *[we do this too quickly because you just begins it is more precise to use this]*
10	47	20.3	CAM-3	對啊 一步一步啊 我 就是說 我們是比較慢 其實說老外 就很給你時間 *[oh yes step by step i i mean we are slower and actually for foreigners give you a lot of time]*
10	47	25.2	CAM-2	給你時間啊 *[give you time]*
10	47	26.1	CAM-3	他給你他 *[they give you]*
10	47	26.6	CAM-2	因為他看的不是那個 他看的重點不是在那邊 *[because he does not want to see that he does not put too much focus on that]*
10	47	27.8	CAM-3	…
10	47	28.9	TWR	(與其他航機對話) *[communication with other aircraft]*
10	47	32.2	CAM-2	因為 教官你剛剛講到是說 甚麼時候轉到 n-d 頁面 當你做到這個程序 bleed valve 的情況下 它會轉換成這個頁面給你看 *[because sir you just mentioned when to switch to n-d page when you are doing this procedure at bleed valve it will switch to this page for you]*
10	47	40.9	CAM	(疑似按鍵聲響) *[sound similar to clicking pushbutton]*
10	47	41.8	CAM-2	轉到這個頁面 當你做到這個頁面之後呢 你就檢查完了 … 你就自己把它換到 n-d page 就好了 *[turn to this page when you are up to this page you are done with the check… you switch to n-d page on your own]*
10	47	48.3	CAM-3	它是甚麼時候會轉到這個頁面你說 *[again when will it switch to this page]*
10	47	49.8	CAM-2	我剛就是講 bleed valve 這個 我我現在示範給你看嘛 *[i just said bleed valve i i will show you]*
10	47	51.7	CAM-3	… bleed valve 是不是啊 *[…is it bleed valve]*

hh[7]	mm	ss	Source	Context
10	47	53.5	CAM-2	啊我我現在試給你看 *[ah i now will show you]*
10	47	54.6	CAM-3	你按到它 bleed valve 它就會轉過去是不是啊 *[when you proceed to bleed valve it will switch over right]*
10	47	55.5	CAM-2	嗄 呃 a little 啊 air flow 那邊啊 這邊轉它這邊它會 它先不會的那一種 *[ah uh a little as for air flow if i turn this then here it would will it not]*
10	48	02.4	CAM-3	你沒有放 system 頁面 *[you did not display system page]*
10	48	03.9	CAM-2	嗄 喔 對 喔對 剛好在 system 頁面這邊 *[uh oh yes oh yes it is right at the system page]*
10	48	08.6	CAM-2	等一下喔 我先跳回這個頁面 我剛在這邊嘛這樣 *[wait a second let me jump back this page where i was]*
10	48	10.7	CAM-3	欸 啊 *[hey uh]*
10	48	15.4	CAM-2	…這樣 自己做 *[… like this will do on its own]*
10	48	19.7	CAM-2	(台語)抱歉抱歉 *[sorry sorry]*
10	48	20.3	CAM-3	你只要按到這邊 你 啊 *[you only have to press here you uh]*
10	48	23.1	CAM-2	我剛在 air flow air flow 那邊好像就會這樣跳了 *[i was at the air flow air flow page and it would switch like this]*
10	48	23.5	CAM-3	… 呃 *[… uh]*
10	48	28.7	CAM-2	等一下 *[wait a second]*
10	48	28.9	CAM-3	現在怎麼辦 這個時候 才轉轉過去 *[what to do now right now it just switched]*
10	48	31.5	CAM-2	好的 好先等一下喔 我再轉另外一個 頁 system *[okay okay wait a second let me switch to another page system]*
10	48	35.0	CAM-2	好

hh[7]	mm	ss	Source	Context
				[okay]
10	48	36.5	CAM-2	不好意思 *教官 *[sorry sir]*
10	48	37.6	CAM-1	hey 怎樣 *[hey what's up]*
10	48	37.8	CAM-2	對啊 我在給它測試這樣 *[oh yah i want to give it a check]*
10	48	40.6	CAM-1	沒問題 *[no problem]*
10	48	41.0	CAM-2	好 *[okay]*
10	48	42.0	CAM-2	等一下 它它跳到 air flow 的時候就會自己轉換 *[wait a second it it will automatically switch when jumping to air flow page]*
10	48	44.5	CAM-3	嗄 呃 air flow 嗯 *[uh uh air flow hmmm]*
10	48	46.1	CAM-2	它可以看 它都可以看啊 我們平常有 high 跟 low 嘛 *[it will show it will show normally it would be high or low]*
10	48	49.6	CAM-3	嗯 high 是甚麼樣子 *[hmm so what does is look like when at high]*
10	48	51.6	CAM-2	high 它變成藍 藍 air flow 這邊 *[for high it will turn blue blue here air flow]*
10	48	53.5	CAM-3	啊有一個 high high 長什麼樣子 看看 *[ah there is a high what does it look like check it out]*
10	48	58.8	CAM-3	因為它 這個 轉過去 *[because it this switch it over]*
10	49	00.8	CAM-2	它自己跳過去了 跳到這一邊之後呢 你做到這個程序 你這個呃 *[it switched over automatically after switching over here you proceed to this procedure you uh]*
10	49	04.9	CAM-3	然後這個 bleed valve 這個時候呢 *[then the bleed valve and now]*
10	49	07.4	CAM-2	嗯 *[hmmm]*

hh[7]	mm	ss	Source	Context
10	49	07.7	CAM-3	它還是保持 *[it will remain]*
10	49	08.3	CAM-2	它還是會保持 它就不會跳了 *[it will remain it will not switch]*
10	49	09.2	CAM-3	… 就可以轉過去是吧 *[... will switch over right]*
10	49	10.7	CAM-2	這邊就要靠自己用手動的方式了 *[here you have to do it manually]*
10	49	11.0	CAM-3	嗯 嗯 嗯 *[hmmm hmmm hmmm]*
10	49	14.3	CAM-3	就是那 *[this is it]*
10	49	15.0	CAM-2	對啊 *[yes]*
10	49	18.9	CAM-2	好教官不好意思 冒犯了 *[all right sir excuse me for disturbing you]*
10	49	20.9	CAM-3	沒有沒有沒有沒有 沒有沒有 我不好意思啊我要問 *[no no no no not at all i shall say excuse me instead it is me who asked help]*
10	49	23.9	CAM-2	嗯 *[hmmm]*
10	49	24.7	CAM-3	…
10	49	24.9	CAM-2	我是冒犯了 *教官打斷他的 呃 抱歉 *[oh i meant to apologize to captain for interrupting his uh sorry for that]*
10	49	28.0	CAM-1	我在放空你們繼續繼續 放空 *[i was in numb you guys can continue in numbness]*
10	49	39.2	CAM-1	(疑似伸懶腰聲音) *[sound similar to yawning while stretching]*
10	50	08.2	TWR	transasia two tree five line up and wait runway one zero
10	50	11.2	RDO-2	line up and wait runway one zero transasia two tree five
10	50	13.6	CAM-1	進跑道等待 *[line up runway and wait]*
10	50	13.8	CAM-2	他許可進跑道 *[it grants to line up runway]*
10	50	16.0	PA-1	cabin crew prepare for takeoff

hh[7]	mm	ss	Source	Context
10	50	18.4	CAM-1	哇 before takeoff procedure *[wow before takeoff procedure]*
10	50	20.8	CAM-2	好 roger *[okay]*
10	50	23.1	CAM-2	gust lock 我就會鬆掉它同時打開 radar *[gust lock i will release it and open radar]*
10	50	26.3	CAM-3	這是一個一連串 *[these are actions in a row]*
10	50	27.3	CAM-2	一連串動作就這樣就好了 好 before takeoff left side spoiler up *[a series of actions like these and we are done now okay before takeoff left side spoiler up]*
10	50	30.4	PA-4	各位貴賓我們即將起飛請您確實扣緊您的安全帶謝謝 (台語)各位貴賓我們即將起飛請您確實扣緊您的安全帶感謝 *[ladies and gentlemen we will be taking off shortly please fasten your seatbelt thank you (repeat in Taiwanese)]*
10	50	32.2	CAM-1	left up
10	50	33.1	CAM-2	right side spoiler up
10	50	34.4	CAM-1	lights on
10	50	34.6	CAM-2	lights on
10	50	37.4	CAM-2	因為剛好那個 比較順手嘛這樣做 好 before 嗯 before takeoff procedure complete *[because it is right at that doing this way makes it more smoothly okay before uh before takeoff procedure complete]*
10	50	40.2	TWR	(與其他航機對話) *[communication with other aircraft]*
10	50	42.9	CAM-1	before takeoff checklist
10	50	44.2	CAM-2	跑道是么洞 verified *[runway one zero verified]*
10	50	45.5	OTH	(與 TWR 對話) *[communication between other aircraft and tower]*
10	50	46.0	CAM-1	么洞 verified *[one zero verified]*
10	50	46.8	CAM-2	gust lock
10	50	47.5	CAM-1	released
10	50	48.1	CAM-2	flight control

hh[7]	mm	ss	Source	Context
10	50	49.0	CAM-1	check
10	50	49.4	CAM-2	transponder tcas
10	50	50.7	CAM-1	check
10	50	51.6	CAM-2	air flow
10	50	52.3	CAM-1	normal
10	50	52.9	CAM-2	現在看那個 normal 呃 有沒有跳回來 好 bleed valves *[now watch that normal uh did it switch back good bleed valves]*
10	50	56.0	CAM-1	on
10	50	57.2	CAM-2	external lights
10	50	58.3	CAM-1	on
10	50	59.0	CAM-2	when line up standby f-d bar 我就這樣換回來這樣 *[when line up standby f-d bar i will switch it back like this]*
10	51	02.4	CAM-3	這樣子喔換回來 line up standby *[switch it back like this line up standby]*
10	51	07.5	CAM-3	而且 line up 這 when line up standby 是不是啊 *[and line up this when line up standby isn' t it]*
10	51	09.7	CAM-2	啊對 standby 對啊 那這個要等到 when line up *[oh yes standby yes that has to wait until when line up]*
10	51	12.5	CAM-3	沒有…這句話怎麼講的 line up 等待 *[no… what does that mean line up and wait]*
10	51	12.7	TWR	transasia two tree five runway one zero wind one zero zero degree niner knots cleared for takeoff
10	51	15.2	CAM-2	等一下 *[wait a second]*
10	51	18.1	CAM-1	…
10	51	18.9	RDO-2	cleared for takeoff runway one zero transasia two tree five
10	51	23.4	CAM-2	好 許可起飛了 *[ok cleared for takeoff]*
10	51	23.8	CAM-1	許可起飛 *[cleared for takeoff]*
10	51	28.9	CAM-2	好 f-d bar *[okay f-d bar]*
10	51	29.7	CAM-1	center
10	51	30.2	CAM-2	center

