Aviation Safety Council

Taipei, Taiwan

GE222 Occurrence Investigation
Factual Data Collection
Group Report

Flight Recorders Group

December 26, 2014

ASC-FRP-14-12-09

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Contents

I. Team Organization

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2. Brian Kuo Aviation Safety Council, Taiwan ROC
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4. Henri Denis Bureau d'Enquêtes et d'Analyses(BEA), France
5. Joneshen Huang Civil Aeronautics Administration (CAA), Taiwan ROC
6. Mango Huang TransAsia Airways
7. Shi-Wei Wu TransAsia Airways

II. History of Major Activities

Date	Activities
7/23/14	1. Received the occurrence notification 2. Arrived in ASC office and prepared site survey equipment 3. To RCSS airport and waited for a charter flight 4. TNA cancelled the charter flight
7/24/14	On-Scene team 1. IIC provided the GE222 basic information and Day 1 plans 2. At the flight operation division of Magong airport, checked the damaged conditions of CVR and FDR. 3. Performed the site survey task by Garmin 60CS and Sony Camera (with GPS tag information) 4. Assisted system group in wreckage recovery, searched the avionic devices (GPWS, QAR, MFC…) 5. Returned to Magong airport and arranged the flight to Taipei LAB team 1. Prepared spare CVR(S200-0012-00) and FDR (S800-3000-00) ◆ Read A200S / F1000 Accident Investigation Kit manual. ◆ Read A200S / F1000 Accident Investigation Kit manual. ◆ Operated A200S / F1000 Accident Investigation Kit and tore down the spare CVR and FDR to test equipment. 2. Contacted Air Navigation and Weather Services (ANWS) for MSTS information. ◆ Processed the MSTS flight path. ◆ Provided the KML and Excel data to group chairman. 3. Using digital camera and digital video to document the damaged conditions of flight recorders (CVR, FDR, and QAR). 4. Cleaned the QAR PCMCIA card and retrieved the QAR data. 5. Dried QAR CF card by heater for 20mins at 55 degree C.

Date	**Activities**
	6. Tore down damaged CVR and FDR. 7. Downloaded CVR and FDR data.
7/25/14	1. Prepared the site survey and FDR readout status information for AR and technical advisors. 2. Checked CVR recording length and time synchronization with FDR. 3. According to TNA's FDR database, checked the recorded parameters step by step. 4. Drafted the CVR transcript (last 15 min). 5. Prepared the wreckage mapping for IIC.
7/26/14	1. Prepared the site survey and FDR readout status information for AR and technical advisors. 2. Obtained the latest version of FDR database, and checked it step by step. 3. Discussion with BEA investigator and compared the readout parameters. 4. Confirmed time synchronization result, and used the ATC time as common reference information. 5. Prepared the wreckage mapping for IIC.
7/27/14	1. Prepared the organization meeting material, and field notes. 2. Discussed the first impact point issue with BEA investigators. 3. Performed CVR spectrum analysis for the last 10 sec. 4. Discussion with BEA investigators and IIC. 5. Released GE222 FDR parameters to IIC and Capt. Pin.
7/28/14	1. Organization Meeting and group meeting. 2. Drafted CVR transcript and provided BEA two spectrum charts, and checked parameter signs of the control surfaces. 3. Decoded B7 647 QAR data, provided it to flight operation group 4. Joint flight operation group to discuss FDR recorded parameters and relevant settings on the instrument panel. 5. Printed ATR72-500/600 A0 poster of instrument panel for flight operation group.

Date	**Activities**
7/29/14	1. Drafted CVR transcript more than last one hour. Checked the signs of FDR parameters – control surfaces. 2. Discussion with BEA and performed double-integration of acceleration data to validate and finalized the flight path. 3. Contacted National Land Surveying and Mapping Center (NLSC) to request terrain information. 4. Processed UAV aerial photos, and superposed with flight path and wreckage maps. 5. Validated the flight path by different methods.
7/30/14	1. Drafted CVR transcript up to one hour and 20mins. Checked the signs of FDR parameters – FMA lateral/vertical mode related parameters 2. Provided flight data of GE222, GE 220, and B7 647 to Capt. Pin. 3. Plotted FMA lateral/vertical mode related parameters chart to calculate vertical speed (IVV) parameter. 4. Drafted CVR transcript up to one hour and 20mins.
7/31/14	1. Continued to draft CVR transcript. 2. Downloaded misplaced CVR audio data, 26mins SQ recording. 3. Superposed the Flight Path with Sat. image, aerial photos, and wreckage maps. 4. Reconstructed the flight path and create the insight animation for IIC.
8/1/14	1. Continued to draft CVR transcript 2. Press conference 3. Finished CVR draft transcript
8/4/14	1. TNA Mr. Wu presented the FOQA operational procedures and events detection for recorder and organization group members. There were three cases that have been discussed and selected for further application. 2. Joint discussion with weather group, Prof. Lin of NTU and NCDR's meteorology team to request technical assistance to reconstruct the 3D wind field. 3. Returned the copy of QAR raw data to TNA 4. Drafted CVR transcript, assisted by Capt. Yang from Transasia Airways

Date	**Activities**
8/5/14	1. Updated GE222 flight animation. 2. Drafted CVR transcript, assisted by Capt. Yang from TransAsia Airways. 3. Used DEM and DSM data to evaluate the pressure altitude and radio height. 4. Discussion with IIC regarding BEA's comment on the last VHF key issue.
8/6/14	1. Prepared time synchronization table (CVR-FDR-ATC) 2. Worked with site-survey group to evaluate the altitude of the GE222 flight path. Used the terrain data to correct the radio altitude. 3. Discussion with group members and IIC, to confirm the time synchronization result, and evaluated the flight path and impact conditions.
8/7/14	1. Reviewed the vertical / lateral control inputs associated with its attitude after autopilot disengagement in final approach. 2. Discussion with group members and IIC, to confirm the aileron input and rudder deflection during the last 30 sec.
8/8/14	1. Modified the 3D model of Insight animation, to change the aircraft texture with TransAsia Logo. 2. Received the office document from CAA, it covered the MSTS data and accuracy report. Checked with previous version.
8/11/14	1. Discussion with group members, to finalize the SSCVR transcript for the last one hour.
8/13/14	1. Discussion with group members, to finalize the SSCVR transcript for the whole flight.

III. Factual Description

1.11 Flight recorders

1.11.1 Cockpit Voice Recorder

Recorder Description

The following Solid-State Cockpit Voice Recorder (SSCVR, or CVR thereafter) was received by the ASC laboratory:

Manufacturer: L-3 Communications

Part Number: S200-0012-00

Serial Number: 00452

1.11.1.1 Details of Investigation

CVR Description

The aircraft was equipped with a L-3 Communications CVR, model A200S. The CVR is capable of recording 2 hours of 2-channel standard quality cockpit audio, and 30 minutes of 4-channel high quality cockpit audio. The 2-hour portion of the recording is comprised of one channel from the Cockpit Area Microphone (CAM), and one channel which combines the captain's audio track, the first officer's track, and public announcement track. The 30-minute portion of the recording contains 4 channels of audio: two channels from each flight crew, one CAM channel, and the fourth channel from public announcement.

The CVR was recovered by the search and rescue team at XiXi village in the night of July 23th, and was later handover to the duty officer at Magong Airport. The CVR was transported to the ASC Investigation Laboratory for disassembling and readout on July 24th.

CVR Damage and Disassembly

Upon the first inspection by ASC investigators, it was evident that the exterior of the CVR sustained severe structural damage as a result of the impact, primarily denting and deformation on the exterior of the case. The case did not appear to have any punctures, fire, or other penetration traces. Per ASC standard damaged recorder disassembly procedures, the dust cover was removed by cutting it away from the steel crash case (Figure 1.11.1-1). The Crash Survival Memory Unit (CSMU) was then removed from the CVR, and was found in good condition.

CVR Download and Readout

Following the A200S Accident Investigator's Kit (AIK), provided by the recorder manufacturer L-3 Communications, download operation of the recorder involved in the accident was performed. From the AIK manual: *"…The Accident Investigator's Software is largely the same as the normal A200S Software except that it cannot write flash memory (record over data in memory)*

and its configuration adapts to the flash memory configuration it finds when it powers up (30-minute configuration or 120-minute configuration). Therefore, a Flash Crash Survivable Memory Unit (CSMU) from a recorder involved in an accident can be connected to an Accident Investigator's Recorder without prior knowledge of the configuration of the recorder that was present on the aircraft…"

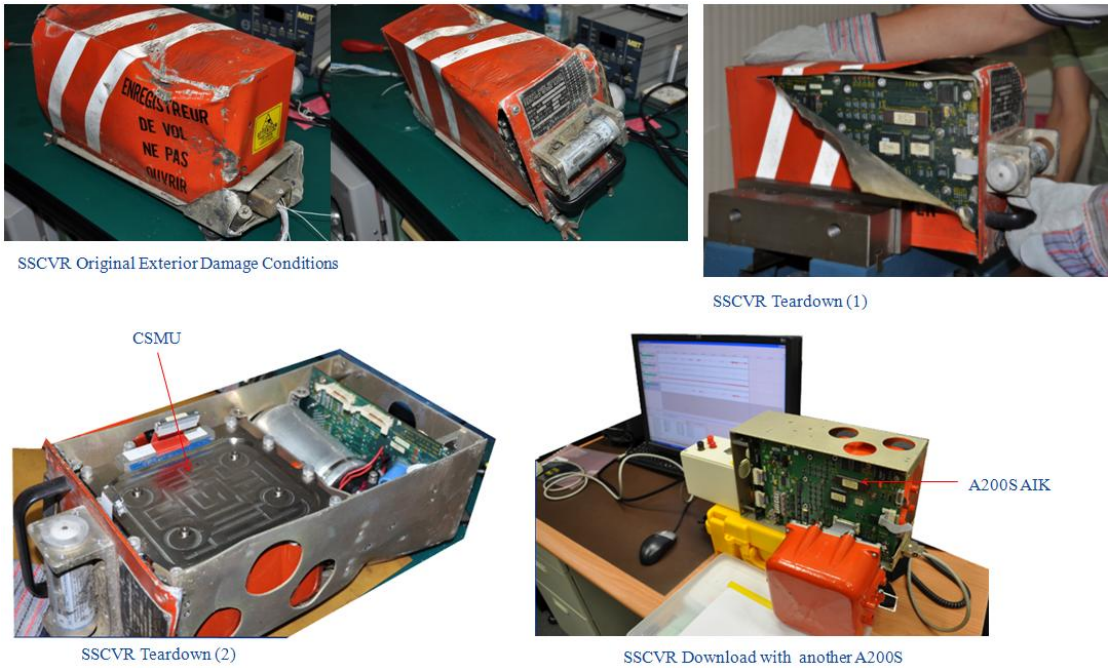


Figure 1.11.1-1 (a) Damaged SSCVR exterior view and its teardown; (b) Raw data download as suggested in the A200S AIK

Detailed download procedures were as follows:

Step 1: Disassemble a good condition A200S CVR (in this case an "investigator's CVR" owned by ASC) to the extent required to access main processor of the Printed Wiring Circuit (PWA).

Step 2: Remove U54 (shown in Figure 1.11.1-2) and install AIK Erasable Programmable Read Only Memory(EPROM) in its place.

Step 3: Remove DC Power Supplies PS3 and PS4 to ensure absolute stored data protection.

Step 4: Disconnect CSMU cable from main processor PWA, and connect the CSMU involved in accident to main processor PWA (Figure 1.11.1-2).

Step 5: Connect Digital Audio Playback Unit (DAPU), the CVR and computer, and power up. Wait 5 minutes before a display appears on the DAPU (Figure 1.11.1-1).

Step 6: Download data.

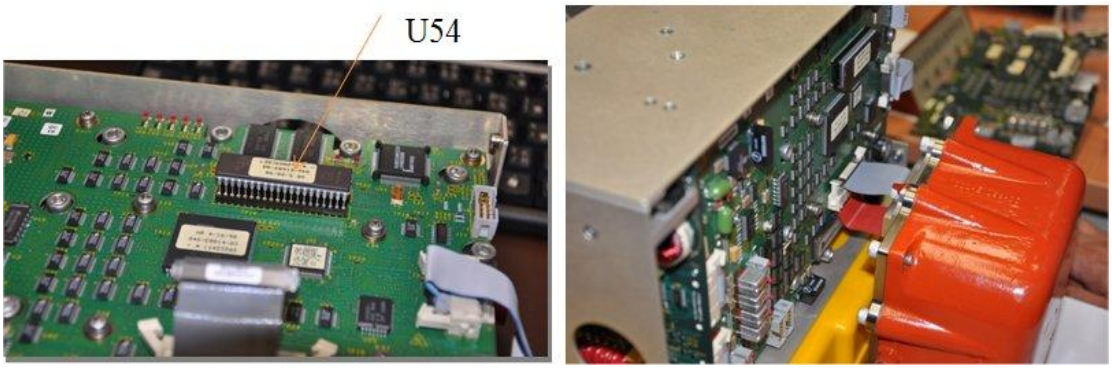


Figure 1.11.1-2 (a) Installation of AIK EPROM onto investigator's A200S CVR and, (b) Connect the CSMU from GE 222 SSCVR with the A200S

As the download completed, it was found that the first 25 min 57 sec of the 2-channels, standard quality recordings and the final 4 minutes of the 4-channel, high quality recordings were both misplaced to the beginning of their tracks[1], respectively, which was suspected due to the crash impact. However, the audio quality of each channel is either good or excellent, and is illustrated in the following table (Table 1.11-1). Detailed definition of SSCVR audio quality is available in Appendix 9-1 :

Table 1.11-1 SSCVR recording quality

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

Timing Synchronization and Correlation

Timing of the CVR recording was established by correlating the CVR events to common events on the Flight Data Recorder (FDR) and then offsetting to the timing system of Kaohsiung Approach. The entire air traffic equipment and surveillance radar timing system are based on GPS Time, whose source is provided by the National Time and Frequency Standard Laboratory, Telecommunication Laboratories, Chunghwa Telecom Co., Ltd[2].

Radio transmission made by the aircraft recorded throughout the flight were correlated to the radio transmit microphone key parameter from 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

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

[2] Website http://www.stdtime.gov.tw/english/e-home.aspx.

called Signal Reference Number (SRN); and (2) SSFDR recorded parameter "UTC". Once a correlation between CVR and FDR was established, CVR time (now same as FDR time) was offset, according to the radio transmission events made by the aircraft to Kaohsiung Approach, to correlate the recorder time to the air traffic control time system. A time synchronization event listing can be found in the following table 1.11-2:

Table 1.11-2 GE222 Time Synchronization

ATC Time (UTC+8)	FDR SRN	FDR UTC Time	CVR Time	Event Description
17:45:40.1	123946	09:45:13.016	17:45:12.4	ATC communication
17:46:29.9	123996	09:46:03.016	17:46:02.3	ATC communication
17:49:43.2	124190	09:49:17.016	17:49:16.0	ATC communication
17:55:23.4	124530	09:54:57.016	17:54:55.8	ATC communication
17:56:23.4	124590	09:55:57.016	17:55:55.6	ATC communication
17:56:34.5	124601	09:56:08.016	17:56:06.7	ATC communication
18:48:29.1	127715	10:48:02.016	18:48:01.2	ATC communication
18:48:40.4	127726	10:48:13.016	18:48:12.6	ATC communication
19:01:08.4	128474	11:00:41.016	19:00:40.7	ATC communication
19:01:13.2	128479	11:00:46.016	19:00:45.5	ATC communication
---	128714	11:04:41.188	19:04:41.3	Auto callout 500' FDR RA 504 ft
---	128749	11:05:16.391	19:05:16.4	A/P disengaged
19:06:15.8	128782 (128782.016)	11:05:49.016	19:05:48.1	ATC communication (calling go-around)
19:06:18.9	128783 (128783.883)	11:05:50.883	19:05:50.9	CVR stopped recording FDR stopped recording

FDR UTC + 28.0 seconds = ATC UTC

CVR UTC + 28.2 seconds = ATC UTC

1.11.1.2 CVR Transcript and Audio Spectrum

The SSCVR recording began when the same pair of crew was performing flight GE 221 from Magong to Kaohsiung International Airport. The occurrence flight portion began at 1739:09.5 local time and ended at 1906:18.9 local time. It covered entire flight phases from pushback to final approach and the occurrence happened. The transcript of the entire flight can be found in the Appendix 9-2.

Figure 1.11.1-3 presents a spectrogram that contains audio information from the CAM track between 1906:08.8 and 1906:18.8. Both engine operated normally

prior to 1906:13.3 when the first unidentified sound was heard, and emitted noise at 490 Hz, the frequency that propellers run near its full speed (Np = 100%). After the end of that 1.5-second unidentified sound, the engine noise frequency splitted into two (shown in yellow arrows) distinguished branches, where one gradually decreased and the other one dropped to around 400 Hz immediately. Both of them terminated when the second unidentified sound occurred at 1906:18.0. The trends matches the observation from FDR data that, engine #1 Np dropped immediately right after the time when the first unidentified sound was heard, and engine #2 slowed down gradually until the time when the second unidentified sound was present.

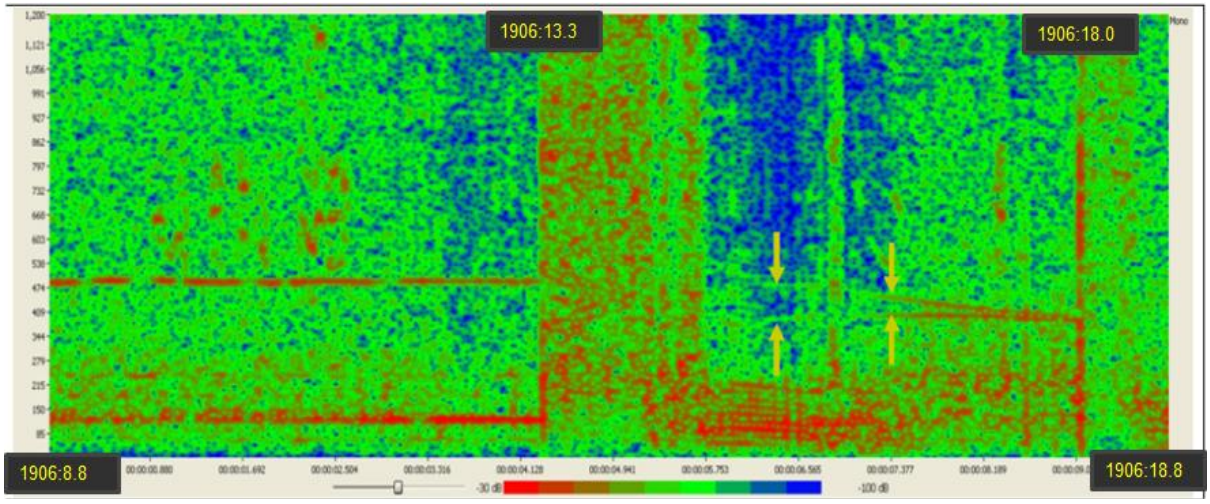


Figure1.11.1-3 Spectrogram of the last 10-second CAM recording.

1.11.2 Flight Data Recorder

The aircraft was equipped with a L-3 Communications Solid-State Flight Data Recorder (SSFDR, or FDR thereafter), part number S800-3000-00, and serial number 00381. The FDR was recovered by the search and rescue team at XiXi village in the night of July 23th, and was later handover to the duty officer at Magong Airport. The FDR was transported to the ASC Investigation Laboratory for disassembling and readout on July 24th.

Disassembling and readout operation of the FDR were accomplished using the standard hardware and software at ASC laboratory. These systems, including the L-3 Communications F1000 Accident Investigator's Kit (AIK), Read-Out Support Equipment and Analysis Unit (ROSE), and Insight analysis software. Section 1.11.3 describes detailed teardown and download procedures.

Data plots and tabular listings of each data parameter for the entire occurrence flight are included in this report. The FDR recording contained about 35 hours 41 minutes and 7 seconds of data. The occurrence flight was the last flight of the recording and its duration was 1 hour 27 minutes and 10 seconds.

According to the readout data, both recorders stopped recording at 1906:18.9.

1.11.2.1 Description of Investigation

Recorder Description

Manufacturer: L-3 Communications

Part Number: S800-3000-00 （2X, 128 Words/sec）

Serial Number: 00381

Database Source: ATR, service letter no. ATR72-31-6010

The no. of Recorded Parameters: 180

Database List: Appendix 9-3

Recorder Examination, Disassembly, CSMU Removal and Preparation

Inspection of the FDR exterior was immediately conducted. The recorder's dust cover was removed by cutting it away from the steel crash case using pneumatic tools. The crash case exhibited some evidence of impact damage, primarily denting and deformation on the exterior of the case.

Figure 1.11.2-1 FDR exterior view, teardown and download process

There is no evidence of heat or fire damage on the exterior of FDR, the FDR casing presented some impacted marks, and two of support units of Crash Survival Memory Unit (CSMU) were broken. CSMU surface contained some moisture and dust, but after teardown, cleaning and drying the CSMU, there was no damage condition found on the CSMU. Figure 1.11.2-1 shows the photos of SSFDR exterior view, teardown and download process.

Download and Readout

Refer to F1000 Accident Investigator's Kit to perform its download procedures, the relevant operational information extracted as followings.

The accident investigator's kit software is largely the same as the normal F1000 software except that it cannot write into flash memory, and it would adapt to corresponding configuration of the occurrence FDR automatically when locating the flight data after being powered up. Specifically, the accident investigator's kit software will scan the flash memory on initialization and determine which and how many devices are present. It will then infer the correct configuration based upon that information. If the flash memories are 1 Mbit devices, the system will choose among 703-1000, 800-2000, or 800-3000. If the flash memories are 8 Mbits, the system will choose among 800-2000, 800-3000, or 800-3500. If an 8 Mbit flash memory module was from a 703 or 603, the F1000 will be able to dump all its flight data under the 800-2000 configuration.

Flight data dumped to the GS/2 disk under the inferred configuration (even if the inferred configuration did not exactly match the configuration of the unit that the flash memory came from) can be analyzed at the GS/2.

When an operator power up an F1000 Flight Recorder using the accident investigator's kit, he or she should wait 10 minutes before dumping data. This is providing the accident investigator's kit software sufficient time to initialize. Part of the initialization is for the software to search out the point in flash memory that the recording begins and ends. This can take up to 10 minutes.

After downloading the raw data from the L-3 Read-Out Support Equipment and Analysis Unit, the FDR raw data is converted as an un-pack binary formation and imported into the Insight Analysis software. The entire recording of FDR can be found in section 1.11.2.2.

1.11.2.2 SSFDR Data Plots and Corresponding Tabular Data

Figure 1.11.2-2 is a plot of recorded parameters which indicates GE222 takingoff from runway 27 of Kaoshing International Airport at 1745:03, and the FDR continued recording until 1906:18.9. Parameters in Figure 1.11.2-2 include master warning, main landing gear air/ground status, barometric setting, VHF keying status, vertical acceleration, both engine NP speeds, both engine power lever position, indicated airspeed, GPS ground speed, standard pressure altitude, and associated with a QNH corrected pressure altitude[3]- PALT (997).

Figure 1.11.2-3 is a plot of recorded parameters which shows the final approach

[3] Pressure altitude correction: the pressure altitude recorded by the FDR is standard pressure altitude, which corresponding to the static pressure sensed at the aircraft's static port (1013 mbar). For the GE222 occurrence investigation, the altimeter setting are varies between 1000 and 996 mbar, which provided by Kaohsiung approach and Magong Tower. Since 1902:43, QNH recording is 997.

operation and wind information. Parameters in Figure 1.11.2-3 include: autopilot engaged status, yaw damper[4] status, VOR captured status, pitch attitude, roll attitude, angle of attack, wind direction, wind speed, selected altitude, indicated airspeed, ground speed, radio height and PALT (997).

Figure 1.11.2-4 is a plot of recorded parameters which indicates the engine related parameters and accelerations for the last 30 seconds. Parameters in Figure 1.11.2-4 include: vertical acceleration, longitudinal acceleration, lateral acceleration, magnetic heading, both engine NP speeds, engine torques, engine power lever angles, radio height and PALT (997).

Below PALT (997) 2,000ft and before impact, average wind speed 41 +/- 10.6 knots, average wind direction 242+/- 38 degree. In addition, average vertical acceleration 1.025 +/- 0.0086 g's, the turbulence intensity is based on vertical acceleration and true airspeed, then to calculate the eddy dissipation rate[5]. Table 1.11-2 shows the timeline of GE 222 flightcrew activities, and relevant FDR parameters, it includes – indicated airspeed (IAS), magnetic heading (MHDG), PALT (997) and Selected Altitude (SALT).

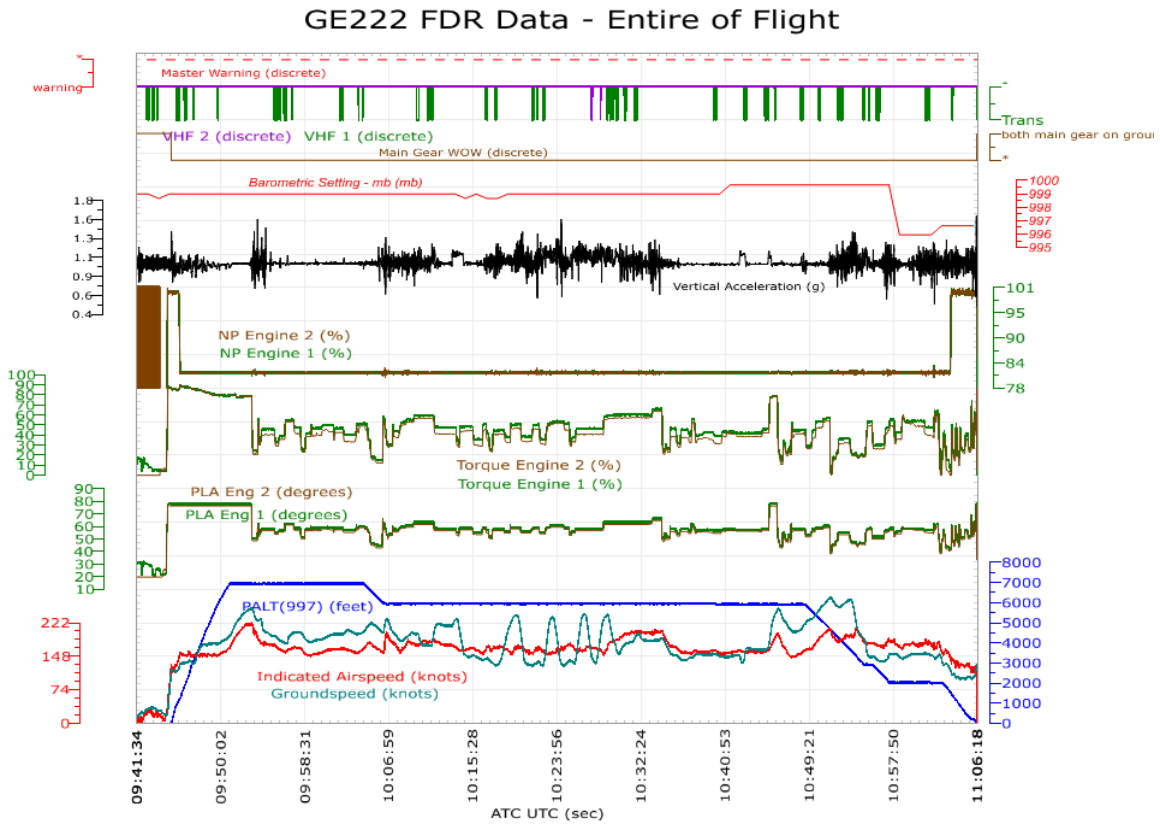


Figure 1.11.2-2 GE222 Entire of Flight Data Plot (source: SSFDR)

[4] The yaw effort, applied on the rudder pedal, which triggers the yam damper disagreement parameter recording into the FDR is in the range of 25.5 daN to 31.5daN.

[5] Refer to ICAO ANNEX 3, detail in Attachment 9-1.

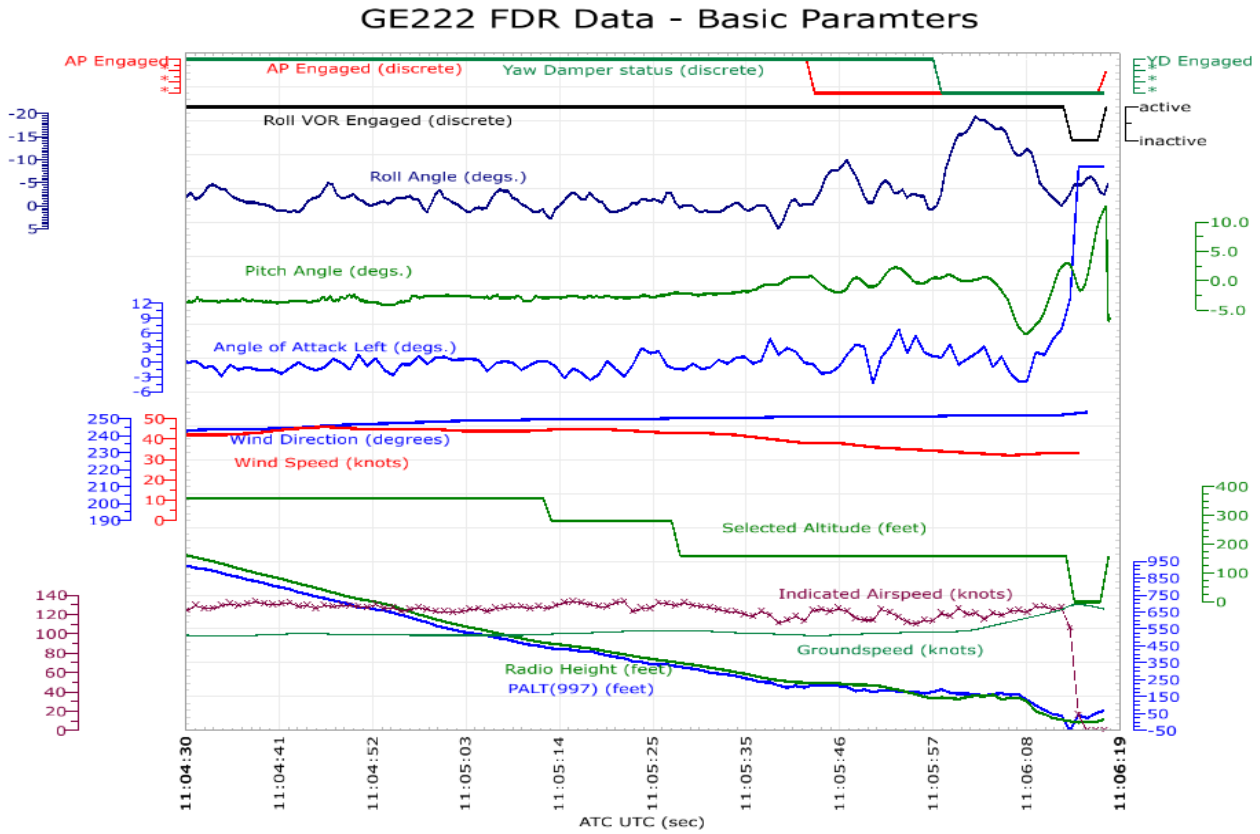


Figure 1.11.2-3 GE222 Flight Data Plot (Below 1,000 ft RA)

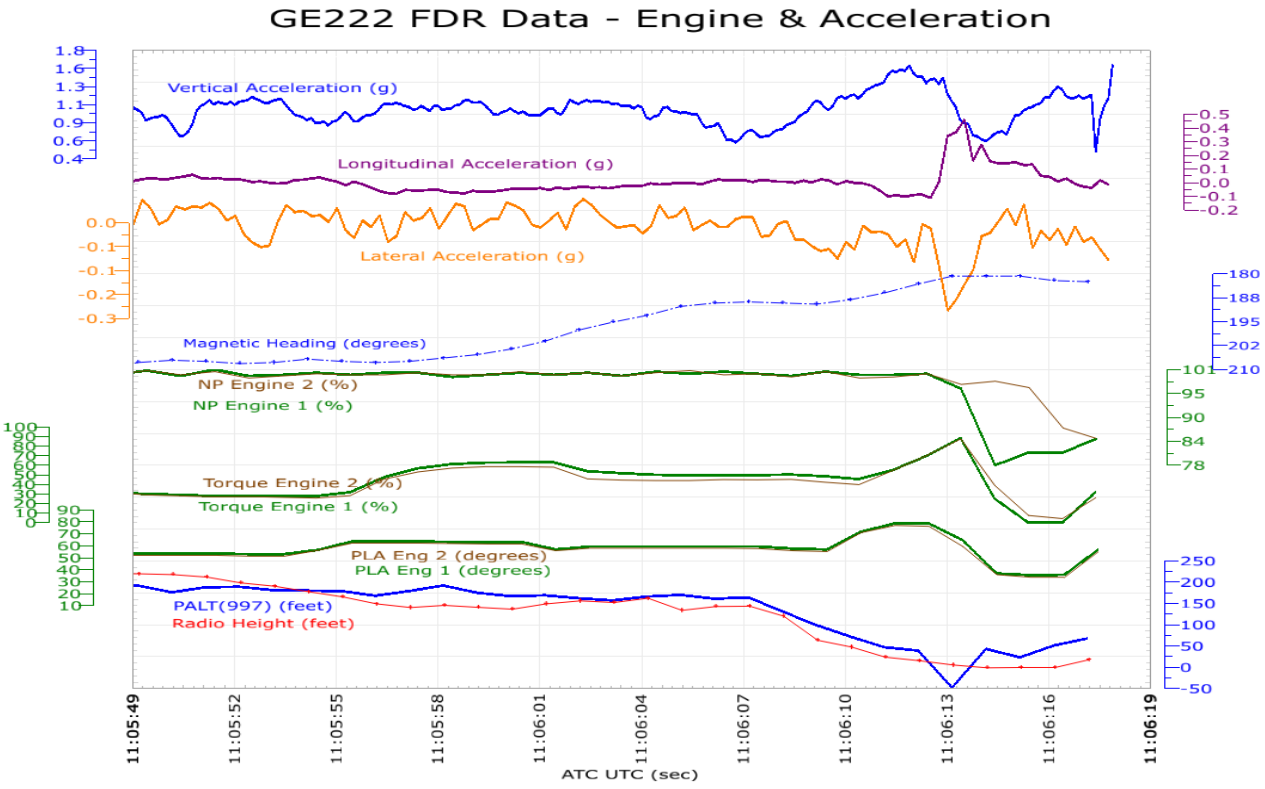


Figure 1.11.2-4 GE222 Flight Data Plot (Below 250 ft RA)

Table 1.11-2 Timeline of GE222 Flightcrew activies, and FDR events

ATC Time	Flightcrew activities, extracted from CVR transcript	IAS[1]	MHDG[2]	PALT(997) SALT[3]
1811:16.7	Request Kaohsiung approaches, holding pattern	179	292	5,936
1827:38.4	Kaohsiung approach broadcasts Magong airport forecast RWY02 wind 210 degree. 5 knotss max 11 knotss, RWY20 wind 190 degree. 11 knotss max 15 knots	168	226	5,941
1828:48.6	Kaohsiung approach reports Magong airport visibility 800m	158	21	5,959
1829:50.3	Request RWY02 ILS approach	184	254	5,946
1842:28.3	Kaohsiung approach reports Magong airport RWY20 visibility 1,600m still T-storm overhead	160	214	5,918
1842:47.9	Request RWY02 ILS approach again	158	276	5,912
1845:00.5	Request RWY20 VOR approach	159	289	5,923
1855:24.0 | 1859:14.0	Kaohsiung approach reports Magong airport QNH 996 Altitude captured at 2,000 ft	174+/- 5	229+/- 2	2,050+/-40 <u>2,000</u>
1859:15.0	Discussion selected altitude and distance	174	227	2,025 <u>1,600</u>
1859:16.0	Discussion selected altitude and distance	174	227	2,025 <u>1,200</u>
1859:17.0	Pre-set selected altitude 400 ft	173	227	2,027 <u>800</u>
1859:21.0	-	172	227	2,023 <u>400</u>
1903:38.7	Magong tower grants RWY20 landing clearance, wind 250 degree. 19 knots	131	218	841
1905:13.0	Pre-set selected altitude 300 ft	129	216	439 <u>300</u>
1905:28.0	CM1 :”oh oh oh oh two hundred”	129	215	330 <u>200</u>
1905:44.1	The autopilot disengaged	124	214	219

ATC Time	Flightcrew activities, extracted from CVR transcript	IAS[1]	MHDG[2]	PALT(997) SALT[3]
1906:10.8	Crew calls go-around	128	190	99
1906:13.3	Unidentified sound	106	127	39
1906:15.8	Crew calls go-around again	0	181	23
1906:18.0	Unidentified sound similar to impact	0	183	68
1906:18.9	Recorders stop recording	No data	No data	No data

1 Indicated Airspeed (IAS), unit [knots]

2 Magnetic Heading (MHDG), unit [degree]

3 Selected Altitude (SALT), unit [ft].

The raw value of "Selected Altitude" needs to multiply by 40 then converted into engineering unit in feet. However it contains a bias, and requires manual correction into a nearest hundred feet. For example, readout data is 360 ft, the corrected value shall be 400 ft.

