expected. However, the DFDR record indicated two one- to three-second transmissions with an interval of ten seconds at 15:59 hours. It could not be established on which frequency, to whom, or why these two transmissions were made. However, between 15:58:52 and 16:00:09 there were eight other transmissions by KE 007 on VHF 3. This activity was followed, at 16:00:39, by KE 015 calling Anchorage ARTCC to relay KE 007's position report for passing NEEVA.

1.13.5.2 VHF 2 was reported to be "noisy" after the previous sector, New York to Anchorage. The set was ground tested at Anchorage and found to be serviceable. The DFDR radio transmission keying parameters showed that the VHF 2 set was used by KE 007 in its radio communications with Anchorage CD/TWR, APP and ARTCC between 12:50 hours and 14:35 hours, indicating that the VHF 2 set was functioning normally at least in this time period.

1.13.5.3 The HF transmissions with Tokyo Radio were identified as being spoken by the co-pilot. Since the pilot-in-command of KE 007 was not an instructor pilot, he was required by KAL procedures to fly the aircraft and the co-pilot was expected to carry out the radio communications.

1.13.6 **Flight crew training programme**

1.13.6.1 **INS training**

1.13.6.1.1 KAL trained its flight crews in the procedures for the use of the INS. The six hour ground course included practical training using a CDU mock-up and was followed by in-flight training in conjunction with route training on two flights of a distance exceeding 1 000 NM.

1.13.6.2 **Interception procedures**

1.13.6.2.1 KAL flight crews were taught the interception procedures including the visual signals to be used by intercepting and intercepted aircraft, as contained in ICAO Annex 2 and the KAL/Jeppesen Route Manual.

1.14 **Flight recorders**

1.14.1 **General**

1.14.1.1 Some DFDR and CVR information was recovered by the USSR in 1983. A copy of the CVR tape and the CVR and DFDR armoured containers were given to the Republic of Korea in late 1992. The original CVR and DFDR tapes were handed over to ICAO in Paris, France, on 8 January 1993 by representatives of the Russian Federation.

1.14.1.2 ICAO entered into an agreement with the Government of France which provided for ICAO to rely upon the technical resources of the Bureau Enquêtes-Accidents (BEA) in Paris for the read-out and processing of the flight recorders. The agreement stipulated that the French experts worked under the aegis of ICAO. Accordingly the recovery of information was made by BEA. The Centre d'Essais en Vol at Brétigny-sur-Orge assisted in the primary recovery of DFDR information.

1.14.1.3 A comprehensive assessment of the physical characteristics of the tapes and the information recorded was made to ensure that they contained authentic records from the CVR and the DFDR installed on KE 007.

1.14.2 **Cockpit voice recorder**

1.14.2.1 **CVR design and installation**

1.14.2.1.1 KE 007 was equipped with a Collins 642C-1 CVR, part number 522-4057-002 and serial number 1397. The CVR was designed to record four channels of information on a continuous loop of tape that was 0.25 inches wide and approximately 215 ft in length. The tape was driven at 1.33 inches/second by a synchronous motor that rotated at a speed dictated by the frequency of the aircraft's 400 Hz AC power supply. The CVR was required to retain a minimum of the last thirty minutes of recorded information.

1.14.2.1.2 The CVR had a light-weight outer case into which was slid a chassis containing the tape transport which was housed in an armoured and heat-insulated container. Forward and aft of the container were the associated connectors, power supply and electronic circuits. The armoured container was designed to protect the tape from exposure to fires and high speed impacts.

1.14.2.1.3 The CVR was installed adjacent to the DFDR in the Aft Equipment Centre located in the pressure cabin aft of the left rear passenger door and above the level of the top of the door.

1.14.2.1.4 The 400 Hz power supply to the CVR was fed from the circuit breaker panels near the Flight Engineer's station on the flight deck, in a raceway along the upper right side of the main passenger cabin to a point opposite the CVR and then across the top of the cabin to the CVR. The CVR signals were fed in a raceway along the upper left side of the fuselage.

