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SPECIAL INVESTIGATION REPORT

BUREAU OF AIR SAFETY INVESTIGATION

BASI REPORT B/902/3110

Boeing 747 - 338
Aircraft VH - EBY

Flap limit speed exceedence
on departure from London Heathrow
on Monday 26 March 1990

BASI
Bureau of Air Safety Investigation

Transport and Communications
AUSTRALIA

QANTAS

SPECIAL INVESTIGATION REPORT

B747 - 338 AIRCRAFT VH-EBY
Flap limit speed exceedence on departure from London Heathrow
on 26 March 1990.

Prepared by the
BUREAU OF AIR SAFETY INVESTIGATION
and
QANTAS SAFETY DEPARTMENT

The report on the incident concerning B747-338 VH-EBY at London Heathrow on 26 March 1990 has been prepared by:

B. Sargeant
Senior Inspector (Air Safety)
Bureau of Air Safety Investigation

and

M. Quinn
Air Safety Investigator
Qantas Airways Limited

and is released by the Director of the Bureau of Air Safety Investigation under the provisions of Air Navigation Regulation 283.

CONTENTS

Units of Measurement

All speeds (IAS/CAS)	-	Knots
All altitudes/heights	-	Feet
Heading/bearings/tracks	-	Degrees magnetic
All times/dates	-	UTC

Abbreviations

ADF	:	Automatic Direction Finder
AIFEA	:	Australian International Flight Engineers Association
AIPA	:	Australian International Pilots Association
ASI	:	Air Speed Indicator
ATPL	:	Airline Transport Pilot Licence
BASI	:	Bureau of Air Safety Investigation
CAB	:	Command Airspeed Bug
CAS	:	Computed Air Speed
CRM	:	Cockpit Resource Management
DFDR	:	Digital Flight Data Recorder
DME	:	Distance Measuring Equipment
FFRATS	:	Full Flight Regime Auto Throttle System
FOPAM	:	Flight Operations Policy & Administration Manual
HDG	:	Heading
Intam	:	Internal Notice To Airmen
Khz	:	Kilohertz
LF/MF	:	Low Frequency/Medium Frequency
NDB	:	Non-Directional Beacon
Notam	:	Notice To Airmen
R/T	:	Radio telephony
SID	:	Standard Instrument Departure
UTC	:	Universal Co-ordinated Time
Vftc	:	Final Take-off Climb Speed
VHF	:	Very High Frequency
VOR	:	VHF Omnidirectional Range

References
This report has been prepared , in part, with reference to the following Qantas operational documentation:

- Flight Operations Policy & Administration Manual
- B747 Operations Manual
- Flight Crew Training Manual
- Route Manual (Jeppesen)
- Flight Plan data (VH-EBY)

The Incident

Qantas Boeing B747-338 aircraft, VH-EBY, exceeded the Flap 1 limit airspeed during the departure from London Heathrow Airport on Monday 26 March 1990.

1. FACTUAL INFORMATION

1.1 History of the Flight

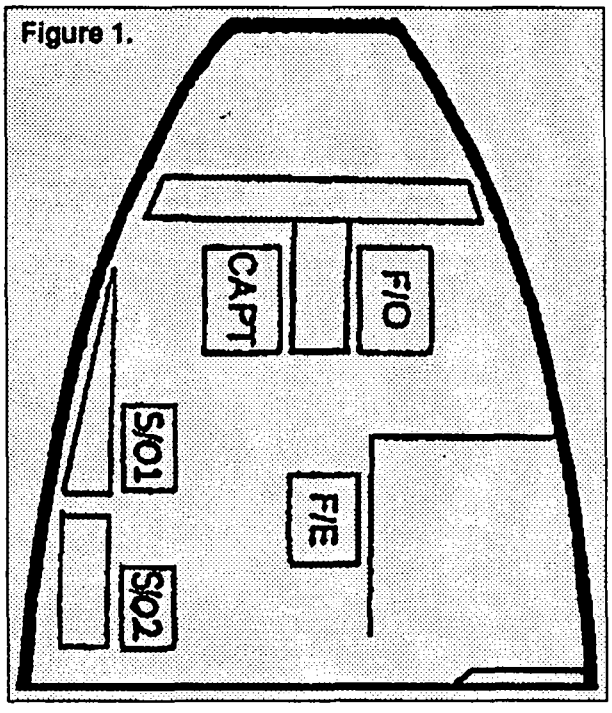
QF002 was scheduled for departure from London Heathrow at 1315 hours UTC on 25 March 1990. Due to engineering problems with the aircraft allocated for this sector, VH-EBY was dispatched from Sydney as a replacement, thus causing a subsequent 18 hour delay in the departure of QF002. The flight eventually departed London at 0704 hours UTC on 26 March 1990 as QF002A.

On arrival at London Flight Dispatch the crew were issued with the Flight Plan and accompanying Notams, Intams and company documentation.

Prior to departure the crew was issued with a runway 27L, Brookmans Park 3G SID. This departure requires a right turn, shortly after take-off, towards the Burnham VOR. At a position 6DME from London, another right turn is required to intercept a track of 058 degrees to Chiltern NDB. Noise abatement procedures apply to this departure as well as an altitude requirement of reaching 3,000 ft nearing completion of the turn towards Chiltern NDB, above 4,000 ft over Chiltern NDB and a crossing altitude of 6,000 ft at Brookmans Park VOR. A speed constraint of 250 knots existed below 10,000 ft.

The seating configuration on the flight deck for departure is shown at Figure 1. The First Officer was flying this sector from the right hand pilot's seat.

Figure 1.