Figure 1.11.2-5 shows the navigation modes displayed on the Advisory Display Unit (ADU) and Electronic Attitude Director Indicator (EADI), the relevant information extracted from ATR FCOM 1.04.10 AFCS General.

Figure 1.11.2-6 is a plot of parameters which indicates GE222 lateral navigation modes below 2,000 ft. Parameters in Figure 1.11.2-6 include: VOR armed mode, VOR captured mode, BC armed mode, BC captured mode, LOC armed mode, LOC captured mode, HDG captured mode, HDG Hold mode, LNAV mode, lateral active mode status (track vs. capture), indicated airspeed, ground speed, radio height, and PALT (997).

Figure 1.11.2-7 is a plot of parameters which indicates GE222 vertical navigation modes below 2,000 ft. Parameters in Figure 1.11.2-7 include: ALT armed mode, ALT captured mode, GS armed mode, GS captured mode, IAS captured mode, ALT captured mode, ALT armed mode, VS captured mode, vertical active mode status (track vs. capture), autopilot engaged status, the pitch effort[6] on the pitch axis from Capt. Side and F/O side, selected altitude, indicated airspeed, ground speed, radio height, and PALT(997).

[6] according to ATR72-500 technical specification it will be triggered as nose up and nose down, when pushing/pulling force in the range of 9.9 daN to 12.8 daN. One deka-newton (daN) is a decimal multiple of the SI derived unit of force newton. 1 daN = 10 Newton; 1 KgF= 9.81 Newton.

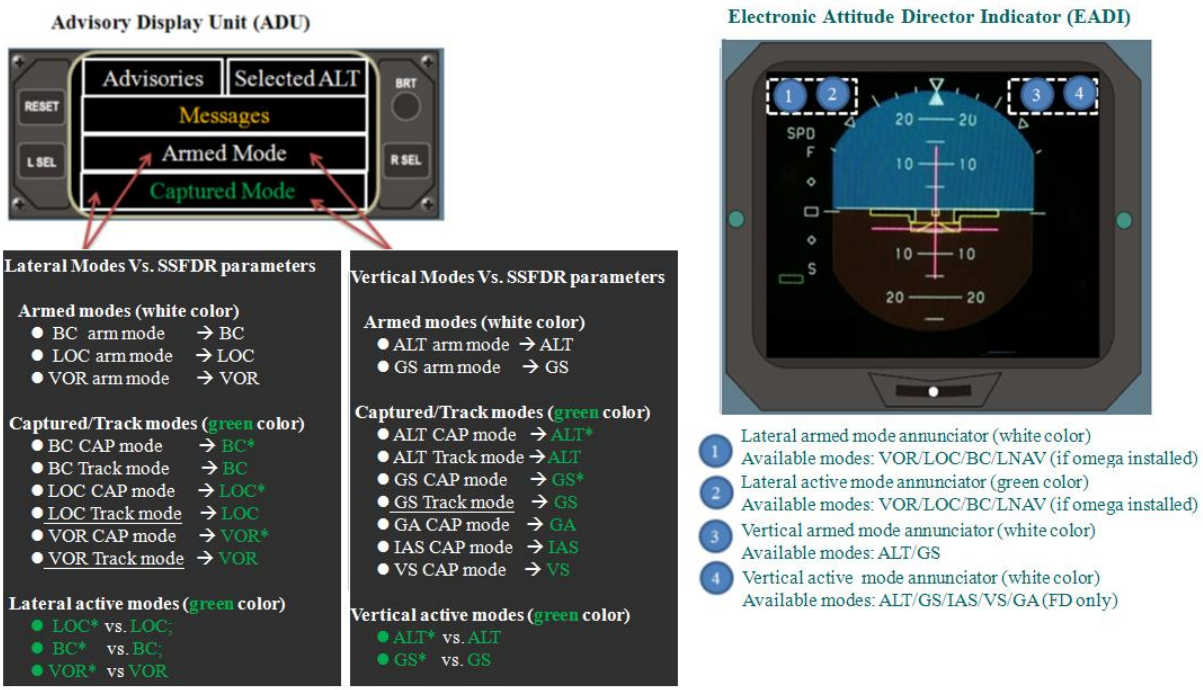


Figure 1.11.2-5 the Navigation modes displayed on the ADU and EADI

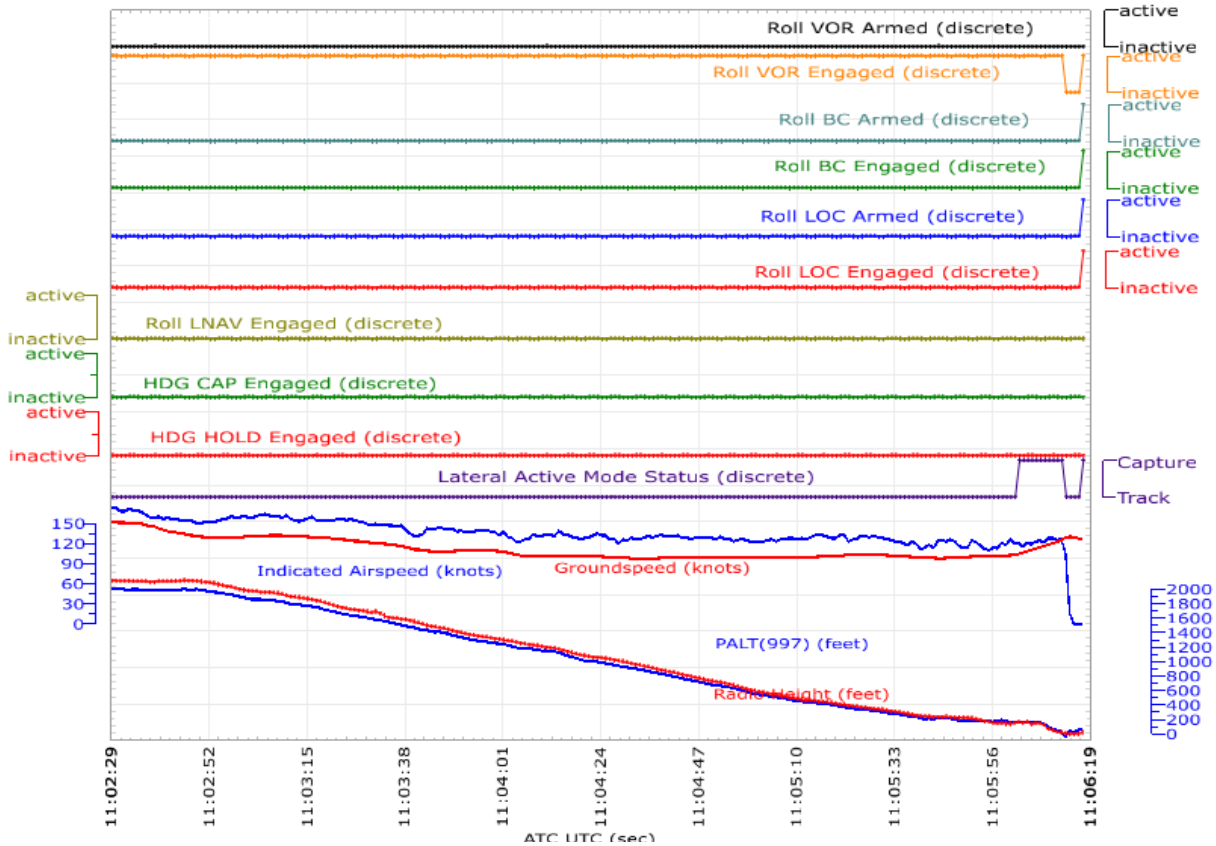


Figure 1.11.2-6 GE222 lateral navigation modes data Plot (Below 2,000 ft)

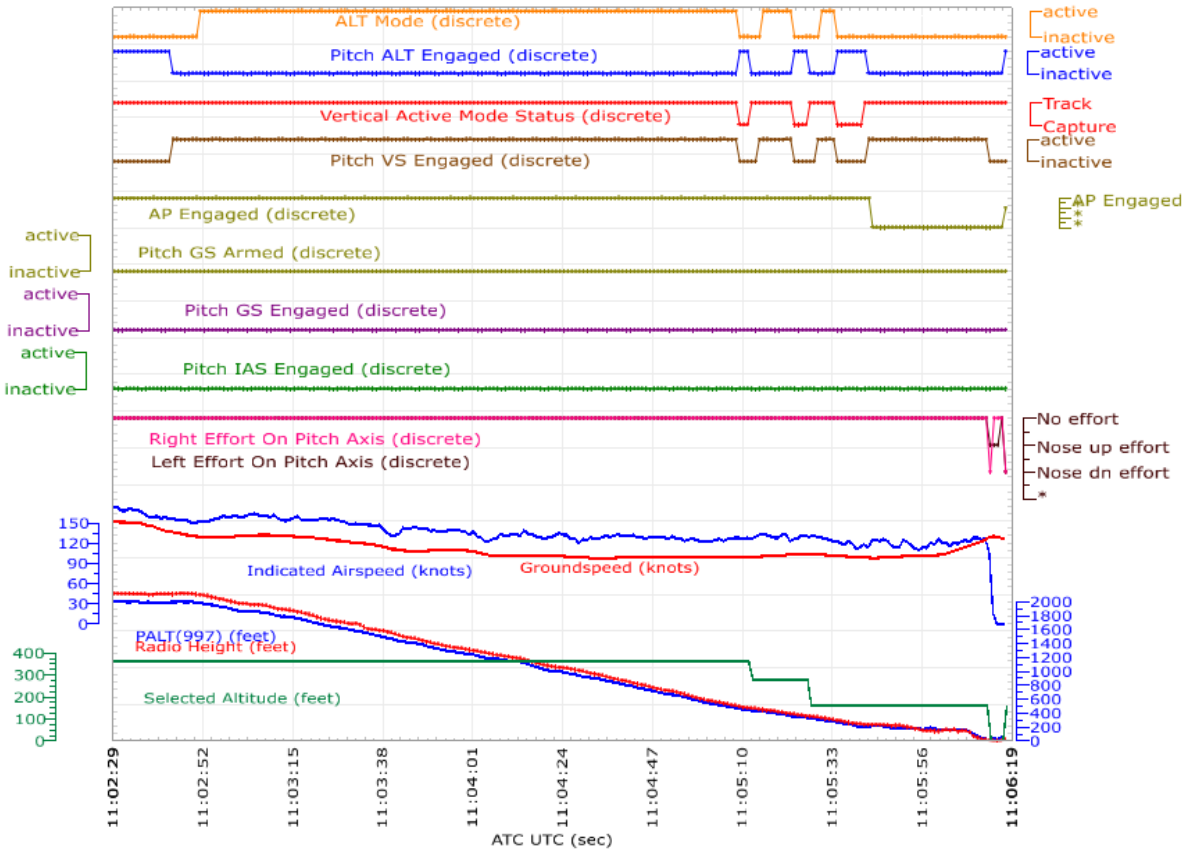


Figure 1.11.2-7 GE222 Vertical navigation modes data Plot (Below 2,000 ft)

The digital cockpit torque indication in the cockpit was consistent with FDR torque record since they came from the Engine Electronic Control (EEC). The angular position of power lever angle recorded in the FDR corresponded to the Hydro Mechanical Unit (HMU) angular position. Target torque computation was performed by the Flight Data Acquisition Unit (FDAU) independently from EEC that indicated actual torque value. The value of the target torque was the value that should be the actual torque when, and only when the power lever angle was in the notch position at 75° as recorded in the FDR.

Refer to ATR FCOM 1.16.30 Power Plant, Figure 1.11.2-8 indicates that the relationship between "PWR MGT Selector" and Torque and NP speed. For example, Line B shows that normal conditions of "TO" and "MCT". At "TO" position, Torque and NP speed are 90%, and 100% respectively. At "MCT" position, Torque and NP speed are 90.9%, and 100%, respectively. At "RTO" position, Torque and NP speed are 100%, and 100%, respectively.

ATR FCOM 1.16.30 Power Plant, page 5, considers sea level, bleed off and static conditions: At "CLB" position, Torque and NP speed are 97.2%, and 82.0%, respectively. At "CRZ" position, Torque and NP speed are 94.5%, and 82.0%, respectively. When necessary, power is automatically reduced in such way as to maintain the torque at the maximum value, authorized for the rating considered (thermo dynamic limit). Table 1.11-3 presents the engine target torques, NP

speeds and derived position of PWR MGT Selector.

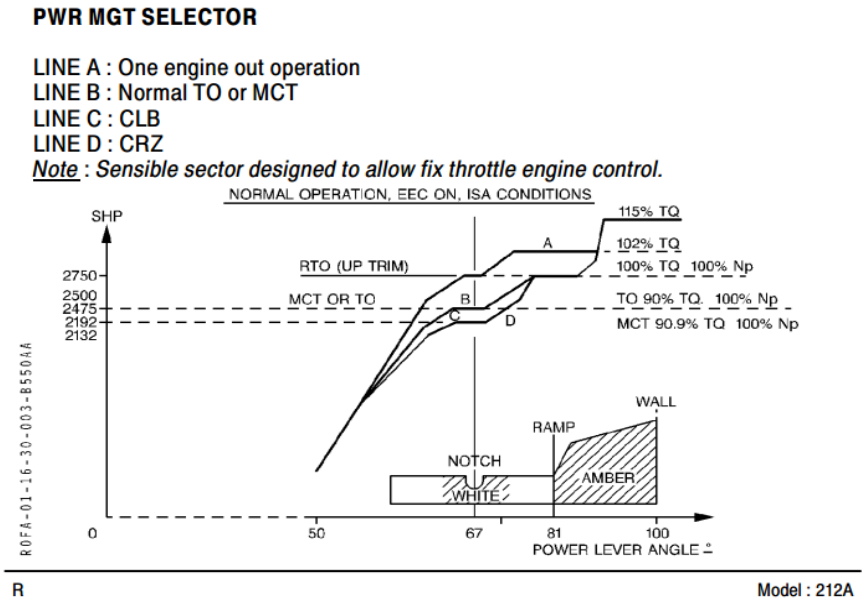


Figure 1.11.2-8 The Relationships of PWR MGT Selector, Torque and NP speed.

Table 1.11-3 Engine Power Lever angles, NP speeds, target torques and derived positon of PWR MGT Selector

ATC Time	No.1 Power Lever Angle (deg)	No.2 Power Lever Angle (deg)	No. 1 Engine NP (%)	No. 2 Engine NP (%)	No. 1 Engine Target Torque (%)	No. 2 Engine Target Torque (%)	PWR MGT Selector
1903:35	43	41	82	82	90	90	CRZ
1903:36 | 1903:40	42	42	86 | 100	86 | 100	90 | 95	90 | 95	TO
1903:41 | 1906:13	58 | 79	56 | 76	100 | 101	100 | 101	96 | 100	96 | 100	TO
1906:14	65	59	96	98	100	100	TO
1906:15	37	36	78	98	100	100	TO
1906:16	36	34	82	97	100	100	TO
1906:17	36	34	82	87	100	100	TO
1906:18	57	55	85	85	100	100	TO

1.11.3 Other Flight Data and Radar Track Data

1.11.3.1 Quick Access Data

The damaged Quick Access Data (QAR) and its PCMCIA card of the occurrence flight was recovered by ASC investigators at XiXi village on July 24th. There was no evidence of heat or fire damage on the exterior of the PCMCIA card. After utilizing high pressurized cool air to dry the PCMCIA card, all data were downloaded successfully to a PC computer. It recorded fifteen flights, and six different reports.

The last flight segment data was also imported into Insight Analysis software for readout. According to QAR readout data, it was consistent with FDR readout data, except the QAR stopped recording at 1906:14 of Taipei local time. Detailed QAR data plot can be found in Figure 1.11.3-1.

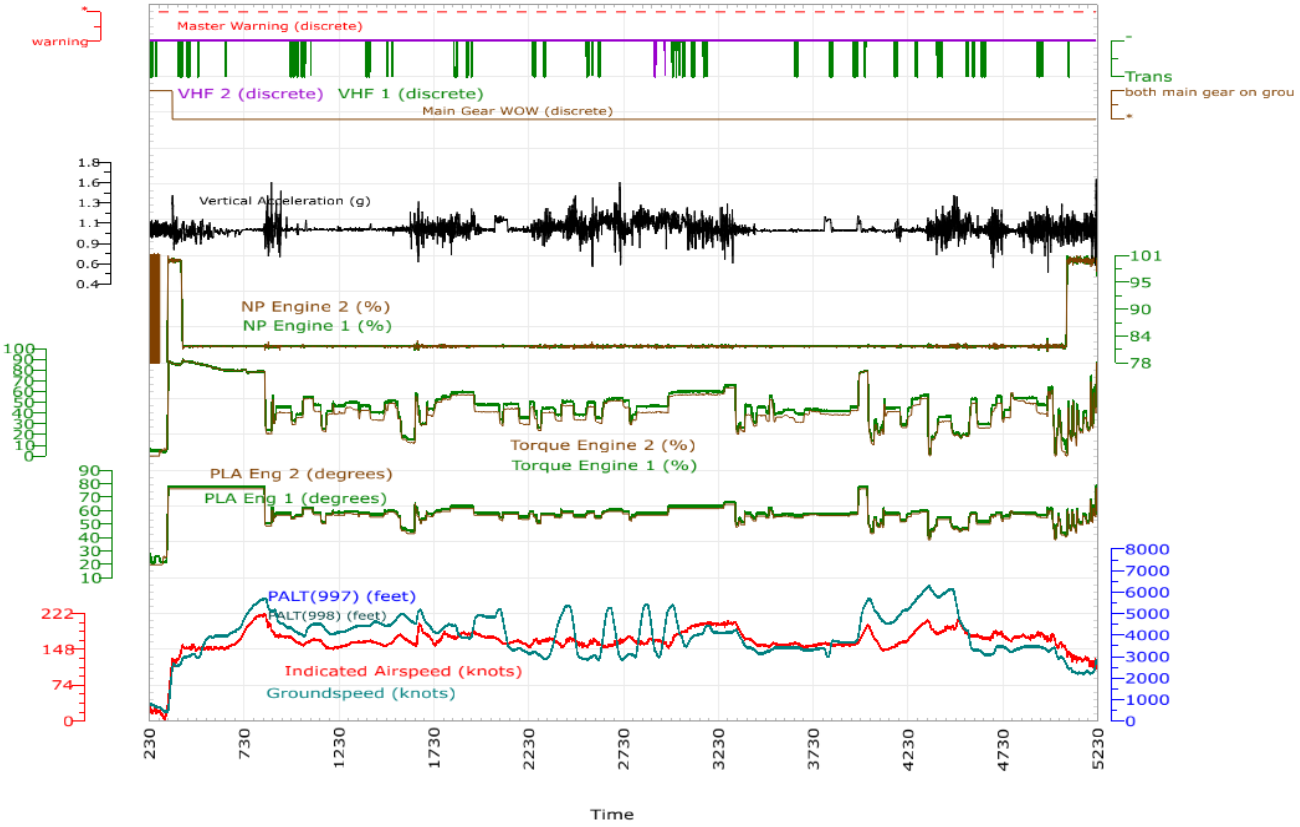


Figure 1.11.3-1 GE222 Entire of Flight Data Plot (source: QAR)

1.11.3.2 Secondary Surveillance Radar Data

After the occurrence happened, ASC investigators received the Secondary Surveillance Radar (SSR) Data from Civil Aeronautics Administration (CAA) of Taiwan, which was processed by the Multi Surveillance Tracking System (MSTS) with GPS timing system.

The squawk number of GE222 was A1172. The radar track number was 1654. The SSR data recorded period was between 1746:13 (altitude 2,100ft) and 1906:16 (altitude 400 ft) of Taipei local time.

The time correlation of surveillance radar data and FDR data was established by comparing the pressure altitude, the formula is as follows:

MSTS UTC Time = FDR UTC Time + 28.0 seconds

Note: the time uncertainty is about +/- 2.5 seconds, due to the scan rate of the surveillance radars.

Figure 1.11.3-2 shows GE222 radar track superposing with Google Earth satellite imagery, there are four red triangular marks, which were predicted positions from MSTS and invalid for future analysis. The original MSTS data indicated that the last record data occurred at UTC Time 11:06:16, Mode-C altitude 400 ft, slant range 1.85NM, bearing angle 18.01 degrees, and transponder code A1172. According to MSTS technical specification document, the Air Navigation and Weather Services (ANWS), CAA confirmed the root mean square horizontal position accuracy of MSTS was about 72 meters (based on standard requires condition- below 500 meters), detail information is available in Appendix 9-4.

Figure 1.11.3-2 GE222 radar track

1.11.3.3 GE220 Flight Data

After reading out the occurrence flight data, the flight recorder group also found one previous flight (GE220) performed the same flight route on July 23th. Figure 1.11.3-3 is a plot of recorded parameters which indicates the GE220 tookoff from runway 27 of Kaoshing Intl. Airport at 1448:40, and landed at Magong airport via runway 20 at 1510:36. Parameters in Figure 1.11.3-3 include master warning, GPWS status, barometric setting, vertical acceleration, both engine NP speeds, both engine power lever position, indicated airspeed, GPS ground speed, standard pressure altitude, and associated with a QNH corrected pressure altitudes- PALT (999). During 1518:38 and 1519:01 period, one of the GPWS modes was activated, the associated radio height was descent from 296 ft to 235 ft. During this period, the selected vertical speed changed from descent 700 ft/min to climb 900 ft/min.

Figure 1.11.3-4 is a plot of parameters which indicates GE220 lateral navigation modes below 2,500 ft. Parameters in Figure 1.11.3-4 include: VOR armed mode, VOR captured mode, BC armed mode, BC captured mode, LOC armed mode, LOC captured mode, HDG captured mode, HDG Hold mode, LNAV mode, lateral active mode status (track vs. capture), indicated airspeed, ground speed, radio height, and PALT(999).

Figure 1.11.3-5 is a plot of parameters which indicates GE220 vertical navigation modes below 2,500 ft. Parameters in Figure 1.11.3-5 include: ALT armed mode, ALT captured mode, GS armed mode, GS captured mode, IAS captured mode, ALT captured mode, ALT armed mode, VS captured mode, vertical active mode status (track vs. capture), autopilot engaged status, the pitch effort on the pitch axis from Capt. Side and F/O side, selected altitude, indicated airspeed, ground speed, radio height, and PALT (999).

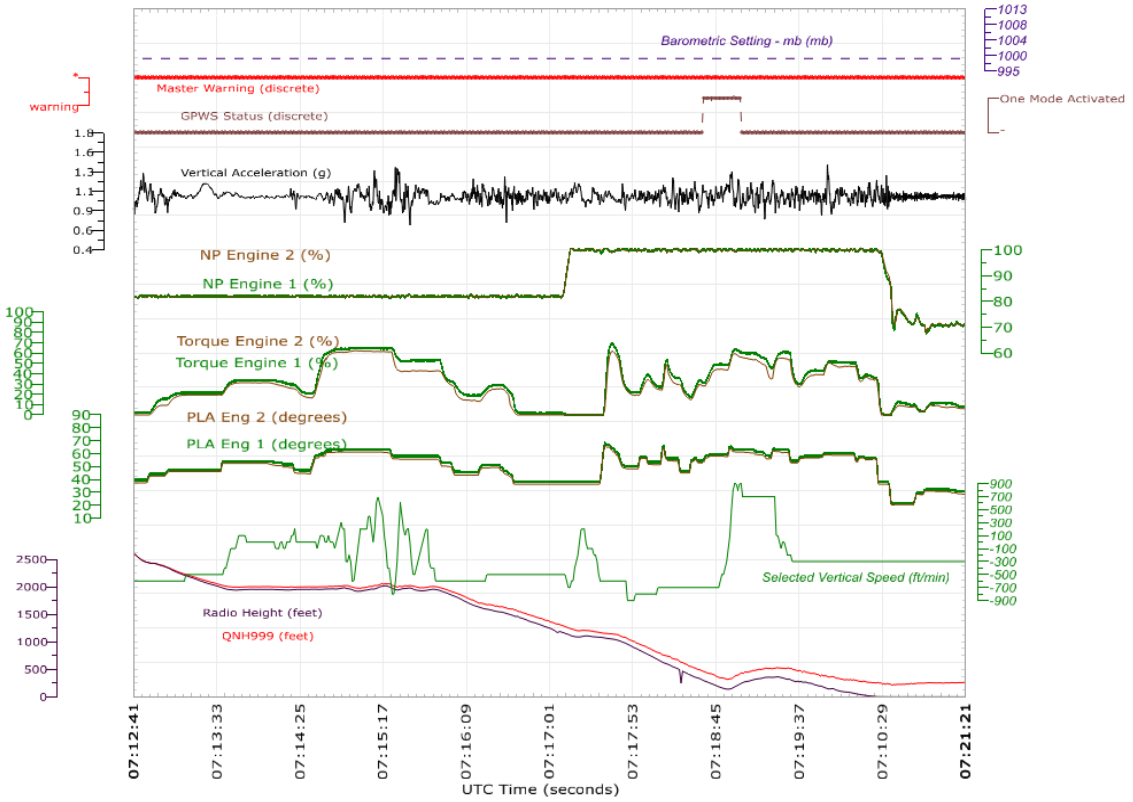


Fig 1.11.3-3 GE220 Flight Data Plot (below 2,500 ft)

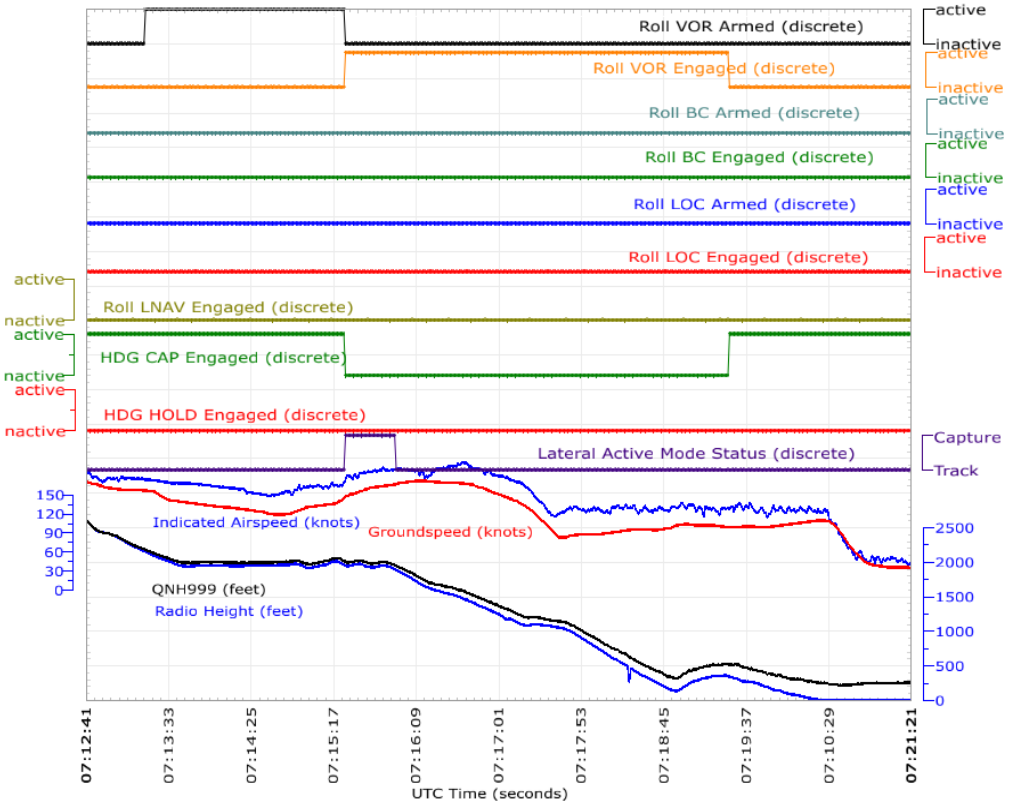


Figure 1.11.3-4 GE220 lateral navigation modes flight data Plot (Below 2,500 ft)

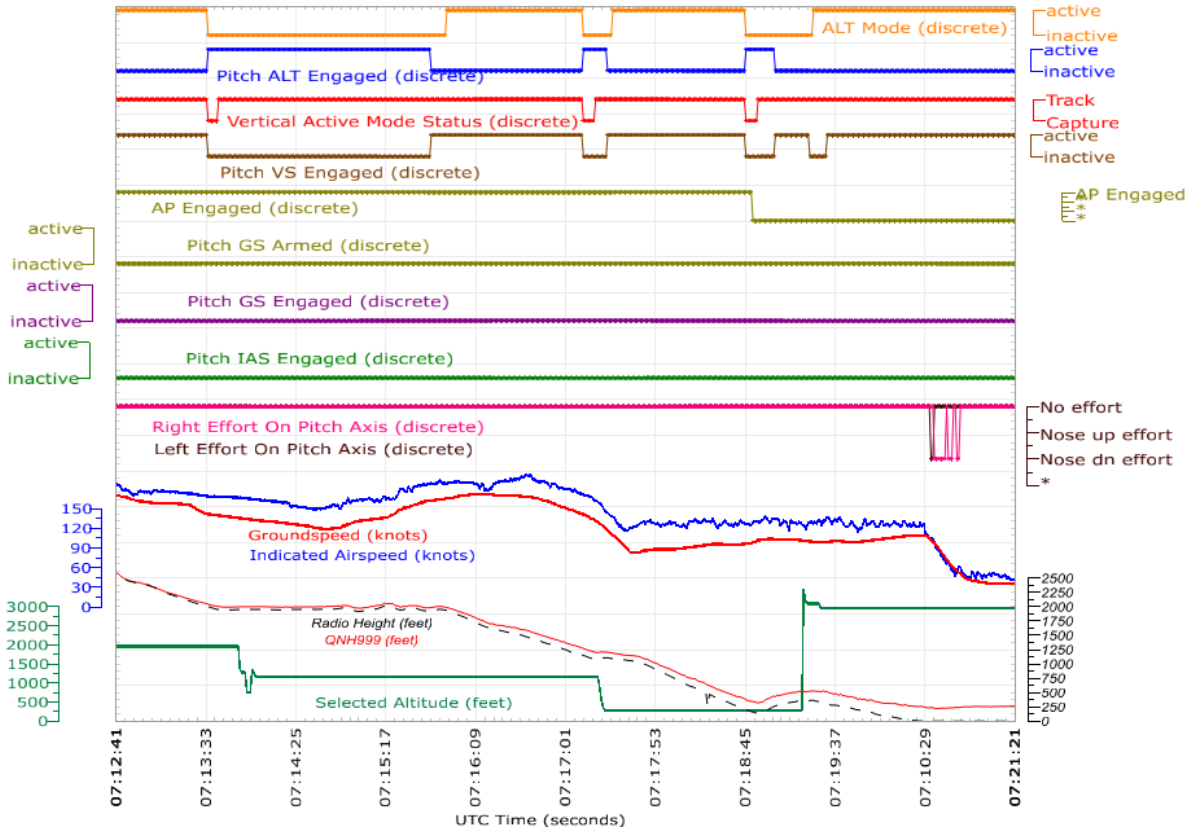


Figure 1.11.3-5 GE220 vertical navigation modes flight data Plot (Below 2,500 ft)

1.11.3.4 B7 647 Flight Data

Before few minutes before Magong ATC cleared the GE222 to land, another airplane (ATR 72-600 type), B7 647 of Uni Airways, performed RNAV RWY20 procedure to land at Magong airport. In order to collect the relevant wind information, the flight recorders group requested the operator to provide the flight data on July 28th. Figure 1.11.3-6 is a plot of recorded parameters which indicates the ATR72-600 tookoff from the runway 36 of Tainan Airport at 1705:10 on July 23rd, and landed at Magong airport via runway 20 at 1857:25. Parameters in Figure 1.11.3-6 include: UTC time, air/ground switch status, pitch attitude, ro1l attitude, magnetic heading, wind speed, wind direction, vertical acceleration, airspeed, ground speed, TAWS windshear alert, TAWS windshear warning, GPS latitude position, GPS longitude position and baro-corrected altitude. Baro-altitude below 2,000ft, average wind speed 22.5 +/- 6.6 knots, average wind direction 259 +/- 4.6 degree. In addition, average vertical acceleration 1.0066 +/- 0.061 g’s, the turbulence intensity is based on vertical acceleration and true airspeed, then to calculate the eddy dissipation rate.