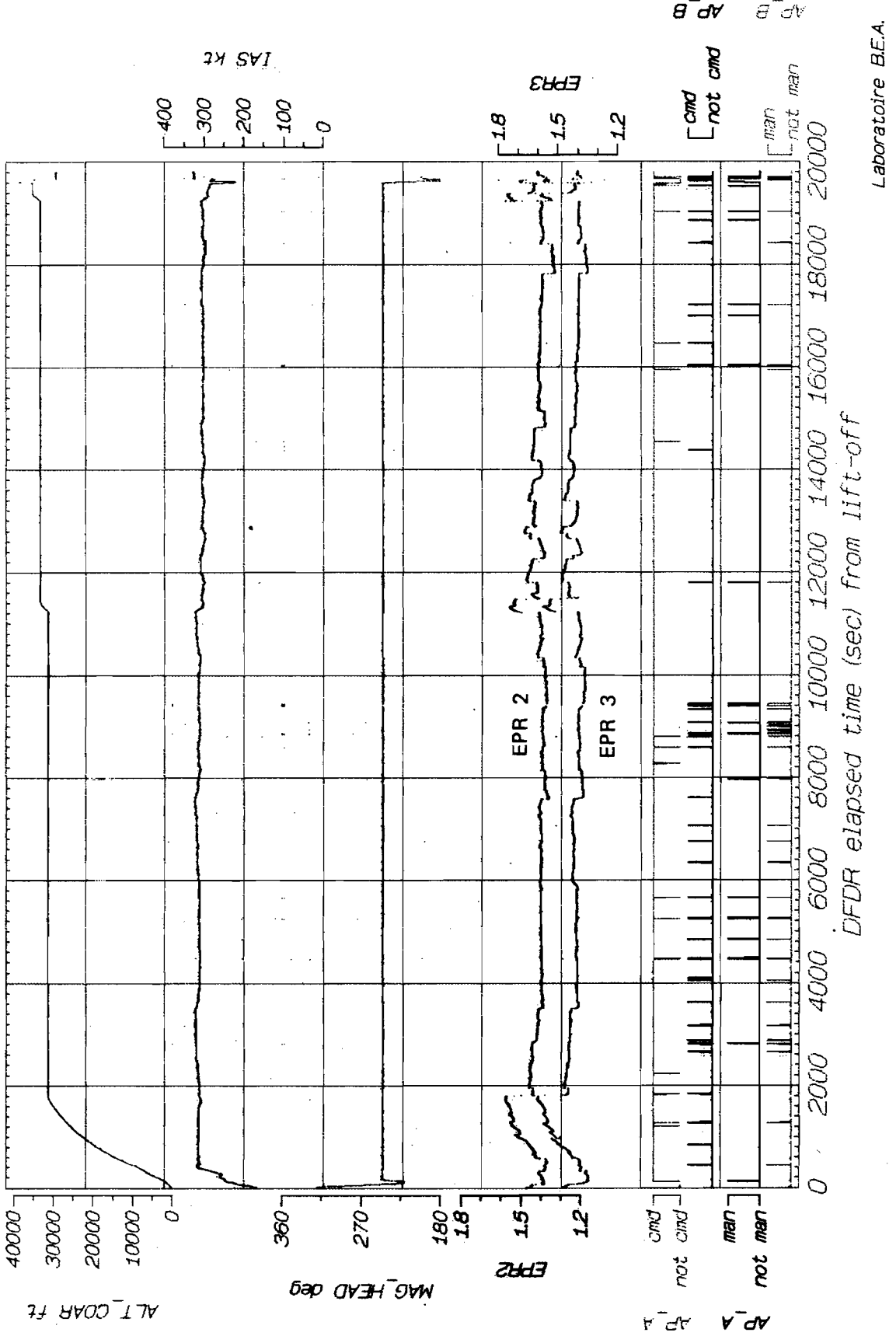
1.14.2.1.5 The information recorded on the individual crew member's audio channels depended on the selections each had made on his audio selector panel. This could have included any combination of incoming information from the three VHF and two HF radios together with intercom and public address messages. Audio through hand, boom or oxygen mask microphones of the crew member concerned were also recorded.

1.14.2.2 **Inspection of the CVR components**

1.14.2.2.1 Examination of the tape transport identified it as being from a Collins 642C-1 CVR. The unit had suffered structural and corrosion damage and components inside had been dismantled. The corrosion was similar to that seen on other recorders that had been immersed in sea water.

1.14.2.2.2 The armoured container had suffered a severe blow on the front side, which had deformed it inwards. Marks in one corner of the box that formed the inner layer of the armoured container were consistent with damage to the turntable and its metal cover which indicated that those items had become detached from their mountings. Also, the side of the container had been subjected to a large distributed force, such as a high speed water impact.

Chart 5. Flight KE 007 from Anchorage to Shoot-down
Graphique 5. Vol KE 007 - D'Anchorage au point d'attaque
Carta 5. El vuelo KE 007 desde Anchorage hasta el derribo
Карта 5. Полет KE 007 от Анкориджа до пункта, в котором воздушное судно было сбито
الخارطة (٥) : مسار طيران الطائرة KE 007 من انكوريدج حتى اسقاطها



1.14.2.3 **Inspection of the CVR tape**

1.14.2.3.1. The full length of the tape was examined visually. Only one tape splice was found for which both ends of the tape had been cut precisely at a 45° angle. This was the original splice necessary to create the tape loop. The length of the tape was not measured though the duration of the recording was determined from the playback and indicated a length of approximately 224 ft as compared with 215 ft specified in the manual. Apart from increasing the duration of the recording, this additional length would not have affected the functioning of the CVR.

1.14.2.3.2 There were traces of mineral deposits, particularly along the edges of the tape, that were consistent with salt water immersion. Significant physical damage at the beginning of the tape matched that of the inside diameter of the CVR tape stack. The tape damage was consistent with that on the tape transport and its armoured container. A point mark and a line across the tape, 2.92 inches and 1.77 inches from the end of the tape, respectively, corresponded to the distance between the erase and record heads. The distance of these marks from the end of the tape and playback of the audio information, indicated that the tape loop was cut before the erase head when it was being removed from the container in the USSR in 1983. This was the normal procedure to ensure that the cut was made a short distance into the oldest information.

1.14.2.4 **CVR tape playback**

1.14.2.4.1 The CVR tape was played back at the BEA cockpit voice recorder laboratory. The frequencies of the power supply interference on one of the channels were monitored by spectral analysis and the tape speed synchronized before the copy tapes were started in the record mode. A working copy was used to make the written transcription of communications and initial noise analyses.