hh[7]	mm	ss	Source	Context
10	51	31.6	CAM-2	rudder cam
10	51	32.4	CAM-1	center
10	51	33.9	CAM-2	center procedure complete
10	51	35.4	CAM-1	yes sir
10	51	35.8	CAM-2	好 *[okay]*
10	51	35.9	CAM-1	五么分 v one 么洞六 *[time five one v one one zero six]*
10	51	36.6	CAM-2	嗯 五么分 roger check *[hmmm time five one roger check]*
10	51	39.6	CAM	(發動機轉速提高聲響) *[sound of engine spool up]*
10	51	42.4	CAM-2	欸 *[hey]*
10	51	42.8	CAM-1	欸 *[hey]*
10	51	43.3	CAM-2	沒有 a-t-p-c-s armed *[no a-t-p-c-s armed]*
10	51	44.5	CAM-1	是喔 *[really]*
10	51	46.2	CAM-2	好 takeoff inhibit *[okay takeoff inhibit]*
10	51	47.7	CAM-1	takeoff inhibit
10	51	48.4	CAM-2	好 *[okay]*
10	51	48.7	CAM-1	好繼續起飛 *[ok continue to takeoff]*
10	51	49.2	CAM-2	我們繼續走喔 seventy *[we will continue seventy]*
10	51	50.6	CAM-1	seventy i have control
10	51	50.6	OTH	(其他航機通話) *[communication between tower and other aircraft]*
10	51	51.5	CAM-2	喔有啊 a-t-p-c-s armed 有 *[oh there it is a-t-p-c-s armed]*
10	51	53.7	TWR	(與其他航機對話) *[communication with other aircraft]*
10	51	57.9	CAM-2	engine instrument check normal
10	51	58.8	CAM-1	v one v r
10	51	59.4	CAM-2	v one v r

hh[7]	mm	ss	Source	Context
10	52	00.2	CAM-1	rotate
10	52	01.7	CAM	(pitch trim 聲響) *[sound of pitch trim]*
10	52	03.7	CAM-2	好 positive rate *[okay positive rate]*
10	52	05.0	CAM-1	gear up
10	52	05.4	CAM-2	gear up
10	52	07.4	CAM	(pitch trim 聲響) *[sound of pitch trim]*
10	52	07.8	CAM-1	l nav green
10	52	09.0	CAM-2	check
10	52	13.9	CAM-1	au autopilot on
10	52	15.5	CAM-2	autopilot on
10	52	16.0	CAM	(pitch trim 聲響) *[sound of pitch trim]*
10	52	17.1	CAM-1	a-p green
10	52	17.7	CAM-2	check
10	52	20.8	CAM-2	gear up set
10	52	21.1	CAM-1	… check
10	52	32.1	CAM-2	他可能 throttle 補一下就有了 呃大概 *[it came back after we advanced the throttle uh maybe]*
10	52	33.6	CAM-1	yes
10	52	33.8	TWR	transasia two three five contact taipei approach one one niner decimal seven good day
10	52	34.3	CAM-2	yah…
10	52	36.7	CAM	(bleed valve 關閉聲響) *[sound of bleed valve closure]*
10	52	37.7	RDO-2	one one niner seven transasia two tree five good day
10	52	38.3	CAM	(master warning 至 1052:40.0) *[sound of master warming until 1052:40.0]*
10	52	39.4	CAM-2	欸 看一下 來 欸 *[hey take a look hey]*
10	52	39.4	CAM-1	* 好 i i have control *[* okay i i have control]*
10	52	41.4	CAM	(自動駕駛解除聲響) *[sound of autopilot disengagement]*
10	52	41.6	CAM-2	you have control
10	52	43.0	CAM-1	我把 一號發動機 收回來

hh[7]	mm	ss	Source	Context
				[i will pull back engine one throttle]
10	52	43.0	CAM	(pitch trim 聲響) *[sound of pitch trim]*
10	52	43.6	CAM-2	等一下 cross check *[wait a second cross check]*
10	52	44.8	CAM	(sound of single cavalry charge)
10	52	46.1	CAM-1	heading mode
10	52	46.6	CAM-2	heading mode
10	52	47.3	CAM-1	好 我們繼續 *[okay let us continue]*
10	52	48.4	CAM-2	heading mode 嘛還是 *[heading mode or]*
10	52	48.5	CAM	(single chime)
10	52	50.0	CAM-1	好 *[okay]*
10	52	50.1	CAM-2	我們… 呃 低於兩千五 我們 heading 轉去 啊 那個 *[we are… uh lower than twenty five hundreds we turn the heading to that]*
10	52	54.1	CAM-1	繼續 *[continue]*
10	52	54.3	CAM-2	洞 洞九五那邊 *[zero zero niner five]*
10	52	55.6	CAM-1	好 *[okay]*
10	52	56.3	CAM-2	… heading select
10	52	57.4	CAM-1	check
10	52	58.5	CAM-1	那我速度 *[and speed]*
10	52	58.9	CAM-2	好 check *[okay check]*
10	52	58.9	CAM	(pitch trim 聲響) *[sound of pitch trim]*
10	52	59.4	CAM	(sound similar to single chime)
10	53	00.4	CAM-2	好 engine flameout check *[okay engine flameout check]*
10	53	01.6	CAM-1	check
10	53	01.8	CAM	(pitch trim 聲響) *[sound of pitch trim]*
10	53	02.2	CAM-2	check up trim 有

hh[7]	mm	ss	Source	Context
				[check up trim yes]
10	53	04.1	CAM-2	auto feather 有 *[auto feather yes]*
10	53	05.2	CAM-1	好 *[okay]*
10	53	05.5	CAM-2	速度先注意一下 *[watch the speed]*
10	53	06.4	CAM-1	number one 收回來 *[pull back number one]*
10	53	07.7	CAM-2	好 現在是確定二號 engine flameout *[okay now number two engine flameout confirmed]*
10	53	08.6	CAM	(sound of triple clicks)
10	53	09.3	CAM-1	好 *[okay]*
10	53	09.9	CAM	(失速警告聲響至 1053:10.8) *[sound of stall warning until 1053:10.8]*
10	53	10.7	CAM-2	等一下 他 *[wait a second it]*
10	53	12.1	CAM-1	* 有地障 *[* terrain ahead]*
10	53	12.1	CAM-2	好 低… *[okay lower…]*
10	53	12.9	CAM-3	你低了 *[you are low]*
10	53	12.6	CAM	(失速警告聲響至 1053:18.8) *[sound of stall warning until 1053:18.8]*
10	53	12.8	CAM	(stick shaker 聲響至 1053:18.8) *[sound of stick shaker until 1053:18.8]*
10	53	13.7	CAM-2	好 推 推回 *[okay push push back]*
10	53	15.0	CAM-1	shut
10	53	15.6	CAM-2	等一下 …油門 *[wait a second … throttle]*
10	53	17.9	CAM-2	油門 *[throttle]*
10	53	19.6	CAM-1	number one
10	53	20.2	CAM-2	number feather
10	53	21.1	CAM-1	feather shut off
10	53	21.4	CAM	(失速警告聲響至 1053:23.3)

hh[7]	mm	ss	Source	Context
				[sound of stall warning until 1053:23.3]
10	53	21.4	CAM	(stick shaker 聲響至 1053:23.3) *[sound of stick shaker until 1053:23.3]*
10	53	21.7	CAM-2	okay
10	53	22.6	CAM-1	呃 number one *[uh number one]*
10	53	25.3	CAM-1	好我繼續飛啊 *[okay i have control]*
10	53	25.3	CAM	(single chime)
10	53	25.7	CAM	(失速警告聲響至 1053:27.3) *[sound of stall warning until 1053:27.3]*
10	53	25.7	CAM	(stick shaker 聲響至 1053:27.3) *[sound of stick shaker until 1053:27.3]*
10	53	26.2	CAM-2	好 你來飛 *[okay you have control]*
10	53	27.4	CAM	(sound of one click)
10	53	27.6	CAM	(single chime)
10	53	28.1	CAM-2	好 跟著 heading bug *[okay follow the heading bug]*
10	53	29.7	CAM-1	跟著 heading bug 喔 *[follow the heading bug oh]*
10	53	30.4	CAM-2	好 heading autofeather 唉唷 *[okay heading autofeather ouch]*
10	53	32.1	CAM-1	check
10	53	34.9	RDO-2	tower transasia two tree five mayday mayday engine flameout
10	53	39.4	TWR	transasia two tree five please try again contact taipei approach one one niner decimal seven
10	53	43.1	CAM-2	好 現在航向轉一個洞九五 *[okay now heading turn to zero niner five]*
10	53	45.4	CAM-1	check
10	53	46.4	CAM-1	autopilot 接上 *[engage autopilot]*
10	53	47.0	CAM-2	好的 autopilot 好 *[okay autopilot okay]*
10	53	48.7	CAM-1	a p green
10	53	49.7	CAM-2	a p green
10	53	50.7	CAM	(pitch trim 聲響) *[sound of pitch trim]*
10	53	51.0	CAM-2	trim 打好…

hh[7]	mm	ss	Source	Context
				[put the trim right]
10	53	53.5	CAM-3	怎麼這樣子勒 *[how come it becomes like this]*
10	53	54.5	CAM-1	好你負責對外 *[okay you are in charge of communication]*
10	53	55.6	CAM-2	好　我來對啊 *[okay　will do]*
10	53	55.9	CAM	(失速警告聲響至 1053:59.7) *[sound of stall warning until 1053:59.7]*
10	53	55.9	CAM	(stick shaker 聲響至 1053:59.7) *[sound of stick shaker until 1053:59.7]*
10	53	56.7	CAM-2	不要帶太高　不要太高 *[don't pull too high　not too high]*
10	53	58.7	CAM-1	我現在是 autopilot autopilot 再接一次 *[i now have autopilot　reconnect the autopilot]*
10	54	00.0	CAM	(autopilot 解除聲響) *[sound of autopilot disengagement]*
10	54	00.3	CAM-2	好　再接一次 *[okay　reconnect it one more time]*
10	54	03.4	CAM-2	疑 沒有 *[eh　no]*
10	54	04.1	CAM	(autopilot 解除聲響) *[sound of autopilot disengagement]*
10	54	04.2	CAM-1	我先轉... *[i will turn…]*
10	54	05.0	CAM-2	兩邊都沒有… *[both sides … lost]*
10	54	06.1	CAM	(失速警告聲響至 1054:10.1) *[sound of stall warning until 1054:10.1]*
10	54	06.1	CAM	(stick shaker 聲響至 1054:10.1) *[sound of stick shaker until 1054:10.1]*
10	54	06.5	CAM	(sound of two clicks)
10	54	07.0	CAM-2	沒有 engine flameout both sides 沒有了 *[no　engine flameout　we lost both sides]*
10	54	08.9	CAM-1	好 *[okay]*
10	54	09.2	CAM-1	重新開車 *[restart the engine]*
10	54	09.9	CAM-2	好 *[okay]*

hh[7]	mm	ss	Source	Context
10	54	10.2	CAM	five hundred
10	54	10.4	CAM	(autopilot 解除聲響) *[sound of autopilot disengagement]*
10	54	11.4	CAM-1	重新開車 *[restart the engine]*
10	54	11.9	CAM-2	okay
10	54	12.4	CAM	(失速警告聲響至 1054:21.6) *[sound of stall warning until 1054:21.6]*
10	54	12.4	CAM	(stick shaker 聲響至 1054:21.6) *[sound of stick shaker until 1054:21.6]*
10	54	14.1	CAM-1	重新開車 *[restart the engine]*
10	54	14.5	CAM-2	roger
10	54	16.2	CAM-2	button on
10	54	17.7	CAM-1	重新開車 *[restart the engine]*
10	54	18.3	CAM-2	okay
10	54	18.7	TWR	(與其他航機通話) *[communication with other aircraft]*
10	54	20.4	CAM-2	okay
10	54	21.3	CAM-1	重新開車 *[restart the engine]*
10	54	21.8	CAM-2	roger
10	54	21.9	CAM	(autopilot 解除聲響) *[sound of autopilot disengagement]*
10	54	22.6	CAM-2	呃 要往左邊哪 *[uh to the left hand side]*
10	54	23.2	CAM	(失速警告聲響至 1054:33.9) *[sound of stall warning until 1054:33.9]*
10	54	23.5	CAM	(stick shaker 聲響至 1054:33.9) *[sound of stick shaker until 1054:33.9]*
10	54	24.0	CAM-1	重新開車 *[restart the engine]*
10	54	25.5	CAM-2	開不到 *[cannot restart it]*
10	54	26.3	CAM-1	重新開車 *[restart the engine]*
10	54	27.1	CAM-1	哇油門收錯了 *[wow pulled back the wrong side throttle]*
10	54	30.5	CAM-1	重新開車

hh[7]	mm	ss	Source	Context
				[restart the engine]
10	54	30.9	CAM-2	啊 *[ah]*
10	54	31.8	CAM-3	impact impact brace for impact
10	54	34.0	CAM-1	啊* *[ah]*
10	54	34.1	CAM	pull up
10	54	34.2	CAM	(sound of cavalry charge)
10	54	34.6	CAM	(master warning)
10	54	34.8	CAM	(不明聲響) *[unidentified sound]*
10	54	35.4	CAM-2	…
10	54	35.9	CAM	pull up
10	54	36.6		CVR 錄音終止 *[CVR recording ends]*

Note: The languages used in original CVR transcript include Chinese and English. To make it better understanding for investigation parties, the Chinese is translated into English in this translation version. Although efforts are made to translate it as accurate as possible, discrepancies may occur. In this case the Chinese version will be the official version.