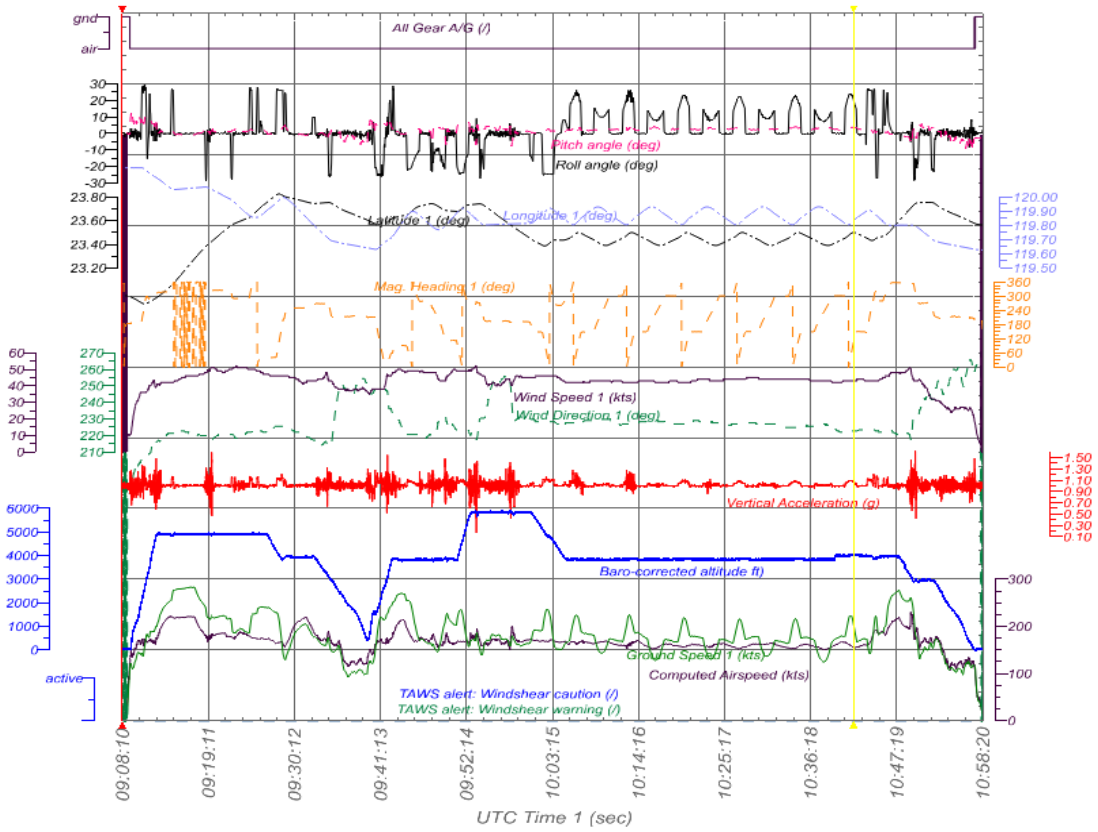


Figure 1.11.3-6 another ATR72-600 Flight Data Plot

1.11.4 Flight Path Reconstruction and Unrecorded Parameters

1.11.4.1 Flight Path Reconstruction and Mapping

The GE222 flight path is determined by two recording parameters- GPS latitude, GPS longitude, sampling rate 1/4 Hz. In addition, applying the double-integration[7] of the accelerations' data to reconstruct the flight path and calculate the last recorded position, detailed information is available in Appendix 9-5. At 1906:18.9, the last recorded position is N23°35'08.2", E119°38'21.1". Figure 1.11.4-1 shows GE222 flight path and radar track, superposing with RCQC VOR RWY20 chart. Figure 1.11.4-1 also indicates nine place marks. Detailed flight crew activities, and SSFDR events can check on table 1.11-2. Figure 1.11.4-2 presents GE222 flight path, satellite imagery and six place marks during the last 40 seconds.

[7] Double-Integration and flight path reconstruction: initial point 1906:15, GPS recording position (23°35'14.30", E119°38'19.35"), using the three-axes acceleration data (sampling rate 8 Hz) to calculated the flight path.

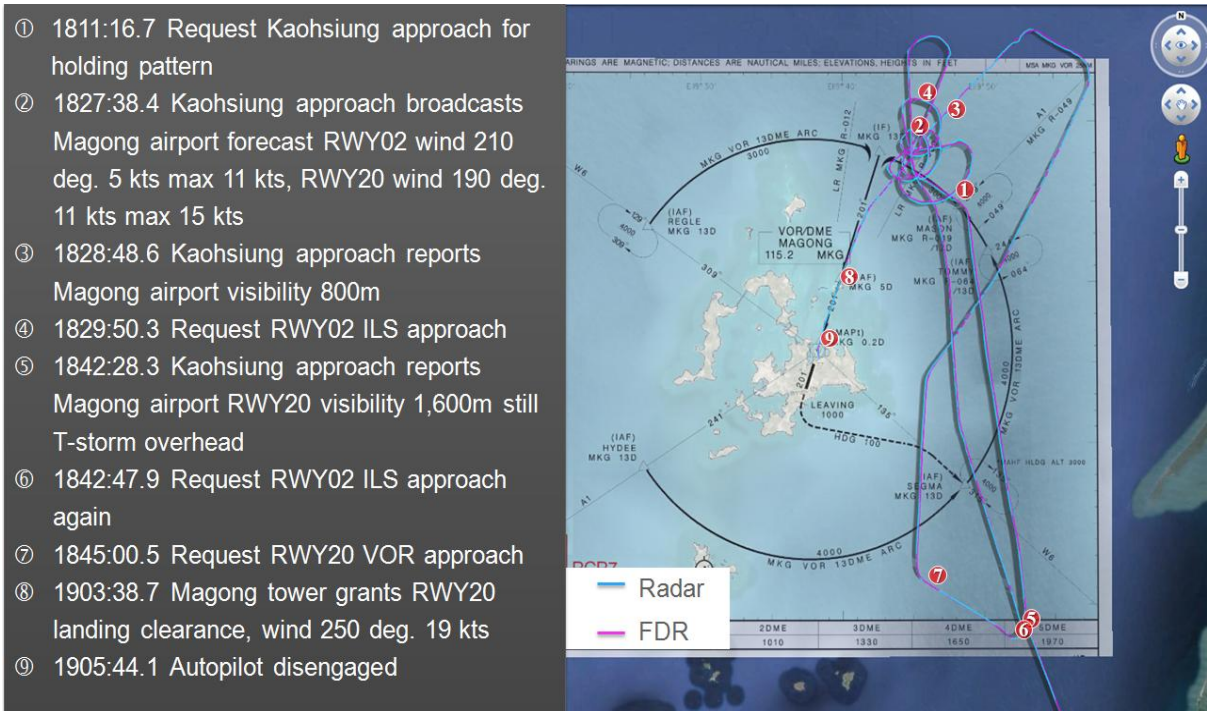


Figure 1.11.4-1 superposing of GE222 flight path, radar track and VOR chart

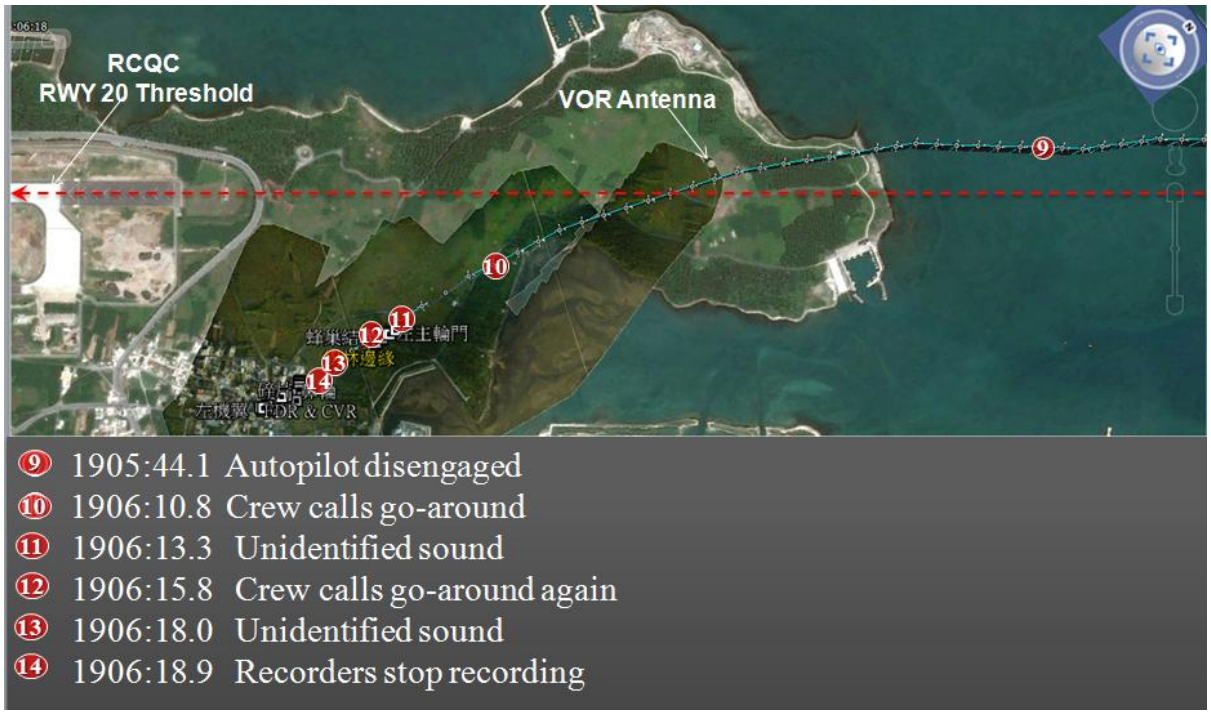


Figure 1.11.4-2 superposing of GE222 flight path with satellite imagery during the last 40 seconds.

1.11.4.2 Unrecorded Parameters and Derived Parameters

For the investigative purpose, there are several unrecorded parameters need to derive from the relevant recording parameters, it includes the reference distance between the aircraft and the runway 20 threshold of Magong Airport, vertical speed, control column position and control wheel position.

Calculation of reference distance and vertical speed

According to the FDR readout database, version 2B configuration 1, parameters "DME 1" and "DME 2" are not recorded. During the progress meeting in Toulouse, the group confirmed that "DME 1" and "DME 2" are recorded into FDR. During the final approach, the reference positions of "DME 1" and "DME 2" refer to the Magong VOR station, and runway reference point, respectively. The result plots are shown in Figure 1.11.4-3 (a) and Figure 1.11.4-3 (b).

After reconstructing GE222 flight path, then setting the threshold of runway 20 of Magong airport as an anchor point, to calculate the reference distance (presented as "Ref. Distance"). Figure 1.11.4-3(a) indicates the result, parameters in Figure 1.11.4-3 include: autopilot engaged status, selected vertical speed, derived vertical speed[8] (presented as "VS_SM 5pt"), left elevator position (positive value: pitch surface down and nose down), pitch attitude, left aileron position (positive value: left aileron down and right bank), roll attitude, rudder position (positive value: rudder to left), magnetic heading, selected altitude, radio height and PALT (997).

[8] Derived vertical speed: time differential the recorded radio height and using the precise terrain elevation data to calibrate the value, then applying the 5-seconds moving average algorithm, and multiply 60 to convert the unit into feet per minute. Terrain elevation data is available in section 1.12.

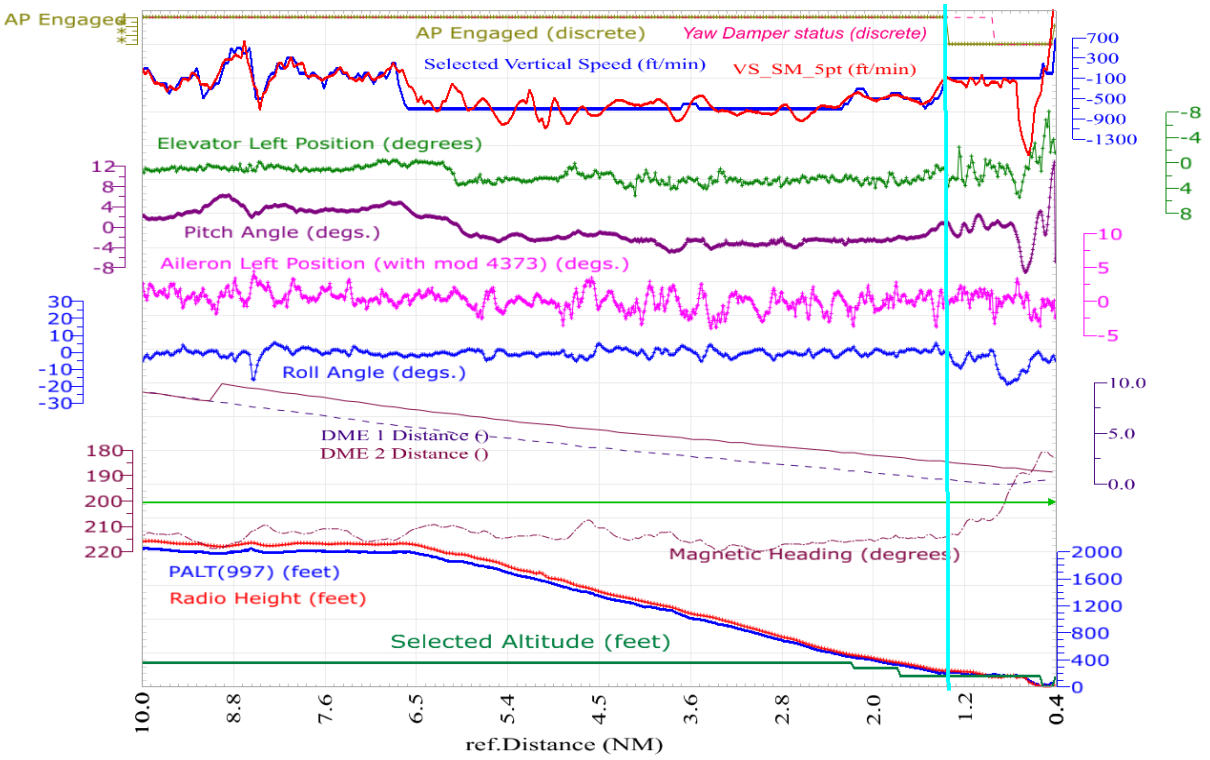


Figure 1.11.4-3 (a) Flight control surface related parameters and reference distance

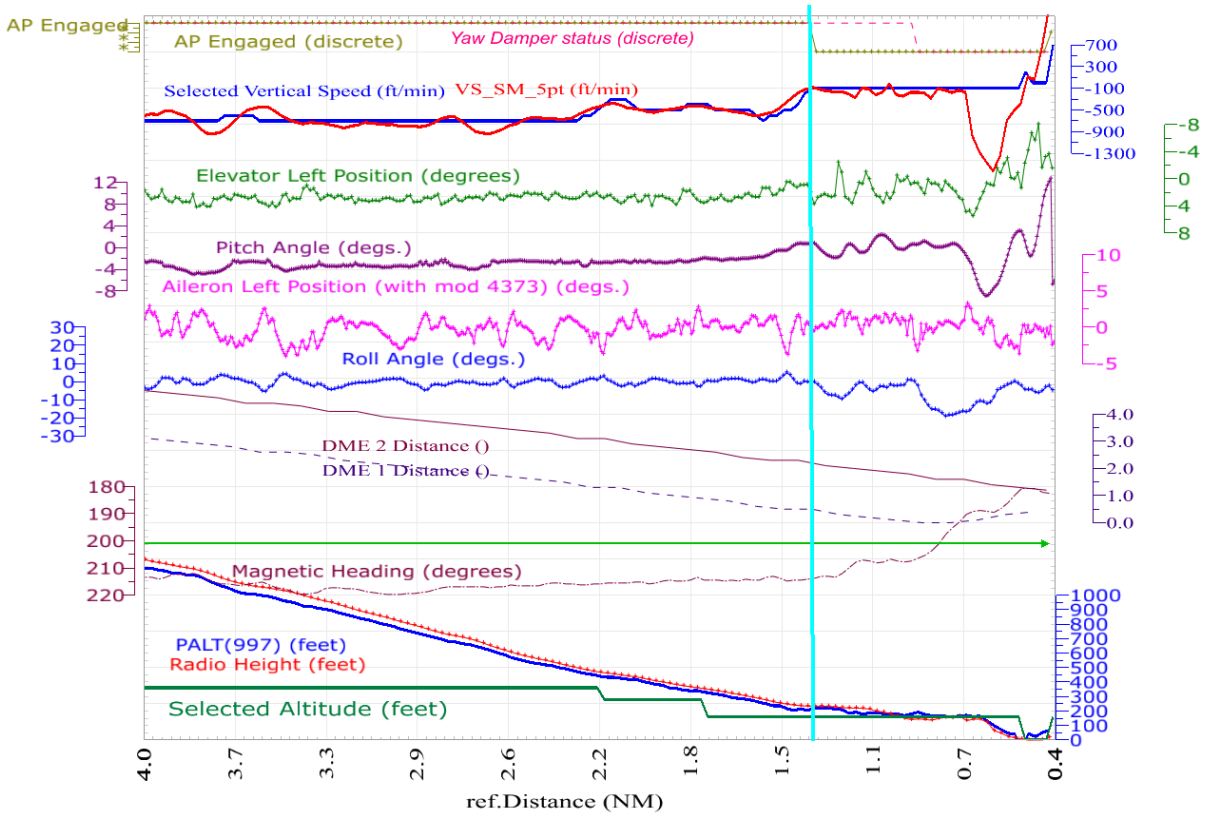


Figure 1.11.4-3(b) Flight control surface related parameters and reference distance

Calculation of Control Column Position and Control Wheel Position

The control column position and control wheel position are not included in the FDR recording parameters; the group requested ATR to provide technical information to describe the relationships between control column position, control wheel position, elevation deflection and aileron deflection, detail information is available in Appendix 9-6. Consider the aircraft on the ground without any aerodynamic effect, the kinematic relationship between the elevator position and the control column position shall be almost linear.

The aileron surface deflection depends on the control wheel position and the spring tab deflection (which varies in proportion to loads / aerodynamics resistance to aileron deflection). Therefore, there is no direct relationship between the control wheel position and the aileron position. The linear relationship between the aileron and the control wheel position is only applicable when no load applies on the aileron/tabs.

Figure 1.11.4-4 depicts the result of the derived control column position, control wheel position and relevant parameters below 6,000 ft, parameters in Figure 1.11.4-4 include: control column position, control wheel position, aileron left position, elevator left position, pitch attitude, roll attitude, selected vertical speed, derived vertical speed, radio height and PALT (997).

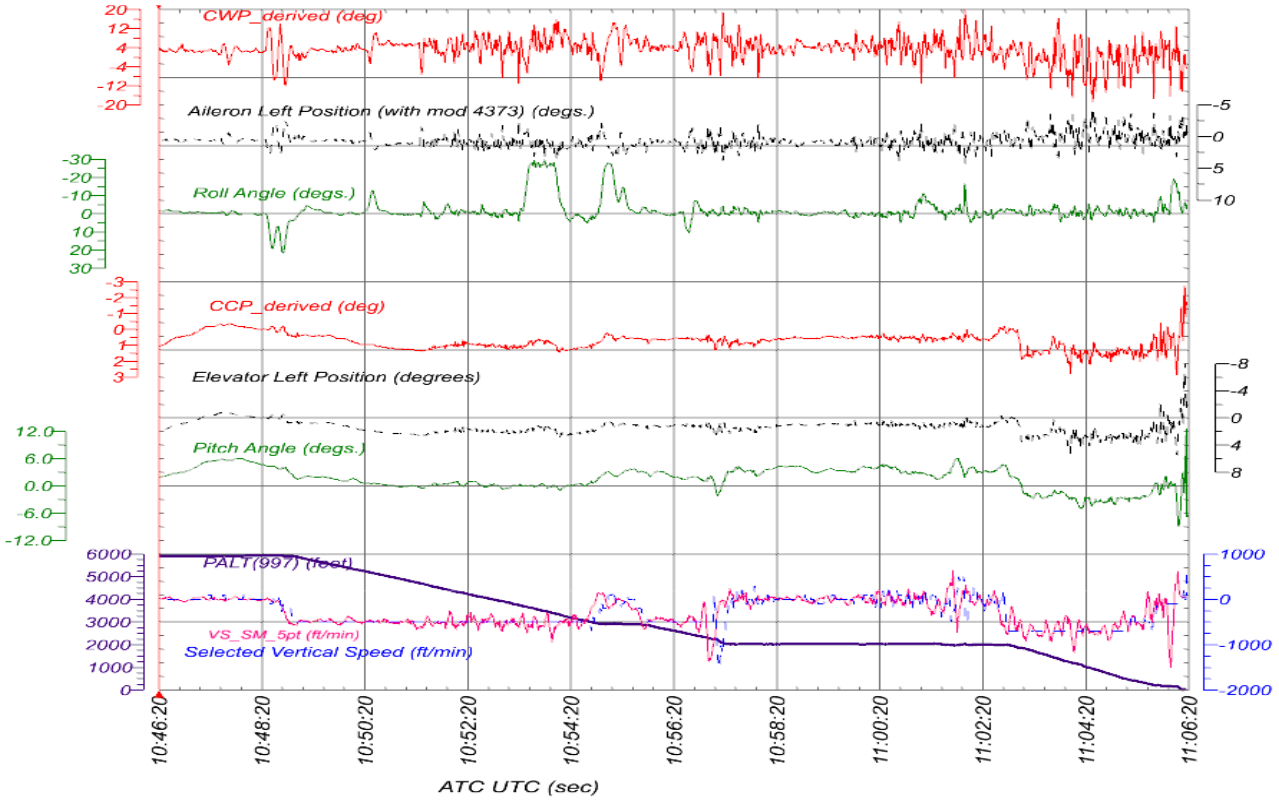


Figure 1.11.4-4 Derived control column and control wheel positions and their relevant parameters below 6,000 ft.

1.11.5 TNA FOQA Events

According to TNA Safety Management Manual, FOQA event handling guide, there are three different categories for detecting FOQA events: red events, amber events, and yellow events. Detailed event settings are available in Attachment 9-2.

According to TNA FOQA statistical records for the ATR fleet, there are two amber events related to unstable approach during its last three months operation, and triggered the pre-setting criteria, including: (1) amber event- speed low, approach speed low detected at 1,170 ft. (2) Rate of descent high in approach, between 1,000 ft and 500 ft.

ICAO DOC 10000 – Manual on Flight Data Analysis Programmes (FDAP), it is guidance material on Flight Data Analysis (FDA), and it was contained in the first edition of the ICAO Safety Management Manual (SMM DOC 9859). This manual contains a more detailed description is provided of the composition of the FDA team and a description of the key objectives for an effective relationship between the FDA team and management rather than proposing a specific method, detail in Attachment 9-3.

1.11.6 Electrical Power Supply of CVR and FDR

Figure 1.11.6-1 illustrates a blockdiagram of power supply, Digital Flight Data Acquisition Unit (DFDAU), FDR, and flight data entry panel. The flight data entry panel is located on the electrical center pedestal, which was used in conjunction with the DFDAU to display and set time, date and year, select flight number, display system warnings, and send an event marker signal to the FDAU. The recording parameter "UTC Time" was set by ground crew or flight crew, and it does not correlate with GPS time.

According to ATR72 FCOM section 1.10.40, P4/050/Flight Recorders, the electrical power supply of SSCVR, SSFDR and DFDAU as follows:

Equipment	**DC Bus Supply**	**AC Bus Supply**
DFDAU power supply	28VDC Bus	ESSENTIAL Bus
FDR power supply	28VDC Bus	ESSENTIAL Bus
CVR power supply	28VDC Bus	ESSENTIAL Bus

Refer to Aircraft Maintenance Manual (AMM CH 23-71, CH 31-31), both CVR and FDR stop recording in the following conditions:

- when aircraft electrical network is de-energized
- ten minutes after both engines shutdown
- by pressing RESET pushbutton switch when the power supply is delivered by the ground power unit and when RCDR pushbutton switch is selected ON.

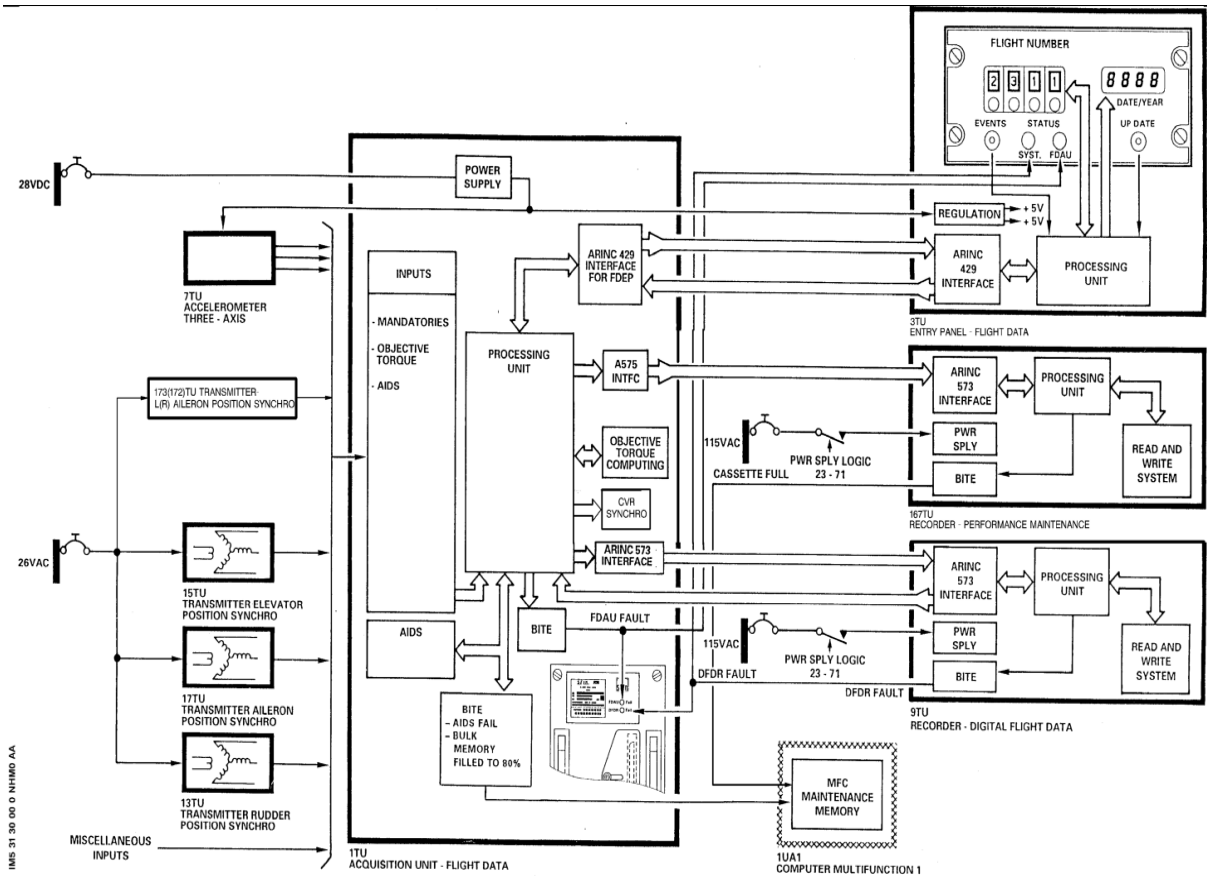


Figure 1.11.6-1 Blockdiagram of power supply, DFDAU, FDR, and flight data entry panel

1.16 Tests and Research

1.16.1 ATR 72 Engineering Simulation

An ATR 72 engineering simulation was organized by ATR in aid of ASC and BEA to evaluate the flight dynamics and three dimensional winds of GE222 accident.

1.16.1.1 Background Information for the ATR 72 Engineering Simulation

The ATR 72 engineering simulation tools are designed by ATR. They are used for two main purposes: accident/incident analysis of flight dynamics and flight dynamic analysis for studies, modifications, certifications, and publications etc..

For the accident analysis, the tools are used to accurately determine if the aircraft behavior is due to external conditions and/or pilot control inputs. And the engineering simulation is based on “what if” scenarios to perform the relevant simulations.

The engineering simulation is based on FDR recorded parameters, ATR72 aerodynamic database, and engine database to calculate aircraft flight dynamics, and evaluate any performance degradation.

IV. Section Summary

According to the collected factual information, the group concludes the sectional summary into four categories- secondary surveillance radar data, time synchronization, the FDR recording parameters related issues, and related to GE222 occurrence flight.

The last secondary surveillance radar data and its position accuracy

1. According to the second surveillance radar data, processed by the Multi System Tracking System (MSTS) records, the last record indicated– UTC Time 11:06:16, Mode-C altitude 400 ft, slant range 1.85NM, bearing angle 18.01 degrees, and transponder code A1172. The root mean square horizontal position accuracy of MSTS is 72 meters (based on standard requires condition- below 500 meters).

Time synchronization and the CVR and FDR recording length

1. After cleaning and drying process, both CSMU maintained in good condition. Refer to L-3 AIKs and ASC damaged recorder handling procedures to download and readout data. The recording length of CVR is 2hr3m06s (4 channels), the recording length of FDR is 35h41m7s (number of recording parameters 180).
2. All of recording data was time synchronized, and based on ATC timing system. Both CVR and FDR time were offset by +28.2 seconds and +28.0 seconds, respectively. QAR stopped recording at UTC 11:06:14; Both CVR and FDR stopped recording at UTC 11:06:18.9.