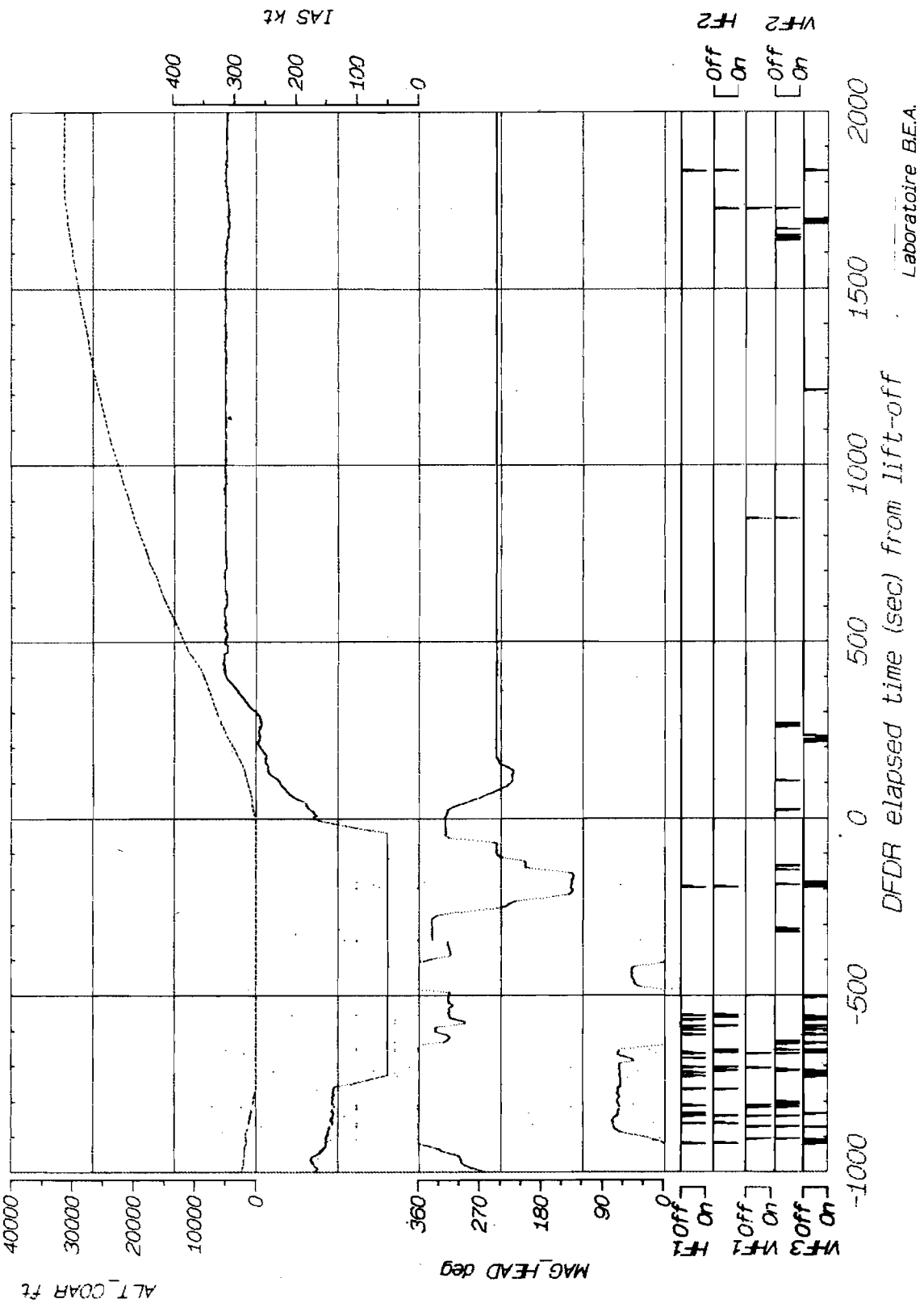
1.14.2.4.2 The task of producing a transcript of the CVR involved translation from Korean to English. In addition to Korean Air personnel, the assistance of a Korean translator was arranged by the French authorities. The elapsed time of the copy tape to the nearest second was displayed and noted for each audio record.

1.14.2.4.3 For the first nine minutes, voice recordings were confined to casual conversation on the flight deck and public address announcements. Apart from the voice recordings, a number of background noises were examined. Intermittently through the first seven minutes forty-five seconds of recordings some unusual sounds occurred which were identified as a keyed continuous wave semi-automatic Morse code tone. Due to the poor quality of the recorded signal and the limited activity no read-out or user identification was possible.

1.14.2.4.4 From 18:15:42 to 18:20:10 hours radio telegraphy signals of varying amplitudes with a carrier frequency of 500 Hz were evident. Analysis confirmed that the signal was a keyed continuous wave semi-automatic Morse code sequence of numbers transmitted at forty words per minute. A transcript was made but no user identification was possible. The reception of such signals on HF by aircraft was a common occurrence.

1.14.2.4.5 At 18:22:56 hours KE 007 reported reaching FL 350. Just over three minutes later, at 18:26:02 hours, a rapid series of loud noises was heard on the cockpit area microphone (CAM) track. This was the moment of missile detonation.

Chart 6. Flight KE 007 Take-off at Anchorage
Graphique 6. Vol KE 007 - Décollage d'Anchorage
Carta 6. Despegue del vuelo KE 007 en Anchorage
Карта 6. Взлет рейса KE 007 в Анкоридже
الخارطة (٦) : اقلاع الطائرة KE 007 من انكوريدج



1.14.2.5 **Validation of the CVR recordings**

1.14.2.5.1 Using the garnet film technique developed by Schlumberger Industries, it was confirmed that the track widths and spacings were compatible with those of the record head used in the Collins' CVR.

1.14.2.5.2 During playback of a copy tape, each crew audio channel was monitored throughout the duration of the recording to ensure that no changes in the frequency of the power supply interference occurred.

1.14.2.5.3 The HF radio communications were correlated with those recorded on the Tokyo ATC tape and their relative timings checked with the radio transmission keying parameters recorded on the DFDR tape. The timings of the VHF radio communications, the change of flight level, and the autopilot disconnect warnings after the attack, were consistent with the DFDR record.

1.14.3 **Digital flight data recorder**

1.14.3.1 **Recording system design**

1.14.3.1.1 KE 007 was equipped with a Teledyne flight data acquisition unit (FDAU). Electrical signals of various types from the numerous sources monitored were fed to this unit where they were processed to a common 0 to 5 volt DC format and then multiplexed into an ARINC 573 serial digital signal that consisted of a string of binary zeros and ones in the form of square waves.

1.14.3.1.2. The signal processing depended on the type of signal input. One group of parameters, which included the magnetic heading, was measured by synchros from which outputs were fed to the FDAU. In the Teledyne FDAU, the conversion from recorded digital numbers to synchro angles was not a linear relationship but a trigonometric function which deviated from linear values by up to $\pm 4°$.

1.14.3.1.3 In the ARINC 573 format, parameters were monitored in a basic four-second cycle known as a frame. This was divided into subframes 1 to 4, each of which spanned one second and contained sixty-four twelve-bit words. The first word in each subframe was a synchronization word that was unique to that subframe number.