Appendix 3 FDR recording parameters list

Parameter Name	Alternate Name
26VAC1	26VAC Bus 1 Status
26VAC2	26VAC Bus 2 Status
26VACSTBY	26VAC STBY Bus Status
4096ID	4096 Ident Code
ACB1	AC 1 BUS STATUS
ACB1OFF	AC Bus 1 OFF
ACB2	AC 2 BUS STATUS
ACB2OFF	AC Bus 2 OFF
ACCX	Acceleration X
ACCXC	Acceleration X MSB
ACCXF	Acceleration X LSB
ACCY	Acceleration Y
ACCYC	Acceleration Y MSB
ACCYF	Acceleration Y LSB
ACCZ	Acceleration Z
ACCZC	Acceleration Z MSB
ACCZF	Acceleration Z LSB
ACID1	A/C Ident 1
ACID2	A/C Ident 2
ACID3	A/C Ident 3
ACID4	A/C Ident 4
ACID5	A/C Ident 5
ACID6	A/C Ident 6
ACID7	A/C Ident 7
ACID8	A/C Ident 8
ACID9	A/C Ident 9
ACPINPROG	A/C Pin prog integrity
ACTYPE1	A/C Type 1
ACTYPE2	A/C Type 2
ACTYPE3	A/C Type 3
ACTYPE4	A/C Type 4
ACWB1	ACW Bus 1 OFF
ACWB2	ACW Bus 2 OFF
ACWGEN1F	ACW Generatrice 1 Fault
ACWGEN2F	ACW Generatrice 2 Fault
ADC1DU1	ADC selection 1 DU1
ADC1DU2	ADC selection 1 DU2
ADC2DU4	ADC selection 2 DU4
ADC2DU5	ADC selection 2 DU5

ADCSELCAP	ADC selection (Captain) CAC1
ADCSELCAP2	ADC selection (Captain) CAC2
ADCSELFO	ADC selection (F/O) CAC1
ADCSELFO2	ADC selection (F/O) CAC2
ADCSWSEL	ADC Switch Selection
ADVDWN	Advisory down
ADVRATE	Resolution Advisory (part 1)
ADVUP	advisory up
AFCSABDIS	AFCS Abnormal Disconnect CAC1
AFCSABDIS2	AFCS Abnormal Disconnect CAC2
AFCTL	AIR FLOW CONTROL
AFRMDICE	De-Icing Airframe ON
AFSCFMAM	AFCS FMA Messages CAC1
AFSCFMAM2	AFCS FMA Messages CAC2
AHRS1DU1	AHRS selection 1 DU1
AHRS1DU2	AHRS selection 1 DU2
AHRS2DU4	AHRS selection 2 DU4
AHRS2DU5	AHRS selection 2 DU5
AHRSELCAP	AHRS selection (Captain) CAC1
AHRSELCAP2	AHRS selection (Captain) CAC2
AHRSELFO	AHRS selection (F/O) CAC1
AHRSELFO2	AHRS selection (F/O) CAC2
AILL	ROLL Surf. pos. LH
AILR	ROLL Surf. pos. RH
AILT	Roll Trim Surface Position
AILTLH	Roll Trim LH Command
AILTRH	Roll Trim RH Command
AIRDISP1	Air disp 1
AIRDISP2	Air disp 2
AIRDISP4	Air disp 4
AIRDISP5	Air disp 5
AIRFRAMEF	De-Icing Airframe FAULT
APMACTEST	APM aircraft test (light test)
APMENAB	APM enable test
APMFAULT	APM FAULT
APMON	APM ON/OFF
APMV1	APM Version 1
APMV2	APM Version 2
APMV3	APM Version 3
APMV4	APM Version 4
APPCAT	Approach Category CAC1
APPCAT2	Approach Category CAC2
APYDENG	AP/YD engagement CAC1

APYDENG2	AP/YD engagement CAC2
ARMLAT2	Armed Lateral Mode CAC2
ARMLATM	Armed Lateral Mode CAC1
ARMVERTM	Armed Vertical Mode CAC1
ARMVERTM2	Armed Vertical Mode CAC2
ATRSEL	ATR42/72 selection 1
ATRSEL2	ATR42/72 selection 2
BAROCALT	Baro-corrected altitude
BAROCALT_sign	Baro-corrected altitude sign
BAROCALTC	Baro-corrected altitude MSB
BAROCALTF	Baro-corrected altitude LSB
BOOST	Boost PW127M
BRKPLC	CAPT LH Pedal Brake Application
BRKPLF	F/O LH Pedal Brake Application
BRKPRC	CAPT RH Pedal Brake Application
BRKPRF	F/O RH Pedal Brake Application
CAC1STAT	CAC 1 STATUS
CAC2STAT	CAC 2 STATUS
CAS	Computed Airspeed
CAS_sign	Computed Airspeed sign
CASC	Computed Airspeed MSB
CASF	Computed Airspeed LSB
CCLCF	Pitch Captain Axis Effort
CCLFOF	Pitch F/O Axis Effort
CCLNL	LH Pitch Ctl Position
CCLNR	RH Pitch Ctl Position
CLAFSO1	CLA 1 Fuel shut off
CLAFSO2	CLA 2 Fuel shut off
COMBCONT	combined control
CURRENTL	Current detector Left
CURRENTR	Current detector Right
CWHL	ROLL control wheel pos.
DAY	Day
DC1	DC Bus 1
DC2	DC Bus 2
DCB1ST	DC 1 BUS STATUS
DCB2ST	DC 2 BUS STATUS
DCBSTBY	DC STBY Bus OFF
DCEMERG	DC Emergency Bus
DCESS1	DC Essential Bus 1
DCESS2	DC Essential Bus 2
DCGEN1F	DC Generatrice 1 Fault
DCGEN2F	DC Generatrice 2 Fault

DCGENU12	DC Generatrice Utilities 1&2
DEGPERFL	Degraded Perf
DESTRACK1	Desired Track DU2/FMS1
DESTRACK2	Desired Track DU4/FMS2
DETREDW1	Detection_Red_Warning_1 CAC1
DETREDW1_2	Detection_Red_Warning_1 CAC2
DETREDW10	Detection_Red_Warning_10 CAC1
DETREDW10_2	Detection_Red_Warning_10 CAC2
DETREDW11	Detection_Red_Warning_11 CAC1
DETREDW11_2	Detection_Red_Warning_11 CAC2
DETREDW12	Detection_Red_Warning_12 CAC1
DETREDW12_2	Detection_Red_Warning_12 CAC2
DETREDW13	Detection_Red_Warning_13 CAC1
DETREDW13_2	Detection_Red_Warning_13 CAC2
DETREDW14	Detection_Red_Warning_14 CAC1
DETREDW14_2	Detection_Red_Warning_14 CAC2
DETREDW15	Detection_Red_Warning_15 CAC1
DETREDW15_2	Detection_Red_Warning_15 CAC2
DETREDW16	Detection_Red_Warning_16 CAC1
DETREDW16_2	Detection_Red_Warning_16 CAC2
DETREDW17	Detection_Red_Warning_17 CAC1
DETREDW17_2	Detection_Red_Warning_17 CAC2
DETREDW18	Detection_Red_Warning_18 CAC1
DETREDW18_2	Detection_Red_Warning_18 CAC2
DETREDW19	Detection_Red_Warning_19 CAC1
DETREDW19_2	Detection_Red_Warning_19 CAC2
DETREDW2	Detection_Red_Warning_2 CAC1
DETREDW2_2	Detection_Red_Warning_2 CAC2
DETREDW20	Detection_Red_Warning_20 CAC1
DETREDW20_2	Detection_Red_Warning_20 CAC2
DETREDW21	Detection_Red_Warning_21 CAC1
DETREDW21_2	Detection_Red_Warning_21 CAC2
DETREDW22	Detection_Red_Warning_22 CAC1
DETREDW22_2	Detection_Red_Warning_22 CAC2
DETREDW23	Detection_Red_Warning_23 CAC1
DETREDW23_2	Detection_Red_Warning_23 CAC2
DETREDW24	Detection_Red_Warning_24 CAC1
DETREDW24_2	Detection_Red_Warning_24 CAC2
DETREDW25	Detection_Red_Warning_25 CAC1
DETREDW25_2	Detection_Red_Warning_25 CAC2
DETREDW26	Detection_Red_Warning_26 CAC1
DETREDW26_2	Detection_Red_Warning_26 CAC2
DETREDW27	Detection_Red_Warning_27 CAC1

DETREDW27_2	Detection_Red_Warning_27 CAC2
DETREDW28	Detection_Red_Warning_28 CAC1
DETREDW28_2	Detection_Red_Warning_28 CAC2
DETREDW29	Detection_Red_Warning_29 CAC1
DETREDW29_2	Detection_Red_Warning_29 CAC2
DETREDW3	Detection_Red_Warning_3 CAC1
DETREDW3_2	Detection_Red_Warning_3 CAC2
DETREDW30	Detection_Red_Warning_30 CAC1
DETREDW30_2	Detection_Red_Warning_30 CAC2
DETREDW31	Detection_Red_Warning_31 CAC1
DETREDW31_2	Detection_Red_Warning_31 CAC2
DETREDW32	Detection_Red_Warning_32 CAC1
DETREDW32_2	Detection_Red_Warning_32 CAC2
DETREDW33	Detection_Red_Warning_33 CAC1
DETREDW33_2	Detection_Red_Warning_33 CAC2
DETREDW34	Detection_Red_Warning_34 CAC1
DETREDW34_2	Detection_Red_Warning_34 CAC2
DETREDW35	Detection_Red_Warning_35 CAC1
DETREDW35_2	Detection_Red_Warning_35 CAC2
DETREDW36	Detection_Red_Warning_36 CAC1
DETREDW36_2	Detection_Red_Warning_36 CAC2
DETREDW37	Detection_Red_Warning_37 CAC1
DETREDW37_2	Detection_Red_Warning_37 CAC2
DETREDW38	Detection_Red_Warning_38 CAC1
DETREDW38_2	Detection_Red_Warning_38 CAC2
DETREDW39	Detection_Red_Warning_39 CAC1
DETREDW39_2	Detection_Red_Warning_39 CAC2
DETREDW4	Detection_Red_Warning_4 CAC1
DETREDW4_2	Detection_Red_Warning_4 CAC2
DETREDW40	Detection_Red_Warning_40 CAC1
DETREDW40_2	Detection_Red_Warning_40 CAC2
DETREDW41	Detection_Red_Warning_41 CAC1
DETREDW41_2	Detection_Red_Warning_41 CAC2
DETREDW42	Detection_Red_Warning_42 CAC1
DETREDW42_2	Detection_Red_Warning_42 CAC2
DETREDW43	Detection_Red_Warning_43 CAC1
DETREDW43_2	Detection_Red_Warning_43 CAC2
DETREDW44	Detection_Red_Warning_44 CAC1
DETREDW44_2	Detection_Red_Warning_44 CAC2
DETREDW45	Detection_Red_Warning_45 CAC1
DETREDW45_2	Detection_Red_Warning_45 CAC2
DETREDW46	Detection_Red_Warning_46 CAC1
DETREDW46_2	Detection_Red_Warning_46 CAC2