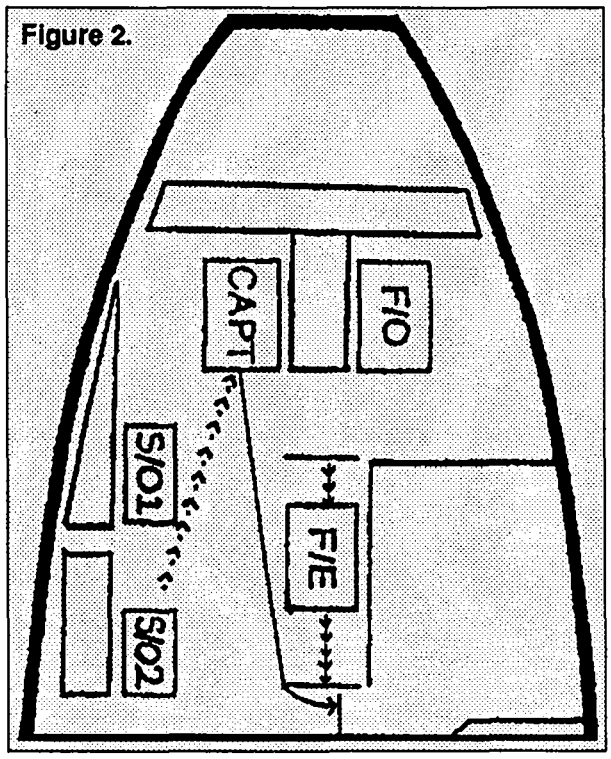


Prior to departure both ADFs were selected to the Chiltern NDB on 279 Khz. S/O 1 stated she had difficulty in positively identifying this station whilst the aircraft was still on the ground. Positive identification was obtained shortly after lift-off with both ADFs giving apparently normal bearing indications.

Shortly after a normal Flap 20 take-off, the Flap selector was moved to the Flap 10 position. As the aircraft neared the completion of the turn towards Chiltern NDB, Flap 5 was selected. Twenty seconds later Flap 1 was selected whilst on a HDG of 088 degrees. The aircraft continued the turn onto a heading of 096 degrees with the 250 knot speed restriction now removed by ATC.

At about this point the Captain called for a seat change which involved removing himself from the left pilot seat and replacing himself with S/O 2. The F/E moved his seat aft, and the Captain then moved to the rear of the flight deck. The seat change sequence is shown at Figure 2.

Figure 2.



As S/O 2 was settling into his new position in the left pilot's seat, London Heathrow departures instructed the aircraft to take up a heading of 040 degrees. The crew asked for a confirmation of 040 degrees, which was confirmed by ATC. The crew were then asked 'where were you going ?' and were told they had passed four miles south of Chiltern. The aircraft was then cleared to Brookmans Park VOR on climb to FL130.

Some four minutes and 12 seconds after Flap 1 was selected, the F/E noticed that the flaps were

still in the Flap 1 position and alerted the F/O. The F/O immediately selected Flap 0, and instructed the F/E to log the flap speed exceedence for entry into the Technical Log. On arrival Bangkok the F/E raised a Technical Log entry of a flap speed exceedence of 25-28 knots on departure London.

1.2 Injuries to Persons

No injury to persons resulted from this occurrence.

1.3 Damage to Aircraft

After the Technical Log was raised in Bangkok, Engineering carried out a Phase One inspection of the flaps in accordance with the Boeing Maintenance Manual Procedure 5.51.04. As the reported speed exceedence in the Technical Log was under 30 knots the Fuse Bolts were not required to be inspected.

Following receipt of the actual flap speed exceedence from the Digital Flight Data Recorder (DFDR), Engineering Sydney notified the aircraft manufacturer and were instructed to inspect Fuse Bolts 1, 3, 6 and 8 followed by the remaining bolts. Fuse Bolts 1, 2, 3, 4 and 8 were inspected immediately, revealing no damage. The aircraft was released for Line Operations with an Engineering Inspection Sheet approved by the manufacturer.

An inspection of the remaining Fuse Bolts was conducted the following week, also revealing no damage.

1.4 Other Damage

Not applicable.

1.5 Personnel Information

Captain
Licence : Valid 1st Class Airline Transport
Age : 42 years
Total hours : 11,128
Hours B747 : 8,453
Last departure LHR prior to 26/3/90 was 4/1/90.
Completed CRM Course 20/9/89.

First Officer
Licence : Valid 2nd Class Airline Transport
Age : 34 years
Total hours : 6,255
Hours B747 : 2,970
Last departure LHR prior to 26/3/90 was 9/10/89.
Completed CRM Course 23/2/90

Second Officer 1
Licence : Valid 2nd Class Airline Transport
Age : 24 years
Total hours : 1,933
Hours B747 : 606
Last departure LHR prior to 26/3/90 was 25/1/90
Completed CRM Course 23/2/90

Second Officer 2
Licence : Valid 2nd Class Airline Transport
Age : 29 years
Total hours : 2,500
Hours B747 : 337
Last departure LHR prior to 26/3/90 was 20/3/90
Had not attended CRM Course

Flight Engineer
Licence : Valid Flight Engineer
Age : 47 years
Hours B747 : 678
Completed CRM Course 11/7/89

1.6 Aircraft Information

VH-EBY is a Boeing 747-338 Extended Upper Deck passenger aircraft, serial number 23823 and basic airframe number R1250. The aircraft is owned and operated by Qantas Airways Limited and was delivered on 1 May 1987. The Certificate of Airworthiness was issued on 1 May 1987 and was valid at the time of the incident. A Maintenance Release for the aircraft was issued at 0630 hours UTC on 26 March 1990. The aircraft was released on Transit Qualification (TQ) 22/04 with the FFRATS inoperative. As a result, automatic flap limit speed protection was not available.

1.7 Meteorological Information

Weather conditions were not considered to have contributed to the development of this occurrence.