The FDR recording parameters related issues

1. According to the FDR recording parameter document, it is confirmed that “decision height” and “fuel quantity” had no signal input; “aux. hydraulic” was in inverted state.
2. According to the FDR recording parameter document, there are typing errors on the sign conventions for “left roll trim position” and “yaw trim position”.
3. According to the FDR recording parameter document, it is confirmed that “selected vertical speed” is the vertical speed target selected by the flight crew when the vertical speed mode is engaged. When the vertical speed mode is not engaged, the “selected vertical speed” present the current vertical speed of the aircraft.
4. According to the FDR recording parameter document, version 2B configuration 1, "DME 1" and "DME 2" are not recorded. The group confirmed that "DME 1" and "DME 2" are recorded into FDR.
5. According to the ATR 72-500 technical specification, the pitch effort that

triggered parameter recording into FDR is in the range of 9.9 daN to 12.8 daN. The yaw effort, applied on the rudder pedal, which triggers the yam damper disagreement parameter recording into the FDR is in the range of 25.5 daN to 31.5daN.

Related to GE222 Occurrence Flight

1. Pressure altitude and barometric setting: the FDR recorded pressure altitude was standard atmosphere condition with QNH 1013.25 mbar. During approach from 6,000 ft to 2,000 ft (during 1841:23 and 1858:26), the recorded barometric setting was 1,000 mbar; holding at 2,000 ft period, the recorded barometric setting was 996 mbar (during 1858:27 and 1902:42); below 2,000 ft operation, the recorded barometric setting was 997 mbar. One mbar altitude correction is 28 ft.
2. At 1855:20, GE222 flightcrew was cleared for VOR runway 20 approach, the aircraft started to descend from 2,916 ft to 2,000ft, and the relative distance was 24.5 NM north east to the threshold of runway 20, Magong airport. During the approach operation, the associated conditions of autopilot mode, navigation modes were as followings:
   - PALT (997), Selected altitude and DME 1 distance: 2,907 ft / 2,000 ft / 24.33 NM (1855:24); 2,025 ft/ 1,600 ft / 14.4 NM (1859:15); 2,025 ft/ 1,200 ft / 14.4 NM (1859:16); 2,027 ft/ 800 ft / 14.3 NM (1859:17); 2,025 ft/ 600 ft / 14.2 NM (1859:20); 2,023 ft/ 400 ft / 14.1 NM (1859:21); 1,847 ft/ 400 ft / 5.0 NM (1903:08); 330 ft/ 439 ft/ 300 ft / 1.3 NM (1105:13); 330 ft/ 200 ft / 0.9 NM (1105:28) until the FDR stopped recording.
   - Selected vertical speed operation: - 100 ft/min (1855:20); -200 ft/min (1855:36); -300 ft/min (1855:43); -500 ft/min (1855:50); -100 ft/min (1857:08); -400 ft/min (1857:09) increased to -1,500 ft/min (1857:13); -1,300 ft/min (1857:14) reduced to -400 ft/min (1857:23); varied between -300 ft/min and -700 ft/min (1857:24 to 1905:41); and then maintained at -100 ft/min until the time when CVR recorded the first unidentified sound.
   - Between 1805:20 and 1905:13, vertical active mode status was maintained at track mode, two associated parameters activated – ALT Arm mode and VS CAP mode. ALT CAP mode status activated, when (pressure altitude – selected altitude) less than 60 ft.
   - Selected heading and selected course operation: Since 1901:07 until FDR stopped recording, both settings were same 201 degrees.
   - Autopilot status was engaged until 1905:43; then vertical active mode status changed from capture state into track state. Indicated airspeed and selected speed were 124 knots, and 120 knots, respectively. The radio height and PLAT (997) were 232.7 ft, and 219 ft, respectively.

- Yaw damper status was engaged until 1905:58; after the yaw damper was disengaged, rudders continued to receive input of left direction between 2 degrees and 4 degrees; in the meantime, magnetic heading continued to drift from 205 degrees to 182 degrees. During the heading drifting to left side, the roll attitude varied from wing level to the left bank, 19.3 degrees was the maximum value appeared in 1906:03.
- The VOR CAP mode was active until 1906:14, then "lateral active mode status" changed from capture state into track state. In the meantime, all of lateral navigation parameters were not active.

3. Radio height below 500ft, the FDR recording wind speed and wind direction were 38.7 +/- 4.8 knots, 251 +/- 1.11 degree, respectively.
4. During the left bank recovery period (1906:03 and 1906:18.9), pitch attitude varied from 0.2 degree nose up to 9.0 degrees nose down (1906:08 to 1906:10), and then to about 3.0 degrees nose up. It was consistent with elevator inputted sequences- nose down deflection (maximum 5.5 degrees), then nose up deflection (maximum 3 degrees).
5. CVR recording indicated the first unidentified sound occurred between 1906:13 and 1906:15, while FDR data confirmed the abnormal values on lateral acceleration, longitudinal acceleration, indicated airspeed and engine NP speeds. CVR CAM recording spectrum also illustrated that one of the engines was slowed down immediately after the first unidentified sound occurred. During the first unidentified sound period, relevant FDR data is as following:
   - Radio height descended from 15.5 ft to 5.4 ft; the corrected pressure altitude (QNH 997) descended from 39 ft to -48 ft (it was an erroneous value due to the impact)
   - Indicated airspeed dropped from 127 knots to 16 knots, and then maintained at zero, it implied the pitot tube may be broken or separated from the aircraft.
   - Magnetic heading changed from 183 degrees to 181 degrees;
   - Pitch attitude decayed from +2.9 degrees to -1.7 degrees;
   - Roll attitude changed from wing level to left bank 4.6 degrees;
   - The related maximum lateral acceleration and maximum longitudinal acceleration were -0.28 g's and 0.46 g's, respectively.

V. Appendices

Appendix 9-1 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 9-2 GE222 CVR Transcript

Legend

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 cabin crew 1
(RDO, CAM, INT, PA)-4 : Voice identified as cabin crew 2
APP : Kaohsiung approach
TWR_M : Magong Tower
TWR_K : Kaohsiung Tower
B7 647 : Communication from B7 647
OTH : Communication from other flights
GC : Ground crew
… : Unintelligible
( ) : Remarks
[ ] : Translation
* : Communication not related to operation / expletive words

hh[9]	mm	ss	Source	Context
17	39	09.4		(GE 222 CVR 紀錄開始) *[GE 222 CVR recording begins]*
1739:09.4 ~ 1906:18.9				
17	39	09.4	CAM-2	oil pressure rising n-h forty five starter light off
17	39	17.5	INT-1	可以拆外電源後推煞車鬆向東 *[you may disconnect gpu parking brake release clear to push back facing east]*
17	39	19.6	GC	…頭朝東 *[... facing east]*
17	39	20.8	CAM-2	i-t-t drop … normal start
17	39	32.7	CAM-2	四洞分 *[time forty]*
17	39	34.1	CAM-1	嗯 好 *[um okay]*
17	39	35.3	INT-1	開二號解鎖 *[release number two]*
17	39	36.6	GC	okay 二號解鎖 *[okay number two released]*
17	39	38.2	CAM	(客艙呼叫聲響) *[sound of cabin call]*

[9] Based on Kaohsiung approach time

hh[9]	mm	ss	Source	Context
17	39	38.9	INT-3	cabin is ready
17	39	41.4	INT-2	好 謝謝 *[okay thank you]*
17	39	42.4	CAM-1	嗯(um)
17	39	43.0	CAM-2	ready 了 好快啊 *[ready so fast]*
17	39	44.2	CAM-1	嗯好*[um okay]*
17	39	45.8	CAM-2	oil pressure rising i-t-t rising n-p rising
17	39	50.2	CAM	(single chime)
17	39	52.1	CAM-2	oil pressure rising n-h forty five starter light off
17	40	04.5	CAM-2	i-t-t drop and stable normal start
17	40	08.8	CAM-1	after start check
17	40	10.5	CAM-2	after start check down to the line packs and bleeds one and two
17	40	12.3	CAM-1	on
17	40	13.5	CAM-2	prop brake
17	40	14.1	CAM-1	released
17	40	14.7	CAM-2	a-d-u heading lo bank
17	40	16.2	CAM-1	check
17	40	16.3	CAM-2	么么拐 拐千 flaps *[one one seven seven thousand flaps]*
17	40	17.4	CAM-1	fifteen
17	40	18.1	CAM-2	anti skid test
17	40	18.6	CAM-1	check
17	40	19.1	CAM-2	radar
17	40	19.6	CAM-1	standby
17	40	20.2	CAM-2	after start checklist down to the line complete
17	40	25.0	CAM-1	(咳嗽聲)*[sound of coughing]*
17	40	26.7	CAM-1	(咳嗽聲)*[sound of coughing]*
17	40	35.6	CAM-1	(咳嗽聲)*[sound of coughing]*
17	40	37.5	CAM-2	single channel
17	40	42.1	RDO-2	transasia two two two request taxi
17	40	43.0	GC	教官請煞車 *[sir parking brake please]*
17	40	45.0	INT-1	煞好請撤離 *[parking brake set and you may disconnect]*
17	40	45.7	GC	byebye…
17	40	46.5	GND	transasia two two two taxi via golf sierra foxtrot holding point runway two seven
17	40	51.3	RDO-2	taxi via golf sierra foxtrot holding point runway two seven transasia two two two
17	40	55.2	CAM-2	golf sierra foxtrot 兩拐許可滑出了

hh[9]	mm	ss	Source	Context
				[golf sierra foxtrot two seven cleared to taxi]
17	40	57.4	CAM-1	嗯(um)
17	40	58.2	GC	okay 教官撤離掰 *[okay sir you're disconnected bye]*
17	40	58.4	CAM-2	after start below the line con lever one and two
17	40	59.2	INT-1	好掰*[okay bye]*
17	41	02.6	CAM-1	嗯 standby *[um standby]*
17	41	04.8	CAM-2	hydraulic pressure normal
17	41	05.9	CAM-1	uh normal
17	41	07.2	CAM-2	taxi golf sierra foxtrot 兩拐*[two seven]* gear pin inside after start check complete right side clear
17	41	11.3	CAM-1	好*[okay]*
17	41	15.4	CAM-1	taxi check please
17	41	16.7	CAM-2	taxi check taxi light
17	41	17.9	CAM-1	on
17	41	18.2	CAM-2	com hatch
17	41	19.0	CAM-1	closed
17	41	19.7	CAM-2	brakes test
17	41	20.4	CAM-1	normal
17	41	20.7	CAM-2	right side checked oxygen probes wind heating
17	41	22.4	CAM-1	on
17	41	23.1	CAM-2	flight instruments
17	41	23.6	CAM-1	check normal
17	41	24.5	CAM-2	right side checked takeoff config test
17	41	27.4	CAM-2	m-p-c 四六點三 set *[m-p-c four six point three set]*
17	41	29.9	CAM-2	takeoff briefing sosan one tango
17	41	32.5	CAM-1	嗯(um) taxi checklist complete
17	42	29.0	GND	transasia two two two ground
17	42	31.6	RDO-2	transasia two two two
17	42	33.2	GND	transasia two two two now magong airdrome on is below landing minimum say intention
17	42	40.1	CAM-1	uh hold on seg segma hold on mason
17	42	42.5	RDO-2	hold on segma
17	42	44.7	CAM-1	mason
17	42	45.1	RDO-2	oh mason transasia two two two
17	42	47.8	GND	transasia two two two roger
17	42	59.5	GND	transasia two two two holding request approved and contact tower one one eight decimal seven
17	43	05.6	RDO-2	contact tower transasia two two two

hh[9]	mm	ss	Source	Context
17	43	08.9	CAM	嘟 (無線電波道切換提醒聲響) *[sound of radio frequency switching]*
17	43	12.2	RDO-2	kaohsiung tower good afternoon transasia two two two taxi on sierra
17	43	16.8	TWR_K	transasia two two two kaohsiung tower roger
17	43	27.0	TWR_K	transasia two two two runway two seven wind two zero zero degreeree one four knots gusting two five knots cleared for takeoff
17	43	34.7	INT-1	cabin crew cleared for departure
17	43	35.7	RDO-2	cleared for departure transasia two two two
17	43	37.5	CAM-2	兩洞洞十四 gust 兩五 *[two zero zero fourteen gust two five]*
17	43	39.8	CAM-1	(咳嗽聲)*[sound of coughing]*
17	43	39.9	PA-3	(客艙廣播至 1743:49.8) *[cabin passenger announcement until 1743:49.8]*
17	43	40.1	CAM-2	許可起飛 *[cleared for takeoff]*
17	43	49.4	CAM-1	flight control check
17	43	50.1	CAM-2	left side spoiler light on
17	43	52.5	CAM-2	right side spoiler check spoiler up
17	43	54.0	CAM-1	欸 嗯 沒看到 喔好好 晚一點 *[hey um haven't seen it uh ok ok later]*
17	43	56.8	CAM-2	flight control left side spoiler light on
17	43	57.8	CAM-1	un light on
17	44	00.4	CAM-2	complete before takeoff checklist runway 兩 拐 *[two seven]* verify
17	44	03.9	CAM-1	兩拐*[two seven]*
17	44	04.4	CAM-2	flight controls
17	44	05.2	CAM-1	normal
17	44	05.8	CAM-2	right side checked c-cas
17	44	06.9	CAM-1	takeoff inhibit
17	44	08.4	CAM-2	transponder
17	44	09.4	CAM-1	altitude
17	44	09.7	CAM-2	么么拐 lights *[one one seven lights]*
17	44	11.0	CAM-1	on
17	44	11.5	CAM-2	cabin crew
17	44	12.1	CAM-1	advised
17	44	12.8	CAM-2	b air flow
17	44	13.4	CAM-1	normal
17	44	13.9	CAM-2	rudder cam
17	44	14.7	CAM-1	center

hh[9]	mm	ss	Source	Context
17	44	15.3	CAM-2	heading course
17	44	16.1	CAM-1	…
17	44	18.3	CAM-2	… set takeoff clearance received before takeoff checklist complete
17	44	23.5	CAM-1	check
17	44	25.0	CAM-2	final runway clear
17	44	28.5	CAM-2	四十四分 *[time forty four]*
17	44	35.1	CAM	(發動機轉速提高聲響) *[sound of engine rotational speed increasing]*
17	44	35.4	CAM-1	唉嘿 嗯 *[uh hey um]*
17	44	36.1	CAM-2	timing
17	44	39.8	CAM-2	a-t-p-s armed
17	44	40.8	CAM-1	notch check …
17	44	42.3	CAM-2	power set engine instrument check
17	44	44.2	CAM-1	(咳嗽聲)*[sound of coughing]*
17	44	45.4	CAM-2	normal
17	44	46.3	CAM-1	等一下*[later]*
17	44	47.2	CAM-2	seventy
17	44	48.0	CAM-1	check i have control
17	44	49.1	CAM-2	you have control engine instrument check
17	44	51.4	CAM-1	check
17	44	53.1	CAM-2	normal
17	44	53.9	CAM-1	check
17	44	57.9	CAM-2	v one v r
17	44	58.9	CAM-1	rotate
17	45	03.1	CAM-2	positive climb
17	45	03.8	CAM-1	gear up yaw damper on
17	45	04.6	CAM-2	gear up yaw damper on
17	45	07.9	CAM	(pitch trim 聲響) *[sound of pitch trim]*
17	45	08.2	CAM-1	啊*[ah]* autopilot on
17	45	09.4	CAM-2	autopilot on
17	45	17.2	CAM-2	加速高度 *[acceleration altitude]*
17	45	21.5	CAM-1	nav on
17	45	22.9	CAM-2	check
17	45	28.8	TWR_K	transasia two two two contact departure one two four decimal seven
17	45	32.2	RDO-2	contact departure one two four decimal seven transasia two two two good day

hh[9]	mm	ss	Source	Context
17	45	36.3	CAM	嘟 (無線電波道切換提醒聲響) *[sound of radio frequency switching]*
17	45	40.1	RDO-2	kaohsiung approach good evening transasia two two two passing one thousand two hundred sigang one sosan one tango departure
17	45	44.0	CAM	(pitch trim 聲響) *[sound of pitch trim]*
17	45	46.7	CAM-1	嗯(um) roger
17	45	47.1	APP	transasia two two two kaohsiung approach roger climb and maintain seven thousand
17	45	50.9	RDO-2	climb maintain seven thousand transasia two two two
17	45	52.9	CAM-2	拐千爬高保持 *[climb and maintain seven thousand]*
17	45	53.9	CAM-1	check
17	45	54.3	CAM	(pitch trim 聲響) *[sound of pitch trim]*
17	45	55.1	CAM-2	flap zero set after takeoff checklist
17	45	56.5	CAM-1	嗯(um)
17	45	57.2	CAM-2	gears up flap zero power management climb con lever auto n-p … taxi lights off anti icing off seat belts on bleed and air flow high approach brief uh after takeoff checklist complete
17	46	16.5	APP	transasia two two two squawk ident
17	46	20.4	RDO-2	ident passing one thousand niner hundred transasia two two two
17	46	25.1	APP	two two roger now radar contact two miles west of the airport climb and maintain seven thousand
17	46	29.9	RDO-2	climb and maintain seven thousand transasia two two two
17	46	32.9	CAM-2	爬高保持拐千嗯 *[climb and maintain seven thousand]*
17	46	34.4	CAM-1	嗯(um)
17	46	37.3	CAM-1	嗯(um)
17	46	50.1	OTH	(復興 2082 與 ATC 對話) *[communication between GE 2082 and ATC]*
17	46	54.4	APP	(與復興 2082 對話) *[communication with GE 2082]*
17	47	00.3	OTH	(復興 2082 與 ATC 對話) *[communication between GE 2082 and ATC]*
17	47	04.5	APP	(與復興 2082 對話) *[communication with GE 2082]*
17	47	06.3	CAM-2	喔 sosan approach 航向三么洞 *[ah sosan approach heading three one zero]*
17	47	09.0	OTH	(復興 2082 與 ATC 對話) *[communication between GE 2082 and ATC]*

hh[9]	mm	ss	Source	Context
17	47	12.4	APP	two two two direct magong v-o-r
17	47	15.2	RDO-2	roger direct to magong v-o-r transasia two two two
17	47	18.0	APP	(與港龍 432 對話) *[communication with KA 432]*
17	47	19.4	CAM-2	好馬公 v-o-r *[okay magong v-o-r]*
17	47	21.0	CAM-1	check
17	47	21.5	OTH	(港龍 432 與 ATC 對話) *[communication between KA 432 and ATC]*
17	47	23.1	CAM-2	…
17	47	24.0	CAM-1	好*[okay]*
17	47	28.0	CAM-1	mason 啊 … 洞四九 *[mason ah … zero four nine]*
17	48	04.6	CAM-1	那 有沒有 mason 啊 *[that is mason there ah]*
17	48	07.1	CAM-2	好教官加一個 mason *[okay sir insert mason]*
17	48	09.8	CAM-1	magong
17	48	10.8	CAM-2	好 先 magong *[okay magong first]*
17	48	12.0	CAM-1	m-a-s-o-n 嗯(um)
17	48	19.0	APP	(與復興 2082 對話) *[communication with GE 2082]*
17	48	22.9	OTH	(復興 2082 與 ATC 對話) *[communication between GE 2082 and ATC]*
17	49	01.5	CAM	嘟嘟 (客艙安全帶提示聲響) *[sound of seat belt reminder]*
17	49	17.2	APP	(與復興 2082 對話) *[communication with GE 2082]*
17	49	26.8	OTH	(復興 2082 與 ATC 對話) *[communication between GE 2082 and ATC]*
17	49	33.1	APP	transasia two two two traffic at your two o-clock five miles southeast bound same company a-t-r leaving eight thousand four hundred to eight thousand
17	49	43.2	RDO-2	information looking transasia two two two
17	49	44.8	CAM	(高度提示聲響) *[sound of altitude alert]*
17	49	46.4	CAM-1	(咳嗽聲)*[sound of coughing]*
17	49	46.9	CAM	(高度提示聲響) *[sound of altitude alert]*
17	49	47.1	CAM-2	one thousand to go
17	49	47.9	CAM-1	check
17	49	49.5	CAM-2	兩點鐘五浬八千四下到八千 *[two o'clock five miles eight thousand four hundred*

hh[9]	mm	ss	Source	Context
				descending to eight thousand]
17	49	54.5	CAM	(不明聲響數聲至 1750:00.7) *[some unidentified sound until 1750:00.7]*
17	50	00.9	PA-4	(客艙廣播至 1752:48.9) *[cabin announcement until 1752:48.9]*
17	50	12.6	APP	(與復興 2082 對話) *[communication with GE 2082]*
17	50	16.1	OTH	(復興 2082 與 ATC 對話) *[communication between GE 2082 and ATC]*
17	50	37.4	APP	(與復興 2082 對話) *[communication with GE 2082]*
17	50	40.6	OTH	(復興 2082 與 ATC 對話) *[communication between GE 2082 and ATC]*
17	50	50.7	CAM-2	altitude star
17	50	52.0	CAM-1	對七千 *[yes seven thousand]*
17	51	01.8	CAM-2	altitude check 拐千*[seven thousand]*
17	51	06.8	CAM-1	check
17	51	27.4	CAM-1	cruise check
17	51	28.1	CAM-2	cruise check power management
17	51	29.0	CAM-1	cruise
17	51	29.6	CAM-2	altimeter 九九九*[nine nine nine]*
17	51	30.7	CAM-1	九九九*[nine nine nine]* set
17	51	32.1	CAM-2	altitude 拐千*[seven thousand]*
17	51	33.1	CAM-1	check
17	51	33.3	CAM-2	速 度 么 九 四 加 速 中 *[airspeed one nine four and increasing]* cruise check complete
17	51	35.1	CAM-1	check 好*[okay]*
17	51	36.6	CAM-2	我聽 a-tis *[let me listen to a-tis]*
17	51	37.7	CAM	(ATIS information kilo)
17	51	55.5	APP	(與復興 2082 對話) *[communication with GE 2082]*
17	51	58.6	OTH	(復興 2082 與 ATC 對話) *[communication between GE 2082 and ATC]*
17	52	45.2	CAM-1	… check 那 broken 是 broken 是多少 *[... check that broken how high is the broken]*
17	52	46.2	CAM	(嘟) *[toot]*
17	52	47.9	CAM-2	六百*[six hundred]*
17	52	48.7	CAM-1	六百喔*[six hundred uh]*
17	52	49.5	CAM-2	對*[yes]*
17	52	50.3	CAM-2	scatter 兩百 broken 六百 few c-b 是一千二 overcast

hh[9]	mm	ss	Source	Context
				是一千六 *[scatter two hundred broken six hundred few c-b at one thousand two hundred overcast at one thousand six hundred]*
17	52	53.9	CAM-1	喔*[oh]*
17	52	54.6	CAM-2	然後二十四度二十二 九九三 *[then twenty four degreeree twenty two nine nine three]*
17	52	56.4	CAM-1	喔*[oh]*
17	52	57.4	CAM-2	能見度在八百呎*[visibility eight hundred feet]* r-a thunder visibility thunderstorm
17	52	59.2	CAM-1	喔*[oh]*
17	53	01.6	CAM-1	喔*[oh]*
17	53	01.9	CAM-2	below minimum 么九洞二十一 gust 三兩 *[below minimum one nine zero twenty one gust three two]*
17	53	05.5	CAM-1	喔*[oh]*
17	53	10.1	CAM-1	啊 (咳嗽聲)*[ah] [sound of coughing]*
17	53	19.4	APP	(與復興 2082 對話) *[communication with GE 2082]*
17	53	22.4	OTH	(復興 2082 與 ATC 對話) *[communication between GE 2082 and ATC]*
17	53	25.3	APP	(與復興 2082 對話) *[communication with GE 2082]*
17	53	26.4	CAM	(客艙安全帶提示聲響) *[sound of seat belt reminder]*
17	53	33.1	OTH	(復興 2082 與 ATC 對話) *[communication between GE 2082 and ATC]*
17	53	33.8	PA-4	(客艙廣播至 1753:54.9) *[cabin announcement until 1753:54.9]*
17	54	17.9	OTH	(國泰航機對話) *[communication between Cathay Pacific aircraft]*
17	54	25.3	OTH	(廈航 863 與 ATC 對話) *[communication between MF 863 and ATC]*
17	54	33.0	APP	(與廈航 863 對話) *[communication with MF 863]*
17	54	44.8	OTH	(廈航 863 與 ATC 對話) *[communication between MF 863 and ATC]*
17	54	58.1	CAM-1	(打哈欠聲) *[sound of yawning]*
17	55	04.1	CAM-1	嗯九九六嘛喔 *[um nine nine six right]*
17	55	05.2	OTH	(復興 2093 與 ATC 對話) *[communication between GE 2093 and ATC]*

hh[9]	mm	ss	Source	Context
17	55	06.5	CAM-2	九九三 *[nine nine three]*
17	55	07.2	CAM-1	九九三啊 *[nine nine three ah]*
17	55	12.4	APP	(與復興 2093 對話) *[communication with GE 2093]*
17	55	16.6	OTH	(復興 2093 與 ATC 對話) *[communication between GE 2093 and ATC]*
17	55	19.9	APP	transasia two two two contact kaohsiung approach one two eight decimal one good day
17	55	23.4	RDO-2	contact kaohsiung approach one two eight decimal one good day transasia two two two
17	55	26.8	CAM	嘟 (無線電波道切換提醒聲響) *[sound of radio frequency switching]*
17	55	27.0	APP	(與立榮 647 對話) *[communication with B7 647]*
17	55	36.4	RDO-2	kaohsiung approach good evening transasia two two two south east four two d-m-e direct to magong v-o-r maintain seven thousand information kilo
17	55	49.2	APP	uh transasia two two two kaohsiung approach roger now direct segma initially
17	55	56.7	CAM-2	check squawk
17	55	57.5	APP	transasia two two two kaohsiung
17	55	59.4	RDO-2	uh transasia two two two direct to segma trans two two two
17	56	04.8	CAM-2	segma
17	56	06.0	OTH	(立榮 647 與 ATC 對話) *[communication between B7 647 and ATC]*
17	55	09.6	APP	(與立榮 647 對話) *[communication with B7 647]*
17	56	11.3	CAM-2	e-g-m-a
17	56	14.4	CAM-2	g
17	56	15.5	OTH	(立榮 647 與 ATC 對話) *[communication between B7 647 and ATC]*
17	56	17.1	CAM-2	喔*[oh]*
17	56	18.0	APP	transasia two two two for your information magong airport now below landing minimum
17	56	23.4	RDO-2	copy that request hold at segma transasia two two two
17	56	27.9	APP	transasia two two two roger maintain seven thousand direct segma join holding pattern report join
17	56	34.5	RDO-2	maintain seven thousand direct to segma and join holding pattern report join transasia two two two
17	56	41.6	CAM-2	好*[okay]* segma report
17	56	42.8	CAM-1	segma 么三五*[one three five]*
17	56	46.3	CAM-2	么三五*[one three five]*

hh[9]	mm	ss	Source	Context
17	56	48.7	CAM-1	哇*[wow]*
17	56	50.2	CAM-2	教官我們右偏了喔 *[sir we are deviating to the right oh]*
17	56	50.7	APP	復興兩兩兩遠東三洞伍伍高雄 *[kaohsiung approach call GE 222 and FE 3055]*
17	56	56.8	APP	最新的顯著危害天氣在馬公機場接下來的兩小時能見度大約是么千兩百公尺有 有雷雨有霧裂雲兩百 *[latest sigmet forcasts magong airport visibility 1,200 meters thunderstorm fog scatter 200 for the next two-hour]*
17	57	09.7	CAM-2	喔*[oh]*
17	57	11.4	RDO-2	復興兩兩兩抄收 *[GE222 copy that]*
17	57	12.9	APP	謝謝各位 *[thanks all]*
17	57	14.8	CAM-2	兩個小時能見度一千二 有雷雨 有霧 *[visibility 1,200 meters thunderstorm fog for two-hour]*
17	57	19.1	CAM-1	喔*[oh]*
17	57	19.8	CAM-2	然後裂雲 這個 scatter 兩百 *[then scatter scatter 200]*
17	57	25.5	CAM-1	一千二 我們要一千六 *[one thousand two hundred we need one thousand six hundred]*
17	57	27.7	CAM-2	報告教官 是 *[affirmative sir]*
17	57	34.3	APP	(與立榮 895 對話) *[communication with B7 895]*
17	57	43.5	OTH	(立榮 647 與 ATC 對話) *[communication between B7 647 and ATC]*
17	57	48.6	APP	(與立榮 647 對話) *[communication with B7 647]*
17	57	52.3	OTH	(立榮 647 與 ATC 對話) *[communication between B7 647 and ATC]*
17	58	01.6	APP	(與立榮航機對話) *[communication with Uni Air flight]*
17	58	08.8	OTH	(其他航機對話) *[communication with other aircraft]*
17	58	13.8	CAM-1	看起來好像還好 *[seems to be ok]*
17	58	14.1	APP	(與遠東 3055 對話) *[communication with FE 3055]*
17	58	17.5	CAM-2	就是那 那一塊啊 *[that that's the one]*
17	58	17.7	CAM-1	欸 欸*[hey hey]*
17	58	19.7	APP	(與遠東 3055 對話)

hh[9]	mm	ss	Source	Context
				[communication with FE 3055]
17	58	19.9	CAM-2	紅色的很糟　後面好像還好 *[the red one is much worse　looks ok behind it]*
17	58	29.1	CAM-1	segma
17	58	29.4	APP	(與華信 786 對話) *[communication with AE 786]*
17	58	31.5	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
17	58	36.2	APP	(與華信 786 對話) *[communication with AE 786]*
17	58	41.7	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
17	58	42.7	CAM-2	segma 是飛 *[to sigma via where]*
17	58	43.6	APP	(與華信 786 對話) *[communication with AE 786]*
17	58	47.5	CAM-2	一分鐘我們是要跟他申請　要不要十浬 *[we request one minute　or ten miles]*
17	58	50.6	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
17	58	52.5	CAM-1	嗯嗯*[um um]*
17	58	53.7	CAM-2	啊*[ah]*
17	58	54.2	CAM-1	沒關係等一下他 *[it is okay　let's wait awhile for him]*
17	58	55.2	APP	(與華信 786 對話) *[communication with AE 786]*
17	58	55.6	CAM-2	好*[okay]*
17	58	58.5	CAM-1	啊直接加入 *[ah direct entry]*
17	58	59.4	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
17	59	00.4	CAM-2	教官我們加入是　是那個 *[sir which　which one for us to direct to]*
17	59	03.1	CAM-1	直接加入　我知道　你 … *[direct entry　I know　you]*
17	59	05.3	CAM-2	知道 *[I see]*
17	59	05.5	CAM-1	holding 待命邊啊*[join holding pattern]*
17	59	06.7	CAM-2	知道 holding 是要 hold 一分鐘還是 hold 距離 *[I know it's holding　but to hold by leg length in one minute or by distance]*
17	59	09.0	CAM-1	hold 啊 hold 距離 *(hold ah hold by distance]*
17	59	10.4	CAM-2	hold 距離 那我跟他申請

hh[9]	mm	ss	Source	Context
				[hold by distance I would request from ATC]
17	59	13.7	CAM-1	喔五浬*[oh five miles]*
17	59	14.4	CAM-2	五浬 好*[five miles roger]*
17	59	23.1	CAM-1	segma 十三*[thirteen]*
17	59	25.6	CAM-1	等一下再申請 *[request later]*
17	59	26.7	CAM-2	喔喔 (笑聲) *[oh oh laughing]*
17	59	27.0	APP	(與立榮 647 對話) *[communication with B7 647]*
17	59	30.2	OTH	(立榮 647 與 ATC 對話) *[communication between B7 647 and ATC]*
17	59	34.2	APP	(與立榮 647 對話) *[communication with B7 647]*
17	59	37.2	OTH	(立榮 647 與 ATC 對話) *[communication between B7 647 and ATC]*
17	59	38.0	CAM-2	等一下*[later]*
17	59	38.1	OTH	(華信 786 與 ATC 對話) *[communication between B7 647 and ATC]*
17	59	41.2	CAM-2	... 應該就是這一條 thunderstorm 過來就好了 *[... these squall line thunderstorms should be the one would be great if they move this way]*
17	59	42.0	APP	(與華信 786 對話) *[communication with AE 786]*
17	59	46.2	CAM-1	喔*[oh]*
17	59	47.1	CAM-2	現在是吹西南風 吹過去 *[now wind from southwest blows them over]*
17	59	47.1	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
17	59	50.9	APP	(與華信 786 對話) *[communication with AE 786]*
17	59	56.1	APP	(與華信 786 對話) *[communication with AE 786]*
18	00	04.4	APP	(與立榮 895 對話) *[communication with B7 895]*
18	00	16.6	CAM-1	mason mason mason
18	00	20.4	APP	(與立榮 647 對話) *[communication with B7 647]*
18	00	24.0	OTH	(立榮 647 與 ATC 對話) *[communication between B7 647 and ATC]*
18	00	28.3	CAM-1	四九*[four nine]*
18	00	30.9	CAM-1	唉 (咳嗽聲)*[sigh [sound of coughing]]*
18	00	36.3	CAM-1	請求在 mason 待命喔 *[request holding at mason]*