DETREDW47	Detection_Red_Warning_47 CAC1
DETREDW47_2	Detection_Red_Warning_47 CAC2
DETREDW48	Detection_Red_Warning_48 CAC1
DETREDW48_2	Detection_Red_Warning_48 CAC2
DETREDW49	Detection_Red_Warning_49 CAC1
DETREDW49_2	Detection_Red_Warning_49 CAC2
DETREDW5	Detection_Red_Warning_5 CAC1
DETREDW5_2	Detection_Red_Warning_5 CAC2
DETREDW50	Detection_Red_Warning_50 CAC1
DETREDW50_2	Detection_Red_Warning_50 CAC2
DETREDW51	Detection_Red_Warning_51 CAC1
DETREDW51_2	Detection_Red_Warning_51 CAC2
DETREDW52	Detection_Red_Warning_52 CAC1
DETREDW52_2	Detection_Red_Warning_52 CAC2
DETREDW53	Detection_Red_Warning_53 CAC1
DETREDW53_2	Detection_Red_Warning_53 CAC2
DETREDW54	Detection_Red_Warning_54 CAC1
DETREDW54_2	Detection_Red_Warning_54 CAC2
DETREDW6	Detection_Red_Warning_6 CAC1
DETREDW6_2	Detection_Red_Warning_6 CAC2
DETREDW7	Detection_Red_Warning_7 CAC1
DETREDW7_2	Detection_Red_Warning_7 CAC2
DETREDW8	Detection_Red_Warning_8 CAC1
DETREDW8_2	Detection_Red_Warning_8 CAC2
DETREDW9	Detection_Red_Warning_9 CAC1
DETREDW9_2	Detection_Red_Warning_9 CAC2
DISINNER1	Discrete Inner 1
DISINNER2	Discrete Inner 2
DISMIDDL1	Discrete Middle 1
DISMIDDL2	Discrete Middle 2
DISMISAP1	Distance to missed approach point 1
DISMISAP2	Distance to missed approach point 2
DISOUT1	Discrete Outer 1
DISOUT2	Discrete Outer 2
DMEDIS1	DME Distance 1
DMEDIS2	DME Distance 2
DRIFANG1	Drift Angle 1
DRIFANG2	Drift Angle 2
DU1STAT	DU1 status
DU2STAT	DU2 status
DU3STAT	DU3 status
DU4STAT	DU4 status
DU5STAT	DU5 status

EEC1F	EEC 1 Fault
EEC2F	EEC 2 Fault
EGT1W	Eng Overtemp LH
EGT2W	Eng Overtemp RH
ELVL	PITCH Surf. pos. LH
ELVR	PITCH Surf. pos. RH
ELVT	Pitch Trim Surface Position
ENG1BV	Eng Bleed Valve Position LH
ENG2BV	Eng Bleed Valve Position RH
ENGLATM	Engaged Lateral Mode CAC1
ENGLATM2	Engaged Lateral Mode CAC2
ENGMOD1L	ENG mode 1 Left
ENGMOD1R	ENG mode 1 Right
ENGMOD2L	ENG mode 2 Left
ENGMOD2R	ENG mode 2 Right
ENGVERTM	Engaged Vertical Mode CAC1
ENGVERTM2	Engaged Vertical Mode CAC2
EVTMKR	Event Marker
FDALERT	FD Alert CAC1
FDALERT2	FD Alert CAC2
FDAUBITE11	FDAU BITE part 1 (bits 12-1)
FDAUBITE12	FDAU BITE part 1 (bits 24-13)
FDAUBITE13	FDAU BITE part 1 (bits 32-25)
FDAUBITE21	FDAU BITE part 2 (bits 12-1)
FDBDISEL	FD Bar Display selected CAC1
FDBDISEL2	FD Bar Display selected CAC2
FFKG1	Fuel Flow left (KPH)
FFKG2	Fuel Flow right (KPH)
FFPPH1	Fuel Flow left (PPH)
FFPPH2	Fuel Flow right (PPH)
FLIGHTID	A/C Flight ident
FLIGHTID10	A/C Flight ident 1 character 10
FLIGHTID11	A/C Flight ident 1 character 1
FLIGHTID12	A/C Flight ident 1 character 2
FLIGHTID13	A/C Flight ident 1 character 3
FLIGHTID14	A/C Flight ident 1 character 4
FLIGHTID15	A/C Flight ident 1 character 5
FLIGHTID16	A/C Flight ident 1 character 6
FLIGHTID17	A/C Flight ident 1 character 7
FLIGHTID18	A/C Flight ident 1 character 8
FLIGHTID19	A/C Flight ident 1 character 9
FLP0	Flap Command 0°
FLP15	Flap Command 15°

FLP2528	Flap Command 25°/28°
FLP33	Flap Command 33°
FLPASYM	Trailing Edge Flap Assym
FLPRH	FLAP RH POSITION
FMSPOSERR1	FMS Estimated Position Error DU2/FMS1
FMSPOSERR1_sign	FMS Estimated Position Error DU2/FMS1 sign
FMSPOSERR1C	FMS Estimated Position Error DU2/FMS1 coarse
FMSPOSERR1F	FMS Estimated Position Error DU2/FMS1 fine
FMSPOSERR2	FMS Estimated Position Error DU4/FMS2
FMSPOSERR2_sign	FMS Estimated Position Error DU4/FMS2 sign
FMSPOSERR2C	FMS Estimated Position Error DU4/FMS2 coarse
FMSPOSERR2F	FMS Estimated Position Error DU4/FMS2 fine
FQ1KG42	Fuel Quantity 1 (PPH)
FQ1KG72	Fuel Quantity 1 (KPH)
FQ1LBS42	Fuel Quantity 1 (PPH)
FQ1LBS72	Fuel Quantity 1 (KPH)
FQ2KG42	Fuel Quantity 2 (PPH)
FQ2KG72	Fuel Quantity 2 (KPH)
FQ2LBS42	Fuel Quantity 2 (PPH)
FQ2LBS72	Fuel Quantity 2 (KPH)
FWAPBUP1	FWA Primary/Backup CAC1
FWAPBUP2	FWA Primary/Backup CAC2
GPSALT1	GPS1 altitude
GPSALT1_sign	GPS altitude GPS1 sign
GPSALT1C	GPS altitude GPS1 coarse
GPSALT1F	GPS altitude GPS1 fine
GPSALT2	GPS2 altitude
GPSALT2_sign	GPS altitude GPS2 sign
GPSALT2C	GPS altitude GPS2 coarse
GPSALT2F	GPS altitude GPS2 fine
GPWS	Gpws Status
GRSPEED1	Ground Speed 1
GRSPEED2	Ground Speed 2
GW1	Gross Weight 1
GW2	Gross Weight 2
HAILELVRI	Horns Aileron & RH Elevator De-Ice
HDG	Heading
HDG_sign	Heading sign
HDGC	Heading MSB
HDGF	Heading LSB
HEMERGBAT	Hot Emergency Bat Bus
HF	HF
HFOM1	HFOM GPS1

HFOM1C	HFOM GPS1 coarse
HFOM1F	HFOM GPS1 fine
HFOM2	HFOM GPS2
HFOM2C	HFOM GPS2 coarse
HFOM2F	HFOM GPS2 fine
HIL1	HIL1
HIL1C	HIL GPS1 coarse
HIL1F	HIL GPS1 fine
HIL2	HIL2
HIL2C	HIL GPS2 coarse
HIL2F	HIL GPS2 fine
HMAINBAT	HOT Main Bat. Bus
HOUR	UTC HOUR
HOUR2	UTC HOUR
HPBLEED1	HP Air Bleed 1
HPBLEED2	HP Air Bleed 2
HRUDELVLI	Horns Rudder & LH Elevator De-Ice
HSICOUPL	HSI Coupling CAC1
HSICOUPL2	HSI Coupling CAC2
HYDAW	Hydraulic aux. low press.
HYDBP	Hydraulic Blue Pressure
HYDBW	Hydraulic blue low press.
HYDGP	Hydraulic Green Pressure
HYDGW	Hydraulic green low press.
IAS1	IAS 1
IAS2	IAS 2
IBOOTMSEL	Ice-Boots Mode Selection
ICEAOA	Icing AOA
ICEBOOT1F	De-Icing Engine 1 Boots Fault
ICEBOOT2F	De-Icing Engine 2 Boots Fault
ICEDETECT	Ice Detection
ICEPROP1F	De-Ice Propeller 1 Fault
ICEPROP2F	De-Ice Propeller 2 Fault
ILSGLID1	ILS/Glide Deviation 1
ILSGLID2	ILS/Glide Deviation 2
IMAUTOSEL	Ice-Mode Auto Selection
INCSPDL	Increase Speed
INTNUMB	intruder number
IPROPSLOW	Ice Propellers Slow
ITT1CAC1	ITT 1 CAC1
ITT1CAC2	ITT 1 CAC2
ITT2CAC1	ITT 2 CAC1
ITT2CAC2	ITT 2 CAC2

IWINDL	Ice-LH Side Windows
IWINDR	Ice-RH Side Windows
LAOA1B	AOA1 local
LAOA2B	AOA2 local
LAT1	LATitude 1
LAT2	LATitude 2
LATACC1	Lateral Acceleration 1
LATACC2	Lateral Acceleration 2
LATDEVFMS1	Lateral deviation from FMS 1
LATDEVFMS2	Lateral deviation from FMS 2
LATFINE1	Latitude Fine GPS1
LATFINE2	Latitude Fine GPS2
LATG	Lateral Acceleration
LATLSB1	LATitude LSB GPS1
LATLSB2	LATitude LSB GPS2
LATMSB1	LATitude MSB GPS1
LATMSB2	LATitude MSB GPS2
LHTRAILFLAP	LH Trailing Edge Flap
LONG	Longitudinal Acceleration
LONG1	LONGitude 1
LONG1_sign	LONGitude GPS1 sign
LONG2	LONGitude 2
LONG2_sign	LONGitude GPS2 sign
LONGACC1	Longitudinal Acceleration 1
LONGACC2	Longitudinal Acceleration 2
LONGFINE1	Longitude Fine GPS1
LONGFINE2	Longitude Fine GPS2
LONGLSB1	LONGitude LSB GPS1
LONGLSB2	LONGitude LSB GPS2
LONGMSB1	LONGitude MSB GPS1
LONGMSB2	LONGitude MSB GPS2
LOP1	Discrete Low pitch 1
LOP2	Discrete Low pitch 2
LOWSPDL	Cruise Speed Low
M04a19	S/W P/N CODE
MACH1	mach number ADC1
MACH1C	Mach Number ADC1 coarse
MACH1F	Mach Number ADC1 fine
MACH2	mach number ADC2