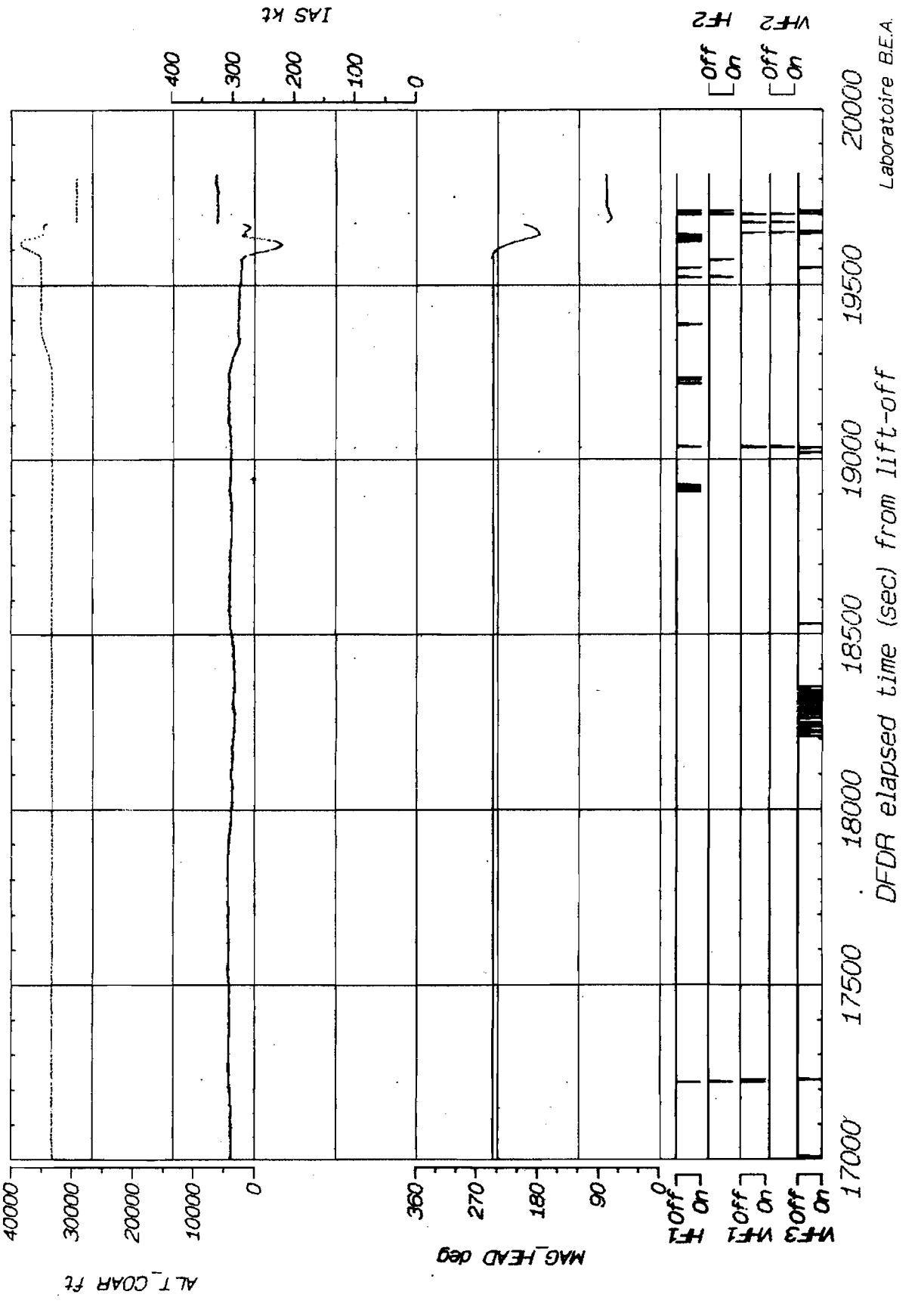
1.14.3.1.4 There was a fixed grouping of words in the frame in which certain words contained measurements with a twelve-bit resolution whilst others had a ten-bit resolution with two bits reserved for bistate signals. Some words were also grouped together so that a parameter could be sampled at rates varying from once per four seconds to four times per second.

1.14.3.2 **DFDR description**

1.14.3.2.1 KE 007 was equipped with a Sundstrand 573A DFDR, part number 981-60009-010 and serial number 3069. The DFDR recorded the ARINC 573 serial digital signal that was generated in the FDAU sequentially on the four tracks of a reversing 0.25 inch Vicalloy metal tape at a tape speed of 0.43 inches/second with a packing density of 1 786 bits/inch. The tape had a length of approximately 800 ft which enabled it to retain the previous twenty-five hours of information.

Chart 7. Flight KE 007 Last 45 Minutes
Graphique 7. Vol KE 007 - Quarante-cinq dernières minutes
Carta 7. Últimos 45 minutos del vuelo KE 007
Карта 7. Последние 45 минут полета KE 007

KE 007 الخارطة (٧) : الدقائق الـ ٤٥ الأخيرة فى رحلة الطائرة



1.14.3.2.2 During recording, the old data was erased immediately prior to the recording of new data. The erase feature was incorporated on the Sundstrand DFDR because of the magnetic characteristics of the metal tape.

1.14.3.2.3 As with the CVR, the tape transport was installed in an armoured and heat insulated container mounted on a chassis that was slid into a light outer box. Power supplies and associated electronics were mounted on the chassis ahead of and behind the container. Again, only the tape in its container was expected to survive a major accident.

1.14.3.2.4 The FDAU was installed in the Main Equipment Centre immediately ahead of the forward cargo compartment. The DFDR was installed in the Aft Equipment Centre adjacent to the CVR. Cables carrying both the serial digital signal and the power supply to the DFDR were fed along the fuselage on the left side above the main passenger cabin in the same raceway as the signal inputs to the CVR.

1.14.3.3 **DFDR parameter list**

1.14.3.3.1 The DFDR recorded the following parameters:

Acceleration (lateral, longitudinal and vertical), altitude (coarse and fine), calibrated airspeed, control column position in pitch, control wheel position in roll, engine pressure ratio for engines No. 2 and 3, flap configuration, VHF and HF keying for HF 1 and 2 and VHF 1, 2 and 3; magnetic heading, pitch and roll attitude; rudder pedal position, horizontal stabilizer position, thrust reverser state for each engine, radio altimeter; autopilot (in and out of Manual, and in and out of Command), and marker beacon (outer and middle).