hh[9]	mm	ss	Source	Context
18	00	37.9	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	00	39.5	CAM-2	好*[okay]*
18	00	41.2	CAM-1	等一下喔*[later]*
18	00	45.1	CAM-2	等一會你說要我我再 我再講好了 *[later when you ask me to I will tell them]*
18	00	46.4	CAM-1	好*[okay]*
18	00	46.8	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	00	55.6	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	00	58.4	CAM	嘟 (無線電波道切換提醒聲響) *[sound of radio frequency switching]*
18	01	00.9	CAM	(ATIS information lima)
18	01	08.1	APP	(與其他航機對話) *[communication with other aircraft]*
18	01	10.8	CAM-2	在換天氣了 *[weather is changing]*
18	01	11.8	APP	(與華信 786 對話) *[communication with AE 786]*
18	01	16.5	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	01	19.5	APP	(與華信 786 對話) *[communication with AE 786]*
18	01	20.3	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	01	49.1	APP	(與立榮 6295 對話) *[communication with B7 6295]*
18	01	53.4	CAM-1	好 我們請求請求定向 mason mason 待命 *[okay we request request direct to mason to hold at mason]*
18	01	55.0	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	01	57.1	CAM-2	好 定向五浬 *[okay direct course by five miles]*
18	02	00.0	CAM-1	欸對 *[um yes]*
18	02	02.0	RDO-2	transasia two two two request direct to mason and join holding pattern at five mile leg
18	02	10.5	APP	confirm far eastern tree zero five five
18	02	12.3	RDO-2	negative transasia two two two
18	02	14.4	APP	transasia two two two roger approved as requested maintain seven thousand
18	02	18.2	RDO-2	maintain seven thousand direct to mason transasia two two two

hh[9]	mm	ss	Source	Context
18	02	20.5	CAM	(ATIS information lima)
18	02	25.8	APP	(與其他航機對話) *[communication with other aircraft]*
18	02	39.5	APP	(與立榮 647 對話) *[communication with B7 647]*
18	02	44.1	OTH	(立榮 647 與 ATC 對話) *[communication between B7 647 and ATC]*
18	03	00.3	CAM-2	好 *[okay]* information lima
18	03	02.4	CAM	嘟(無線電波道切換提醒聲響) *[sound of radio frequency switching]*
18	03	03.2	CAM-2	lima 還是一樣　能見度八百 *[still lima　visibility eight hundred]*
18	03	05.0	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	03	11.6	APP	(與華信 786 對話) *[communication with AE 786]*
18	03	15.0	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	03	17.5	APP	(與華信 786 對話) *[communication with AE 786]*
18	03	19.6	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	03	21.9	APP	(與立榮 6295 對話) *[communication with B7 6295]*
18	03	29.0	APP	(與立榮 6295 對話) *[communication with B7 6295]*
18	03	39.4	APP	(與立榮 647 對話) *[communication with B7 647]*
18	03	44.1	OTH	(立榮 647 與 ATC 對話) *[communication between B7 647 and ATC]*
18	03	46.7	APP	(與立榮 647 對話) *[communication with B7 647]*
18	03	50.3	OTH	(立榮 647 與 ATC 對話) *[communication between B7 647 and ATC]*
18	03	52.4	APP	transasia two two two information lima
18	03	54.6	RDO-2	good day information lima transasia two two two 謝謝 *[thank you]*
18	03	58.9	CAM-2	lima
18	03	59.7	CAM-1	喔 lima *[oh lima]*
18	04	01.3	OTH	(復興 2093 與 ATC 對話) *[communication between GE 2093 and ATC]*
18	04	05.6	APP	(與復興 2093 對話) *[communication with GE 2093]*

hh[9]	mm	ss	Source	Context
18	04	05.7	CAM-1	(咳嗽聲)*[sound of coughing]*
18	04	10.7	OTH	(復興 2093 與 ATC 對話) *[communication between GE 2093 and ATC]*
18	04	14.3	APP	transasia two two two descend and maintain six thousand transasia two two two
18	04	14.4	CAM-1	嘿呀*[hey yes]*
18	04	18.9	RDO-2	descend and maintain six thousand transasia two two two
18	04	20.6	PA-1	各位女士各位先生 下午好 這是機長報告 歡迎您搭乘本班機從高雄到澎湖 目前通過台南外海 飛行高度七千英呎 平均速度每小時 嗯 三百公里 因為馬公 現在目前的天氣是低於起降 我們預計在馬公的北面待命 有進一步的天氣消息我們會再向您報告 祝您身體 身體健康 謝謝 *[ladies and gentlemen good afternoon this is captain speaking welcome onboard our flilght from kaohsiung to penghu we are now flying over tainan at an altitude of seven thousand feet with an average speed of um three hundred kilometers per hour due to current weather condition magong is below landing minimum we will be holding at the north of magong and I will keep you updated on further weather information wish you a good day thank you]*
18	04	24.7	CAM	(高度提示聲響) *[sound of altitude alert]*
18	04	26.4	CAM-2	one thousand to go
18	04	29.5	APP	(與其他航機對話) *[communication with other aircraft]*
18	04	55.9	APP	(與立榮 647 對話) *[communication with B7 647]*
18	04	57.7	CAM-2	航向保持六千 …速度在一百八 *[remain heading maintain six thousand… speed one eighty]*
18	04	58.6	OTH	(立榮 647 與 ATC 對話) *[communication between B7 647 and ATC]*
18	05	01.1	CAM-1	好*[okay]*
18	05	01.8	CAM-2	no change
18	05	03.7	CAM-1	yah i have control
18	05	04.5	CAM-2	you have control
18	05	05.0	APP	(與立榮 647 對話) *[communication with B7 647]*
18	05	08.1	OTH	(立榮 647 與 ATC 對話) *[communication between B7 647 and ATC]*
18	05	13.3	APP	(與立榮 647 對話) *[communication with B7 647]*

hh[9]	mm	ss	Source	Context
18	05	15.3	OTH	(立榮 647 與 ATC 對話) *[communication between B7 647 and ATC]*
18	05	18.8	APP	(與立榮 6295 對話) *[communication with B7 6295]*
18	05	23.5	CAM-1	兩兩九 啊 平行 平行加入好了喔 *[two two nine uh parallel parallel entry]*
18	05	25.2	OTH	(立榮 6295 與 ATC 對話) *[communication between B7 6295 and ATC]*
18	05	31.7	CAM-2	兩兩九*[two two nine]*
18	05	31.9	APP	(與立榮 6295 對話) *[communication with B7 6295]*
18	05	38.0	OTH	(立榮 6295 與 ATC 對話) *[communication between B7 6295 and ATC]*
18	05	46.9	OTH	(立榮 786 與 ATC 對話) *[communication between B7 786 and ATC]*
18	05	51.5	APP	(與立榮 786 對話) *[communication with B7 786]*
18	05	54.4	OTH	(立榮 786 與 ATC 對話) *[communication between B7 786 and ATC]*
18	05	57.2	CAM	(高度提示聲響) *[sound of altitude alert]*
18	05	59.7	PA-1	cabin crew turbulence
18	06	01.4	OTH	(復興 2093 與 ATC 對話) *[communication between GE 2093 and ATC]*
18	06	04.9	APP	(與復興 2093 對話) *[communication with GE 2093]*
18	06	07.5	OTH	(復興 2093 與 ATC 對話) *[communication between GE 2093 and ATC]*
18	06	08.5	PA-4	(客艙廣播至 1806:30.1) *[cabin announcement until 1806:30.1]*
18	06	11.5	CAM-2	這個 有紫色的 *[this one it has purple color]*
18	06	13.5	CAM-1	欸奇怪怎麼 看起來沒看到東西啊 *[hey it is strange and didn't seem to have this within]*
18	06	16.8	CAM-2	對啊*[right]*
18	06	19.3	CAM-2	altitude star
18	06	20.5	CAM-1	check set
18	06	24.2	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	06	27.8	APP	(與華信 786 對話) *[communication with AE 786]*
18	06	30.8	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	06	38.7	CAM-2	altitude capture 六千 *[six thousand]*

hh[9]	mm	ss	Source	Context
18	06	41.0	CAM-1	check
18	06	47.2	CAM	(不明聲響) *[unidentified sound]*
18	06	50.7	CAM-1	欸 (咳嗽聲)*[um [sound of coughing]]*
18	07	04.2	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	07	08.4	APP	(與華信 786 對話) *[communication with AE 786]*
18	07	10.9	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	07	12.4	APP	(與華信 786 對話) *[communication with AE 786]*
18	07	17.8	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	07	21.5	APP	(與華信 786 對話) *[communication with AE 786]*
18	07	24.1	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	07	29.8	APP	(與立榮 647 對話) *[communication with B7 647]*
18	07	33.0	OTH	(立榮 647 與 ATC 對話) *[communication between B7 647 and ATC]*
18	07	36.3	APP	(與立榮 647 對話) *[communication with B7 647]*
18	07	55.1	CAM-1	嗯*[um]*
18	08	06.1	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	08	32.6	CAM-1	(咳嗽聲)*[sound of coughing]*
18	08	38.0	CAM-1	剛剛看 mason 還不錯 怎麼* 吹過來了 *[mason was looking good moments ago what the * it was blown to here]*
18	08	41.2	CAM-2	風吹進來嘛 *[wind blows it here]*
18	08	42.1	CAM-1	喔*[oh]*
18	09	01.4	APP	(與立榮 692 對話) *[communication with B7 692]*
18	09	05.3	OTH	(立榮 692 與 ATC 對話) *[communication between B7 692 and ATC]*
18	09	08.3	APP	(與立榮 692 對話) *[communication with B7 692]*
18	09	11.3	OTH	(立榮 692 與 ATC 對話) *[communication between B7 692 and ATC]*
18	09	14.8	APP	(與立榮 692 對話) *[communication with B7 692]*

hh[9]	mm	ss	Source	Context
18	09	19.0	OTH	(立榮 692 與 ATC 對話) *[communication between B7 692 and ATC]*
18	09	31.6	CAM-2	喔兩兩九*[oh two two nine]*
18	09	32.7	CAM-1	喔來我們請求那個航向三兩洞加入那個馬公的兩洞么的十三浬 待命 好就 *[oh let us request heading three two zero to join the holding pattern of one three dme from magong two zero one okay]*
18	09	39.1	CAM-2	okay
18	09	40.5	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	09	46.5	RDO-2	transasia two two two request heading tree two zero and join correction tree one zero turn left heading and join magong two zero one one tree d-m-e
18	09	50.3	CAM-1	tree one zero
18	10	01.5	APP	transasia two two two approved as requested
18	10	05.0	CAM-2	三么洞*[three one zero]*
18	10	05.1	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	10	06.7	CAM-1	三么洞*[three one zero]*
18	10	15.2	CAM-2	啊*[uh]*
18	10	15.8	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	10	17.7	CAM-1	啊啊 * 我好累啊 *[uh uh I am so * tired]*
18	10	28.4	CAM-2	教官那要在這邊做 *[sir are we holding here]*
18	10	30.4	CAM-1	對*[yes]*
18	10	30.9	CAM-2	right orbit 還是 left orbit *[right orbit or left orbit]*
18	10	32.5	CAM-1	沒有沒有 那個 這麼做 做做 右轉的 待命航線 *[no not that this will do do right orbit holding pattern]*
18	10	37.3	CAM-2	okay
18	10	38.2	APP	(與立榮 692 對話) *[communication with B7 692]*
18	10	40.5	CAM-2	兩洞么 *[two zero one]*
18	10	44.2	OTH	(立榮 692 與 ATC 對話) *[communication between B7 692 and ATC]*
18	10	51.1	RDO-2	transasia two two two ah request magong two zero one one tree d-m-e right pattern
18	10	59.7	APP	transasia two two two approved as requested
18	11	02.0	RDO-2	thank you

hh[9]	mm	ss	Source	Context
18	11	03.0	CAM-1	唉*[sigh]*
18	11	04.5	APP	(與復興 2093 對話) *[communication with GE 2093]*
18	11	08.3	OTH	(復興 2093 與 ATC 對話) *[communication between GE 2093 and ATC]*
18	11	11.6	CAM-2	噢加入我跟他報 *[oh established I will report to him]*
18	11	13.4	CAM-1	好*[okay]*
18	11	16.7	RDO-2	transasia two two two join uh holding pattern request five mile leg
18	11	17.7	CAM-1	嗯*[um]*
18	11	21.3	APP	transasia two two two approved as requested
18	11	23.5	CAM-1	對*[yes]*
18	11	23.9	RDO-2	thank you transasia two two two
18	11	25.4	APP	(與其他航機對話) *[communications with other aircraft]*
18	11	25.4	CAM-2	好*[okay]*
18	11	36.6	CAM-1	嗯*[um]*
18	11	42.1	CAM-1	噢 一下子就吹掉 *[oh blown away immediately]*
18	11	46.0	CAM-2	嗯*[um]*
18	11	47.4	APP	(與其他航機對話) *[communication with other aircraft]*
18	11	50.7	CAM-2	五浬的 leg *[five mile leg]*
18	11	52.1	CAM-1	唉*[sigh]*
18	11	53.7	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	12	08.5	CAM-1	啊 十三浬三千 五浬的兩千 *[ah thirteen dme three thousand five dme two thousand]*
18	12	13.1	CAM-2	么八 么八也是五浬 *[one eight one eight reaches five miles too]*
18	12	15.0	CAM-1	嗯 嗯啊*[um um]*
18	12	16.3	CAM-2	沒有我說我們 holding 的話是 十 十八浬的時候再右轉回來 *[no I said if we're holding we have to turn inbound at one one eight dme]*
18	12	16.5	APP	(與復興 5133 對話) *[communication with GE 5133]*
18	12	24.9	CAM-1	唉 兩洞么噢 *[sigh two zero one]*
18	12	27.9	CAM-2	course 是兩洞么 *[course is two zero one]*

hh[9]	mm	ss	Source	Context
18	12	29.1	CAM-1	好　洞兩　這是洞兩么的噢 *[okay　zero two　this is zero two one]*
18	12	31.7	CAM-2	教官　我現在先設 兩洞么　因為我們現在是風修嘛噢 *[sir　I will initially set two zero one　because we need this wind correction]*
18	12	34.5	CAM-1	好*[okay]*
18	12	35.2	CAM-2	我們現在做風修啊 *[we can have this wind correction now]*
18	12	39.3	CAM-1	欸*[um]*
18	12	43.4	CAM-1	喔這樣喔*[oh I see]*
18	12	54.0	CAM-2	等一下要轉到　多少　兩三么吧　風那麼大 *[later we need to turn to　how much　two three one wind is so strong]*
18	13	04.3	CAM-1	嗯*[um]*
18	13	12.2	CAM-2	好教官五浬到 *[okay sir here comes the five miles]*
18	13	14.2	CAM-1	好*[okay]*
18	13	25.7	APP	(與立榮 6295 對話) *[communication with B7 6295]*
18	13	34.7	APP	(與立榮 6295 對話) *[communication with B7 6295]*
18	13	38.1	CAM-2	兩三么　我看看 *[two three one　let me see]*
18	13	50.2	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	14	12.8	APP	(與華信 786 對話) *[communication with AE 786]*
18	14	24.0	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	14	29.5	APP	(與華信 786 對話) *[communication with AE 786]*
18	14	31.4	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	14	36.4	APP	(與復興 2093 對話) *[communication with GE 2093]*
18	14	40.9	OTH	(復興 2093 與 ATC 對話) *[communication between GE 2093 and ATC]*
18	14	43.6	APP	(與立榮 6295 對話) *[communication with B7 6295]*
18	14	53.9	CAM-1	看一下*[take a look]*
18	15	02.6	CAM-2	快要　嗯　thunderstorm 快要吹過來了 *[coming um　thunderstorm is gonna be blown toward us]*
18	15	06.0	CAM-1	喔*[oh]*

hh[9]	mm	ss	Source	Context
18	15	06.6	CAM-2	對啊所以馬公　可能我們就第一架下去了 *[yes so magong　we may the first one for the approach]*
18	15	12.3	CAM-1	嗯啊*[um uh]*
18	15	13.9	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	15	19.7	APP	(與華信 786 對話) *[communication with AE 786]*
18	15	25.6	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	15	34.0	APP	(與復興 5133 對話) *[communication with GE 5133]*
18	15	37.0	OTH	(長榮航機間通話) *[communication between BR flights]*
18	15	41.5	OTH	(其他航機通聯) *[other aircraft communication]*
18	15	48.2	OTH	(其他航機通聯) *[other aircraft communication]*
18	15	52.8	OTH	(其他航機通聯) *[other aircraft communication]*
18	15	57.9	CAM-1	躲它一下好了 *[better evade it]*
18	15	58.3	OTH	(其他航機通聯) *[other aircraft communication]*
18	15	59.9	CAM-2	抄收*[copy that]*
18	16	01.4	APP	(與立榮 786 對話) *[communication with B7 786]*
18	16	03.2	CAM-2	那我們剛好跟他錯開啊 右邊這一塊剛好錯開 *[then we happen to circumvent it　happens to circumvent the right side one]*
18	16	07.1	CAM-1	喔*[oh]*
18	16	07.8	CAM-2	對啊*[yes]*
18	16	18.4	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	16	20.5	OTH	(長榮 758 與 ATC 對話) *[communication between BR 758 and ATC]*
18	16	22.2	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	16	28.6	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	16	36.5	CAM-1	來問一下天氣有沒有轉好　我們請求繼續進場 *[ask whether the weather is getting better　we request to continue the approach]*
18	16	41.5	CAM-1	有沒有 tempo 喔 *[any tempo]*

hh[9]	mm	ss	Source	Context
18	16	42.8	APP	(與華信 786 對話) *[communication with AE 786]*
18	16	43.5	CAM-2	好*[okay]*
18	16	46.5	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	16	50.4	RDO-2	高雄復興兩兩兩 嗯 check 馬公天氣是否好轉可以的話我們就申請進場 *[kaohsiung transasia two two two um is magong weather getting better and if yes we will request for approach]*
18	16	54.4	CAM-1	tempo 的天氣 *[tempo weather]*
18	16	55.9	APP	好的我幫你申我幫你詢問一下 *[okay i will apply for I will inquire about it for you]*
18	16	58.1	CAM-1	短暫的好天氣 *[temporary good weather]*
18	17	00.5	CAM-2	好*[okay]*
18	17	15.4	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	17	20.4	OTH	(長榮 758 與 ATC 對話) *[communication between BR 758 and ATC]*
18	17	29.9	CAM-2	好教官十三浬到 我們 要再轉一個 holding 喔 *[okay sir here is the one three dme we are going to turn for another holding orbit]*
18	17	35.1	CAM-1	對啊那呢要轉 那就左轉喔 *[yes then if turn needed turn left]*
18	17	38.3	CAM-2	左轉 orbit *[left turn orbit]*
18	17	39.6	CAM-1	好*[okay]*
18	17	40.8	RDO-2	transasia two two two request left turn orbit one orbit
18	17	45.3	APP	transasia two two two approved as requested
18	17	48.1	RDO-2	left turn one orbit transasia two two two
18	17	50.2	CAM-2	好左轉 one orbit *[okay left turn one orbit]*
18	17	56.4	CAM-1	看樣子啊 看 看起來都已經好了 *[it seems to look look like it is clear]*
18	17	58.8	CAM-2	要過了啊 *[it is passing over]*
18	17	59.9	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	18	04.1	CAM-2	教官我聽一下好了 *[sir I will listen to it]*
18	18	05.4	CAM-1	好*[okay]*
18	18	06.5	CAM	嘟 (無線電波道切換提醒聲響)

hh[9]	mm	ss	Source	Context
				[sound of radio frequency switching]
18	18	06.6	CAM	(ATIS information lima)
18	18	08.1	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	18	12.3	CAM-2	還是 lima 沒變 *[still lima]*
18	18	16.3	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	18	20.9	CAM	嘟 (無線電波道切換提醒聲響) *[sound of radio frequency switching]*
18	18	21.7	CAM-2	教官 lima 沒變 *[sir still lima]*
18	18	23.1	CAM-1	喔喔*[oh oh]*
18	18	24.4	CAM-2	嗯討厭耶*[um annoying]*
18	18	40.5	B7 647	approach 立榮 嗯 六四拐請問現在要往 馬公的航機有幾架在待命 *[approach glory um six four seven how many aircraft to magong are holdind now]*
18	18	46.1	APP	有四架 包含您是四架 您是第一架 *[there are four including you and you are the first]*
18	18	49.5	B7 647	了解*[roger]*
18	18	51.4	APP	教官請問您的意向 *[sir say your intention please]*
18	18	54.0	B7 647	要等你們給我們天氣我們再做判斷 *[we will make our decision after the weather you provide us]*
18	18	56.8	APP	好的我們已經請塔台去 詢問了謝謝 *[okay we already have the tower to inquire about it thank you]*
18	19	00.4	CAM-2	天氣 天氣都不好 (笑聲) *[weather weather is not good [laughing]]*
18	19	00.5	B7 647	謝謝*[thank you]*
18	19	21.3	APP	(與華信 786 對話) *[communication with AE 786]*
18	19	25.1	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	19	29.4	APP	(與華信 786 對話) *[communication between AE 786 and ATC]*
18	19	32.4	OTH	(華信 786 與 ATC 對話)
18	19	35.5	APP	(與華信 786 對話) *[communication with AE 786]*
18	19	44.4	CAM-2	那要轉多少 *[to which shall we switch to]*
18	19	46.3	CAM	嘟 (無線電波道切換提醒聲響)

hh[9]	mm	ss	Source	Context
				[sound of radio frequency switching]
18	19	46.9	CAM-2	好*[okay]*
18	19	47.6	CAM-1	守聽一下*[listening watch for awhile]*
18	19	48.6	CAM-2	okay
18	19	52.3	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	19	57.1	CAM-1	唉*[sigh]*
18	19	58.2	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	20	14.5	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	20	35.5	CAM-1	那就這樣亂轉喔 躲天氣就亂轉囉 *[then we're turning randomly turn randomly to dodge the weather]*
18	20	39.1	CAM-2	反正 orbit 就是我們的啊 這個空域都是我們的啊 *[anyway the orbit is ours this whole area is ours]*
18	20	42.0	CAM-1	好*[okay]*
18	20	51.1	CAM-1	看樣子是蠻好的*[looks pretty good]*
18	20	54.5	CAM-2	嗯*[um]*
18	20	59.5	CAM-1	嗯好*[um okay]*
18	20	59.9	APP	(與復興 5133 對話) *[communication with GE 5133]*
18	21	01.7	CAM-2	快過完了啊 那個 thunderstorm 就快過完了 *[almost completely passing through the thunderstorm is about to pass over soon]*
18	21	04.7	CAM-1	對啊*[yes]*
18	21	12.8	APP	(與華信 786 對話) *[communication with AE 786]*
18	21	17.5	CAM-2	繼續跟他要嗎 繼續跟他要 orbit 喔 *[keep requesting keep requesting orbit]*
18	21	18.0	OTH	(華信 786 與 ATC 對話) *[communication between AE 786 and ATC]*
18	21	23.1	CAM-1	嗯對*[um yes]*
18	21	25.9	RDO-2	transasia two two two ah request left orbit at two zero one radial one tree d-m-e
18	21	33.3	APP	confirm transasia two two two
18	21	34.8	RDO-2	affirmative
18	21	35.7	APP	transasia two two two approved as requested
18	21	37.6	RDO-2	thank you transasia two two two
18	21	39.1	CAM-2	好 我們就在這邊么三 么三 么 么三浬 *[okay we will remain here at one three one three one one three dme]*
18	21	39.2	APP	立榮六四拐高雄

hh[9]	mm	ss	Source	Context
				[glory six four seven kaohsiung]
18	21	41.4	B7 647	嗯請講*[um go ahead]*
18	21	42.4	APP	教官塔臺報告雷雨大概還要持續一個小時 嗯能見度我們還在詢問 *[sir tower reported that thunderstorm will probably continue for another hour and we are still requesting the visibility]*
18	21	50.0	B7 647	好謝謝 *[okay thank you]*
18	21	51.3	APP	復興兩兩兩教官 confirm 你抄收 *[transasia two two two sir confirm you copy that]*
18	21	54.3	RDO-2	抄收復興兩兩兩 *[roger transasia two two two]*
18	21	56.8	CAM-2	唉一個小時 *[sigh one hour]*
18	21	57.4	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	21	59.7	APP	(與復興 5133 對話) *[communication with GE 5133]*
18	22	05.9	APP	(與復興 5133 對話) *[communication with GE 5133]*
18	22	10.8	APP	(與復興 5133 對話) *[communication with GE 5133]*
18	22	11.7	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	22	15.9	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	22	20.0	CAM-2	好 … 那我們轉囉 orbit *[okay… then we have to turn orbit]*
18	22	22.1	CAM-1	好*[okay]*
18	22	30.1	RDO-1	嗯復興兩兩兩請問有沒有短暫的好天氣 *[um transasia two two two is there any temporary good weather]*
18	22	34.9	APP	教官我們正在問如果有我們馬上跟您報 *[sir we are waiting for an answer we will let you know immediately if there is any]*
18	22	38.1	RDO-1	好謝謝*[okay thank you]*
18	22	39.2	APP	不客氣*[you are welcome]*
18	22	58.4	CAM-1	唉唉唉*[sigh sigh sigh]*
18	23	31.7	CAM-1	唉唉唉*[sigh sigh sigh]*
18	23	48.1	CAM-2	那我看一下距離喔 *[let me check the distance]*
18	24	07.1	CAM-2	對啊應該都已經開了啊 *[yes it should be clear]*

hh[9]	mm	ss	Source	Context
18	24	08.9	CAM-1	嘿壓*[hey yes]*
18	24	09.1	CAM-2	*怎麼又來了 *[* here it comes again]*
18	24	33.3	CAM-1	唉(咳嗽聲)*[sigh [sound of coughing]]*
18	24	44.1	CAM-1	沒有了嗎*[gone yet]*
18	24	45.7	CAM-2	沒有了*[it's gone]*
18	24	48.3	CAM-1	應該好了*[should be good now]*
18	24	51.7	CAM-1	唉唷*[sigh]*
18	25	06.6	CAM-2	唉*[sigh]*
18	25	17.3	APP	(與其他航機對話) *[communication with other aircraft]*
18	25	21.5	APP	(與其他航機對話) *[communication with other aircraft]*
18	25	25.1	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	25	30.4	CAM-2	(笑聲) …拐千隨便你了 (笑聲) *[[laughing] ... seven thousand and all up to you [laughing]]*
18	25	36.3	APP	(與其他航機對話) *[communication with other aircraft]*
18	25	57.4	CAM-1	唉 … 好了 *[sigh ... all right]*
18	26	25.4	CAM-1	…
18	27	04.4	CAM-2	要接上嗎 *[contact him or not]*
18	27	05.6	CAM-1	啊 等一下喔 *[ah wait a second]*
18	27	07.3	CAM-2	好*[okay]*
18	27	12.1	CAM-2	還是要問馬公 tower *[or ask magong tower]*
18	27	19.3	CAM-1	好我來問他 *[okay let me ask him]*
18	27	20.2	CAM-2	好教官*[okay sir]*
18	27	23.9	RDO-1	馬公塔台復興兩兩兩 請問有沒有短暫好天氣 我們看起來還不錯啊 *[magong tower transasia two two two is the weather temporarily in good conditon it looks fine from our perspective]*
18	27	38.2	TWR_M	復興兩兩兩塔台 欸教官我們剛剛在跟天氣室作天氣的確認 目前的預報是 數 能見度的數值應該會維持八百 那地面風的狀況 十分鐘平均風力 是風向風速是兩兩洞的么拐浬 最大兩拐浬 洞兩跑道頭的即時風向風速是兩么洞的六浬 最大么么浬 兩洞頭的即時風速是兩洞洞的么兩浬最大么六浬

hh[9]	mm	ss	Source	Context
				[transasia two two two tower sir we just confirmed with the forecast office and the forecast now visibility will remain at eight hundred and as for ground wind average ten minutes wind two two zero degreerees one seven knots maximum two seven knots runway zero two wind two one zero degreerees six knots maximum one one knots runway two zero wind two zero zero degreerees one two knots maximum one six knots]
18	27	38.4	APP	高雄 approach 廣播 馬公預報長報告十到 十 二十分鐘 能見度會好一點但是... 洞兩跑道的風會兩么洞風的五浬 最大風么么浬 兩洞跑道的風么九洞風的么么浬 最大風么五浬 confirm 抄收 立榮六四拐 *[kaohsiung approach broadcasts magong forecast chief reported that visibility will improve in the next ten to ten twenty minutes but... runway zero two wind two one zero degreerees five knots maximum one one knots runway two zero wind one nine zero degreerees one one knots maximum one five knots confirm you copy it glory six four seven]*
18	28	05.0	APP	glory six four seven 高雄 *[kaohsiung]*
18	28	07.5	B7 647	六四拐回答 請問洞兩的跑道 洞兩的跑道風向風速再報一次 *[glory six four seven can you repeat runway zero two wind information at runway zero two]*
18	28	12.0	APP	洞兩跑道風 兩么洞風五浬最大么么浬 兩洞跑道風么九洞風么么浬最大么五浬 *[runway zero two wind two one zero degreerees five knots maximum one one knots runway two zero wind one nine zero degreerees one one knots maximum one five knots]*
18	28	18.6	RDO-1	抄收謝謝 *[roger thank you]*
18	28	20.2	TWR_M	教官不會 *[you are welcome sir]*
18	28	21.9	CAM-2	好教官切過去囉 *[okay sir I will switch over now]*
18	28	22.5	B7 647	那他現在能見度 他沒有報能見度嗎 *[what about the visibility didn't he report the visibility]*
18	28	24.3	CAM	嘟 (無線電波道切換提醒聲響) *[sound of radio frequency switching]*
18	28	25.6	APP	他們 預報長說不會調整數值 但是他說天氣會好一點點 *[they the forecast chief said they will not issue any adjustment but he said the weather will get better a little bit]*
18	28	25.9	CAM-2	都在八百 *[remain at eight hundred]*

hh[9]	mm	ss	Source	Context
18	28	32.2	B7 647	那現在數值多少 *[what about now]*
18	28	34.0	CAM-2	八百 *[eight hundred]*
18	28	34.2	APP	現在 我幫你查一下 *[now let me check for you]*
18	28	37.1	CAM-2	還是八百 *[still eight hundred]*
18	28	42.6	APP	立榮六四拐 教官 現在 馬公的 metar 報告能見度是八百公尺 *[glory six four seven sir right now magong metar visibility eight hundred meters]*
18	28	58.1	RDO-1	approach 兩兩兩 請問那個洞兩跑道的 跑道頭風向風速 *[approach two two two may we request wind information at runway zero two]*
18	29	04.8	APP	嗯 洞兩 洞兩的風兩么洞風的五浬 最大么么浬 兩洞跑道么九洞風么么浬 最大么五浬 *[um zero two zero two wind two one zero degreerees five knots maximum one one knots runway two zero wind one nine zero degreerees one one knots maximum one five knots]*
18	29	15.2	CAM-1	抄收了嗎 洞兩跑道 *[copy yet runway zero two]*
18	29	18.0	RDO-2	please say again 復興兩兩兩 *[transasia two two two]*
18	29	20.6	APP	transasia two two two runway zero two wind two one zero degreerees five knots maximum one one knots runway two zero wind one niner zero degreerees one one knots maximum one five knots
18	29	32.4	RDO-2	copy standby transasia two two two
18	29	34.7	CAM-2	那我猜一下 i-l-s 洞兩的能見度 *[let me guess the visibility at i-l-s zero two]*
18	29	38.3	B7 647	高雄 approach glory 六四拐 請求雷達引導 i-l-s 洞兩跑道進場 *[kaohsiung approach glory six four seven request radar vector for i-l-s runway zero two approach]*
18	29	39.4	CAM-1	那就可以 *[then it works]*
18	29	39.8	CAM-2	能見度八百可以 洞兩可以 *[visibility eight hundred is good for zero two]*
18	29	44.3	CAM-2	真敢 * 他們要下了 *[how dare * they are going to descend]*
18	29	44.8	APP	我幫你申請一下 *[I will apply for you]*
18	29	46.4	CAM-2	被他們搶了 教官那我們也要喔 *[they run in front of us sir we would request the same]*
18	29	46.7	B7 647	好 *[okay]*