1.8 Aids to Navigation

All aircraft radio navigation aids, and appropriate ground stations in the London Terminal Area were serviceable.

Prior to take-off; NAV 1 was tuned to London (LON) VOR/ DME. NAV 2 was tuned to Burnham (BUR) VOR.

ADF 1 and ADF 2 were selected to 279 Khz in accordance with the frequency of the Chiltern (CHT) NDB as depicted by the current Jeppesen Chart for the Brookmans Park and Daventry, Standard Instrument Departure (SID) procedures.The CHT NDB was only able to be identified on both ADFs after take-off. S/O 1 stated that the identification signal was weak.

The Chiltern NDB frequency had been changed to 277 Khz, and promulgated by United

Kingdom Class II Notam A155 on 2 March 1990, and also issued as a Class I Notam. This change was included in the 9 March 1990 revision of Jeppesen Chart Notams, page E-54.

Company Intam QOG9448 was issued on 25 March 1990, at 0450 hours UTC, concerning the amended frequency of the Chiltern NDB.

Both the relevant Chart Notam and Company Intam were carried in the aircraft at the time of the occurrence.

1.9 Communications

The serviceability of radio communications systems was not a factor in this occurrence.

1.10 Aerodrome Information

Not a factor in this occurrence.

1.11 Flight Recorder

The aircraft was equipped with a Lockheed Aeronautical Systems Digital Flight Data Recorder (DFDR). A readout was conducted by the Bureau of Air Safety Investigation (BASI) to determine whether a flap placard limit speed exceedence had taken place. The readout determined the following:

- The recorded data quality was assessed as very good.
- The incident take-off was positively identified.
- The recorded Computed Airspeed (CAS) exceeded 275 knots (the Flap 1 limit speed) for approximately 2 minutes and 55 seconds with the flaps extended in the Flap 1 position. The maximum recorded CAS during that period was 347 knots.
- Flaps were retracted from Flap 1 to Flap 0 at a CAS of 339 knots.
- The difference between the Captain's ASI and the recorded CAS value would typically be within 3 knots.

1.12 Wreckage and Impact Information

Not applicable.

1.13 Medical and Pathological Information

Not applicable.

1.14 Fire

Not applicable.

1.15 Survival Aspects

Not applicable.

1.16 Tests and Research

The Qantas B747-2/300 Flight Simulator was used in an attempt to duplicate the flight profile of VH-EBY on departure from London Heathrow. The purpose of the exercise was to examine what effect a crew change, as conducted on the incident flight, would have had on the operation of the aircraft.

By itself, the crew change generally appeared to have little adverse effect. However, without the problems caused by navigational error, and ATC communications at a critical phase of the departure procedure, the exercise proved to be of limited value.

It was possible to show that the F/E should have had little difficulty in reading the ASI on the F/O's instrument panel.

It was also considered that the green coloured flap annunciator on the centre panel was reasonably inconspicuous and could easily have been overlooked by the crew, especially when their attention was distracted by other events, or by adverse ambient light conditions.

The flight path of the aircraft, using an estimated wind component based on the actual surface wind, was found to be consistent with information provided by ATC.

1.17 Additional Information

Summary of interview with Technical Crew.

A meeting with the technical crew of VH-EBY was conducted at the Qantas Jet Base on 30 March 1990 to investigate the circumstances surrounding the departure of QF002A from London Heathrow on 26 March 1990, and the subsequent exceedence of the Flap 1 maximum airspeed limit. The crew said the aircraft had carried out a normal take-off from runway 27L at Heathrow on a Brookmans Park 3G SID, with a requirement to reach 3,000 feet before 6 DME London. In accordance with the SID, the aircraft was turned right to intercept a track of 058 to the Chiltern NDB.

At that stage the Captain was in the left seat as the non-flying pilot. The F/O was flying the aircraft from the right seat. S/O 1 occupied the 1st observers station, behind the Captain's seat, and S/O 2 occupied the 2nd observers station at the rear.

The navaids had been selected for departure as follows:

NAV 1	London VOR/DME
NAV 2	Burnham VOR
ADF 1	Chiltern NDB
ADF 2	Chiltern NDB

Prior to take-off S/O 1 had experienced considerable difficulties in obtaining an ident on the Chiltern NDB, finally getting a very weak ident in the range mode.

During the turn towards the Chiltern NDB the F/O called for a heading of about 090. At that point the speed mode was in IAS hold at 200 knots. The aircraft was turned to intercept the 058 track. The needles did not move as expected and the F/O began to think there may have been something wrong.

The Captain looked at the ADF needles and, although a little surprised, considered the heading appropriate. He then changed seats with S/O 2, at a height of about 5,000 feet, to give him experience in support duties and R/T procedures. Shortly after, the Captain heard London Control ask 'where are you going Qantas?'. They were told the aircraft was well south of Chiltern and were given a radar heading of 040. At that point the ADF needles were in confliction with the reported position of the aircraft. Prior to departure the Chiltern NDB had been tuned and checked and had been subsequently identified by three pilots.

London Control then said they had had a similar occurrence earlier that day.

At about that time the Captain thought the speed restriction of 250 knots was cancelled and the aircraft cleared to Brookmans Park. He had become concerned about the operation of the ADF navigation equipment, particularly because they had a long flight to Bangkok, including flight over Russia. Because of this he had allowed his attention to be distracted from the operation of the aircraft.

The F/O recalled that London had said they were 4 miles off track, cancelled the 250 knot speed restriction and cleared them direct to Brookmans Park VOR. Things had become very busy, and he was concerned about the navigation of the aircraft as well as assisting S/O 2 in communicating with ATC. He was not sure if the Command Airspeed Bug (CAB) had been moved to the normal climb speed.