MACH2C	Mach Number ADC2 coarse
MACH2F	Mach Number ADC2 fine
MAGNHEAD1	Magnetic Heading 1
MAGNHEAD2	Magnetic Heading 2
MASWAR1	Master warning CAC1
MASWAR2	Master warning CAC2
MASWARN	MASTER WARNING
MFC1AF1	MFC1-A STATUS 1
MFC1AF2	MFC1-A STATUS 2
MFC1BF2	MFC1-B STATUS 2
MFC2AF1	MFC2-A STATUS 1
MFC2AF2	MFC2-A STATUS 2
MFC2BF1	MFC2-B STATUS 1
MINUTE	UTC MIN
MINUTE2	UTC MIN
MONTH	Month
MWA429INT11	MWA429Int1 (bits 12-1)
MWA429INT12	MWA429Int1 (bits 24-13)
MWA429INT21	MWA429Int2 (bits 12-1)
MWA429INT22	MWA429Int2 (bits 24-13)
MWA429OUT	MWA429out (bits 12-1)
MWA429POR11	MWA429Port1 (bits 12-1)
MWA429POR12	MWA429Port1 (bits 24-13)
MWA429POR21	MWA429Port2 (bits 12-1)
MWA429POR22	MWA429Port2 (bits 24-13)
MWANALOG1	MWANALOG (bits 12-1)
MWANALOG2	MWANALOG (bits 24-13)
MWDIS1	MWDIS1 (bits 12-1)
MWDIS2	MWDIS2 (bits 12-1)
MWDOT	MWDOT (bits 12-1)
MWFREQ	MWFREQ (bits 12-1)
MWLG	MW L/G Not Down
MWLOAD	MWLOAD (bits 12-1)
MWMPC1	MWMPC (bits 12-1)
MWMPC2	MWMPC (bits 24-13)
MWPROP	MW Prop Brake
MWRCDR1	MWRCDR (bits 12-1)
MWRCDR2	MWRCDR (bits 24-13)
MWSINT	MWSerInt (bits 12-1)
MWTO	MW T.O Config
NAVDISP1	Nav disp 1
NAVDISP2	Nav disp 2
NAVDISP4	Nav disp 4

NAVDISP5	Nav disp 5
NAVMOD1	Nav mode 1
NAVMOD2	Nav mode 2
NAVPERF1	A/C navigation performance 1
NAVPERF2	A/C navigation performance 2
NBRKP1P	Brake Pressure 1
NBRKP2P	Brake Pressure 2
NBRKP3P	Brake Pressure 3
NBRKP4P	Brake Pressure 4
NDCONFDU1	ND configuration DU1
NDCONFDU2	ND configuration DU2
NDCONFDU4	ND configuration DU4
NDCONFDU5	ND configuration DU5
NDRANGE1	ND range DU1
NDRANGE2	ND range DU2
NDRANGE4	ND range DU4
NDRANGE5	ND range DU5
NH1	NH1
NH2	NH2
NL1	NL1
NL2	NL2
NP1	NP1
NP2	NP2
OILPRESS1	Oil pressure 1
OILPRESS2	Oil pressure 2
OILTEMP1	Oil temperature 1
OILTEMP2	Oil temperature 2
PCK1VLV	PACK AIR FLOW 1
PCK2VLV	PACK AIR FLOW 2
PEC1	PEC 1 Status
PEC1F	PEC 1 fault
PEC2	PEC 2 Status
PEC2F	PEC 2 fault
PICESELC	Captain Probes De-Ice Selection
PICESELF	F/O Probes De-Ice Selection
PITCHA	Pitch angle
PITCHAC	Pitch angle MSB
PITCHAF	Pitch angle LSB
PITCHATT1	Pitch Attitude 1
PITCHATT2	Pitch Attitude 2
PLA1	PLA1
PLA2	PLA2
PRESALT1	Press Alt 1

PRESALT1SIG	Press Alt 1 sign
PRESALT2	Press Alt 2
PRESALT2SIG	Press Alt 2 sign
PRESALTF1	Press Alt 1 fine
PRESALTF2	Press Alt 2 fine
PRESALTG1	Press Alt 1 gross
PRESALTG2	Press Alt 2 gross
PROCD1	Proc Displayed ID 1
PROCD1C	Proc Displayed ID 1 (MSB)
PROCD1F	Proc Displayed ID 1 (LSB)
PROCD2	Proc Displayed ID 2
PROCD2C	Proc Displayed ID 2 (MSB)
PROCD2F	Proc Displayed ID 2 (LSB)
PROP1BETA	Beta 1
PROP2BETA	Beta 2
PROPAI1	Propeller Anti-Ice 1
PROPAI2	Propeller Anti-Ice 2
PROPBRKL	Propeller Brake lock
PROPBRKU	Propeller Brake unlock
PTDCAPT	Effort Pitch Axis (Capt Down)
PTDFO	Effort Pitch Axis (F/O Down)
PTDWNC	Pitch Trim Down Command Captain
PTDWNF	Pitch Trim Down Command F/O
PTDWNSTBY	Pitch Trim Down Command Stand By
PTUPC	Pitch Trim Up Command Captain
PTUPCAPT	Effort Pitch Axis (Capt Up)
PTUPF	Pitch Trim Up Command F/O
PTUPFO	Effort Pitch Axis (F/O Up)
PTUPSTBY	Pitch Trim Up Command Stand By
PULSEID	Special Pulse Identifier
RADALBCD1	Radio Altitude 1 (BCD)
RADALBCD2	Radio Altitude 1 (BCD)
RADALBNR1	Radio Altitude 1 BNR
RADALBNR1_sign	Radio Altitude 1 sign (BNR)
RADALBNR2	Radio Altitude 2 BNR
RADALBNR2_sign	Radio Altitude 2 sign (BNR)
RADALLSBC1	Radio Altitude 1 LSB (BCD)
RADALLSBC2	Radio Altitude 2 LSB (BCD)
RADALLSBN1	Radio Altitude 1 LSB (BNR)
RADALLSBN2	Radio Altitude 2 LSB (BNR)
RADALMSBC1	Radio Altitude 1 MSB (BCD)
RADALMSBC2	Radio Altitude 2 MSB (BCD)
RADALMSBN1	Radio Altitude 1 MSB (BNR)

RADALMSBN2	Radio Altitude 2 MSB (BNR)
RADDISP1	Rad disp 1
RADDISP2	Rad disp 2
RADDISP4	Rad disp 4
RADDISP5	Rad disp 5
ROLLA	Roll angle
ROLLAC	Roll angle MSB
ROLLAF	Roll angle LSB
ROLLATT1	Roll Attitude 1
ROLLATT2	Roll Attitude 2
ROLLEFF	Roll Axis Effort
RPB	Remote Print Button (RPB)
RUDD	YAW Surface position
RUDP	YAW control ped. pos.
RUDT	Yaw Trim Surface Position
RUDTLH	Yaw Trim LH Command
RUDTRH	Yaw Trim RH Command
SALT	Standard altitude
SALT_sign	Standard altitude sign
SALTC	Standard altitude MSB
SALTF	Standard altitude LSB
SECONDE	UTC SEC
SECONDE2	UTC SEC
SELALT1	Selected altitude CAC1
SELALT2	Selected altitude CAC2
SELBAR1	Selected Baro-Setting 1
SELBAR2	Selected Baro-Setting 2
SELBARLS1	Selected Baro-Setting 1 (LSB)
SELBARLS2	Selected Baro-Setting 2 (LSB)
SELBARMS1	Selected Baro-Setting 1 (MSB)
SELBARMS2	Selected Baro-Setting 2 (MSB)
SELCSEL	Selected Course left
SELCSER	Selected Course right
SELDH1	Selected DH 1
SELDH1_sign	Selected DH 1 sign
SELDH2	Selected DH 2
SELDH2_sign	Selected DH 2 sign
SELDHLS1	Selected DH 1 LSB
SELDHLS2	Selected DH 2 LSB
SELDHMS1	Selected DH 1 MSB
SELDHMS2	Selected DH 2 MSB
SELHEADL	Selected Heading left
SELHEADR	Selected Heading right

SELSPEED1	Selected speed CAC1
SELSPEED2	Selected speed CAC2
SELVERTS1	Selected vertical speed CAC1
SELVERTS2	Selected vertical speed CAC2
SENSIBIL	
SENSIBLEV	Sensitivity
SLDG	L/G Selector
SPEEDHENG	Speed Hold Engagement CAC1
SPEEDHENG2	Speed Hold Engagement CAC2
SPLH	Left Spoiler Position
SPRH	Right Spoiler Position
STBYPICE	STBY Probes De-Ice
STCKPUSH	Stick Pusher
STKSC	Stick shaker captain
STKSF	Stick shaker first officer
TAS1	True airspeed ADC1
TAS1C	True Airspeed ADC1 coarse
TAS1F	True Airspeed ADC1 fine
TAS2	True airspeed ADC2
TAS2C	True Airspeed ADC2 coarse
TAS2F	True Airspeed ADC2 fine
TAT1	TAT 1
TAT2	TAT 2
TAWST11	TAWS status 1 (part 1)
TAWST12	TAWS status 1 (part 2)
TAWST21	TAWS status 2 (part 1)
TAWST22	TAWS status 2 (part 2)
TCASDISP1	TCAS disp 1
TCASDISP2	TCAS disp 2
TCASDISP4	TCAS disp 4
TCASDISP5	TCAS disp 5
TCASF1	TCAS fault summary (part 1)
TCASF2	TCAS fault summary (part 2)
TCSACT	TCS Active CAC1
TCSACT2	TCS Active CAC2
TDISPCAU	T disp caution
TDISPWARN	T disp warning
TERDISP1	Ter disp 1
TERDISP2	Ter disp 2
TERDISP4	Ter disp 4
TERDISP5	Ter disp 5
TERDISR1	
TERDISR2	

TERRDISPST	Terrain Display Status part2
TMPGAUG1	Temperature gauge 1
TMPGAUG2	Temperature gauge 2
TPRESS	Total pressure
TPRESS_sign	Total pressure sign
TPRESSC	Total pressure MSB
TPRESSF	Total pressure LSB
TQ1	TQ1
TQ2	TQ2
TQO1	Objective TQ 1
TQO2	Objective TQ 2
TRACKANG1	true track angle GPS1
TRACKANG1C	True Track Angle GPS1 coarse
TRACKANG1C360	True Track Angle GPS1 coarse
TRACKANG1F	True Track Angle GPS1 fine
TRACKANG2	true track angle GPS2
TRACKANG2C	True Track Angle GPS2 coarse
TRACKANG2F	True Track Angle GPS2 fine
TRAFADV2	Traffic Advisory (part 2)
TRIMALERT	Trim Allert CAC1
TRIMALERT2	Trim Allert CAC2
TRUEHEAD1	True Heading 1
TRUEHEAD2	True Heading 2
UNITSEL	
UNITSEL2	
UTC	GMT
UTCF1	UTC Fine GPS1
UTCF1C	UTC Fine (MSB) GPS1
UTCF1F	UTC Fine (LSB) GPS1
UTCF2	UTC Fine GPS2
UTCF2C	UTC Fine (MSB) GPS2
UTCF2F	UTC Fine (LSB) GPS2
UTCFFRAC1	UTC FINE FRAC GPS1
UTCFFRAC2	UTC FINE FRAC GPS2
UTCH	GMT (hours)
UTCM	GMT (mintures)
UTCS	GMT (seconds)
VALIDR1	
VALIDR2	
VALIDR3	
VERTCONT	Vertical control
VERTDFMS1	Vertical deviation from FMS 1 DU2
VERTDFMS2	Vertical deviation from FMS 2 DU4