hh[9]	mm	ss	Source	Context
18	29	48.3	CAM-1	好*[okay]*
18	29	50.3	RDO-2	高雄*[kaohsiung]* transasia two two two request radar vector to i-l-s runway zero two
18	29	55.4	APP	transasia two two two roger standby for coordination with magong tower
18	29	59.8	RDO-2	thank you standby transasia two two two continue left orbit
18	30	03.4	CAM-1	(咳嗽聲)*[sound of coughing]*
18	30	03.5	APP	roger
18	30	04.6	CAM-2	教官我們繼續轉 orbit 吧 *[sir let us continue the orbit]*
18	30	06.3	CAM-1	好*[okay]*
18	30	08.1	CAM-2	他在聯絡塔台幫我們帶 *[he is contacting tower to assist us]*
18	30	10.2	CAM-1	好的*[okay]*
18	30	11.0	CAM-2	兩么洞五浬 maximum 么么 尾風沒超限 *[two one zero five knots maximum one one under tail wind limit]*
18	30	14.5	CAM-1	好*[okay]*
18	30	15.1	CAM-2	能見度八百 i-l-s 洞兩可以下 *[visibility eight hundred i-l-s zero two is good]*
18	30	17.5	CAM-1	好*[okay]*
18	30	35.1	CAM-2	(咳嗽聲)*[sound of coughing]*
18	30	38.3	CAM-1	請求航向么八洞向南飛 *[request heading one eight zero to south]*
18	30	41.9	RDO-2	transasia two two two request heading one eight zero and to south
18	30	46.9	APP	transasia two two two roger approved as requested and heading one eight zero
18	30	51.1	RDO-2	heading one eight zero transasia two two two
18	30	53.6	CAM-2	航向么八洞許可 *[heading one eight zero approved]*
18	30	54.8	CAM-1	好的*[okay]*
18	30	56.6	CAM-1	嗯 落地是 ... *[um and for landing...]*
18	30	58.7	CAM-2	一樣 落地是用洞八么三三六六么 我們現在尾風不加了 *[same use zero eight one three three six six one for landing we have tail wind now so no more addition]*
18	31	03.6	CAM-1	好*[okay]*
18	31	37.8	CAM-1	請求么六洞 唉 *[request one six zero sigh]*
18	31	39.7	CAM-2	么六洞*[one six zero]*
18	31	40.6	CAM-1	嘿么六洞*[hey one six zero]*

hh[9]	mm	ss	Source	Context
18	31	42.1	RDO-2	transasia two two two request heading turn left one six zero
18	31	46.9	APP	transasia two two two heading one six zero approved
18	31	49.5	RDO-2	one six zero thank you transasia two two two
18	31	52.3	APP	transasia two two two any deviation is approved maintain ah maintain six thousand
18	31	57.6	RDO-2	maintain six thousand thank you transasia two two two
18	32	00.2	APP	welcome sir
18	32	01.3	CAM-2	好 隨便我們飛啦 六千保持就好了 *[okay it is all up to us now as long as maintaining six thousand]*
18	32	03.9	CAM-1	好*[okay]*
18	32	07.2	CAM-2	教官打一個 q-c 洞兩 a 下去了 *[sir I just keyed in q-c zero two a]*
18	32	09.3	CAM-1	好*[okay]*
18	32	12.8	CAM-1	好 航向么八洞啊 *[okay heading one eight zero]*
18	32	14.4	CAM-2	隨便 他說隨便了 *[up to us he said up to us]*
18	32	15.2	CAM-1	隨便 隨便喔 *[up to us up to us]*
18	32	16.5	CAM-2	他說隨便了 any deviation (笑聲) *[he said up to us any deviation [laughing]]*
18	32	19.7	CAM-1	(咳嗽聲)*[sound of coughing]*
18	32	21.1	CAM-1	a-d-m …
18	32	22.9	CAM-2	啊 *[uh]*
18	32	23.2	CAM-1	他說怎麼樣 *[what did he say]*
18	32	24.0	CAM-2	他說*[he said]* any deviation
18	32	25.4	CAM-1	any deviation…
18	32	26.3	CAM-2	any deviation approved maintain six thousand 就是隨便我們了*[it means it is all up to us]*
18	32	27.2	CAM-1	喔喔喔 好好好 okay 好 *[oh oh oh okay okay okay okay okay]*
18	32	32.4	CAM-2	因為他也懶得管了 反正現在這個空域沒有飛機了 *[because they do not care and there is no other aircraft in this area anyway]*
18	32	35.4	CAM-1	喔 *[oh]*
18	32	39.6	CAM-1	唉*[sigh]*
18	32	57.9	CAM-2	教官現在變成那個風是小了嘛 *[sir the wind becomes mild]*
18	33	00.2	CAM-1	嘿啊*[yes]*

hh[9]	mm	ss	Source	Context
18	33	00.9	CAM-2	對啊變成五浬了嘛 *[yes it becomes five knots]*
18	33	02.6	CAM-1	嘿啊*[yes]*
18	33	02.7	CAM-2	maximum 十一啊 剛還在十七 gust 兩拐啊 *[maximum one one it was one seven gusting two seven]*
18	33	06.0	CAM-1	喔*[oh]*
18	33	06.6	CAM-2	現在風都變小了 *[now wind is getting mild]*
18	33	08.0	CAM-1	喔*[oh]*
18	33	33.7	B7 647	kaohsiung approach glory six four seven how about the weather … how about situation
18	33	39.4	APP	立榮六四拐教官還在詢問耶 *[glory six four seven sir we are still requesting]*
18	33	42.2	B7 647	嗯 okay *[um okay]*
18	33	48.1	CAM-2	風有了能見度八百 應該就可以了 *[we have the wind info and visibility eight hundred that should be good]*
18	34	00.7	CAM-2	(咳嗽聲)*[sound of coughing]*
18	34	06.1	CAM-1	洞兩兩喔 … *[zero two two ….]*
18	34	07.3	CAM-2	洞兩兩么洞九么 *[zero two two one zero nine one]*
18	34	14.0	CAM-1	是剛剛 現在到哪裡去了 *[yes moments ago where is it now]*
18	34	23.7	CAM-2	教官要放大一點看嗎 *[sir do you want to increase the range]*
18	34	25.7	CAM-1	啊*[uh]*
18	34	26.5	CAM-2	嗯嗯我說 *[um um I mean]*
18	34	27.3	CAM-1	哇* 這邊還有一架 * 拿四千的 *[wow * here is another one * at four thousand]*
18	34	29.5	CAM-2	四千的 我說 range range 要不要放大一點 我看一下我們在哪裡 *[four thousand I mean range can we increase it a bit let me see where we are]*
18	34	35.6	CAM-2	對啊*[yes]*
18	34	36.7	CAM-1	嘿啊*[hey yes]*
18	34	40.5	CAM-2	教官我這邊可以參考好了 *[sir you can use my side for reference]*
18	34	42.1	CAM-1	好 好*[okay okay]*
18	34	44.3	CAM-2	對*[yes]*
18	34	48.6	CAM-1	好*[okay]*
18	34	51.3	CAM-1	現在* 看一下地圖就知道啊

hh[9]	mm	ss	Source	Context
				*[now * you will know if you check the map]*
18	34	54.1	CAM-2	教官等於是馬公在我們的右手邊啊 *[sir magong is at our right hand side]*
18	34	57.6	CAM-1	喔*[oh]*
18	34	58.5	CAM-2	現在應該是 嗯差不多將近兩拐洞要九點鐘方向了 馬公 v-o-r *[now it shall be um roughly two seven zero at our nine o'clock direction magong v-o-r]*
18	35	04.7	CAM-1	喔*[oh]*
18	35	10.0	B7 647	高雄立榮六四拐 請問三洞分的馬公 那個 metar 是多少 *[kaohsiung glory six four seven what is the magong metar at time three zero]*
18	35	18.3	APP	我幫你詢問一下 *[I will inquire about it for you]*
18	35	19.9	B7 647	好*[okay]*
18	35	25.1	CAM-2	還沒有放嘛 *[not updated yet]*
18	35	26.0	CAM-1	嗯*[um]*
18	35	30.6	CAM	嘟 (無線電波道切換提醒聲響) *[sound of radio frequency switching]*
18	35	30.7	CAM	(ATIS information lima)
18	35	37.9	CAM	嘟 (無線電波道切換提醒聲響) *[sound of radio frequency switching]*
18	35	38.4	CAM-2	還沒變*[no change yet]*
18	35	52.8	CAM-2	所以它是往外飛 它飛外圍 *[so it is flying outbound at outer area]*
18	35	55.6	CAM-1	喔*[oh]*
18	35	56.2	CAM-2	我們在內圈啊 可是它高度比我們低 *[we are at inner area but it's altitude is lower than us]*
18	35	58.7	CAM-1	欸*[hey]*
18	36	14.3	CAM-1	才剛過馬公 v-o-r *[just passing magong v-o-r]*
18	36	16.0	CAM-2	欸 馬公 v-o-r 已經 現在在我們的 兩洞 一九洞 *[hey magong v-o-r is at our two zero one nine zero direction]*
18	36	22.1	APP	立榮六四拐教官 現在 information 是 mike 報告 啊 mike 報 能見度是八百公尺 有雷雨雷陣雨 嗯雷雨當嗯然後還是雷雨當空的 稀雲是兩百 疏雲是六百稀雲的 c b 是么千兩百 嗯裂雲是么千的六百 *[glory six four seven now information mike information mike visibility eight hundred meters thunderstorm thundershower um still thunderstorm overhead clouds few two hundred meters scattered six hundred few c-b one*

hh[9]	mm	ss	Source	Context
				thousand two hundred um broken one thousand six hundred]
18	36	47.8	B7 647	請問馬公有宣布關場嘛 *[is magong airport close]*
18	36	50.4	APP	嗯我們沒有關場 *[um we are not close]*
18	36	51.3	B7 647	okay 好雷達引導的 i-l-s 洞兩跑道 準備進場 *[okay good radar vector i-l-s runway zero two prepare for approach]*
18	36	54.6	CAM-2	風向啊 *[wind direction]*
18	36	55.3	APP	好的教官我們 因為現在馬公是使用兩洞跑道 那如果使用洞兩跑道的話需要由馬基隊同意 我們已經幫您申請了 但是他們還在申請當中 請您稍待一下 *[okay sir we because we are using runway two zero now and if you prefer runway zero two an approval from magong military office is required we have applied it for you but it is still in process please wait]*
18	37	08.3	B7 647	了解 *[roger]*
18	37	10.3	CAM-2	我跟他說同樣喔 *[I will tell him the same thing]*
18	37	12.7	CAM-1	嗯不用 我們已經知道了 嘿 我們剛剛已經跟他講了 *[no we don't have to we know it already hey we just told him]*
18	37	13.5	CAM-2	不要講了*[no need to tell them]*
18	37	16.0	CAM-2	好好好*[okay okay okay]*
18	37	17.6	CAM-2	馬基隊是不是就是空軍那個啊 *[doesn't magong military office belong to air force]*
18	37	19.7	CAM-1	嘿呀 馬公基地 *[hey magong military office]*
18	37	21.6	CAM-2	喔 馬基隊 哈哈哈哈 *[oh magong military office ha ha ha ha]*
18	37	23.9	CAM-1	基勤中隊 *[air force base duty team]*
18	37	25.0	CAM-2	嘿嘿嘿嘿 (笑聲) *[hey hey hey hey] [laugh]*
18	37	26.5	CAM-1	他們要去換那個 *[they are going to change that]*
18	37	28.3	CAM-2	網子還是甚麼 *[a net or something]*
18	37	29.6	CAM-1	對啊*[yes]*
18	37	30.0	CAM-2	可是這種天氣*戰機也會起來才怪咧 對不對 * 他們根本不肯 不會起來啊 *[but in this kind of weather condition * fighters are not*

hh[9]	mm	ss	Source	Context
				*going to get airborne right * they are not willing to get airborne at all]*
18	37	54.8	APP	立榮六四拐教官請您稍待 現在塔台已經跟馬基隊提出三次申請了 請您稍待一下 *[glory six four seven please standby we have made three requests to magong military office already please wait]*
18	38	01.9	CAM-2	教官好像這邊比較好 隨便我們飛了(笑聲) *[sir looks like here is better any deviation as we like]*
18	38	02.4	B7 647	了解謝謝 *[roger thank you]*
18	38	31.7	APP	(與復興 5133 對話) *[communication with GE 5133]*
18	38	35.0	OTH	(復興 5133 與 ATC 對話) *[communication between GE 5133 and ATC]*
18	38	43.3	CAM-2	five one tree tree
18	38	59.9	CAM-2	*
18	39	00.5	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	39	06.1	CAM-2	唉唷*[ouch]*
18	39	06.5	APP	(與復興 5084 對話) *[communication with GE 5084]*
18	39	13.5	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	39	17.3	APP	(與復興 5084 對話) *[communication with GE 5084]*
18	39	23.1	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	39	28.1	APP	(與復興 5084 對話) *[communication with GE 5084]*
18	39	33.8	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	39	38.6	CAM-2	我跟他 check 一下 q-n-h 剛剛是給他報一千 *[I will check q-n-h with him he reported one zero zero zero moments ago]*
18	39	42.7	RDO-2	transasia two two two check magong q-n-h
18	39	45.8	APP	transasia two two two kaohsiung q-n-h one zero zero zero and magong q-n-h uh magong q-n-h niner niner five
18	39	54.9	CAM-1	喔*[oh]*
18	39	55.2	RDO-2	q-n-h one zero zero zero magong airport niner niner five transasia two two two thank you
18	40	00.6	CAM-2	好么洞洞洞 *[okay one zero zero zero]*
18	40	04.0	CAM-2	馬公九九五唉 *[magong nine nine five sigh]*
18	40	13.7	CAM-2	三 油量三 三六四

hh[9]	mm	ss	Source	Context
				[three fuel quantity three three six four]
18	40	19.4	CAM-1	唉*[sigh]*
18	40	29.8	CAM-2	三七三唉 *[three seven three sigh]*
18	40	40.3	APP	(與復興 5084 對話) *[communication with GE 5084]*
18	40	43.8	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	40	48.4	APP	(與復興 5084 對話) *[communication with GE 5084]*
18	40	52.9	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	41	08.0	CAM-1	唉*[sigh]*
18	41	13.4	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	41	18.6	APP	(與復興 5084 對話) *[communication with GE 5084]*
18	41	21.3	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	42	28.3	APP	glory six four seven now magong runway two zero visibility one thousand six hundred meters however still thunderstorm overhead say intention
18	42	41.0	CAM-2	*一千六變我們兩洞可以下去了 *[* one thousand six hundred we now can use two zero]*
18	42	42.1	B7 647	standby
18	42	43.1	APP	roger
18	42	44.4	APP	transasia two two two say intention
18	42	46.6	CAM-1	ahhh
18	42	47.9	RDO-1	request runway zero two i-l-s approach
18	42	54.0	APP	confirm transasia two two two request runway zero two
18	42	57.5	RDO-1	affirm transasia two two two request runway zero two for i-l-s approach
18	43	01.8	APP	transasia two two two roger standby coordination with the military office
18	43	06.7	RDO-1	okay
18	43	07.9	CAM-2	如果兩洞的話就不用了 *[do not need that if using two zero]*
18	43	09.3	B7 647	okay glory six four seven request runway two zero approach
18	43	13.7	APP	glory six four seven roger cancel holding clearance and fly heading … cancel holding clearance heading two eight zero radar vector v-o-r
18	43	25.5	B7 647	confirm left turn or right turn
18	43	27.8	APP	right turn

hh[9]	mm	ss	Source	Context
18	43	29.2	B7 647	okay right turn heading two eight zero glory six four seven
18	43	43.8	APP	(與復興 5084 對話) *[communication with GE 5084]*
18	43	48.0	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	43	51.9	APP	glory six four seven descend and maintain two thousand
18	43	54.7	B7 647	descend and maintain two thousand glory six four seven
18	43	55.6	CAM	(pitch trim 聲響) *[sound of pitch trim]*
18	43	59.3	CAM-1	哇那要等它落地了* *[wow then we have to wait until it lands *]*
18	44	01.5	CAM-2	它是要用兩洞的 我們洞兩要等那個馬基隊的 *[it will use two zero, we have to wait for the approval from magong military office to use zero two]*
18	44	05.4	APP	glory six four seven continue right turn heading tree four zero
18	44	09.2	B7 647	right turn tree four zero request direct to pinit
18	44	13.7	APP	glory six four seven roger maintain four thousand direct to uh correction maintain four thousand heading two eight zero standby pinit
18	44	22.4	B7 647	… four thousand uh heading tree four zero
18	44	28.2	APP	heading two eight zero thank you glory six four seven
18	44	30.5	OTH	(其他航機與 ATC 對話) *[communication between other aircraft and ATC]*
18	44	31.9	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	44	35.6	APP	(與復興 5084 對話) *[communication with GE 5084]*
18	44	37.9	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	44	49.2	CAM-1	嗯*[um]*
18	44	52.5	RDO-1	transasia two two two confirm ah number two
18	44	56.5	APP	transasia two two two affirm ah number two say intention
18	45	00.5	RDO-1	roger request runway two zero for v-o-r approach
18	45	04.2	APP	transasia two two two roger ah fly heading ah zero two ah tree six zero radar vector v-o-r approach
18	45	10.7	RDO-2	right turn heading tree six zero radar vector v-o-r runway two zero transasia two two two
18	45	14.7	CAM-2	右轉航向 三六洞 *[turn right heading three six zero]*
18	45	17.9	CAM-1	嗯*[sigh]*
18	45	19.0	CAM-2	唉 v-o-r 洞 兩洞 *[sigh v-o-r zero two zero]*

hh[9]	mm	ss	Source	Context
18	45	21.6	CAM-1	roger
18	45	22.9	CAM-2	兩洞么*[two zero one]*
18	45	26.7	APP	glory six four seven now information november and direct to pinit
18	45	31.1	B7 647	direct to pinit glory six four seven
18	45	33.7	APP	glory six four seven one six mile from uh pinit cleared r-nav runway two zero approach
18	45	35.1	CAM-1	uh 先不要下降 … *[uh do not descend yet]*
18	45	36.9	CAM-2	我知道…*[I know…]*
18	45	39.0	B7 647	clear for r-nav runway two zero approach glory six four seven
18	45	44.6	APP	transasia two two two continue maintain six thousand heading tree six zero radar vector v-o-r
18	45	50.8	RDO-2	clear maintain present maintain six thousand heading three six zero transasia two two two
18	45	52.5	CAM-1	嗯唉*[um sigh]*
18	45	55.6	CAM-1	(咳嗽聲)*[sound of coughing]*
18	45	57.0	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	45	02.5	CAM-2	…
18	46	03.9	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	46	05.8	CAM-1	所以叫他下兩千他還不下啊 *[so tell them to descend to two thousand but they have not done so]*
18	46	08.4	CAM-2	對啊*[yes]*
18	46	09.3	CAM-1	唉呀呀阿*[ohoh]*
18	46	10.8	CAM-2	受不了他*[cannot stand him]*
18	46	11.9	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	46	16.5	APP	(與復興 5084 對話) *[communication with GE 5084]*
18	46	20.8	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	46	30.9	CAM-1	那請求航向洞三洞 *[request heading zero three zero]*
18	46	32.1	APP	(與復興 5133 對話) *[communication with GE 5133]*
18	46	41.8	CAM-1	算了*[forget about it]*
18	46	42.0	OTH	(復興 5133 與 ATC 對話) *[communication between GE 5133 and ATC]*
18	46	43.6	CAM-2	不用噢*[no]*
18	46	44.5	CAM-1	不用*[no]*

hh[9]	mm	ss	Source	Context
18	46	50.5	CAM-2	他們到底　前面的那架立榮真的是 * 很慢耶 *[they… that Uni Air flight ahead of us is so * slow]*
18	46	56.5	CAM-1	…
18	46	57.6	CAM-2	叫他們下 給他們帶了 *　還那邊慢吞吞的 不懂耶 *[cleared them for descend, and vectored them, I don't understand why they are so slow]*
18	47	03.2	CAM-1	現在…叫它下兩千啊 *[now …. cleared it to descend to two thousand]*
18	47	04.5	B7 647	kaohsiung approach glory six four seven due to weather request direct to mause
18	47	08.7	CAM-2	* r-nav 啊 *[* r-nav]*
18	47	09.1	APP	glory six four seven　can you accept after one zero mile for mause
18	47	17.6	B7 647	affirm glory six four seven
18	47	19.0	CAM-2	五浬後給他們 *[approve them after five miles]*
18	47	19.6	APP	… glory six four seven roger continue present heading descend and maintain tree thousand radar vector to mause
18	47	27.2	B7 647	present heading three thousand ah standby at mause glory six four seven
18	47	33.6	CAM-2	他們要飛十浬去 mause *[they need to fly ten miles to mause]*
18	47	51.4	CAM-2	有帶開一點 *[vectored them further away]*
18	47	52.2	CAM-1	唉*[sigh]*
18	48	04.6	CAM-2	okay …
18	48	05.3	B7 647	kaohsiung approach glory six four seven confirm local q-n-h
18	48	08.3	CAM-2	他把它關掉 *[he turned it off]*
18	48	09.4	APP	glory six four seven kaohsiung q-n-h one zero zero zero magong q-n-h niner niner six
18	48	17.7	B7 647	niner niner six one zero zero zero glory six four seven
18	48	18.3	CAM	(客艙呼叫聲響) *[sound of cabin call]*
18	48	21.1	CAM-1	好等一下航向洞四洞啊 *[okay later heading zero four zero]*
18	48	21.8	APP	transasia two two two turn right heading zero two zero descend and maintain five thousand
18	48	27.3	CAM-1	等一下 zero four zero　嗯 (later zero four zero um)
18	48	29.1	RDO-2	right turn heading zero two zero and request heading zero four zero descend and maintain five thousand transasia two two two

hh[9]	mm	ss	Source	Context
18	48	36.4	APP	transasia two two two heading zero four zero approved maintain five thousand
18	48	40.4	RDO-2	heading zero four zero five thousand transasia two two two
18	48	40.5	CAM	(高度提示聲響) *[sound of altitude alert]*
18	48	43.1	APP	(與復興 5133 對話) *[communication with GE 5133]*
18	48	43.2	CAM-2	好我們進去 *[okay let us go in]*
18	48	50.3	APP	(與復興 5133 對話) *[communication with GE 5133]*
18	49	06.9	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	49	11.3	APP	(與復興 5084 對話) *[communication with GE 5084]*
18	49	17.8	OTH	(復興 5084 與 ATC 對話) *[communication between GE 5084 and ATC]*
18	49	21.6	B7 647	kaohsiung approach glory six four seven due to weather request left turn direct to mause
18	49	26.3	APP	glory six four zero direct to mause approved and position six miles from mause cleared r-nav runway two zero approach
18	49	33.5	B7 647	cleared for r-nav runway two zero approach glory six four seven
18	50	11.2	CAM-1	好 heading zero two zero … zero tree zero 好了 *[okay heading zero two zero ... do zero tree zero]*
18	50	16.9	CAM-2	洞三洞*[zero three zero]*
18	50	17.5	CAM-1	好洞三洞 *[okay zero three zero]*
18	50	19.2	RDO-2	transasia two two two request turn left heading zero tree zero
18	50	22.8	APP	transasia two two two heading zero tree zero approved and descend and maintain four thousand
18	50	27.1	RDO-2	heading zero tree zero descend and maintain four thousand transasia two two two
18	50	30.9	CAM-2	好四千洞三洞 *[okay four thousand zero three zero]*
18	50	31.9	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	50	37.5	CAM-1	嗯唉*[um sigh]*
18	50	38.4	APP	(與復興 5133 對話) *[communication with GE 5133]*
18	50	58.9	CAM	(高度提示聲響) *[sound of altitude alert]*
18	50	59.2	CAM-2	oh one thousand to go

hh[9]	mm	ss	Source	Context
18	51	01.0	CAM-1	唉嗯*[um sigh]*
18	51	08.3	OTH	(華信 1831 與 ATC 對話) *[communication between AE 1831 and ATC]*
18	51	13.9	APP	(與華信 1831 對話) *[communication with AE 1831]*
18	51	17.6	OTH	(華信 1831 與 ATC 對話) *[communication between AE 1831 and ATC]*
18	51	26.3	OTH	(華信 1831 與 ATC 對話) *[communication between AE 1831 and ATC]*
18	51	33.0	OTH	(華信 1831 與 ATC 對話) *[communication between AE 1831 and ATC]*
18	51	37.6	APP	(與華信 1831 對話) *[communication with AE 1831]*
18	51	41.0	OTH	(華信 1831 與 ATC 對話) *[communication between AE 1831 and ATC]*
18	51	44.4	APP	(與華信 1831 對話) *[communication with AE 1831]*
18	51	50.4	OTH	(華信 1831 與 ATC 對話) *[communication between AE 1831 and ATC]*
18	51	53.1	APP	another traffic say again
18	51	58.6	APP	are there any traffic calling kaohsiung
18	52	03.0	B7 647	kaohsiung approach glory six four seven established final
18	52	06.2	APP	glory six four seven contact magong tower one one eight decimal tree see you
18	52	09.1	B7 647	contact tower see you glory six four seven
18	52	11.7	APP	transasia two two two turn left heading two niner zero
18	52	14.3	RDO-2	turn left heading two niner zero transasia two two two
18	52	17.3	CAM-2	兩 左轉航向兩 兩九洞 *[two left heading two two nine zero]*
18	52	18.9	CAM-1	好 嗯*[okay um]*
18	52	22.6	CAM-1	up five mile up five mile
18	52	25.2	CAM-2	five mile
18	52	25.8	CAM-1	喔 up up five mile 五浬以後 *[oh up up five mile after five miles]*
18	52	27.3	CAM-2	okay
18	52	29.1	RDO-2	transasia two two two request another five mile and turn left heading two niner zero
18	52	34.3	APP	transasia two two two approved as requested descend and maintain tree thousand
18	52	37.7	RDO-2	descend maintain tree thousand approved five mile two niner zero transasia two two two
18	52	42.5	CAM-2	好現在保持三千 五浬後 兩九洞 *[okay now maintain three thousand after five miles two nine zero]*

hh[9]	mm	ss	Source	Context
18	52	44.2	CAM-1	嗯*[um]*
18	52	45.7	APP	(與復興 5133 對話) *[communication with GE 5133]*
18	52	50.2	CAM	(不明聲響) *[unidentified sound]*
18	52	54.7	APP	(與復興 5133 對話) *[communication with GE 5133]*
18	52	58.3	CAM	(高度提示聲響) *[sound of altitude alert]*
18	53	00.6	CAM-2	one thousand to go
18	53	19.1	CAM-2	教官這是 basic mode *[sir this is basic mode]*
18	53	21.1	CAM-1	喔 唉*[oh sigh]*
18	53	24.0	CAM-2	okay 謝謝 *[okay thank you]*
18	53	25.9	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	54	02.4	CAM	(安全帶提示聲響) *[sound of seat belt reminder]*
18	54	04.5	CAM-1	heading two nine zero 哦 *[heading two nine zero oh]*
18	54	06.2	CAM-2	對 *[yes]* two nine zero
18	54	06.3	APP	(與其他航機對話) *[communication with other aircraft]*
18	54	08.8	PA-3	(客艙廣播至 1854:52.3) *[cabin announcement until 1854:52.3]*
18	54	44.1	CAM-1	我要兩四洞 *[I want two four zero]*
18	54	46.5	CAM-2	…
18	54	47.4	CAM-1	heading 兩四洞喔 *[heading two four zero]*
18	54	47.4	RDO-2	transasia two two two request left turn heading two four zero
18	54	51.1	APP	transasia two two two heading two four zero approved
18	54	53.2	RDO-2	heading two four zero transasia two two two
18	54	55.0	CAM-2	兩四洞許可了 *[two four zero approved]*
18	54	56.5	CAM-1	唉*[sigh]*
18	54	56.6	CAM-2	altitude check 三千*[three thousand]*
18	55	04.4	CAM-1	唉*[sigh]*
18	55	05.4	CAM-2	剛剛這一塊 吹過去馬公都開啦 *[if this patch we just saw is blown away then magong is clear]*
18	55	09.7	APP	transasia two two two position two five miles northeast of

hh[9]	mm	ss	Source	Context
				magong airdrome turn left heading two three zero descend and maintain two thousand till establish final approach course cleared v-o-r runway two zero approach
18	55	19.9	RDO-2	turn left heading two three zero descend maintain two thousand until establish cleared v-o-r runway two zero approach transasia two two two
18	55	27.7	CAM	(高度提示聲響) *[sound of altitude alert]*
18	55	28.0	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	55	30.4	CAM-2	one thousand to go
18	55	31.9	CAM-2	兩三洞攔上許可 *[two three zero cleared for approach]*
18	55	34.9	CAM-2	v-o-r 兩洞*[v-o-r two zero]*
18	55	36.3	CAM-1	喔*[oh]*
18	55	39.7	CAM-2	五浬兩千　通過五浬可以下降 三三零 *[five dme two thousand after passing five dme we can descend three three zero]*
18	55	42.5	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	55	58.6	CAM-1	唉*[sigh]*
18	56	08.6	RDO-2	transasia two two two check q-n-h for approach
18	56	12.8	APP	transasia two two two say again
18	56	14.7	RDO-2	哦教官我們 check q-n-h *[oh sir we would like to check q-n-h]*
18	56	17.2	APP	嗯復興兩兩兩教官 roger 高雄高度表么洞洞洞 馬公高度表九九六 *[um transasia two two two sir roger kaohsiung q-n-h one zero zero zero magong q-n-h niner niner six]*
18	56	23.2	RDO-2	好么洞洞洞九九六謝謝　復興兩兩兩 *[okay one zero zero zero niner niner six thank you transasia two two two]*
18	56	27.3	APP	教官不要客氣攔上報告 *[you are welcome sir report when established]*
18	56	29.8	RDO-2	攔上報告 *[report when established]*
18	56	31.1	CAM-2	好九九六攔上報告 *[okay niner niner six report when established]*
18	56	33.1	CAM-1	嗯*[um]*
18	56	34.5	CAM-2	耶教官不是 *[yay sir negative]*
18	56	39.9	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	56	45.4	APP	(與復興 5133 對話) *[communication with GE 5133]*

hh[9]	mm	ss	Source	Context
18	56	51.6	OTH	(立榮 8297 與 ATC 對話) *[communication with B7 8297]*
18	56	59.6	CAM-1	唉嗯 *[sigh um]*
18	57	00.7	APP	(與立榮 8297 對話) *[communication with B7 8297]*
18	57	02.9	CAM	(高度提示聲響) *[sound of altitude alert]*
18	57	04.0	OTH	(立榮 8297 與 ATC 對話) *[communication between B7 8297 and ATC]*
18	57	08.2	CAM-2	altitude star
18	57	09.1	CAM-1	check
18	57	25.2	CAM-2	alt captured 兩千*[two thousand]*
18	57	26.8	CAM-1	check
18	56	31.3	CAM-1	唉嗯*[sigh um]*
18	57	37.6	CAM-1	(咳嗽聲)*[sound of coughing]*
18	57	54.0	APP	(與復興 5133 對話) *[communication with GE 5133]*
18	58	34.6	CAM-1	… nav 嘛 *[… nav]*
18	58	34.5	CAM-2	兩洞么 *[two zero one]*
18	58	40.5	OTH	(立榮 8297 與 ATC 對話) *[communication between B7 8297 and ATC]*
18	58	44.2	APP	(與立榮 8297 對話) *[communication with B7 8297]*
18	58	47.2	OTH	(立榮 8297 與 ATC 對話) *[communication between B7 8297 and ATC]*
18	58	49.6	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	58	57.4	CAM-2	我們 course 兩洞么 *[our course is two zero one]*
18	59	58.6	CAM-1	嗯 course 兩洞么啊 *[um course two zero one]*
18	59	01.5	CAM-2	yes sir
18	59	03.3	CAM	(安全帶提示聲響) *[sound of seatbelt reminder]*
18	59	09.9	CAM-2	教官 preset 下一個三四零嘛 還四百 *[sir do we preset next altitude three four zero or four hundred]*
18	59	13.5	CAM-1	啊*[uh]*
18	59	14.2	CAM-2	preset 下一個高度四百 *[preset next altitude four hundred]*
18	59	14.3	CAM-1	喔*[oh]*

hh[9]	mm	ss	Source	Context
18	59	15.7	CAM-2	五浬 *[five dme]*
18	59	15.8	CAM-1	…個高度　嗯 *[… altitude　um]*
18	59	17.3	CAM-2	五浬才可以下　四百 *[descend at five dme　four hundred]*
18	59	18.3	CAM-1	嗯好好好　四百 *[um okay okay okay four hundred]*
18	59	19.9	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	59	43.2	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	59	50.4	APP	(與遠東 3055 對話) *[communication with FE 3055]*
18	59	58.8	CAM-1	五浬兩千　嗯 *[five dme two thousand um]*
19	00	01.2	CAM-2	通過五浬才可以下 *[can only descend after passing five dme]*
19	00	03.4	CAM-1	喔*[oh]*
19	00	04.1	CAM-2	好*[okay]*
19	00	11.4	CAM-2	風怎麼那麼大啊　唉 *[how come the wind is so strong　sigh]*
19	00	15.5	CAM-2	兩四拐三十五　歪著飛不進去 (笑聲) *[two four seven thirty five　we can not land it with crabbing] [laughing]*
19	00	20.7	CAM-1	啊…就這樣 *[uh…. that is it]*
19	00	20.8	OTH	(其他航機與 ATC 對話) *[communication between other aircraft and ATC]*
19	00	21.9	APP	station calling say again
19	00	23.6	CAM-2	風那麼大　原則飛不進去啦 *[wind is too strong to make the landing in principle]*
19	00	25.6	CAM-1	嘿*[hey]*
19	00	26.9	APP	(與立榮航機對話) *[communication with Uni Air flight]*
19	00	34.3	CAM-2	噢喔教　…來了 *[uh uh sir ….. alive]*
19	00	36.5	CAM-1	來了嗎　對啊 *[is it alive　yes]*
19	00	55.7	CAM-1	嗯*[um]*
19	01	01.5	CAM-2	v-o-r star runway heading
19	01	03.2	CAM-1	嗯嗯嗯*[um um um]*
19	01	03.4	RDO-2	transasia two two two established
19	01	05.8	APP	two two two contact tower one one eight decimal three