It was some time later that the F/E said the flaps were still at Flaps 1. The F/O said he looked down, saw the IAS was above 275 knots and selected flaps up, probably at about 300 knots. He immediately realised his mistake as the speed was well above 275 knots. He said he turned and instructed the F/E to log the exceedence. He could not be sure of the exact speed but thought it had been about 300 knots.

The Captain could not recall the aircraft configuration, at the time of the occurrence, or what the CAB was set to. He thought it would have been set at Vftc+10 in line with his usual practice, but could not recall if that was later moved, and if it was, by whom.

The F/O was asked whether he had a target airspeed during the climb. He said the climb speed was 340 knots but he could not remember the speed when the exceedence was noticed. He had not thought it was as high as 340 knots. The F/E had been carrying out his scan when he saw the flaps apparently not retracted. He looked at his panel and saw four green lights, glanced at the ASI, realised there was an exceedence and immediately told the F/O. He was very positive the airspeed was either slightly over, or slightly under, 300 knots. The Captain was asked if had he given any thought to contacting Company engineering, or returning to London, or carrying out a visual inspection to assess for any damage. He did not feel it was serious enough to warrant any of these actions, the flaps were retracted, nothing would be seen, and the aircraft was handling normally.

There was limited discussion with the crew about the occurrence, and it was left to the F/E to enter the exceedence in the Tech Log. The Captain did not consider the occurrence required the submission of an Air Safety Incident Report as he thought the Flight Data Recorder would be pulled when the Tech Log entry was actioned. None of the crew were aware of the leading edge flap inspection criteria following a flap limit speed exceedence. They also believed the exceedence was in the order of 25 to 28 knots.

The crew were also unaware that the frequency of the Chiltern NDB had been changed from 279 to 277 Khz.

1.18 New Investigation Techniques

Not applicable.

2. ANALYSIS

The investigation was designed to examine:

- The circumstances leading to the occurrence, and
- The events following on from that.
- Any matters arising from the investigation, not contributing directly to the occurrence.

2.1 Pre-Incident

Although the aircraft was serviceable for the intended operation, the FFRATS system was inoperative. The technical crew were aware of this factor.

The technical crew were operating on a 18 hour delay to their schedule and had responded to a 0400

hours call. Despite this, it is considered they were adequately rested.

Prior to pushback the aircraft was issued with a Brookmans Park 3G SID. That procedure, in part, imposed altitude, speed and noise abatement limitations on the aircraft during the departure. It also required the aircraft to be navigated with reference to the London, Burnham and Brookmans Park VOR's, as well as the Chiltern NDB. Although the procedure is not considered to be unusually difficult, it nevertheless required crew co-ordination of a high order to ensure a properly executed departure. Prior to take-off, both ADFs were selected to the Chiltern NDB on a frequency of 279 Khz. Some difficulty was experienced in obtaining a usable signal prior to take-off. This resulted in the NDB having to be positively identified shortly after lift-off. Both ADF indicators displayed apparently normal bearing information.

The crew were unaware that the Chiltern NDB frequency had recently been changed to 277 Khz. This information had been available to the crew in the form of a Company Intam and a Jeppesen Chart Notam.

In general, I.C.A.O. Annex 10 recommends a minimum frequency separation standard of 3 Khz to apply to aeronautical beacons operating in the LF/MF frequency band. This is designed to provide for protection from harmful interference. It is considered that the Chiltern NDB met that standard. However, the effect of the 2 Khz change was to result in unreliable ADF indications when incorrectly tuned to 279 Khz. This was because the RF selectivity of the aircraft equipment could be expected to have a band width of up to 3 Khz. This effect was subsequently demonstrated by a company aircraft deliberately selecting 279 Khz whilst on the ground at Heathrow. A usable, and apparently normal signal, was able to be received.

Shortly after take-off the 250 knot ATC speed restriction was removed. As the aircraft approached the final part of the turn to intercept a track of 058 to the Chiltern NDB, the F/O found the aircraft was apparently on a track of about 085 to the NDB. Both the F/O and Captain accepted this as being reasonable and the aircraft was rolled out on a heading of 090. Had the Brookmans Park VOR been selected at that stage the accuracy of the ADF information would have been seen to be questionable.

At an altitude between 4,000 and 5,000 feet the Captain vacated his seat to allow S/O 2 to gain some experience in the left seat. As the change was taking place the F/O was effectively flying the aircraft on his own. The F/E was required to move his seat aft to facilitate the crew change. Disruption was also caused to S/O 1. In the normal course of events this would probably have had little effect on the conduct of the flight, however, as S/O 2 entered the left seat, at 0734 hours, he said he heard London Control instruct the aircraft to turn onto a heading of 040. When queried, ATC said the aircraft had passed four miles south of the Chiltern NDB. A number of exchanges took place between the aircraft and ATC over the next 4 minutes, during which time the aircraft was recleared to FL130, and instructed to resume own navigation to Brookmans Park. At 0739 hours the aircraft was instructed to change to the next ATC frequency.

The DFDR readout showed that at 0735:38 the CAS reached the Flap 1 placard limit speed of 275 knots. The CAS continued to increase until at 0738:30 the Flap selector was positioned to Flap 0, at a CAS of 339 knots. The maximum CAS recorded during this period was 347 knots.

A comparison of the ATC transcript and the DFDR readout shows that S/O 2 was almost wholly engaged in communicating with ATC. The F/O said he had been concerned about the navigation of the aircraft as well as assisting S/O 2 in communicating with London Control. The Captain said he was concerned about the serviceability of the ADF equipment. He was also poorly placed to monitor the operation of the aircraft. The attention of S/O 1 appears not to have been adequately directed towards observing the progress of the aircraft. Although required to provide backup monitoring to the pilot not flying, the F/E also failed to notice the flaps were still extended until almost 3 minutes after the aircraft had exceeded the 275 knot limit.