VERTRATE1	vertical rate ADC1
VERTRATE1_sign	Vertical Rate ADC1 sign
VERTRATE1C	Vertical Rate ADC1 coarse
VERTRATE1F	Vertical Rate ADC1 fine
VERTRATE2	vertical rate ADC2
VERTRATE2_sign	Vertical Rate ADC2 sign
VERTRATE2C	Vertical Rate ADC2 coarse
VERTRATE2F	Vertical Rate ADC2 fine
VEW1	E/W velocity GPS1
VEW1C	E/W velocity GPS1 coarse
VEW1F	E/W velocity GPS1 fine
VEW2	E/W velocity GPS2
VEW2C	E/W velocity GPS2 coarse
VEW2F	E/W velocity GPS2 fine
VFOM1	VFOM GPS1
VFOM1C	VFOM GPS1 coarse
VFOM1F	VFOM GPS1 fine
VFOM2	VFOM GPS2
VFOM2C	VFOM GPS2 coarse
VFOM2F	VFOM GPS2 fine
VHF1	VHF 1
VHF2	VHF 2
VHF3	VHF 3
VNS1	N/S velocity GPS1
VNS1C	N/S velocity GPS1 coarse
VNS1F	N/S velocity GPS1 fine
VNS2	N/S velocity GPS2
VNS2C	N/S velocity GPS2 coarse
VNS2F	N/S velocity GPS2 fine
VORBEAR1	VOR Bearing 1
VORBEAR2	VOR Bearing 2
VORLOCD1	VOR/Loc Deviation 1
VORLOCD2	VOR/Loc Deviation 2
VORSELF1	VOR Selected Frequency 1
VORSELF1C	VOR Selected Frequency 1 MSB
VORSELF1F	VOR Selected Frequency 1 LSB
VORSELF2	VOR Selected Frequency 2
VORSELF2C	VOR Selected Frequency 2 MSB
VORSELF2F	VOR Selected Frequency 2 LSB
VRTACC1	Vertical Acceleration 1
VRTACC2	vertical Acceleration 2
VRTG	Vertical Acceleration
WDICEL	LH Windshield De-Ice

WDICER	RH Windshield De-Ice
WINDIR1	Wind Direction 1
WINDIR2	Wind Direction 2
WINSPEED1	Wind Speed 1
WINSPEED2	Wind Speed 2
WOALDG	Discrete all gear
WOMLDG	Discrete main gear
XFV	X Feed Valve Position
YAWEFF	Yaw Axis Effort
YEAR	Date (year)

Appendix 4 Flight Data Plots

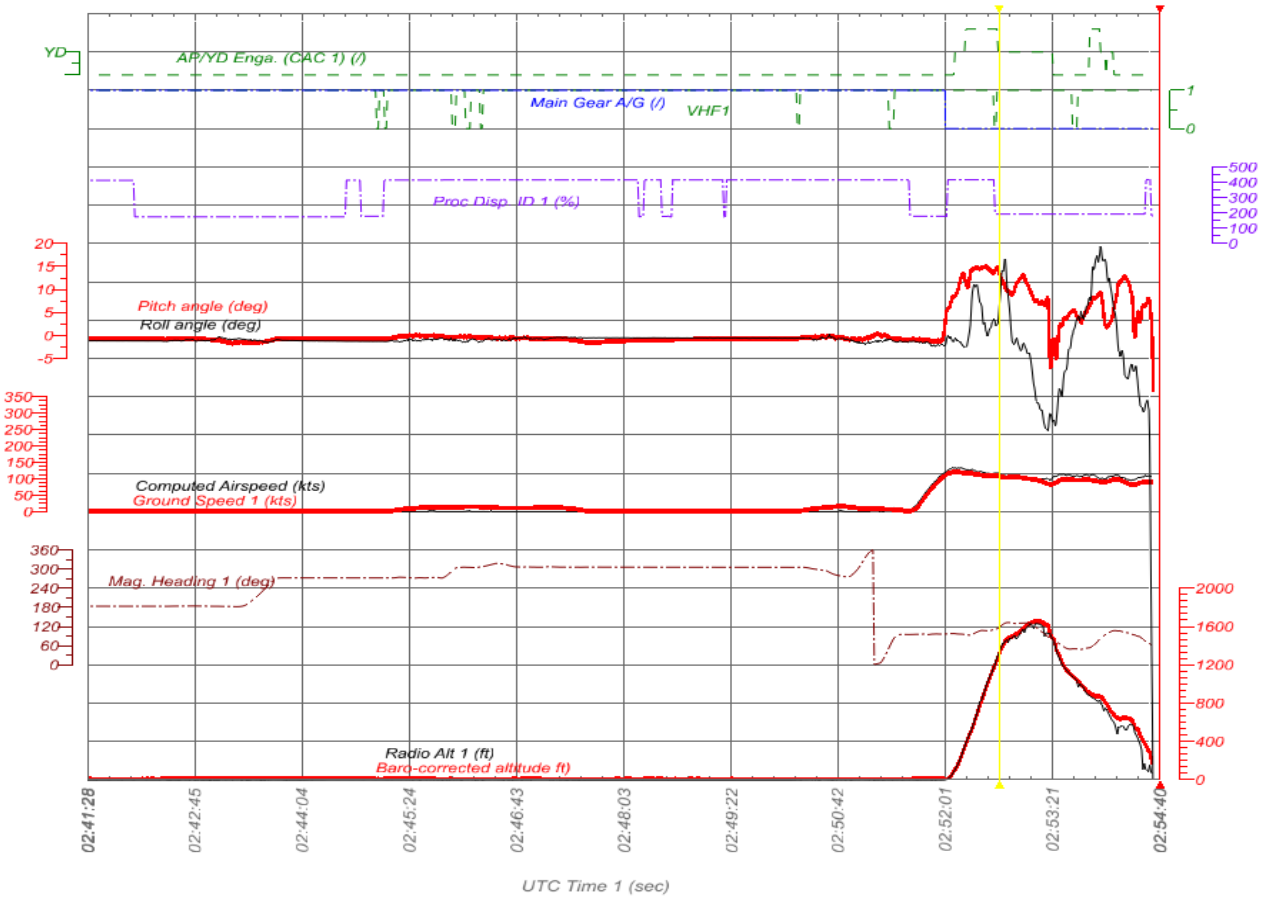

Figure A4-1 GE235 FDR selected parameters plot (1)

Figure A4-2 GE235 FDR selected parameters plot (2)

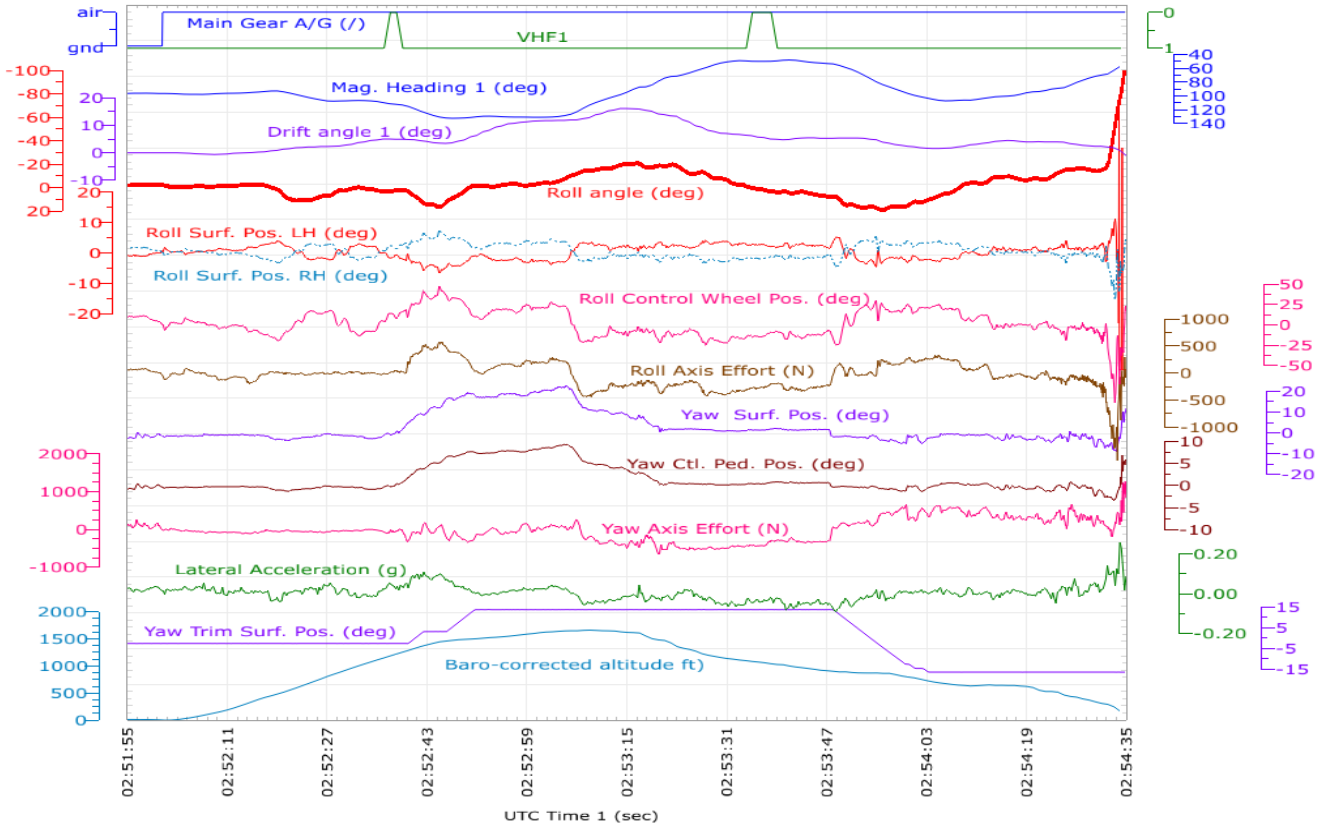

Figure A4-3 GE235 FDR slected parameters plot (3)