1.14.3.3.2 A parameter list provided by representatives of the Republic of Korea contained also the following parameters: UTC, VOR/ILS localizer and glide slope, engine pressure ratio for engines No. 1 and 4, and GPWS. However, these parameters showed no activation throughout the duration of the recordings.

1.14.3.3.3 As UTC was not recorded, reliance had to be placed on elapsed time based on the data clocking rate. Although this rate was based on a crystal oscillator and was therefore inherently accurate, difficulties were encountered when there were losses of data synchronization.

1.14.3.4 **Inspection of the DFDR components**

1.14.3.4.1 Examination of the tape transport confirmed that it was from a Sundstrand 573A DFDR. A handwritten "S/N 3069" on the plate that covered the tape reels and also on one of the posts supporting this plate, was the same as the serial number of the DFDR installed on KE 007.

1.14.3.4.2 The armoured container had a crack, approximately 1.5 inches in length, emanating from the lower corner of the top cover nearest to the front face of the recorder. The four screws which attached the cover to the container had suffered excessive shear loads along the plane of the joint between the two parts. The lack of evidence of any concentrated mechanical loads being applied to the exterior of the container indicated that the damage might have resulted from a high speed water impact.

1.14.3.4.3 The tape transport was relatively intact, although the top cover plate of the reels had been detached and the upper reel removed. In addition, a number of the wires to the tape heads had been disconnected. There was evidence of salt water corrosion.

1.14.3.5 **Inspection of the DFDR tape**

1.14.3.5.1 The DFDR tape was handed over to ICAO wound on a reel of the type missing from the tape transport.

1.14.3.5.2 On the first 11.8 inches of the Vicalloy tape, the side that would have been adjacent to the hub of the reel showed a white deposit that appeared to be the result of salt water corrosion. The length of tape affected by the deposit was consistent with the length that would have been in contact with the light alloy hub.

1.14.3.5.3 A short distance along the tape there were three holes, each 2.0 inches apart, used to trigger tape reversal. The garnet film technique was used to determine on which side of the tape the recordings had been made. The magnetic patterns were noticeably sharper on the inside face of the tape. This was consistent with the configuration of the tape in the DFDR. The garnet film technique was also used to determine the width and spacing of the four tracks of data recorded on the tape. These were found to agree with the nominal values to within an acceptable degree of tolerance.

1.14.3.5.4 The full length of the tape was subject to examination. Spliced joints were found at approximately 108, 440, 442 and 463 ft from the beginning of the tape. The middle two were spaced at a distance corresponding to the length of the tape between the two reels and the last data was recorded between these two joints. It was not unusual for the tape to break as a result of high speed impacts, near where it left the reels.

1.14.3.6 **DFDR tape playback**

1.14.3.6.1 To provide maximum capability to validate the information from the last flight, all of the data recorded during the previous twenty-five hours was studied.

1.14.3.6.2 At the time of missile detonation, a brief loss in synchronization lasting 1.4 seconds occurred at the first indication of abnormal measurements. Further losses occurred over a 14 second period about 37 seconds later. For each of these losses, bit dumps of the serial digital data were obtained and edited manually to recover the majority of the lost measurements. These were then incorporated into the engineering unit data files that were used for analysis and plotting of graphs.

1.14.3.7 **Flights recorded on the DFDR**

1.14.3.7.1 The oldest recorded data commenced during an easterly flight 6.5 hours prior to a landing at Anchorage on a flight which originated in Seoul as the first leg of flight KE 008 on 30 August 1983. This was followed by the second leg of this flight from Anchorage to JFK Airport in New York on the same date. The next data recorded was for the first leg of flight KE 007 from JFK to Anchorage on 31 August 1983, and the last data was for the flight from Anchorage to the end of recording, approximately 5.5 hours after take-off. The record of these flights constituted approximately 27 hours of recording.

1.14.3.7.2 The basic parameters of coarse altitude, calibrated airspeed and magnetic heading for these four flights recorded on the DFDR were consistent with the known details of the flights.

1.14.3.8 **Validation of the data recovered from the DFDR**

1.14.3.8.1 The DFDR record showed that the magnetic heading was constant throughout most of the last flight. The recorded headings were plotted on a sensitive scale on which the resolution of the measurements was clearly evident. This showed that the recorded headings were predominantly 245.4° with variations from 244.9° to 246.0°. The validity of the heading indication was confirmed by the record of the associated roll attitudes of the aircraft. The variations in roll attitude were minimal and were themselves supported by the lack of any significant control wheel movement.

1.14.3.8.2 The magnetic heading was studied for validation at appropriate stages in the recording of the previous flights. Also, the recorded magnetic headings during take-offs and landings were compared with runway directions and were found to be within acceptable tolerances.