When the F/E observed the flap limit had been exceeded he immediately notified the F/O who reacted instinctively by moving the flap selector to the Flaps 0 position. The F/O said he then realised his mistake in not reducing speed below 275 knots prior to flap retraction. He then turned and instructed the F/O to log the exceedence.

As manager of the flight, the Captain is responsible for priority setting, allocation of tasks and communicating with his crew. Breakdowns in each of these functions contributed towards the incident. At the time the Captain initiated the seat change, the progress of the flight was apparently quite normal, however, this changed when the aircraft was advised of the navigational error. As a result, the pilot flying (F/O) was faced with an unreasonable workload. It would appear that task shedding occurred as a consequence of this overload.

The leadership grid included in the company CRM manual describes leadership style in terms of

two axes, concern for people and concern for tasks. It would appear that in this incident the Captain demonstrated a high degree of concern for the training needs, and a lesser concern for the task.

Finally, although the company stresses that CRM is a normal management principle, it is possible that the crew associated CRM with sudden, catastrophic events. Because this incident developed relatively slowly, the crew may not have immediately recognised the situation as one requiring the conscious application of CRM principles. CRM is sometimes perceived as a method for coping with problems once they have been identified. There may be a need for more emphasis on CRM as a normal practice rather than a stategy for dealing with obvious problems.

2.2 Post-Incident

The F/E said that after he had observed the 4 green lights (leading edge flap indicators) he glanced at the airspeed indicator. He was very positive the speed was either slightly over, or slightly under, 300 knots. As a result, he logged the exceedence as between 25/28 knots. The DFDR readout indicated the CAS at flap retraction was 339 knots. The reason for this discrepancy could not be positively determined.

When the F/O was told by the F/E that Flap 1 was still extended, he looked at the ASI and noticed the speed was in excess of 275 knots, although he could not remember what the actual airspeed was. At that point the altitude of the aircraft was 8,780 feet. He did accept that he had a target climb speed of 340 knots, but said he could not recall if the CAB had been moved to the normal climb speed. The DFDR readout of CAS indicated the aircraft reached a speed of 335 knots at 0736:24. The speed remained within the range of 335-347 knots until 0738:30, when the flaps were retracted. This speed range was considered to be consistent with the aircraft being manually flown at the normal climb speed of 340 knots.

The Captain, and both Second Officers were not sure of the airspeed at the time the flap limit exceedence was noticed.

From the evidence available, the rest of the crew accepted the speed stated by the F/E. There was apparently little or no discussion by the crew concerning the event. The Captain said he had left it to the F/E to enter the exceedence in the aircraft Tech Log. The Captain was asked if he had given any thought to carrying out an assessment of possible aircraft damage, or of requesting Company Engineering information to determine what options were available to him. He said he did not regard the exceedence was serious enough to warrant any further action. This was despite no crew member having any knowledge of what constituted a serious flap speed exceedence.

All crew members, with the exception of S/O 2, had completed a Cockpit Resource Management Course (CRM) within the preceeding nine months. Consequently, they would have been aware of the basic concepts of group behaviour, and in particular, the dangers of 'Group Think'. It is considered that a number of the eight main symptoms of 'Group Think' affected the ability of the crew to act effectively after the occurrence. These symptoms were:

- Rationalisation
- Peer Pressure
- Self-Censorship
- Unanimity

It is considered that a reasonably accurate assessement of the airspeed during the occurrence could have been determined had the Captain gathered and analysed all of the available information at the time. By so doing, the seriousness of the incident would have been far more apparent to him, and may have affected his subsequent actions. As it was, the Captain did not regard the occurrence warranted the submission of an Air Safety Incident Report. He considered the Flight Data Recorder would be removed for reading once the Tech Log entry was actioned at Bangkok.

2.3 Other Matters Arising from the Investigation

1. The Tech Log entry was actioned by ground engineering at Bangkok and the appropriate check, for a less than 30 knot exceedence, carried out. This involved a relatively simple inspection of the leading edge flap system.

The inspection procedure did not require the DFDR to be removed. However, had an Air Safety Incident Report been submitted, the exceedence would have resulted in the immediate removal of the DFDR. The Company Flight Operations Policy and Administration Manual (FOPAM) defines an Aircraft Incident as 'Any occurrence other than an accident associated with the operation of the aircraft that affects or could affect the safety of the operation of the aircraft'. The FOPAM also defines when an incident will be reported.

Although it is considered that this particular occurrence clearly needed to be reported, it is also felt that the Incidents and Accidents section of the FOPAM failed to provide sufficiently clear guidance to the Captain.

2. Because the reported exceedence was less than 30 knots, no engineering requirement called for the DFDR to be removed, or for the exceedence to be reported to the company Safety Department.

As a result, the aircraft continued in service, passing through a number of intermediate ports until the DFDR was removed from the aircraft in Melbourne on 28 March 1990.

The decision to remove the recorder resulted from the flap limit speed exceedence becoming known to the Safety Department, by chance, at a Company management meeting reviewing departure delays.

3. The Chiltern NDB frequency change was promulgated by U.K. Class I and Class II Notam on 2 March 1990. This change was also reflected in the 9 March revision of the Jeppesen Chart Notams. No Qantas Intam was issued until 25 March 1990. It is considered that this delay, although not contributing to the occurrence, was unsatisfactory.