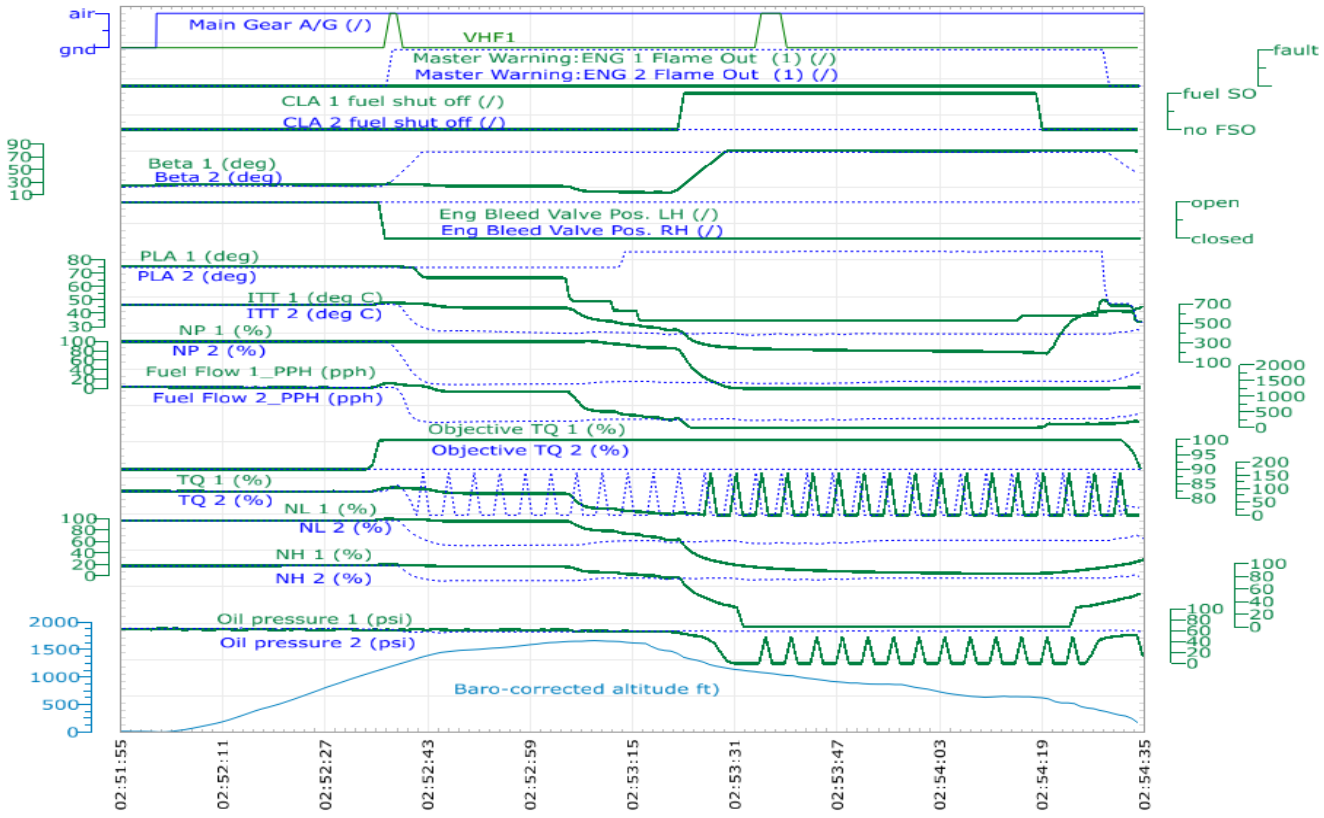

Figure A4-5 GE235 FDR parameters plot (engine related)

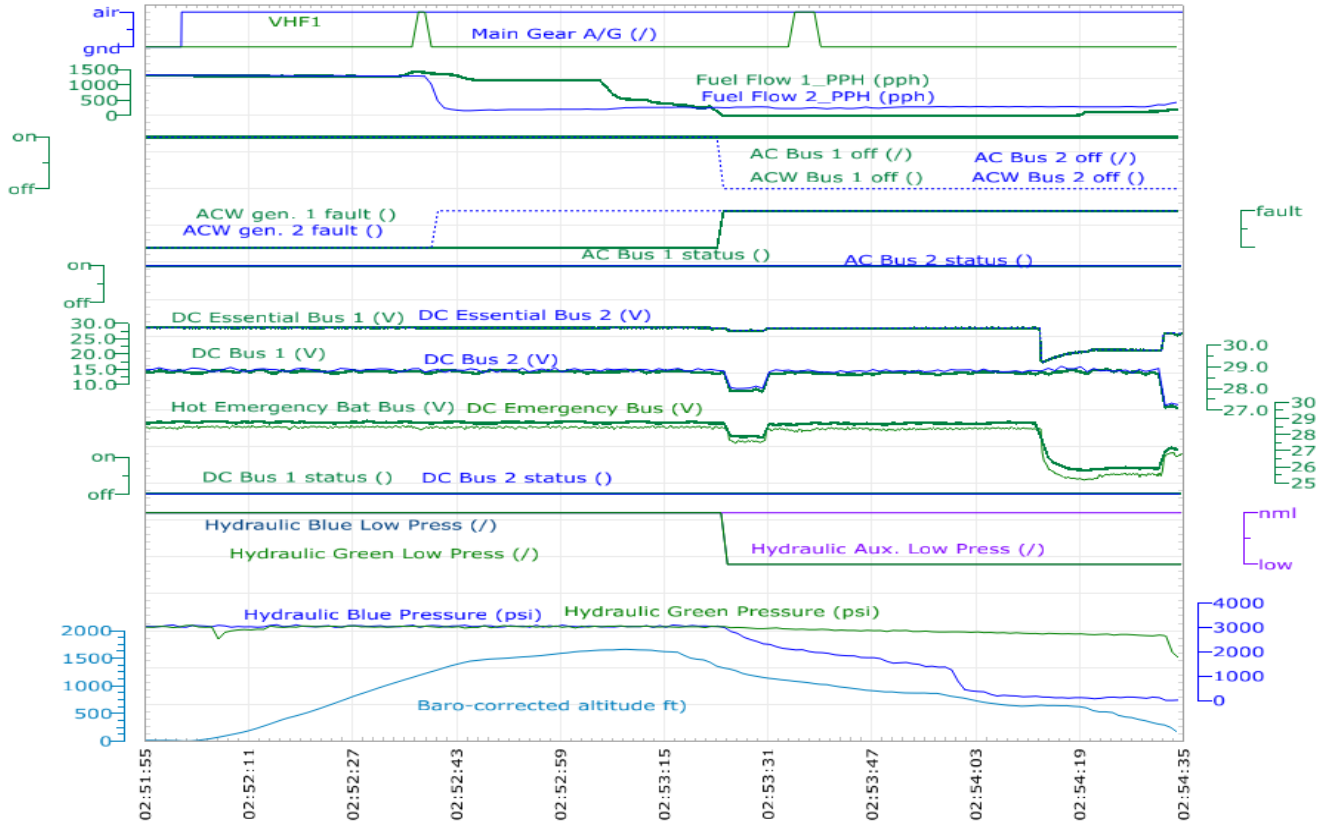

Figure A4-6 GE235 FDR parameters plot (Electrical related)

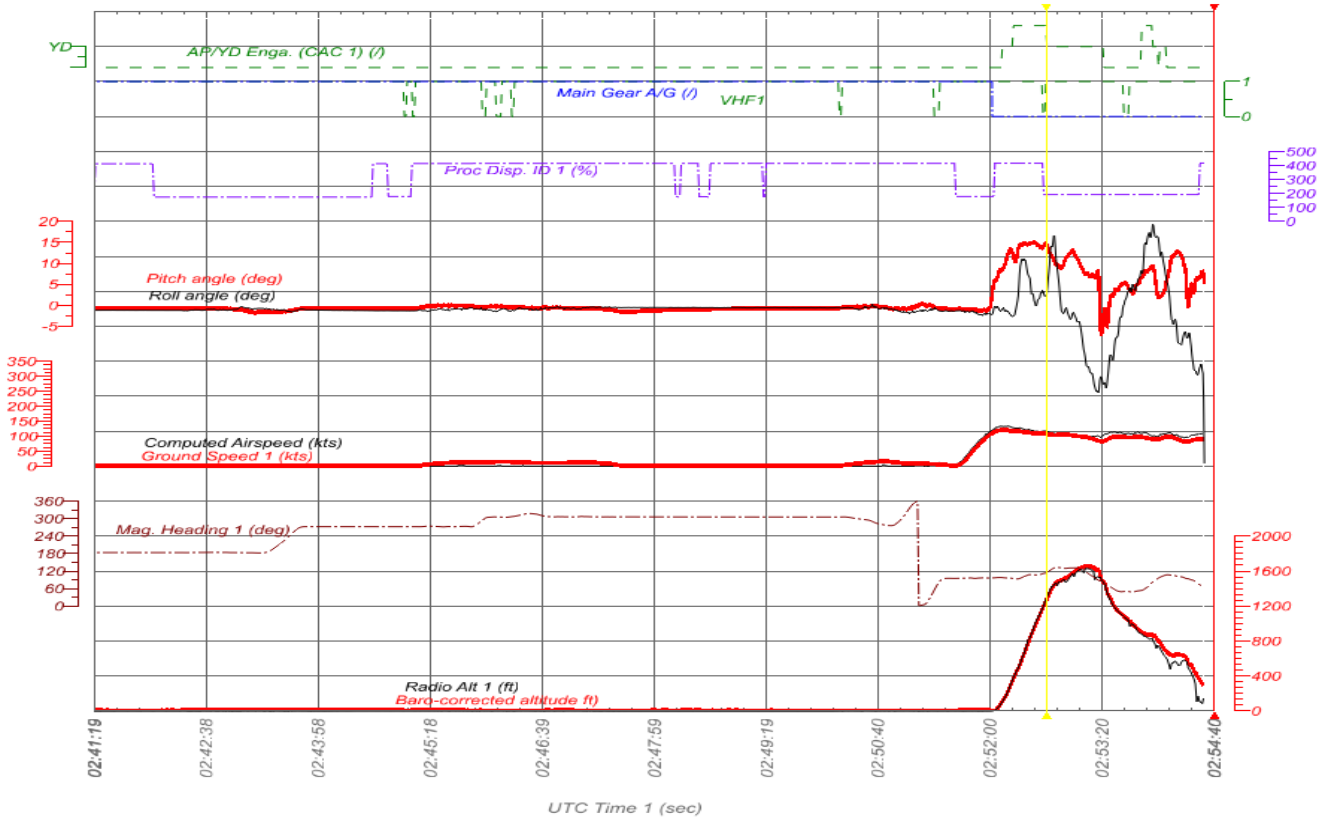

Figure A4-7 GE235 QAR selected parameters plot (entire of flight)

Appendix 5 Site Survey Database

NO.	中文名稱	english name	latitude	longitude	HAE (m)	Examination result	note	photo1 link
001(Y-009)	左副翼	left aileron	25.062973	121.616956	28.8			photo\IMG_001333.jpg
002	殘骸	wreckage	25.062878	121.617024	47.9			photo\IMG_001536.jpg
003	殘骸	wreckage	25.062859	121.617079	47.8			photo\IMG_001537.jpg
004	撞擊點	impact point	25.062904	121.616987	49.6			photo\IMG_001434.jpg
005	撞擊痕跡	scratch mark	25.062916	121.616950	48.6			photo\IMG_001538.jpg
006(Y-016)	襟翼整流罩	flap fairing	25.062901	121.617024	22.8			photo\IMG_001539.jpg
007	燈桿	light pole	25.062925	121.617034	25.1			photo\IMG_001541.jpg
008(Y-008)	左升降舵	left elevator	25.062977	121.617125	24.9			photo\IMG_001642.jpg
009(Y-004)	左襟翼	left flap	25.063031	121.617162	23.9			photo\IMG_001743.jpg
010(Y-010)	左翼	left wing	25.063081	121.617236	23.3			photo\IMG_001844.jpg
011	殘骸	wreckage	25.063078	121.617015	23.3			photo\IMG_001845.jpg
012(W-007)	機身	fuselage	25.063463	121.617663				photo\IMG_001846.jpg
013	計程車	taxi	25.062862	121.616910				photo\DSC07267.JPG
Y-001	左翼	left wing						photo\IMGP0512.JPG
Y-002	右升降舵	right elevator						photo\IMGP0518.JPG
Y-003	右翼	right wing						photo\IMGP0521.JPG
Y-004	左襟翼	left flap						photo\IMGP0525.JPG