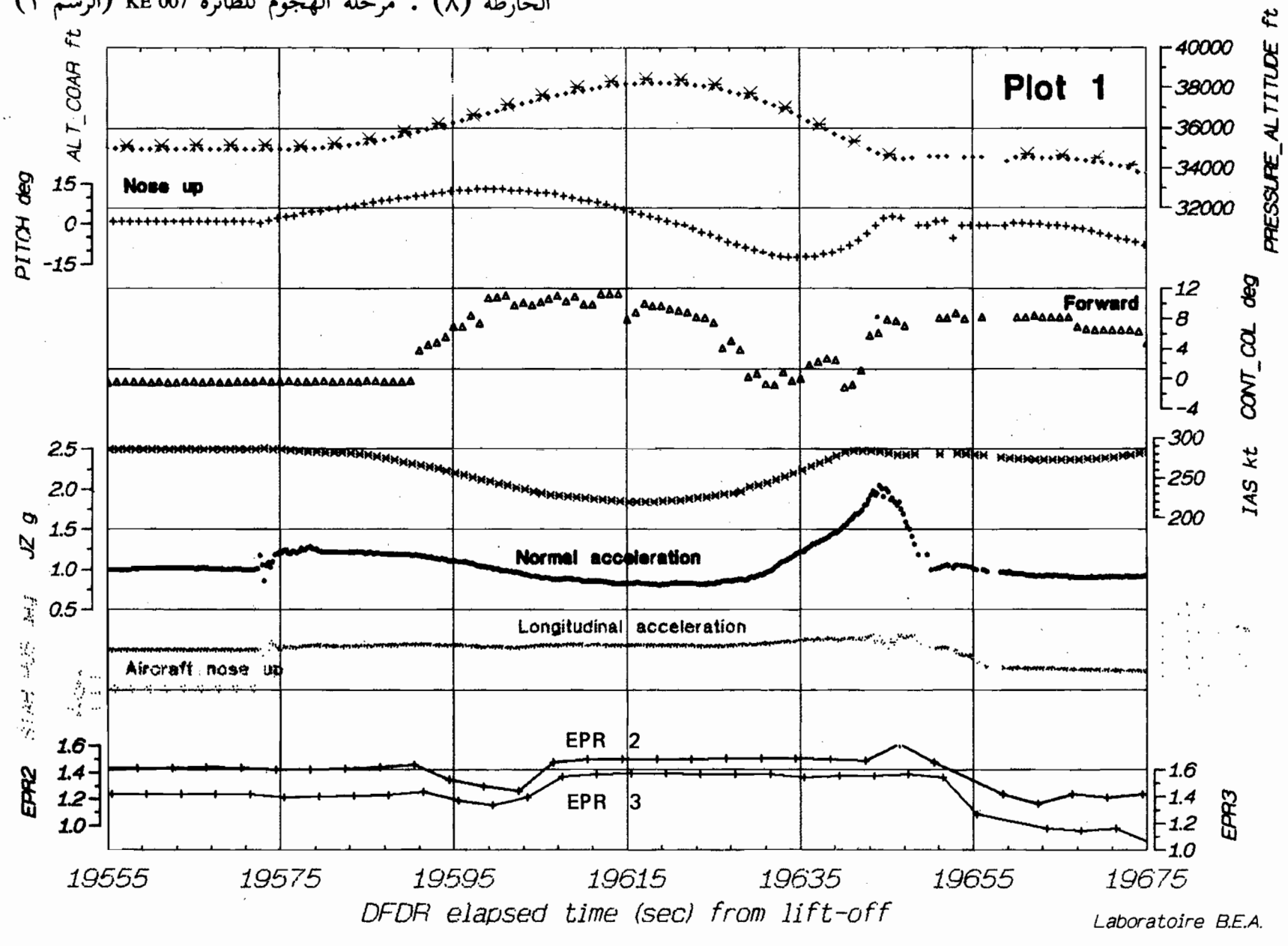
1.14.3.9 **The take-off and cruise phases**

1.14.3.9.1 The DFDR record confirmed that KE 007 turned on to runway 32 at Anchorage and immediately commenced its take-off run. About 23 seconds after lift-off, a turn to the left was initiated onto a magnetic heading of about 220° which was reached approximately 110 seconds after lift-off. Autopilot A was selected to Command mode 130 seconds after lift-off. The aircraft then executed a turn with up to 17° of bank angle on to the magnetic heading of approximately 245° which it reached about 180 seconds after lift-off and then maintained until the attack. Autopilot A remained in Command mode until the attack phase.

1.14.3.9.2 The aircraft reached FL 310 thirty minutes after take-off, and remained at that level for the next two hours thirty-seven minutes. It then climbed to FL 330, maintaining that level for two hours ten minutes and then ascended to FL 350. The attack occurred only three minutes after reaching that level. These changes in flight level matched the ATC clearances.

1.14.3.9.3 A list of 191 radio transmissions from KE 007 recorded on the DFDR during the last flight was compiled. The time and duration of each transmission were noted together with which radio was used. The DFDR information was studied in detail to eliminate any false indications of transmitter keying due to synchronization losses in the recovered serial digital data.

Chart 8. Flight KE 007 Attack Phase (Plot 1)
Graphique 8. Vol KE 007 - Phase d'attaque (graphe 1)
Carta 8. Fase de ataque al vuelo KE 007 (Trazado 1)
Карта 8. Этап атаки рейса KE 007 (график 1)
(الرسم ١) KE 007 مرحلة الهجوم للطائرة : (٨) الخارطة



1.14.3.10 **The attack phase**

1.14.3.10.1 The first abnormality associated with the missile attack was a momentary reduction in the background noise level on the Flight Engineer's audio channel of the CVR. Its duration was of the order of 0.02 seconds. The first of several bursts of noise was detected by the CAM 0.22 seconds later. At the same time, a loss of one zero bit in the recovered serial digital signal from the DFDR occurred. This most likely resulted from a momentary shock to the DFDR that caused a small disturbance in the tape motion.

1.14.3.10.2 Almost immediately, a vertical acceleration of 1.17 g was found as compared with 1.00 g recorded 0.25 seconds earlier. Within a further 0.03 seconds, a reasonable value of lateral acceleration was recorded as compared with obviously incorrect values which had been recorded up to 0.25 seconds earlier. Both these observations suggested that the accelerometer was subjected to a sudden vibration.

1.14.3.10.3 A maximum deflection of the rudder pedal was recorded after the vertical acceleration sample of 1.17 g, and subsequent values stayed constant at the maximum. A near neutral value had been recorded before the attack commenced. Based on a performance analysis of the aircraft's manoeuvres during the attack phase, this was caused by a failure of one of the two cables or their attachments that transmit the rudder pedal motion to the hydraulic actuators at the rear of the aircraft. In this event, the feel centring mechanism would have held the rudder in neutral.

1.14.3.10.4 The first sample of horizontal stabilizer angle recorded after the attack was well outside the maximum range of movement. The previous value had been normal. This change indicated either a failure associated with the transducer installation or an electrical fault in its output.