3. CONCLUSIONS

3.1 Findings

1. The flight crew were properly certificated and qualified to conduct the flight.
2. The aircraft was properly certificated and maintained in accordance with approved procedures.
3. The aircraft was loaded in accordance with prescribed limitations.
4. The Full Flight Regime Auto-Throttle System was inoperative for the flight. As a result, flap placard limit speed protection was disabled.
5. The frequency of the Chiltern NDB had been changed by 2 Khz to 277 Khz. The change had been correctly notified by Class 1 and Class 2 NOTAM, Jeppesen Chart NOTAM and by company INTAM. The aircraft equipment was capable of receiving an apparently usable ADF signal within 3 Khz of the selected frequency.
6. Both ADF receivers in the aircraft were incorrectly selected to 279 Khz.
7. The aircraft failed to track to the Chiltern NDB due to inappropriate ADF bearing indications. The tracking error was detected, and reported, by ATC during a change of crew positions.
8. The Captain disregarded standard company procedures by electing to vacate his seat, below a height of 5,000 feet. His position was taken by a relatively inexperienced Second Officer.
9. The Captain failed to adequately monitor the progress of the flight after vacating his seat.
10. S/O 2 encountered conditions beyond his level of experience. As a consequence, he was unable to provide an adequate level of support for the handling pilot.
11. The First Officer became task saturated and failed to retract Flap 1 before the aircraft reached the Flap 1 limit airspeed of 275 knots.
12. The maximum recorded airspeed (CAS) with Flap 1 extended was 347 knots.
13. Flap 1 was retracted at an airspeed (CAS) of 339 knots.
14. Both F/E and S/O 1 failed to adequately monitor the progress of the flight during the departure.
15. No injuries were sustained by passengers or crew.
16. No damage was sustained by the aircraft.
17. The Captain did not submit an Air Safety Incident Report on the occurrence.
18. The FOPAM did not adequately address the requirements for the submission of an Air Safety Incident Report, nor provide proper guidance to the Captain as to his responsibilities following the occurrence.

3.2 Factors

1. Flap placard limit speed protection, as provided by FFRATS, was disabled.
2. Both the Captain, and other crew members, failed to adequately study the pre-flight Notams issued for the flight. As a result, the flight crew were unaware of the amended frequency of the Chiltern NDB.
3. The Chiltern NDB was incorrectly selected.
4. An NDB tracking discrepancy was accepted by both the Captain and F/O approaching the Chiltern NDB. No attempt was made to utilise other radio navigation aids to test the reliability of the ADF indications.
5. The Captain initiated a seat change with a relatively inexperienced Second Officer, at a critical phase of the departure.
6. Due to his physical location in the cockpit, the Captain was unable to adequately monitor the operation of the aircraft after the seat change.
7. The workload of the handling pilot (First Officer) was excessive, due to:
    - Undetermined navigational error
    - Conflicting navigation information
    - Having to assist the Second Officer with radio communications
    - Changes to ATC clearance requirements
    - Very limited assistance from the non-handling pilot.
8. The attention of the non-handling pilot (Second Officer 2) was primarily channellised into coping with radio communications concerning the failure of the aircraft to track over the Chiltern NDB, and subsequent control instructions.
9. The attention of the Captain was distracted from the operation of the aircraft by his concern about the serviceability of the ADF systems, and their possible effect on the conduct of the flight.
10. The attention of Second Officer 1 was inadequately directed to the operation of the aircraft. As a result, she had effectively removed herself from monitoring the progress of the flight.
11. The Flight Engineer failed to adequately monitor the operation of the aircraft during the departure procedure. He did eventually observe Flap 1 had not been retracted, and immediately notified the First Officer.
12. The First Officer carried out a spontaneous improper action in immediately retracting the flaps without reducing airspeed to within the placard limit.
13. The Flight Engineer misread the indicated airspeed, at the point of flap retraction, as being about 300 knots. The DFDR readout showed the CAS was 339 knots. He, as distinct from the rest of the crew, was very positive he had read the airspeed accurately.
14. The First Officer, although flying a target airspeed of 340 knots, rationalised his perceived error by accepting the lower airspeed stated by the Flight Engineer.
15. The Captain accepted the speed stated by the Flight Engineer. He made no attempt to try and positively establish the speed of the aircraft at the time of the occurrence.

4. RECOMMENDATIONS

1. It is recommended that the Qantas Flight Operations Policy and Administration Manual (FOPAM) be revised so as to provide a more specific interpretation of what constitutes an Air Safety Incident, and the notification responsibilities resulting.

2. It is recommended that Qantas Air Safety Incident reporting procedures be revised so as to provide for two classes of Incidents:

   (a) Immediately Notifiable Incident. All incidents which could be considered by the company to require the immediate initiation of investigation procedures. Details required to be notified to the Safety Department upon arrival of the flight at the next landing point.

   (b) Incident. All other incidents requiring less timely notification, but no later than 48 hours after the event.

3. It is recommended that ground engineering procedures be revised so as to require the immediate notification to the Safety Department of any exceedence of airframe limitations recorded in the aircraft Technical Log.

4. It is recommended that the FOPAM be revised to require the Captain of the aircraft to occupy a pilot seat whenever the flaps, speed brakes, or landing gear, are extended during the arrival or departure phases of a flight, except in an emergency.

5. It is recommended that all pilot seat changes be made only when the auto-pilot is engaged.

6. It is recommended that the circumstances of this incident be used as a basis for inclusion in the Line Orientated Flight Training (LOFT) program.

7. It is recommended that the Bureau of Air Safety Investigation inform the United Kingdom Civil Aviation Authority of the results of the investigation, concerning the potential effect of minor changes to Non-Directional Beacon frequencies.

8. It is recommended that a Company investigation be conducted to determine why an Intam concerning the amended frequency of the Chiltern NDB was not produced until 25 March 1990.

9. It is recommended that the company CRM training program be modified so as to place more emphasis on CRM as a normal practice, rather than a strategy for dealing with obvious problems.