hh[9]	mm	ss	Source	Context
				good day
19	01	08.4	RDO-2	contact tower good day transasia two two two 謝謝喔 *[thank you]*
19	01	11.2	APP	good day
19	01	12.1	CAM	嘟 (無線電波道切換提醒聲響) *[sound of radio frequency switching]*
19	01	13.2	RDO-2	magong tower good evening transasia two two two eight miles for v-o-r runway two zero
19	01	19.9	TWR_M	transasia two two two good evening magong tower runway two zero q-n-h niner niner seven continue approach
19	01	26.7	RDO-2	runway two zero q-n-h niner niner seven continue transasia two two two
19	01	31.3	CAM-2	九九拐兩洞繼續進場 *[nine nine seven two zero continue approach]*
19	01	32.8	CAM-1	Roger
19	01	38.8	CAM-1	啊雷達關了喔 *[uh is radar off yet]*
19	01	39.9	CAM-2	好教官雷達關 *[okay sir radar off]*
19	01	53.8	TWR_M	(與遠東 082 對話) *[communication with FE 082]*
19	01	57.7	OTH	(遠東 082 與 ATC 對話) *[communication between FE 082 and ATC]*
19	02	00.0	TWR_M	(與遠東 082 對話) *[communication with FE 082]*
19	02	02.5	OTH	(遠東 082 與 ATC 對話) *[communication between FE 082 and ATC]*
19	02	05.7	TWR_M	(與遠東 082 對話) *[communication with FE 082]*
19	02	12.3	OTH	(遠東 082 與 ATC 對話) *[communication between FE 082 and ATC]*
19	02	14.9	CAM-2	啊么四浬么么八 *[uh one four knots one one eight]*
19	02	18.0	CAM-1	么么八啊 *[one one eight]*
19	02	18.9	CAM-2	我先加十浬　因為兩洞 *[I will add ten knots due to two zero]*
19	02	21.1	CAM-1	喔*[oh]*
19	02	26.1	CAM-1	嗯*[um]*
19	02	36.2	CAM-2	嗯　我 *[um　i]*
19	02	37.8	PA-1	組員準備落地 *[cabin crew prepare for landing]*
19	02	39.0	CAM-1	嗯*[um]*

hh[9]	mm	ss	Source	Context
19	02	40.7	CAM-2	噢我五浬放外型 *[oh I will set landing configuration at five dme]*
19	02	48.7	PA-3	(客艙廣播至 1902:59.2) *[cabin announcement until 1902:59.2]*
19	02	57.6	CAM-2	剛好通過五浬 *[passing five dme]*
19	02	58.1	CAM-1	好 flap fifteen *[okay flap fifteen]*
19	02	59.8	CAM-2	speed check
19	03	05.1	CAM	(pitch trim 聲響) *[sound of pitch trim]*
19	03	05.6	OTH	(遠東 082 與 ATC 對話) *[communication between FE 082 and ATC]*
19	03	07.8	TWR_M	(與遠東 082 對話) *[communication with FE 082]*
19	03	08.1	CAM	(pitch trim 聲響) *[sound of pitch trim]*
19	03	21.1	CAM-1	嗯 嗯 嗯*[um um um]*
19	03	27.3	CAM-2	flap fifteen set
19	03	28.3	CAM-1	好*[okay]*
19	03	29.9	CAM-1	…
19	03	31.0	CAM-2	speed check
19	03	31.9	CAM	(起落架艙門開啟聲響) *[sound of gear doors open]*
19	03	32.7	CAM	(客艙播放音樂) *[cabin music starts]*
19	03	36.1	CAM	(疑似雨刷加速聲響) *(sound similar to wiper speeding up]*
19	03	38.7	TWR_M	transasia two two two runway two zero wind two five zero degreeree one niner knots cleared to land
19	03	44.8	RDO-2	copy runway two zero runway two zero wind copy cleared to land transasia two two two
19	03	45.5	CAM	(高度提示聲響) *[sound of altitude alert]*
19	03	50.6	CAM-2	啊許可落地 *[uh cleared to land]*
19	03	51.2	CAM-1	flap thirty
19	03	52.3	CAM-2	speed check gear down …
19	03	54.4	CAM-2	好教官我做你飛 *[okay sir I will monitor and you have control]*
19	03	56.0	CAM-1	好*[okay]*
19	03	57.0	CAM-2	before landing check landing gear down three green flaps thirty thirty t-l-u … on control auto 一百*[one hundred]* power management takeoff lights on icing a-o-a light off

hh[9]	mm	ss	Source	Context
				runway 兩洞*[two zero]* verify landing clearance received before landing complete
19	03	58.8	CAM	(pitch trim 聲響) *[sound of pitch trim]*
19	03	04.7	TWR_M	(與遠東 082 對話) *[communication with FE082]*
19	04	07.8	CAM-1	兩九洞風啊*[wind two niner zero]*
19	04	09.3	CAM-2	兩五洞*[two five zero]*
19	04	10.2	CAM-1	兩五洞*[two five zero]*
19	04	10.8	CAM-2	對*[yes]*
19	04	12.5	CAM-2	one thousand stable continue
19	04	14.0	CAM-1	check
19	04	26.4	CAM-1	(打噴嚏聲) *[sneezing]*
19	04	35.3	CAM-1	…
19	04	41.0	CAM-1	啊嗯*[uh um]*
19	05	09.4	CAM	five hundred
19	05	11.2	CAM-2	嗯*[um]*
19	05	12.4	CAM-1	嗯三百*[um three hundred]*
19	05	12.6	CAM-2	alt star 三百 *[alt star three hundred]*
19	05	15.9	CAM-1	唉*[sigh]*
19	05	25.7	CAM-1	唉唉唉唉 兩百 *[sigh sigh sigh sigh two hundred]*
19	05	35.9	CAM-2	alt star
19	05	37.5	CAM-1	嗯*[um]*
19	05	37.9	CAM-2	我們要到零點二浬 *[we will get to zero point two dme]*
19	05	38.1	CAM-1	…
19	05	39.7	CAM-1	好*[okay]*
19	05	40.5	CAM-2	一點五*[one point five]*
19	05	42.6	CAM	(pitch trim 聲響) *[sound of pitch trim]*
19	05	43.5	CAM-1	嗯*[um]*
19	05	44.1	CAM	(自動駕駛解除聲響) *[sound of disengaging autopilot]*
19	05	45.8	CAM-2	disengaged
19	05	46.8	CAM-1	好*[okay]*
19	05	48.5	CAM-1	保持兩百啊 *[maintain two hundred]*
19	05	57.8	CAM-1	看到跑道了嗎 *[have you seen the runway]*

hh[9]	mm	ss	Source	Context
19	06	00.7	CAM-2	跑道*[runway]*
19	06	01.8	CAM-1	嗯*[um]*
19	06	04.9	CAM-1	唉 哇哈哈哈 *[sigh wow ha ha ha]*
19	06	06.8	CAM-2	沒有*[no]*
19	06	07.6	CAM-1	沒有*[no]*
19	06	09.8	CAM-2	教官沒有 *[no sir]*
19	06	10.4	CAM-1	好 好 okay *[okay okay okay]*
19	06	11.1	CAM-2	go around
19	06	11.4	CAM-1	go around
19	06	13.3	CAM	(不明聲響持續 1.5 秒) (*unidentified sound lasting 1.5 seconds]*
19	06	15.8	RDO-2	go around go around
19	06	17.2	TWR_M	roger
19	06	18.0	CAM	(不明聲響) *[unidentified sound]*
19	06	18.9		CVR 錄音終止 *[CVR recording ends]*

Appendix 9-3 FDR Recording Parameter List

GE222 adopted the version 2B, configuration 1

SERVICE LETTER ATR72

TITLE: DFDR recorded parameters decoding law

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Analog V2b parameters - A(V2b)

Parameter	Data Frame Version	ARINC word	Sub frame	Sampling int. (per second)	Position MSB	Position LSB	Reading (r)	K	Result (R=r/K)	Result range (min)	Result range (max)	Result/Engineering value Conversion law
fine altitude (ft) (see table D(V2b) for sign and selected ADC)	V2b config. 1; 2; 3	20	1;2 3;4	1pps	4	1		1		sign: positive		Value = 1*R-0 same sign as for coarse altitude
										sign: negative		Value = 1*R-4095 (convert R into 2's complement before calculation)
coarse altitude (ft) (see table D(V2b) for sign and selected ADC)	V2b config. 1; 2; 3	19	1;2 3;4	1pps	12	1		1		sign: positive		Value = 16*R-0 Value = 16*R-65520
										sign: negative		(convert R into 2's complement before calculation)
selected altitude (ft) (see table D(V2b) for sign)	V2b config. 1; 2; 3	89	1;2 3;4	1pps	12	1		1		sign: positive		Value =40*R-0
										sign: negative		Value = 40*R-2E+05 (convert R into 2's complement before calculation)
selected VS (ft/min) (see table D(V2b) for sign and selected ADC)	V2b config. 1; 2; 3	92	1;2 3;4	1pps	12	1		1		sign: positive		Value = 12,5*R-0
										sign: negative		Value = 12,5*R-51188 (convert R into 2's complement before calculation)
indicated air speed (kt) (see table D(V2b) for selected ADC)	V2b config. 1; 2; 3	22	1;2 3;4	1pps	12	3		4		0000	1023	Value = 1*R-0
selected air speed (kt) (see table D(V2b) for sign)	V2b config. 1; 2; 3	88	1;2 3;4	1pps	12	1		1		sign: positive		Value = 0,5*R-0
										sign: negative		Value = 0,5*R-2048 (convert R into 2's complement before calculation)
total air temperature (°C) (see table D(V2b) for sign and selected ADC)	V2b config. 1; 2; 3	63	1;3	1/2pps	12	1		1		sign: positive		Value = 0,25*R-0
										sign: negative		Value = 0,25*R-1024 (convert R into 2's complement before calculation)
magnetic heading 1 (°)	V2b config. 1; 2; 3	21	1;2 3;4	1pps	12	3		4		0000	1023	Value = 0,351597*R-0

NOTE: For data frame version see paragraph 3.B.

Analog V2b parameters
Table A(V2b), sheet 1 of 7

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Analog V2b parameters - A(V2b)													
Parameter		Data Frame Version	ARINC word	Sub frame	Sampling int. (per second)	Position MSB	Position LSB	Reading (r)	K	Result (R=r/K)	Result range (min)	Result range (max)	Result/Engineering value Conversion law
roll attitude 1	(°)	V2b config. 1; 2; 3	17;81	1;2 3;4	2pps	12	3		4		0000 0512	0511 1023	Value = 0,351631*R-0 Value = 0,351631*R-360 (>0 : right wing down)
pitch attitude 1	(°)	V2b config. 1; 2; 3	16;48 80;112	1;2 3;4	4pps	12	1		1		0000 2048	2047 4095	Value = 0,087895*R-0 Value =0,087895*R-360 (>0 : nose up)
Selected heading	(°)	V2b config. 1; 2; 3	87	1;2 3;4	1pps	12	1		1		0000	4095	Value = 0,087893*R-0
local angle of attack 1 (2)	(°)	V2b config. 1; 2; 3	23 (24)	1;2 3;4	1pps	12	3		4		0000	1023	Value = 0,097666*R-30 (>0 : positive AOA)
vertical acceleration	(g)	V2b config. 1; 2; 3	2;18;34 50;66;82 98;114	1;2 3;4	8pps	12	1		1		0000 0164	0164 4095	Value = 0*R-3 Value = 0,002289*R-3,375 (>0 : normal acceleration)
longitudinal acceleration	(g)	V2b config. 1; 2; 3	3;35 67;99	1;2 3;4	4pps	12	3		4		0000 0041	0041 1023	Value = 0*R+1 Value = -0,00203*R+1,083 (<0 : acceleration or nose up)
lateral acceleration	(g)	V2b config. 1; 2; 3	4;36 8;100	1;2 3;4	1pps	12	3		4		0000 0041	0041 1023	Value = 0*R+1 Value = -0,00203*R+1,083 (>0 : right side slip)
glide slope 1 (2) deviation	(Mv)	V2b config. 1; 2; 3	28 (29)	1;2 3;4	1pps	12	4		8		0000	0511	Value = -1,56556*R+400 (>0 : a/c above beam)
localizer 1 (2) deviation	(Mv)	V2b config. 1; 2; 3	26 (27)	1;2 3;4	1pps	12	4		8		0000	0511	Value = 1,565558*R-400 (>0 : a/c on left side of beam)
selected course	(°)	V2b config. 1; 2; 3	91	1;2 3;4	1pps	12	1		1		0000	4095	Value = 0,087893*R-0

NOTE: For data frame version see paragraph 3.B.

Analog V2b parameters
Table A(V2b), sheet 2

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Analog V2b parameters - A(V2b)

Parameter		Data Frame Version	ARINC word	Sub frame	Sampling int. (per second)	Position		Reading (r)	K	Result (R=r/K)	Result range		Result/Engineering value Conversion law
radio altitude	(ft)	V2b config. 1; 2; 3	25	1;2 3;4	1pps	12	1		1		0000 1280	1280 4095	Value = 0,390625*R-20 Value = 183.93972*e^(R / 1279.6875) - 20 (e = 2.718)
decision height (see table D(V2b) for sign)	(ft)	V2b config. 1; 2; 3	90	1;2 3;4	1pps	12	1		1		sign: positive sign: negative		Value = 1*R-0 Value = 1*R-4096 (convert R into 2's complement before calculation)
GPS/GNSS ground speed (modification No. 03952/04654 (Service Bulletin No. ATR72-34-1036) or No. 05020)	(Kt)	V2b config. 1; 2; 3	31	1;2 3;4	1pps	12	3		4		0000	1023	Value = 0,5*R-0
GPS/GNSS drift angle (modification No. 03952/04654 (Service Bulletin No. ATR72-34-1036) or No.05020)	(°)	V2b config. 1; 2; 3	33	1	1/4pps	12	2		2		0000 1024	1023 2047	Value = 0,175798*R-0 Value = 0,175798*R-360 (convert R into 2's complement before calculation)
GPS wind speed (modification No. 03952)	(Kt)	V2b config. 1; 2; 3	32	1	1/4pps	12	5		16		0000	0255	Value = 1*R-0
GPS wind direction	(°)	V2b config. 1; 2; 3	32	2	1/4pps	12	4		8		0000	0511	Value = 0,703262*R-0
GPS/GNSS latitude coarse (superframe 1, position 12) (see table D(V2b) for sign) (modification No. 03952/04654 (Service Bulletin No. ATR72-34-1036) or No. 05020)	(°)	V2b config. 1; 2; 3	57	1	1/64pps	8	1		1		sign: positive sign: negative		Value = 0,703125*R-0 (>0 : North) Value = 0,703125*R-180
GPS/GNSS latitude fine (see table D(V2b) for sign) (latitude = coarse + fine)	(°)	V2b config. 1; 2; 3	32	3	1/4pps	12	1		1		sign: positive sign: negative		Value = 0,00017166*R-0 (>0 : North) Value = 0,00017166*R-0,703125

NOTE: For data frame version see paragraph 3.B.

Analog V2b parameters
Table A(V2b), sheet 3

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Analog V2b parameters - A(V2b)

Parameter	Data Frame Version	ARINC word	Sub frame	Sampling int. (per second)	Position		Reading (r)	K	Result (R=r/K)	Result range		Result/Engineering value Conversion law
GPS/GNSS longitude coarse (°) (superframe 1, position 13) (see table D(V2b) for sign) (modification No. 03952/04654 (Service Bulletin No. ATR72-34-1036) or No. 05020)	V2b config. 1; 2; 3	57	1	1/64pps	8	1		1		sign: positive sign: negative		Value = 0,703125*R-0 (>0 : East) Value = 0,703125*R-180
GPS/GNSS longitude fine (°) (see table D(V2b) for sign) (latitude = coarse + fine)	V2b config. 1; 2; 3	32	4	1/4pps	12	1		1		sign: positive sign: negative		Value = 0,00017166*R-0 (>0 : East) Value = 0,00017166*R-0,703125
GPS/GNSS desired track (°) (modification No. 03952/04654 (Service Bulletin No. ATR72-34-1036) or No. 05020)	V2b config. 1; 2; 3	33	2	1/4pps	12	1		1		0000	4095	Value = 0,087891*R-0
left elevator position (°)	V2b config. 1; 2; 3	12;76	1;2 3;4	2pps	12	1		1		0000 3834	0147 4095	Value = 0,087891*R-0 Value = 0,08789*R-360 (>0 : pitch surface down)
right elevator position (°)	V2b config. 2; 3	44;108	1;2 3;4	2pps	12	1		1		4095 0261	3948 0000	Value = -0,0879*R+360 Value = -0,08812*R-0 (>0 : pitch surface down)
left aileron position (°) (without modification No. 04373) (Service Bulletin No. ATR72-27-1045)	V2b config. 1; 2; 3	9;41 73;105	1;2 3;4	4pps	12	1		1		0000 3506	0590 4095	Value = 0,023729*R-0 Value = 0,023733*R-97,21 (>0 : left aileron down)
left aileron position (°) (modification No. 04373) (Service Bulletin No. ATR72-27-1045)	V2b config. 1; 2; 3	9;41 73;105	1;2 3;4	4pps	12	1		1		0000 3474	0559 4095	Value = -0,02504*R-0 Value = -0,02251*R+92,21 (>0 : left aileron down)

NOTE: For data frame version see paragraph 3.B.

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Analog V2b parameters - A(V2b)

Parameter		Data Frame Version	ARINC word	Sub frame	Sampling int. (per second)	Position		Reading (r)	K	Result (R=r/K)	Result range		Result/Engineering value Conversion law
right aileron position (modification No. 04373)	(°)	V2b config. 1; 2; 3	10;42 74;106	1;2 3;4	4pps	12	1		1		0000 3537	0622 4095	Value = 0,022508*R-0 Value = 0,025049*R-102,6 (>0 : right aileron down)
left aileron position (modification No. 08229)	(°)	V2b config. 2; 3	9;41 73;105	1;2 3;4	4pps	12	1		1		0000 3836	0260 4095	Value = -0,05385*R-0 Value = -0,05387*R+220,6 (>0 : left aileron down)
right aileron position (modification No. 08229)	(°)	V2b config. 2; 3	10;42 74;106	1;2 3;4	4pps	12	1		1		0000 3836	0260 4095	Value = 0,053846*R-0 Value = 0,053867*R-220,6 (>0 : right aileron down)
rudder position	(°)	V2b config. 1; 2; 3	14;78	1;2 3;4	2pps	12	1		1		0000 3584	0511 4095	Value = -0,05861*R-0 Value = -0,05861*R+240 (>0 : rudder to left)
flap position	(°)	V2b config. 1;2; 3	63	2;4	1/2pps	12	1		1		0000 0069 3755	0069 0473 4095	Value = 0,04348*R+12 Value = 0,04455*R+11,93 Value = 0,03519*R-132,1 (max = 28° for ATR72-200 max = 33° for ATR72-210)
left pitch trim position	(°)	V2b config. 1;2; 3	47	1;2 3;4	1pps	12	1		1		0000 3545 3814	0552 3814 4095	Value = -0,00629*R-1,78 Value = -0,00651*R+24,81 Value = -0,00631*R+24,08 (>0 : tab up)
left roll trim position	(°)	V2b config. 1	13;77	1;2 3;4	2pps	12	1		1		0000 3892	0308 4095	Value = -0,04302*R-0 Value = -0,04293*R+175,8 (<0 : nose up)

NOTE: For data frame version see paragraph 3.B.

Analog V2b parameters
Table A(V2b), sheet 5

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Analog V2b parameters - A(V2b)

Parameter		Data Frame Version	ARINC word	Sub frame	Sampling int. (per second)	Position		Reading (r)	K	Result (R=r/K)	Result range		Result/Engineering value Conversion law
left pitch control column position	(°)	V2b config. 2; 3	13;77	1;2 3;4	2pps	12	1		1		0000 3892	0308 4095	Value = 0*R-0 Value = -0,00614*R+9,996 (<0 : nose up)
right pitch control column position	(°)	V2b config. 2; 3	45;109	1;2 3;4	2pps	12	1		1		0000 3788	0203 4095	Value = 0*R-0 Value = 0,7*R-56 (<0 : nose up)
yaw trim position	(°)	V2b config. 1	45;109	1;2 3;4	2pps	12	1		1		0000 3788	0203 4095	Value = 0,043103*R-0 Value = 0,043033*R-176,3 (<0 : nose up)
roll control wheel position (modification No. 04373)	(°)	V2b config. 2; 3	11;43 75;107	1;2 3;4	4pps	12	1		1		0000 0180 3834 3930	0170 0240 3916 4095	Value = 0,370588*R-0 Value = 0,616667*R-41 Value = 0,45122*R-1837 Value = 0,379747*R-1555 (>0 : turn left)
yaw control pedal position	(°)	V2b config. 2; 3	15;79	1;2 3;4	2pps	12	1		1		0000 3813	0282 4095	Value = 0,045035*R-0 Value = 0,044892*R-183,9 (>0 : turn left)
engine 1 (2) torque (from EEC 1/2)		V2b config. 1;2; 3	52 (53)	1;2 3;4	1pps	12	3		4		0000	1023	Value = 0,25*R-0
propeller speed NP 1 (2) (from EEC 1/2) (Beta PEC)	(%)	V2b config. 1;2; 3	54 (55)	1;2 3;4	1pps	12	3		4		0000	1023	Value = 0,25*R-0
NL 1 (2) (from EEC 1/2)	(%)	V2b config. 1;2; 3	85 (86)	1;2 3;4	1pps	12	6		32		0000	0127	Value = 0,860047*R-0
NH 1 (2) (from EEC 1/2)	(%)	V2b config. 1;2; 3	56 (58)	1;2 3;4	1pps	12	5		16		0000	0255	Value = 1*R-0
target torque 1 (2)	(%)	V2b config. 1;2; 3	62 (62)	1;3 (2;4)	1/2pps	12	3		4		0000	1023	Value = 0,080672*R+22,5

NOTE: For data frame version see paragraph 3.B.

Analog V2b parameters
Table A(V2b), sheet 6

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Analog V2b parameters - A(V2b)													
Parameter		Data Frame Version	ARINC word	Sub frame	Sampling int. (per second)	Position		Reading (r)	K	Result (R=r/K)	Result range		Result/Engineering value Conversion law
inter turbine temperature ITT 1 (2)	(°C)	V2b config. 1;2; 3	83 (84)	1;2 3;4	1pps	12	3		4		0000 0160 0959	0160 0959 1023	Value = 3,125*R-0 Value = 0,625782*R+399,9 Value = 3,081664*R-1955
fuel quantity 1 (modification No. 03376) (Service Bulletin No. ATR72-23-1014) (superframe 2, position 12)	(lb)	V2b config. 1;2; 3	59	1	1/64pps	12	1		1		0000	4095	Value = 1,342806*R-0
fuel quantity 2 (modification No. 03376) (Service Bulletin No. ATR72-23-1014) (superframe 2, position 13)	(lb)	V2b config. 1;2; 3	59	1	1/64pps	12	1		1		0000	4095	Value = 1,342806*R
fuel flow 1 (2)	(kg/h)	V2b config. 1;2; 3	64 (65)	1;2 3;4	1pps	12	3		4		0000	1023	Value = 0,6837*R
PLA 1 (2) position (from EEC 1/2)	(°)	V2b config. 1;2; 3	60 (61)	1;2 3;4	1pps	12	3		4		0000 0512	0511 1023	Value = 0,351631*R-0 Value = 0,351631*R-360
Propeller 1 (2) Beta 3/4 (modification No. 05138)	(°)	V2b config. 3	111 (113)	1;2 3;4	1pps	12	1		1		0000 2048	2047 4095	Value = 0,087895*R-0 Value = 0,087895*R-360 (convert R into 2's complement before calculation)

NOTE: For data frame version see paragraph 3.B.

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Analog V2b parameters - A(V2b)

Parameter		Data Frame Version	ARINC word	Sub frame	Sampling int. (per second)	Position		Reading (r)	K	Result (R=r/K)	Result range		Result/Engineering value Conversion law
inter turbine temperature ITT 1 (2)	(°C)	V2b config. 1;2; 3	83 (84)	1;2 3;4	1pps	12	3		4		0000 0160 0959	0160 0959 1023	Value = 3,125*R-0 Value = 0,625782*R+399,9 Value = 3,081664*R-1955
fuel quantity 1 (modification No. 03376) (Service Bulletin No. ATR72-23-1014) (superframe 2, position 12)	(lb)	V2b config. 1;2; 3	59	1	1/64pps	12	1		1		0000	4095	Value = 1,342806*R-0
fuel quantity 2 (modification No. 03376) (Service Bulletin No. ATR72-23-1014) (superframe 2, position 13)	(lb)	V2b config. 1;2; 3	59	1	1/64pps	12	1		1		0000	4095	Value = 1,342806*R
fuel flow 1 (2)	(kg/h)	V2b config. 1;2; 3	64 (65)	1;2 3;4	1pps	12	3		4		0000	1023	Value = 0,6837*R
PLA 1 (2) position (from EEC 1/2)	(°)	V2b config. 1;2; 3	60 (61)	1;2 3;4	1pps	12	3		4		0000 0512	0511 1023	Value = 0,351631*R-0 Value = 0,351631*R-360
Propeller 1 (2) Beta 3/4 (modification No. 05138)	(°)	V2b config. 3	111 (113)	1;2 3;4	1pps	12	1		1		0000 2048	2047 4095	Value = 0,087895*R-0 Value = 0,087895*R-360 (convert R into 2's complement before calculation)

NOTE: For data frame version see paragraph 3.B.

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	**Data Frame Version**	**ARINC word**	**Subframe**	**Sampling int. (per second)**	**Bit**	**Law**
time (hours) (superframe 1, position 10)	V2b config 1; 2; 3	57	1	1/64pps	8 to 5 4 to 1	convert reading in binary; tens in BCD on 4 bits convert reading in binary; units in BCD on 4 bits
time (minutes) (superframe 1, position 11)	V2b config 1; 2; 3	57	1	1/64pps	8 to 5 4 to 1	convert reading in binary; tens in BCD on 4 bits convert reading in binary; units in BCD on 4 bits
time (minutes/seconds)	V2b config 1; 2; 3	57	3	1/4pps	12 to 9 8 to 5 4 to 1	convert reading in binary; minute units in BCD on 4 bits convert reading in binary; second tens in BCD on 4 bits convert reading in binary; second units in BCD on 4 bits
date (day) (superframe 1, position 4)	V2b config 1; 2; 3	57	1	1/64pps	8 to 5 4 to 1	convert reading in binary; tens in BCD on 4 bits convert reading in binary; units in BCD on 4 bits
date (month) (superframe 1, position 3)	V2b config 1; 2; 3	57	1	1/64pps	8 to 5 4 to 1	convert reading in binary; tens in BCD on 4 bits convert reading in binary; units in BCD on 4 bits
date (year) (superframe 1, position 5)	V2b config 1; 2; 3	57	1	1/64pps	8 to 5 4 to 1	convert reading in binary; tens in BCD on 4 bits convert reading in binary; units in BCD on 4 bits
Time in hotel mode (minute) (superframe 1, position 9)	V2b config 1; 2; 3	57	1	1/64pps	8 to 5 4 to 1	convert reading in binary; thousands in BCD on 4 bits convert reading in binary; hundreds in BCD on 4 bits
Time in hotel mode (minute) (superframe 1, position 8)	V2b config 1; 2; 3	57	1	1/64pps	8 to 5 4 to 1	convert reading in binary; tens in BCD on 4 bits convert reading in binary; units in BCD on 4 bits
Flight number (superframe 1, position 1)	V2b config 1; 2; 3	57	1	1/64pps	8 to 5 4 to 1	convert reading in binary; thousands in BCD on 4 bits convert reading in binary; hundreds in BCD on 4 bits
Flight number (superframe 1, position 2)	V2b config 1; 2; 3	57	1	1/64pps	8 to 5 4 to 1	convert reading in binary; tens in BCD on 4 bits convert reading in binary; units in BCD on 4 bits
A/C ident (airline rank) (superframe 1, position 6)	V2b config 1; 2; 3	57	1	1/64pps	8 to 1	0 to 255 in binary code

NOTE: For data frame version see paragraph 3.B.

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	**Data Frame Version**	**ARINC word**	**Subframe**	**Sampling int. (per second)**	**Bit**	**Law**
Engine & propeller type identification (superframe 1, position 7)	V2b config 1; 2; 3	57	1	1/64pps	4 to 1	4 blades: 0=ATR42/PW120;1=ATR42/PW121; 4 blades: **2=ATR72/PW124;3=ATR72/PW127;** 4 blades: 4=ATR42/PW121A 6 blades: 5=ATR42/PW127E;6=ATR42/PW121A; 6 blades: **7=ATR72/PW127;8=ATR72/PW124;** 6 blades: 9=ATR42/PW127E/SHED
FDEP installed (superframe 1, position 7)	V2b config 1; 2; 3	57	1	1/64pps	5	1: FDEP installed
FDAU BITE (superframe 2, position 11)	V2b config 1; 2; 3	59	1	1/64pps	12 to 1	1: default 0: OK
Event marker	V2b config 1; 2; 3	52	1;2;3;4	1pps	2	1: event (without ACARS) or 0: event (with ACARS)
outer marker	V2b config 1; 2; 3	67	1;2;3;4	1pps	2	1: marker
middle marker	V2b config 1; 2; 3	65	1;2;3;4	1pps	1	1: marker
inner marker	V2b config 1; 2; 3	65	1;2;3;4	1pps	2	1: marker
GPWS status	V2b config 1; 2; 3	27	1;2;3;4	1pps	2	0: one mode activated
Sel baro setting (integer part) (in.Hg - superframe 2, position 8)	V2b config 1; 2; 3	59	1	1/64pps	4 to 1 7 to 5	convert reading in binary; units in BCD on 4 bits convert reading in binary; tens in BCD on 4 bits
Sel baro setting (frac part) (in.Hg - superframe 2, position 9)	V2b config 1; 2; 3	59	1	1/64pps	4 to 1 8 to 5 12 to 9	0000 convert reading in binary; hundredth in BCD on 4 bits convert reading in binary; tenth in BCD on 4 bits

NOTE: For data frame version see paragraph 3.B.

Discrete V2b parameters
Table D(V2b), sheet 2

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	Data Frame Version	ARINC word	Subframe	Sampling int. (per second)	Bit	Law
Coarse/fine altitude sign	V2b config 1; 2; 3	19	1;2;3;4	1pps	12	0: + (positive data); 1: - (negative data)
Selected altitude sign	V2b config 1; 2; 3	89	1;2;3;4	1pps	12	0: + (positive data); 1: - (negative data)
Selected vertical speed sign	V2b config 1; 2; 3	92	1;2;3;4	1pps	12	0: + (positive data); 1: - (negative data)
Selected air speed sign	V2b config 1; 2; 3	88	1;2;3;4	1pps	12	0: + (positive data); 1: - (negative data)
Selected decision height sign	V2b config 1; 2; 3	90	1;2;3;4	1pps	12	0: + (positive data); 1: - (negative data)
TAT sign	V2b config 1; 2; 3	63	1;3	1/2pps	12	0: + (positive data); 1: - (negative data)
GPS/GNSS latitude sign	V2b config 1; 2; 3	32	1	1/4pps	2	0: + (north); 1: - (south)
GPS/GNSS longitude sign	V2b config 1; 2; 3	32	1	1/4pps	1	0: + (east); 1: - (west)
GNSS degrade mode (modification No. 04654 or 05020) (Service Bulletin No. ATR72-34-1036)	V2b config 1; 2; 3	64	1;2;3;4	1pps	1	0: degrade
ADC selection	V2b config 1; 2; 3	17	1;2;3;4	1pps	1	0: ADC2; 1: ADC1

NOTE: For data frame version see paragraph 3.B.

Discrete V2b parameters
Table D(V2b), sheet 3

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	**Data Frame Version**	**ARINC word**	**Subframe**	**Sampling int. (per second)**	**Bit**	**Law**
TCAS - resolution advisory (modification No. 03375)	V2b config 1; 2; 3	30	1;2;3;4	1pps	3 to 1	000: no advisory 001: clear of conflict 010: drop track 011: altitude lost 100: up advisory corrective 101: down advisory corrective 110: preventive
					6 to 4	000: none 001: 'crossing' advisory 010: 'reversal' advisory 011: 'increase' advisory 100: 'maintain' advisory
					9 to 7	000: no up advisory 001: climb 010: don't descend 011: don't descend > 500 100: don't descend > 1000 101: don't descend > 2000
					12 to 10	000: no down advisory 001: descend 010: don't climb 011: don't climb > 500 100: don't climb > 1000 101: don't climb > 2000

NOTE: For data frame version see paragraph 3.B.