1.14.3.10.5 The bursts of noise on the CAM recording lasted over a period of 0.87 seconds and the background noise level returned to its pre-attack level 0.23 seconds later. The CVR noises and the initial events recorded on the DFDR were synchronized to within one second by correlation of autopilot disconnect signals with the associated audio warnings, and HF 1 transmit signals with the audio messages.

1.14.3.10.6 Initially the aircraft pitched up and the vertical acceleration increased to approximately 1.2 g over 3 to 5 seconds. There was no indication of control column movement. During this period, the aircraft rolled slightly right wing down. Autopilot A remained in the Command mode.

1.14.3.10.7 Eleven seconds after the CAM recorded the first sounds of the attack, the sound of the cabin altitude warning was heard. The vertical acceleration remained at approximately 1.2 g for about 17 seconds with the aircraft entering a climb at 7 000 ft/min. At this time, the autopilot tripped or was selected to OFF and the sound of the autopilot disconnect warning occurred. The control column then moved forward significantly.

1.14.3.10.8 From 17 to 40 seconds after the attack the aircraft continued to climb, though at a gradually reducing rate, and the vertical acceleration reduced through the 1 g level to 0.82 g. At the same time there was a reduction in the engine power settings. The aircraft also started to roll left wing down. At that point, a crew member reported that the speed brakes were coming out. Neither the vertical nor the longitudinal accelerations showed any evidence that this actually occurred. The indications of speed brake application available to the crew were the spoiler lever position and an amber master caution warning light.

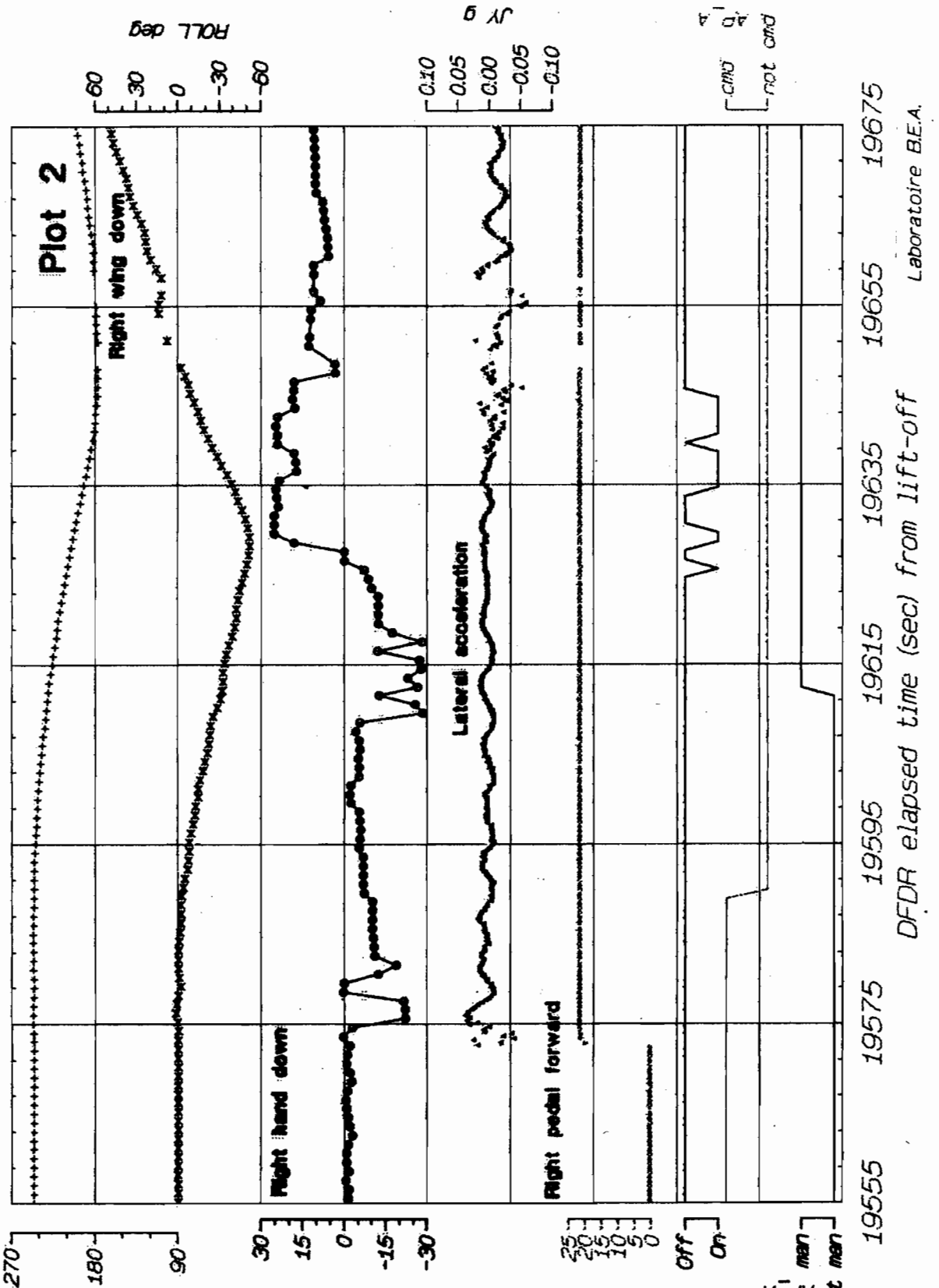


Chart 9. Flight KE 007 Attack Phase (Plot 2)
Graphique 9. Vol KE 007 - Phase d'attaque (graphe 2)
Carta 9. Fase de ataque al vuelo KE 007 (Trazado 2)
Карта 9. Этап атаки рейса KE 007 (график 2)
(الرسم ٢) KE 007 مرحلة الهجوم للطائرة : (٩) الخارطة

1.14.3.10.9 When the roll angle reached about 23°, larger erratic control wheel movements were recorded up to almost 30° left hand down, but there was no noticeable increase in the rate of roll to the left. The DFDR then indicated that autopilot A was selected to the Manual mode in which it remained for the rest of the recording. The DFDR may have recorded the position of the selector only. The selection was accompanied by the sound of a second autopilot disconnect warning.