APPENDIX 'A'

- UK and Ireland Class I Notams
- UK Class II Notam A155
- Jeppesen Chart Notams page E-54
- Intam QOG9448 issued 25/3/90
- Attachment B to Part II, ICAO Annex 10, Vol 1
- Captain's Voyage Report 27/4/90

A1 Prepared at AFTN Date/Time: 25 MAR 0001 1990 by CBS

BRITISH ISLES, OMEGA & DECCA ROUTE & GENERAL INFORMATION.	BULLETIN
London, Scottish, Shannon FIRs/UIRs. Channel Islands CTR. For Shanwick FIR/OCA see Bull P1	A1

Note. Last update incorporated into Area A Bulletins is A50395

Explanatory notes:
1/ Bulletins include info effective within 7 days. Permanent info is included for 21 days from initial entry, last date of inclusion is stated in brackets at the end of an entry e.g. (P15SEP).
2/ Route & General Information Bulletins a/ include info on VOR TACAN DME NDB/LOCATOR facs (except facs only for use at a particular AD) and b/ may include AD info affecting more than one AD.
3/ Information on Air Navigation Obstructions - see Bulletin A5.
4/ Decca info for ALL areas will be published either as an update or forward planned maintenance on THIS bulletin.
5/ Telephone enquiries - CAA AIS LONDON (01) 745-3464.
6/ Issuing authority for UK Class I NOTAM - CAA AIS LONDON (01) 745-3450.

OMEGA, OMEGA/VLF & DECCA

OMEGA — Polar cap disturbance commenced on 20 MAR 0500. Errors may exist on polar path signals on all freqs. 10.2khz signals may be be in error 2/3 of a lane or more. (KFDC A13/90)

DECCA — Irish Sea Fisheries Board Chain Ch 7D. Red station opr fm reserve aerial on reduced power. check red lane numbers (DECPKG 160905) (DECCA 027/88)

UK & IRELAND NAVAIDS (Listed Alphabetically)

'BHD' VOR — BERRYHEAD: til 06 APR 1800 freq 112.700mhz withdrawn. Test transmissions using ident 'TST' may take place for calibration & flt chk purposes only. NDB 'BHD' & DME Ch74X remain in svc (IIA71/90+A645/89)

'BCN' VOR — BRECON: 27 MAR 1200-1400, on maint. (A1029/90)

'BCN' DME — BRECON: 28 MAR 0900-1100 on maint (A1044/90)

'TST' VORDME — BIGGIN: til 09 APR 0900 temp VOR/DME may radiate for test on freq 115.25mhz/CH99Y psn N5119.93 E00002.32 (IIA92/90)

'BIC' VOR — BIGGIN: 09 APR 0900 Til 01 JUN 1800 temp psn N5119.93 E00002.32 Freq 115.250 (Freq 115.100 may opr on test 'TST') (IIA92/90pt)

'CHT' NDB — CHILTERN: opr on new freq 277.0 khz. (IIA155/90)(P04APR)

...CONTINUED

UNITED KINGDOM NOTAM

A153-A160/1990
Information Date:
2 March

153
154
155
156
157
158
159
160

National Air Traffic Services
Aeronautical Information Service (AIS 1c)
Control Tower Building, LONDON/Heathrow Airport
Hounslow, Middlesex TW6 1JJ
Telephone 01-745 3455 Fax 01-745 3453
Distribution 0242-235151
Telex 22807 AFTN EGGNYNYX

NOTES:
(i) All times are UTC.
(ii) References are to the UK AIP. This publication should be ANNOTATED IMMEDIATELY. Information, where applicable, should also be used to amend appropriate charts.

PERMANENT NOTAM

A153 Birmingham Airport

1 From 5 April 1990, Birmingham Approach, VDF and Radar operating on frequency 120.500 MHz will be replaced by 131.325 MHz.

2 All other details remain as published.

COM 2-8 (8 Mar 90).
RAC 3-2-18 (8 Feb 90).

(ASG(C/N))

A154 Blackpool Airport

1 The frequency of NDB(L) 'BPL' has been changed from 278.5 kHz to 276.5 kHz.

2 All other details remain as published.

3 NOTAM I: Domestic EGTT B232, International B422 is cancelled.

COM 2-11 (8 Mar 90). (ER/ATS)

A155 Chiltern NDB

1 The frequency of NDB 'CHT' has been changed from 279 kHz to 277 kHz.

2 All other details remain as published.

3 NOTAM I: Domestic EGTT A775, International A856 is cancelled.

COM 2-19 (8 Mar 90).
RAC 3-4-7-2-15 (14 Dec 89). (ER/NA)

TERMINAL CHARTS
EUROPE

SRA IAP changed to: Climb STRAIGHT AHEAD to 3000' (2326') rwy 14, 3000' (2361') rwy 28, 3000' (2338') rwy 32, or as directed by ATC.

Le Havre, France, (Octeville) Until 24 MAR 90 IAP L rwy 23 avbl as follows: if local altimeter setting not avbl use Deauville altimeter setting; apch proc mandatory followed by circle-to-land (night NA) with increased mims: CAT A MDA(H) 1000' (688'), VIS 1600m, CAT B MDA(H) 1020' (708'), VIS 2000m, CAT C MDA(H) 1120' (808'), VIS 2800m.

Leiden, Netherlands. Ufn IAP ILSDME rwy 23 (chart 11-1) suspended.

Limnos, Greece, Until aprx 8 APR 90 NDB 'LIO' u/s.

Limoges, France, (Bellegarde) Until 1 APR 90 holding LECAR (chart 10-2A) and IAP L rwy 04 (chart 16-2) unuseable Mon-Fri 1900-2230, Sat, Sun & HOL 0900-1800.

London, U.K., (City) STAR LYD 1D ARR avbl by ATC only.