Discrete V2b parameters
Table D(V2b), sheet 4

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	**Data Frame Version**	**ARINC word**	**Subframe**	**Sampling int. (per second)**	**Bit**	**Law**
TCAS - traffic advisory (intruder sensitivity level) (modification No. 03375)	V2b config 1; 2; 3	28	1;2;3;4	1pps	3 to 1	000: not reported 001: SL=1 (unused) 010: SL=2 (level < 500ft) 011: SL=3 (unused) 100: SL=4 (500ft < level < 2500ft) 101: SL=5; (2500ft < level < 10000ft) 110: SL=6; (10000ft < level < 20000ft) 111: SL=7; level > 20000ft
TCAS - sensitivity (TCAS mode/sensitivity) (modification No. 03375)	V2b config 1; 2; 3	29	1;2;3;4	1pps	3 to 1	000: SL=0 (automatic) 001: SL=1 (STBY) 010: SL=2 (TA ONLY) 011: SL=3 (unused) 100: SL=4 (unused) 101: SL=5 (unused) 110: SL=6 (unused) 111: SL=7 (unused)
VHF 1 (2)	V2b config 1; 2; 3	3 (4)	1;2;3;4	1pps	1 (2)	0: transmission
HF (or VHF3 if ACARS installed)	V2b config 1; 2; 3	4	1;2;3;4	1pps	1	0: transmission
HF (or VHF3 if no ACARS installed) (modification No. 03382) (Service Bulletin No. ATR72-23-1024)	V2b config 1; 2; 3	3	1;2;3;4	1pps	2	0: transmission

NOTE: For data frame version see paragraph 3.B.

Discrete V2b parameters
Table D(V2b), sheet 5

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	**Data Frame Version**	**ARINC word**	**Subframe**	**Sampling int. (per second)**	**Bit**	**Law**
AP status	V2b config 1; 2; 3	51	1;2;3;4	1pps	2 to 1	11: AP engaged
Yaw Damper status	V2b config 1; 2; 3	26	1;2;3;4	1pps	2 to 1	11: YD engaged
AP automatic disconnection	V2b config 1; 2; 3	27	1;2;3;4	1pps	3	1: automatic disc ; 0: manual disc
GS CAP mode	V2b config 1; 2; 3	49	1;2;3;4	1pps	12	1: active
IAS CAP mode	V2b config 1; 2; 3	49	1;2;3;4	1pps	11	1: active
VS CAP mode	V2b config 1; 2; 3	49	1;2;3;4	1pps	10	1: active
ALT CAP mode	V2b config 1; 2; 3	49	1;2;3;4	1pps	9	1: active
GA CAP mode	V2b config 1; 2; 3	49	1;2;3;4	1pps	8	1: active
GS ARM mode	V2b config 1; 2; 3	49	1;2;3;4	1pps	7	1: active
vertical active mode status	V2b config 1; 2; 3	49	1;2;3;4	1pps	6	1: capture, 0: track
ALT mode	V2b config 1; 2; 3	49	1;2;3;4	1pps	5	1: active
ADU caution active	V2b config 1; 2; 3	49	1;2;3;4	1pps	4	1: active
TCS active	V2b config 1; 2; 3	49	1;2;3;4	1pps	3	1: active

NOTE: For data frame version see paragraph 3.B.

Discrete V2b parameters
Table D(V2b), sheet 6

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	Data Frame Version	ARINC word	Subframe	Sampling int. (per second)	Bit	Law
EHSI selection	V2b config 1; 2; 3	49	1;2;3;4	1pps	2 to 1	01: RH, 10: LH, 11: dual
BC CAP mode	V2b config 1; 2; 3	51	1;2;3;4	1pps	12	1: active
LOC ARM mode	V2b config 1; 2; 3	51	1;2;3;4	1pps	11	1: active
BC ARM mode	V2b config 1; 2; 3	51	1;2;3;4	1pps	10	1: active
LOC CAP mode	V2b config 1; 2; 3	51	1;2;3;4	1pps	9	1: active
VOR ARM mode	V2b config 1; 2; 3	51	1;2;3;4	1pps	8	1: active
lateral active mode status	V2b config 1; 2; 3	51	1;2;3;4	1pps	7	1: capture, 0: track
HDG HOLD mode	V2b config 1; 2; 3	51	1;2;3;4	1pps	6	1: active
VOR CAP mode	V2b config 1; 2; 3	51	1;2;3;4	1pps	5	1: active
HDG CAP mode	V2b config 1; 2; 3	51	1;2;3;4	1pps	4	1: active
LNAV mode	V2b config 1; 2; 3	51	1;2;3;4	1pps	3	1: active
Effort on pitch axis (captain)	V2b config 1; 2; 3	53	1;2;3;4	1pps	2 to 1	01: nose dn effort; 10: nose up effort; 11: no effort

NOTE: For data frame version see paragraph 3.B.

Discrete V2b parameters
Table D(V2b), sheet 7

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	Data Frame Version	ARINC word	Subframe	Sampling int. (per second)	Bit	Law
Effort on pitch axis (F/O)	V2b config 1; 2; 3	54	1;2;3;4	1pps	2 to 1	01: nose dn effort; 10: nose up effort; 11: no effort
Master Warning	V2b config 1; 2; 3	27	1;2;3;4	1pps	1	0: warning
TO CONFIG Warning	V2b config 2; 3	55	1;2;3;4	1pps	2	0: warning
LDG GEAR NOT DOWN Warning	V2b Config 2; 3	55	1;2;3;4	1pps	1	0: warning
PROP BRK Warning	V2b config ; 3	56	1;2;3;4	1pps	2	0: warning
PITCH DISCONNECT Warning (MFC Lxx)	V2b config 2; 3	94	1;2;3;4	1pps	3	1: warning
PITCH DISCONNECT Warning (MFC Sxx)	V2b config 2; 3	94	1;2;3;4	1pps	4	1: warning
ENG LEFT (RIGHT) Fire Warning	V2b config 2; 3	94	1;2;3;4	1pps	12 (11)	1: warning
EXCESS CAB ALT Warning	V2b config 2; 3	95	1;2;3;4	1pps	2	1: warning
OIL LOW PRESS LEFT (RIGHT) Warning	V2b config 2; 3	94	1;2;3;4	1pps	2 (1)	1: warning (only when CLA not in Fuel shut off position)
ELEC SMOKE Warning	V2b config 2; 3	94	1;2;3;4	1pps	10	1: warning
FWD SMOKE Warning	V2b config 2; 3	94	1;2;3;4	1pps	9	1: warning
AFT SMOKE Warning	V2b config 2; 3	94	1;2;3;4	1pps	8	1: warning

NOTE: For data frame version see paragraph 3.B.

Discrete V2b parameters
Table D(V2b), sheet 8

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	Data Frame Version	ARINC word	Subframe	Sampling int. (per second)	Bit	Law
FLAP UNLK Warning	V2b config 2; 3	94	1;2;3;4	1pps	5	1: warning
NACELLE LEFT (RIGHT) OVHT Warning	V2b config 2; 3	94	1;2;3;4	1pps	7 (6)	1: warning
CAB PRESS OVER LIMIT Warning	V2b config 2; 3	95	1;2;3;4	1pps	1	1: warning
MFC 1A status	V2b config 1; 2; 3	55	1;2;3;4	1pps	2	0: Fault or OFF 1: Normal
MFC 1B status	V2b config 1; 2; 3	55	1;2;3;4	1pps	1	0: Fault or OFF 1: Normal
MFC 2A status	V2b config 1; 2; 3	56	1;2;3;4	1pps	2	0: Fault or OFF 1: Normal
MFC 2B status	V2b config 1; 2; 3	56	1;2;3;4	1pps	1	0: Fault or OFF 1: Normal
AC bus off 1 (2)	V2b config 1; 2; 3	31 (31)	1;2;3;4	1pps	2 (1)	0: bus off
DC bus off 1 (2)	V2b config 1; 2; 3	58 (58)	1;2;3;4	1pps	2 (1)	0: bus off
Airframe de icing	V2b config 1; 2; 3	21	2;4	1/2pps	2	0: de icing on
Ice detection (modification No. 04262)	V2b config 1; 2; 3	52	1;3	1/2pps	1	0: ice detected
Icing AOA (modification No. 04017)	V2b config 1; 2; 3	52	2;4	1/2pps	1	0: icing AOA light on

NOTE: For data frame version see paragraph 3.B.

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	**Data Frame Version**	**ARINC word**	**Subframe**	**Sampling int. (per second)**	**Bit**	**Law**
Supercooled Large Droplet ice detection (modification No. 08121)	V2b config 1; 2; 3	64	1;2;3;4	1pps	2	0: SLD ice detection
Prop 1 (2) anti icing (modification No. 04262)	V2b config 1; 2; 3	61 (61)	1;3 (2;4)	1/2pps	1 (1)	0: propeller anti icing selected
Flap assymetry	V2b config 1; 2; 3	17	1;2;3;4	1pps	2	0: assymetry
LH (RH) spoiler position	V2b config 1; 2; 3	46;110 (46;110)	1;2;3;4 (1;2;3;4)	2pps	2 (1)	0: extended 0: extended
main landing gear	V2b config 1; 2; 3	21	1;2;3;4	1pps	1	1: both main gear on ground
All gears compressed	V2b config 1; 2; 3	22	1;2;3;4	1pps	2	1: all three gears on ground
Landing gear lever position	V2b config 1; 2; 3	33	1	1/4pps	1	1: lever down
blue hydraulic low press	V2b config 1; 2; 3	23	1;2;3;4	1pps	2	0: low pressure
green hydraulic low press	V2b config 1; 2; 3	23	1;2;3;4	1pps	1	0: low pressure
aux hydraulic low press	V2b config 1; 2; 3	24	1;2;3;4	1pps	2	1: low pressure
low pitch 1 (2)	V2b config 1; 2; 3	67 (68)	1;2;3;4	1pps	1 (1)	0: normal traction
Propeller brake	V2b config 1; 2; 3	36	1;2;3;4	1pps	1	0: Propeller brake on

NOTE: For data frame version see paragraph 3.B.

Discrete V2b parameters
Table D(V2b), sheet 10

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	**Data Frame Version**	**ARINC word**	**Subframe**	**Sampling int. (per second)**	**Bit**	**Law**
PEC 1 (2) status (modification No. 04263)	V2b config 1; 2; 3	60 (60)	1;2;3;4	1pps	2 (1)	0: PEC on
Pack valve 1 (2) flow control	V2b config 1; 2; 3	35 (35)	1;3 (2;4)	1/2pps	2 (2)	0: valve open
HP air bleed valve 1 (2)	V2b config 1; 2; 3	35 (35)	1;3 (2;4)	1/2pps	1 (1)	0: valve open
Air flow control	V2b config 1; 2; 3	36	1;2;3;4	1pps	2	0: high on
Propeller 1 (2) Beta 3/4 sign	V2b config 3	111 (113)	1;2;3;4	1pps	12 (12)	0: + (positive data); 1: - (negative data)
CLA 1 (2)	V2b config 3	93 (93)	1;2;3;4	1pps	6 (5)	1: Fuel SO
Prop Brake Lock	V2b config 3	95	1;2;3;4	1pps	9	1: Lock
Prop Brake Unlock	V2b config 3	95	1;2;3;4	1pps	8	1: Unlock

NOTE: For data frame version see paragraph 3.B.

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	**Data Frame Version**	**ARINC word**	**Subframe**	**Sampling int. (per second)**	**Bit**	**Law**
EFIS L (R) Terrain Selection	V2b	96 (96)	2(4)	1/4pps	6 to 1	WSP 30, bit 5 to 0, Specification :
(modification No. 05088)	config 3				1	1: Terr selected for display
					5 to 2	0000: 0.5 Nm
						0001: 1.0 Nm
						0010: 2.5 Nm
						0011: 5.0 Nm
						0100: 10 Nm
						0101: 25 Nm
						0110: 50 Nm
						0111: 100 Nm
						1000: 150 Nm
						1001: 200 Nm
						1010: 300 Nm
						1011: 500 Nm
						1100: 1000 Nm
						1101: 2000 Nm
						1110: Spare
						1111: Spare
					6	1: Terr valid

NOTE: For data frame version see paragraph 3.B.

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	**Data Frame Version**	**ARINC word**	**Subframe**	**Sampling int. (per second)**	**Bit**	**Law**
EFIS L (R) Display & WX Selection (modification No. 05088)	V2b config 3	97 (97)	2(4)	1/4pps	12 to 1	WSP, 31 bit 11 to 0, Specification :
					1	1: WX selected for display
					5 to 2	0000: undefined 0001: 100 Nm 0010: 0.5 Nm (WX growth) 0011: 200 Nm 0100: 1.0 Nm (WX growth) 0101: 300 Nm 0110: 150 Nm 0111: 50 Nm 1000: 500 Nm 1001: 25 Nm 1010: 1000 Nm 1011: 10 Nm 1100: reserved for 2000 Nm 1101: 5 Nm 1110: Undefined 1111: 2.5 Nm (WX growth)
					6	1: ADI composite
					7	1: HIS composite
					8	1: Full mode selected
					9	1: WX valid
					10	Reserved for use with an MFD (not used on ATR-set to 0)
					11	1: HSI in map mode
					12	1: WX in GMAP

NOTE: For data frame version see paragraph 3.B.

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	**Data Frame Version**	**ARINC word**	**Subframe**	**Sampling int. (per second)**	**Bit**	**Law**
NAV 1 (2) sel. Frequency (modification No. 05138)	V2b config 3	57 (57) 59 (59)	2(4) 2(4)	1/4pps 1/4pps	7 to 1 12 to 1	7 to 5 : 10 Mhz 4 to 1 : 1 Mhz 12 to 9 : 0.1 Mhz 8 to 5 : 0,01 Mhz
DME Distance 1 Part 1	V2b config 3	96	1	1/4pps	12 11 10-9 8-5 4-1	Validity: 1 = Valid data, 0 = Invalid data Scale Factor: 1 = x1; 0 = x0.1 Thousands Hundreds Tens
DME Distance 1 Part 2	V2b config 3	97	1	1/4pps	4-1	Ones
DME Distance 2 Part 1	V2b config 3	96	3	1/4pps	12 11 10-9 8-5 4-1	Validity: 1 = Valid data, 0 = Invalid data Scale Factor: 1 = x1; 0 = x0.1 Thousands Hundreds Tens
DME Distance 2 Part 2	V2b config 3	97	3	1/4pps	4-1	Ones

NOTE: For data frame version see paragraph 3.B.

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	**Data Frame Version**	**ARINC word**	**Subframe**	**Sampling int. (per second)**	**Bit**	**Law**
EFIS L(R) Status	V2b config 3	96 (96)	2 (4)	1/4pps	12 to 8	WSP 01, bits 15 to 11, Specification
					12	1: test
					11	1: valid
					10 to 8	000: sapre
						001: MFD backup of copilot HSI
						010: MFD backup of copilot SG
						011: EFIS/MFD not in backup
						100: MFD backup of pilot HSI
						101: MFD backup of pilotSG
						110: MFD backup of both SG's (pilot)
						111: EFIS SG backup of crosside SG MFD backup of both SG's (Copilote)

NOTE: For data frame version see paragraph 3.B.

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	**Data Frame Version**	**ARINC word**	**Subframe**	**Sampling int. (per second)**	**Bit**	**Law**
EFIS L(R) Identifier	V2b config 3	97 (97)	1 (3)	1/4pps	12 to 5	WSP 04, bits 15 to 8, Specification
					12 to 10	000: SRM not selected 001: VOR/LOC 010: LRM to VOR/LOC transition 011: MLS 100: LRM to MLS transition 101: cross side VOR/LOC 110: spare 111: cross side MLS
					9	1: analog ; 0: Arinc 429
					8	1: LRM selected ; 0: SRM selected
					7 to 5	000: LRM not selected 001: LRM A (see WSP 04, bits 2 to 0) 010: spare 011: cross side LRM A 100: spare 101: LRM B 'see WSP 04, bits 5 to 3) 110: spare 111 : cross side LRM B
Stick shaker Captain / FO	V2b config 3	93 (93)	1;2;3;4	1pps	12 (11)	1: active
Stick pusher (modification No. 05138)	V2b config 3	68	1;2;3;4	1pps	2	1: active
PEC 1(2) Fault	V2b config 1;2; 3	93	1;2;3;4	1pps	4(3)	1: fault

NOTE: For data frame version see paragraph 3.B.

Valid for aircraft equipped with modification No. 05136
and not equipped with modification No. 05876 or not equipped with modification No. 05044

Discrete V2b parameters - D(V2b)						
Parameter	Data Frame Version	ARINC word	Subframe	Sampling int. (per second)	Bit	Law
MLS / ILS select 1 (2)	V2b config 3	62 (62)	1;2;3;4	1pps	2 (1)	1: ILS ; 0: MLS
APM ON/OFF *	V2b config 1; 2; 3	5	1 to 4	1pps	12	1: OFF
INCREASE SPEED *	V2b config 1; 2; 3	5	1 to 4	1pps	11	1: ON
DEGRADED PERF *	V2b config 1; 2; 3	5	1 to 4	1pps	10	1: ON
CRUISE SPEED LOW *	V2b config 1; 2; 3	5	1 to 4	1pps	9	1: ON
WEIGHT ROTACTOR POSITION#1 *	V2b config 1; 2; 3	33	4	1/4pps	3	0000: 15T
WEIGHT ROTACTOR POSITION#2 *	V2b config 1; 2; 3	33	4	1/4pps	4	0001: 16T
WEIGHT ROTACTOR POSITION#3 *	V2b config 1; 2; 3	33	4	1/4pps	5	0010: 17T
WEIGHT ROTACTOR POSITION#4 *	V2b config 1; 2; 3	33	4	1/4pps	6	0011: 18T 0100: 19T 0101: 19,5T 0110: 20T 0111: 20,5T 1000: 21T 1001: 21,5T 1010: 22T 1011: 22,5T

NOTE: For data frame version see paragraph 3.B.
* Valid for aircraft equipped with modification No. 05567 or Service Bulletin No. ATR72-31-1054

Appendix 9-4 MSTS Position Accuracy Specification

RSM 970S POSITIONAL ACCURACY

Azimuth accuracy

The **azimuth random error** is **less than 0.068 degrees** (1 sigma), for any Modes 3/A, C or S.

Azimuth precision is 0.0219 degrees (14 bit encoder).

Range accuracy

The range accuracy is a function of various parameters, some of them independent of the radar system, for example the airborne transponder reply time is specified by ICAO to be accurate to within:

- ±0.5 μs, i.e. ±75 m, for Mode A and C transactions,
- ±0.25 μs, i.e. ±37.5 m, for Mode S transactions.

Fortunately this figure is much smaller on modern transponder equipment.

The RSM 970S Mode S radar range accuracy is only limited by:

- the range quantum value (50 ns),
- the coordinates conversion from ϱ–θ to x–y, and
- the clock stability.

Transactions in	Slant range bias (meter)	Range random error (meter RMS)
Mode 3/A or C	< 14 m	< 30 m RMS (1 sigma)
Mode S	< 14 m	<15 m RMS (1 sigma)

備註:
次級雷達提供之航機高度資訊，係由航機transponder傳送至雷達，雷達僅解碼得到航機高度資訊後傳送至飛航管理系統，雷達並未對航機高度資訊加以運算處理，所以雷達本身未存有高度值精確度。

Table 14: Overall accuracy assessment

Accuracy in measured separation	MSTS ACC MST
Number of samples	109378
Root Mean Square horizontal position error (standard requires: expected below 500m)	71.9969m
No more than 10% of the error distribution is exceeding	108.197m
No more than 1% of the error distribution is exceeding	215.639m
No more than 0.1% of the error distribution is exceeding	451.42m

These results are showing the ability of MSTS to perform its service in respect with the International Separation Standard requirements.

Appendix 9-5 Double- Integration and flight path reconstruction

Bias computation: between 17:06:15.465, and t= 17:06:18.298

Parameter	Min value	Max Value	Average	Deviation	Bias
Vertical acceleration	0.990	1.040	1.008	0.008	0.008
Lateral acceleration	-0.009	0.030	0.004	0.005	0.004
Longitudinal acceleration	-0.026	0.044	0.014	0	0.014

19:06:15.242
GPS Position: N23°35'14.30", E119°38'19.35"
Ground speed: 130 knots
Pressure Altitude : 33 ft
True heading : 167°
Magnetic declination: -3°31.3’
Vz=0

The computed trajectory stopped at 1906:18.156, so 719 ms before the end of the recording.
The last computed point is located: N23°35'08.2", E119°38'21.1", which is 14 meters east and 26 meters north of the first house impact point.

Note: all of time is based on ATC Time (FDR UTC + 28 sec = ATC UTC)

Appendix 9-6 Calcuation of Control Column Position and Control Wheel Position

Control Column Position vs Elevator position
The mechanical stops of the elevator surface are reached at:

- -23° (+1°,+0°) in nose up configuration, and
- +13° (+1°,-0.6°) in nose down configuration

On ground, without aerodynamic effort, the corresponding control column position is respectively:

- -11.5° (i.e. 11.25° + 0.25° due to cable stretching), and
- +7° (i.e. 6.75°+ 0.25° due to cable stretching)

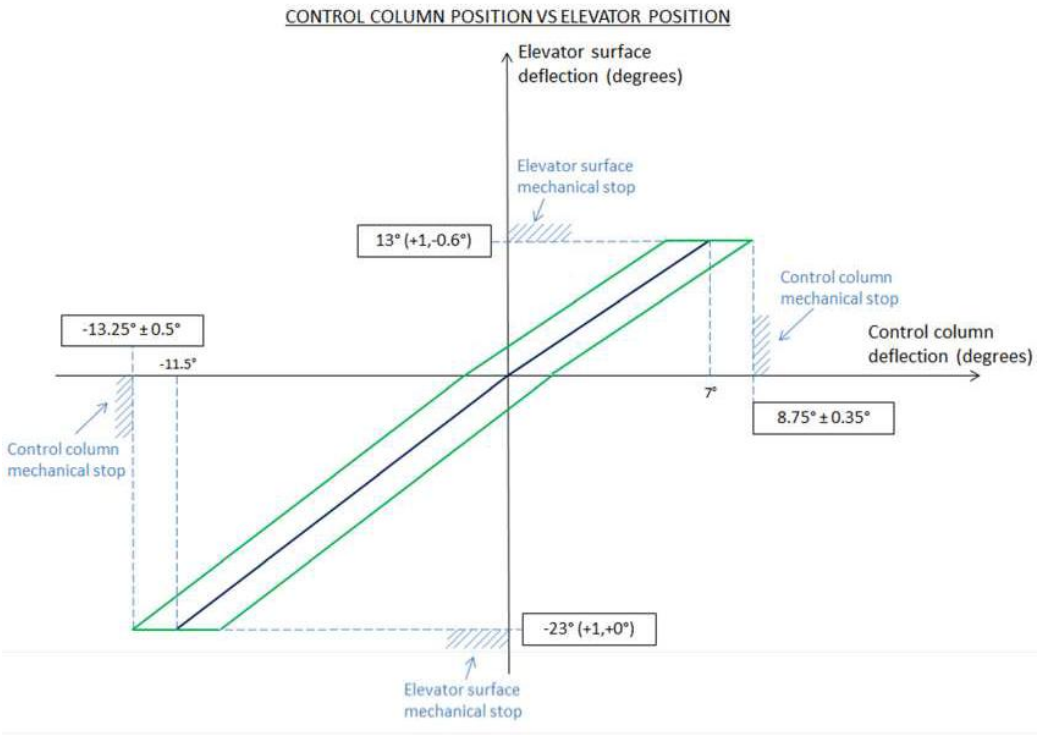
Without aerodynamic effort, the kinematic relationship between the elevator and the control column is almost linear. For ease of reference, following relationship can be used:

- ELV = -23° (+1°,+0°)……..for a control column position of -11.5°
- CCOL = ELV / K1, with 2 < K1 < 2.08……..for a control column position between -11.5° and 0°
- CCOL = ELV / K2, with 1.77 < K2 < 2……...for a control column position between 0° and 7°
- ELV = +13° (+1°,-0.6°)……..for a control column position of 7° With ELV = elevator position and CCOL = control column position.

However, due to cable/linkage stretching, with aerodynamic effort on the elevator, the control column can move further forward or rearward. For reference, when the mechanical stops of the elevator surface are reached, the control column can move beyond the angles provided here above, until it reaches its mechanical stops, i.e. respectively at:

- -13.25° ± 0.5° for a nose up command and
- +8.75° ± 0.35° for a nose down command

In the schematic here below, the blue line represents the kinematic ratio between control column and elevator without aerodynamic effort and the green area represents the range of the same ratio with aerodynamic effort. This schematic is provided to illustrate the answer but shall not be used for any measurement as it is not to scale.



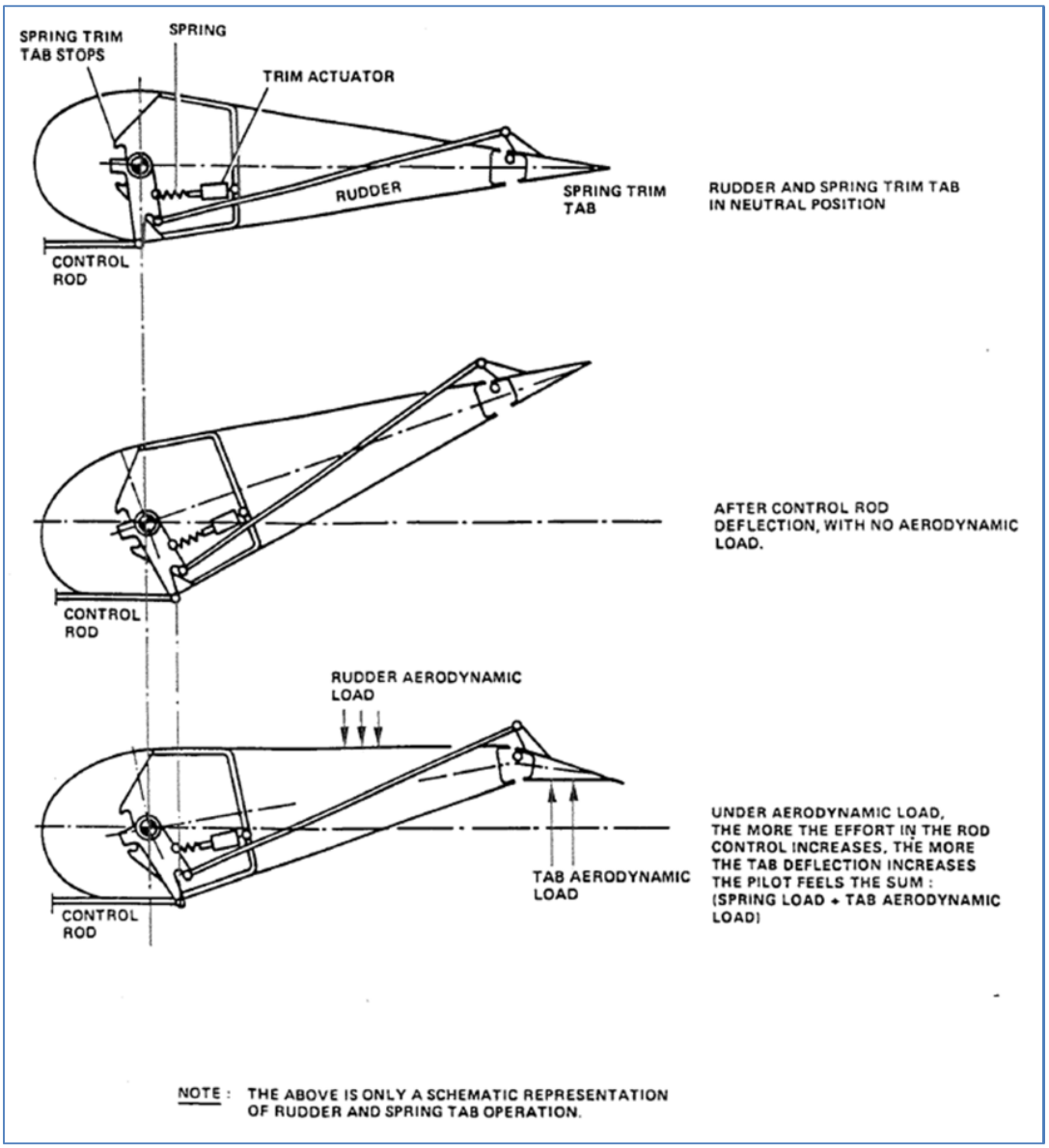
Control Wheel Position vs Aileron position

The mechanical stops of the aileron are 14° ± 0.25° downward and 15° (+0.5°,-0°) upward. The maximal functional aileron deflections are ± 14° ± 0.25°.

The aileron surface deflections depend on the control wheel position and on the spring tab deflection (which varies in proportion to loads / aerodynamics resistance to aileron deflection).

Therefore, there is no direct relationship between the control wheel position and the ailerons position.

The figures below give a schematic representation of a flight control surface / spring tab operation (example of the rudder equipped with a spring tab). It shows that, for a same command, the flight control surface deflection varies in proportion to the loads applied on the surface.

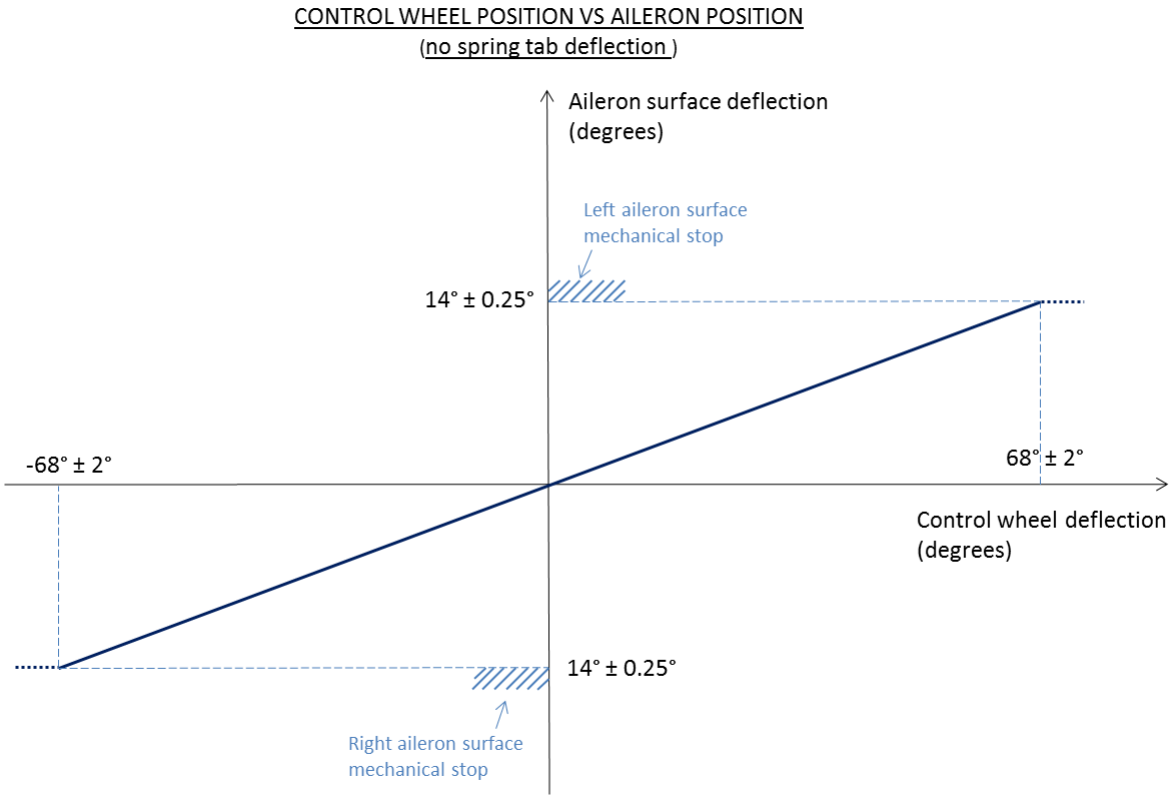


On ground, without any loads on the ailerons/tabs (no spring tab deflection before the aileron surface reaches its maximal functional aileron deflections), the maximal functional aileron deflections of the aileron surfaces are reached for a control wheel position of ±68° (±2°).
However, the control wheel can move beyond these angles (due to spring tab deflection after the aileron surface reaches its maximal functional aileron deflections, and due to cable/linkage stretching), until it reaches its mechanical stops, i.e. at ±107° (± 1°).

The schematic below is only applicable when no load applies on the ailerons/tabs (i.e. without any deflection of the tab). In such a case, following relationship can be used for ease of reference:
CWHEEL = AIL/K3, with K3 around 0.206 (=14/68), for a control wheel position between ± 68° ±2°.

AIL = 14° ± 0.25°, for a control wheel position beyond ± 68° ±2°.

With AIL = aileron position and CWHEEL = control wheel position.



I. Attachment List

No	Item
9-1	ICAO ANNEX 3- Meteorological Service for International Air Navigation
9-2	TNA FOQA Event Setting for ATR Fleet
9-3	ICAO DOC 10000 – Manual on Flight Data Analysis Programes (FDAP)