1.14.3.10.10 The aircraft reached a maximum altitude of 38 250 ft with a reduction in calibrated airspeed from the initial 286 kt to 220 kt. As the aircraft started to descend, the control column first slowly and then more rapidly returned towards the neutral position; the vertical acceleration then increased significantly. For a short period, the rate of descent increased to over 12 000 ft/min and the speed increased to 284 kt. Simultaneously with the more rapid movements of the control column to neutral, the control wheel moved to 25° right hand down, the roll attitude reached 52° left wing down and then decreased.

1.14.3.10.11 During this period, KE 007 contacted Tokyo Radio and transmitted "rapid compressions" and "descend to one zero thousand." Accentuated breathing during the transmission indicated that an oxygen mask was being worn.

1.14.3.10.12 The vertical acceleration increased to just over 2.0 g, at which level it started to fluctuate. With a forward movement of the control column, the aircraft recovered to level flight and rolled right wing down.

1.14.3.10.13 The recordings ceased simultaneously on both the DFDR and the CVR 104 seconds after the attack as the aircraft rolled through 49° right wing down on a magnetic heading of 200° at an altitude of 33 850 ft with a speed of 282 kt CAS and a rate of descent of about 5 000 ft/min.

1.15 Communications recordings

1.15.1 Anchorage ATC recordings

1.15.1.1 The representatives of the United States reported that the original Anchorage ATC tapes were no longer available, but provided certified authentic copy tapes of the recordings as follows: Anchorage CD/TWR/APP (118.3 MHz) between 12:45 and 13:10 hours, Anchorage ARTCC Sector RD 5/6 (125.7 MHz) between 12:59 and 13:39 hours, Anchorage ARTCC Sector D 2/3 (125.2 MHz) between 13:00 and 14:13 hours, Anchorage ARTCC Sector D 10/11 (127.8 MHz and 128.2 MHz) between 13:45 and 17:47 hours, and Anchorage IFSS (HF) between 14:44 and 17:22 hours.

1.15.1.2 The Anchorage CD/TWR/APP, ARTCC and IFSS communications were recorded by separate recording equipment in Anchorage and minor adjustments were made to the recorded times of transmissions to achieve synchronization.

1.15.1.3 The representatives of the United States also made available a copy tape that contained a segment of the Anchorage ARTCC recording at 14:34 hours. This segment of the tape contained nearly inaudible and unintelligible words that had been alleged in 1985 to be the phrase "persons should warn them". This segment had been analyzed by the laboratory of the Federal Bureau of Investigation (FBI) of the United States in 1985 and a copy of the report was made available. The FBI report concluded that "an aural examination of the designated portion of channel 4 ... revealed that no decision can be made

TIME	STATION	TRANSMISSION
18:15:03	Tokyo (CVR 20.53)	Korean Air zero zero seven Tokyo
18:15:07	KE 007 (CVR 20.57)	Korean Air zero zero seven requesting climb three five zero
18:15:13	Tokyo (CVR 21.03)	Requesting three five zero?
18:15:15	KE 007 (CVR 21.05)	That is affirmative now maintain at three three zero Korean Air zero zero seven
18:15:19	Tokyo (CVR 21.09)	Roger stand by call you back
18:15:21	KE 007 (CVR 21.11)	Roger
18:15:36		No recording from 18:15:36 to 18:17:28 on the Tokyo ATC tape.
		— — —
18:17:44	KE 015 (CVR 23.34)	Tokyo Radio Korean Air zero one five reaching ... three seven zero
18:17:49	Tokyo (CVR 23.39)	Korean Air zero one five Tokyo roger
18:18:15		No recording from 18:18:15 to 18:19:53 on the Tokyo ATC tape.
18:20:02	Tokyo (CVR 25.52)	(Selcal 007)
18:20:09	KE 007 (CVR 25.59)	Korean Air zero zero seven Selcal
18:20:11	Tokyo (CVR 26.01)	Korean Air zero zero seven clearance Tokyo ATC clears Korean Air zero zero seven climb and maintain flight level three five zero
18:20:21	KE 007 (CVR 26.11)	Roger Korean Air zero zero seven climb and maintain three five zero leaving three three zero at this time ...
18:20:28	Tokyo (CVR 26.18)	Tokyo roger

TIME	STATION	TRANSMISSION
18:22:56	KE 007 (CVR 28.46)	Tokyo Radio Korean Air zero zero seven ... three five zero
18:23:00	Tokyo (CVR 28.50)	Korean Air zero zero seven Tokyo roger
18:25:55	Dynasty 312 (CVR 31.45)	Tokyo Radio Dynasty three one two on five six
18:26:00	Tokyo (CVR 31.50)	Dynasty three one two Tokyo
18:26:03 18:26:28	Dynasty 312 (CVR 31.53 to 32.18)	Dynasty three one two position PAYON one eight two five level three three zero estimate SHEMYA one nine three five remainder remaining one two six decimal zero minus five zero, zero one zero diagonal four zero, go ahead
18:26:30	Tokyo (CVR 32.20)	Dynasty three one two Tokyo roger contact Anchorage
18:26:35	Dynasty 312 (CVR 32.25)	Thank you out
18:26:57	KE 007 (CVR 32.47)	Tokyo Radio Korean Air zero zero seven
18:27:02	Tokyo (CVR 32.52)	Korean Air zero zero seven Tokyo
18:27:04 18:27:15	KE 007 (CVR 32.54)	... Korean Air zero zero seven rapid ah ... we are ... rapid compressions descend to one zero thousand
18:27:21	Tokyo (CVR 33.11)	Korean Air zero zero seven unreadable unreadable radio check on one zero zero four eight
18:27:33	Dynasty 312	... zero one zero diagonal four zero and Romeo Delta Alpha go ahead
18:27:42	Anchorage	Roger roger, thank you, one five zero south west of SHEMYA contact Anchorage one two eight decimal two
18:27:55	Dynasty 312	One two eight two thank you
18:28:08	Tokyo	(Selcal 007)
18:28:26	Tokyo	(Selcal 007)