NO.	中文名稱	english name	latitude	longitude	DTM (m)	Examination result	note	photo1 link
Y-005	左內側襟翼	left inboard flap						photo\IMGP0527.JPG
Y-006	方向舵	rudder						photo\IMGP0530.JPG
Y-007	垂直安定面	vertical stabilizer						photo\IMGP0535.JPG
Y-008	左升降舵	left elevator						photo\IMGP0537.JPG
Y-009	左副翼	left aileron						photo\IMGP0539.JPG
Y-010	水平安定面	horizontal stabilizer						photo\IMGP0540.JPG
Y-012	左翼部位	left wing part						photo\IMGP0593.JPG
Y-013	左副翼	left aileron						photo\IMGP0594.JPG
Y-014	左翼部位	left wing part						photo\IMGP0606.JPG
Y-015	垂直安定面部位	vertical stabilizer part						photo\IMGP0611.JPG
Y-016	襟翼整流罩	flap fairing						photo\IMGP0614.JPG
Y-017	右升降舵	right elevator						photo\IMGP0617.JPG
Y-018	右機翼外側	right wing outboard wing box						photo\DSCN1091.JPG
W-001	左機身蒙皮	left fuselage skin				overload damage		photo\IMGP0557.JPG
W-002	右機身蒙皮	right fuselage skin				overload damage		photo\IMGP0559.JPG
W-003	機腹	belly				overload damage		photo\IMGP0564.JPG
W-004	駕駛艙	cockpit				overload damage		photo\IMGP0571.JPG
W-005	機身蒙皮	fuselage skin				overload damage		photo\IMGP0578.JPG
NO.	中文名稱	english name	latitude	longitude	DTM (m)	Examination result	note	photo1 link
W-006	雷達罩	radome						photo\IMGP0589.JPG

W-007	機身	fuselage				overload damage		photo\IMGP0591.JPG
W-008	左機身蒙皮	left fuselage skin				overload damage		photo\IMGP0601.JPG
W-010	左主輪艙門	left main gear door						photo\IMGP0603.JPG
O-001	左發動機	Engine no.1						photo\IMGP0584.JPG
O-002	右發動機	Engine no.2						photo\IMGP0583.JPG

Appendix 6 Wreckage Examination Database

Id.	Item	P/N	S/N	Shipping in water or not	Test controlled by	Extra. Information	Photo
1	Eng #1 AFU	30048-0000-28	RT3077	not	TSB		tagging photo\DSC_0895.JPG
2	Eng #2 AFU	30048-0000-28	RT2362	wet	TSB		tagging photo\DSC_0875.JPG
3	ENG#1 DCU	3075879-01	14019276	not	TSB		tagging photo\DSC_0903.JPG
4	ENG#2 DCU	3075879-01	13-014743	not	TSB		tagging photo\DSC_0926.JPG
5	ENG#1 FIRE HANDLE (FEU)	19-51-41	2489	not	TSB	4060690006	tagging photo\DSC_0931.JPG
6	ENG#2 FIRE HANDLE (FEU)	19-51-51	2488	not	TSB	6846600600	tagging photo\DSC_0932.JPG
7	ENG#1 TQ Sensor #1	3073471-01	CH1282	not	TSB		tagging photo\DSC_0897.JPG
8	ENG#1 TQ Sensor #2	3073471-02	CH1734	not	TSB		tagging photo\DSC_0919.JPG
9	ENG#2 TQ Sensor #1	3073471-01	CH1468	not	TSB		tagging photo\DSC_0930.JPG
10	ENG#2 TQ Sensor #2	3077761-02	CH1457	not	TSB		tagging photo\DSC_0922.JPG
11	ENG#1 NL Sensor	3033509	CH21092	not	TSB		tagging photo\DSC_0914.JPG
12	ENG#1 NH Sensor (up)	3077761-01	CH2610	not	TSB		tagging photo\DSC_0908.JPG
13	ENG#1 NH Sensor (lower)	3077761-01	CH2595	not	TSB		tagging photo\DSC_0911.JPG
14	ENG#1 NP Sensor	3077761-01	CH2615	not	TSB		tagging photo\DSC_0916.JPG
15	ENG#2 NL Sensor	3033509	CH20768	not	TSB		tagging photo\DSC_0928.JPG
16	ENG#2 NH Sensor (up)	3077761-01	CH2108	not	TSB		tagging photo\DSC_0924.JPG
17	ENG#2 NH Sensor (lower)	3077761-01	CH2106	not	TSB		tagging photo\DSC_0929.JPG
18	ENG#2 NP Sensor	3077761-01	CH2128	not	TSB		tagging photo\DSC_0923.JPG
19	ENG #1 EEC	1012974-4-002	14040035	wet	TSB		tagging photo\DSC_0887.JPG
20	ENG #2 EEC	1012974-4-002	13100020	wet	TSB		tagging photo\DSC_0891.JPG
21	PEC 1	8163325401	13070018	wet	TSB/NTSB		tagging photo\DSC_0878.JPG
22	PEC 2	8163325401	13080013	wet	TSB/NTSB		tagging photo\DSC_0882.JPG
23	MFCA-I/O1	LA4E20300H30300	00006217473	wet	BEA		tagging photo\DSC_0792.JPG
24	MFCA-Output1	LA4E20300H3080A	00006215088	wet	BEA		tagging photo\DSC_0801.JPG
25	MFCA- I/O1	LA4E20300H30300	00006217508	wet	BEA		tagging photo\DSC_0804.JPG
26	MFCA-5-Analog	LA4E21100H30600	00006213970	wet	BEA		tagging photo\DSC_0806.JPG
27	MFCA-4 logic	LA4E20200H3040B	00006220104	wet	BEA		tagging photo\DSC_0810.JPG
28	MFCA-3 output 2	LA4E20300H3090A	00006215951	wet	BEA		tagging photo\DSC_0813.JPG
29	MFCA-5-Analog	LA4E21100H30600	00006213976	wet	BEA		tagging photo\DSC_0819.JPG
30	MFCA-CPU2	LA4E20706H30200	00006223072	wet	BEA		tagging photo\DSC_0817.JPG
31	MFCA-CPU1	LA4E20706H30100	00006222076	wet	BEA		tagging photo\DSC_0821.JPG

32	MFCA-I/O2	LA4E20300H30700	00006218111	wet	BEA		tagging photo\DSC_0823.JPG
33	MFCA-6 supply	LA4E20200H3050A	00006221486	wet	BEA		tagging photo\DSC_0827.JPG
34	MFCB-I/O1	LA4E20300H30300	00006217489	wet	BEA		tagging photo\DSC_0866.JPG
35	MFCB-Output1	LA4E20300H3080A	00006215143	wet	BEA		tagging photo\DSC_0870.JPG
36	MFCB-2 I/O1	LA4E20300H30300	00006217499	wet	BEA		tagging photo\DSC_0844.JPG
37	MFCB-5-Analog	LA4E21100H30600	00006213928	wet	BEA		tagging photo\DSC_0841.JPG
38	MFCB-4 logic	LA4E20200H3040B	00006220084	wet	BEA		tagging photo\DSC_0833.JPG
39	MFCB-3 output 2	LA4E20300H3090A	00006216144	wet	BEA		tagging photo\DSC_0851.JPG
40	MFCB-CPU2	LA4E21100H30200	00006223082	wet	BEA		tagging photo\DSC_0837.JPG
41	MFCB-5 analog	LA4E20706H30600	00006214005	wet	BEA		tagging photo\DSC_0854.JPG
42	MFCB-CPU1	LA4E20706H30100	00006222099	wet	BEA		tagging photo\DSC_0863.JPG
43	MFCB-8 I/O2	LA4E20300H30700	00006218128	wet	BEA		tagging photo\DSC_0859.JPG
44	MFCB-6 supply	LA4E20200H3050A	00006221547	wet	BEA		tagging photo\DSC_0847.JPG
45	MPC	261065723-1000	2610657230333	wet	BEA		tagging photo\DSC_0830.JPG
46	CAC1 rack	C13203AB	C13203000535	wet	Stored ASC		tagging photo\DSC_0572.JPG
47	SWM	C13160MA01	C13160001462	wet	Stored ASC		tagging photo\DSC_0740.JPG
48	IOM-DC	C13202BA	C13202005059	wet	Stored ASC		tagging photo\DSC_0744.JPG
49	IOM-DC	C13202BA	C13202005080	wet	Stored ASC		tagging photo\DSC_0748.JPG
50	IOM-S	C13159MA	C13159002274	wet	Stored ASC		tagging photo\DSC_0752.JPG
51	CPM	C13158MA01	C13158005024	wet	Stored ASC		tagging photo\DSC_0756.JPG
52	IOM-AP	C13216BA	C13216005049	wet	Stored ASC		tagging photo\DSC_0760.JPG
53	CAC2 rack	C13203AB	C13203000515	wet	Stored ASC		tagging photo\DSC_0611.JPG
54	SWM	C13160MA01	C13160005034	wet	Stored ASC		tagging photo\DSC_0764.JPG
55	IOM-DC	C13202BA	C13202005063	wet	Stored ASC		tagging photo\DSC_0769.JPG
56	IOM-DC	C13202BA	C13202005015	wet	Stored ASC		tagging photo\DSC_0773.JPG
57	IOM-S	C13159MA	C13159005059	wet	Stored ASC		tagging photo\DSC_0777.JPG
58	CPM	C13158MA01	C13158005045	wet	Stored ASC		tagging photo\DSC_0781.JPG
59	IOM-AP	C13216BA	C13216005063	wet	Stored ASC		tagging photo\DSC_0785.JPG
60	DU1	C19736AA01	C19736001238	wet	Stored ASC		tagging photo\DSC_0729.JPG
61	DU2	C19736AA01	C19736001239	wet	Stored ASC		tagging photo\DSC_0732.JPG
62	DU3	C19736AA01	C19736001241	wet	Stored ASC		tagging photo\DSC_0734.JPG
63	DU5	C19736AA01	C19736001154	wet	Stored ASC		tagging photo\DSC_0736.JPG
64	DU4	C19736AA01	C19736001244	wet	Stored ASC		tagging photo\DSC_0738.JPG
65	Eng #1 AFU cable assembly	44KF1-A		not	BEA	Connect AFU & TQ SN	tagging photo\DSC_0976.JPG

66	Eng #2 AFU cable assembly	44KF2-A		not	BEA	Connect AFU & TQ SN	tagging photo\DSC_0968.JPG

VI Attachment

Attachment 1 Document of L-3 FA2100 SSCVR Accident Investigator’s Kit

Attachment 2 Document of L-3 FA2100 SSFDR Accident Investigator’s Kit

Attachment 3 DFDR Recorded Parameters Decoding Law

Attachment 4 ATR 42/72 600 Systems Brief

Attachment 5 Similar Event Flight Data (GE507)