London, U.K., (Heathrow) For a trial period Arrival/Departure ATIS "Heathrow Info" on 133.07 (5) avbl, PTO.
During trial period Departure ATIS on 121.85 not avbl. New ATIS will also bcst on Bovingdon VOR 'BNN' and Biggin VOR 'BIG'.
Until aprx 22 DEC 90 WIP to resurface rwy 09L-27R during nights, for details see chart 10-9 A1.
For rwy 09L-27R CL and TDZ deleted.
Ufn rwy 05-23 turn-off block 73 to 74 clsd.
Chiltern NDB 'CHT' freq chgd to 277 KHz.
Until aprx 30 MAR 90 blocks 56 and 76 clsd.

London, U.K., (Stansted) Until 30 APR 90 SRA rwy 05-23 not avbl.
Acft carrying out practise instrument approaches will not normally be cleared to descent below 2500' (Stansted QNH) until estbld on final approach track within the Stansted CTR unless the pilot requests earlier descent, until 1 JUN 90.
Until 27 MAY 90 WIP in two phases to construct a new entry/exit twy at the thr rwy 05. For details see chart 30-9B/30-9C.

Luton, U.K., Until aprx 30 APR 90 rwy 08-26 TDZ u/s ufn.

Until aprx 31 MAR 90 ILS LOC rwy 26 u/s.
Until aprx 31 MAR 90 ILS GS rwy 26 u/s.

Luxembourg, Luxembourg, Until aprx 1 APR 90 TVOR 'LUX' u/s.

Lyon, France, (Satolas) App frrq 128.00 chgd to 127.95MHz.

Madrid, Spain, (Barajas) Rwy 15-33 clsd 24, 25, 31 MAR 0930-1830Z, 28 MAR 2300 - 29 MAR 0500Z, 29 MAR 2300 - 30 MAR 0500Z, 1 APR 0930 - 1830Z.

Madrid, Spain, (Getafe) Ufn ILS rwy 05 u/s.

Madrid, Spain, (Torrejon), Until aprx 9 APR 90 VORTAC 'TJZ' VOR part u/s.

Malaga, Spain, SIDs, During unserviceability of Malaga VORDME only the initial phase of SIDs in use, ATC will issue complementary clearance using radar vectoring and/or alternate navigational aids.
Ufn VORDME 'MGA' u/s.

Malta, Malta, (Luqa) Until 31 MAY 90 stands 2-8 on apron 9 clsd.

Manchester, U.K., Until 23 MAR 90 twy Link C clsd.
From 18 MAR until 23 MAR 90 nightly 2230-0600Z rwy 06-24 clsd.

Marina Di Campo, Italy, Until aprx 31 MAY 90 apt clsd.

Maubeuge, France, (Elesmes) From 19 MAR until 23 MAR 90 VOR 'MGE' u/s.

Milan, Italy, (Linate) Ufn IFR general aviation with prop and turboprop acft allowed only daily 2000-0530Z.

Milan, Italy, (Malpensa) Until aprx 31 DEC 90 parking stands D8 and D9 clsd.
Ufn rwy 17R-35L clsd.

Mont-De-Marsan, France, Until 19 MAR 90 ILS rwy 27 ops on test, useable with restr.

Mosjoen, Norway, (Kjaerstad) Risnes LCTR 'MS' relocated to N654944 E0131602, facility name chgd to Mosjoen.

Mostar, Yugoslavia, SIDs 10-3, BERAX 2E DEP redesignated BERAX 2G.

Nantes, France, (Chateau-Bougon) Until 17 MAR 90 btn 2100 and 0530Z rwy 03-21 avbl with 5 min PN, btn 0700 and 1700Z with 15 min PN.
During day if CEIL/VIS lower than 300'/2000m precision apch suspended.

Naples, Italy, (Capodichino) SIDs rwy 06, minimum climb gradient raised to 330'/min until leaving 2300'.
Ufn ILS OM rwy 24 u/s.
Ufn twy R1 u/s.
Ufn ILS GS rwy 24 u/s.

Narvik, Norway, (Framnes) Until aprx 31 MAY 90 twy C clsd.

Newcastle, U.K., Ufn TDZ and supplementary CAT II lighting rwy 25 not avbl.

Nice, France, (Cote d'Azur) Until 31 MAR 90 mims raised: IAP LOC rwy 05L (charts 11-3 and 11-4) OCA(H) CAT A+B 373' (360') MDA(H) 380'(367'), VIS unchgd; ILS LOC (GS out) + 'NA' DME (charts 11-1 and 11-2) OCA(H) CAT A-D 373'(360'), MDA(H) 380'(367'), VIS CAT A 1500m, CAT B 1600m, CAT C 1850m, CAT D 2200m; circle-to-land with prescribed flight tracks to rwy 23L (chart 19-1) MDA(H) CAT A 510'(497'), VIS unchgd.

Northolt, U.K., Chiltern NDB 'CHT' freq chgd to 277 KHz.

Nurnberg, Germany, SIDs 10-3A, WUR 2M DEP, 'x'-break Erlangen R-275/15 DME fix - Wurzburg VOR, MEA 5000' established.
Until aprx 31 DEC 90 twy H clsd.
Until aprx 31 DEC 90 twy G clsd.

Ohrid, Yugo, Apt clsd ufn.

Oslo, Norway, (Fornebu) SIDs 10-3G, WITTY 1B, 2A DEPs, WITTY coords should read N5925.9 E00958.6.
Until aprx 31 DEC 90 rwy 01-19 clsd to jet acft.
Until aprx 31 MAR 90 twy E1 clsd.

Oslo, Norway, (Gardermoen) Ufn ILS GS rwy 19 u/s.

Oulu, Finland, Twy shown under construction now in opnl use.

Palermo, Italy, (Punta Raisi) Until aprx 19 MAY 90 twy L clsd.

Pamiers, France, (Les Pujols) Until 5 APR 90 AFIS not provided; IAP L rwy 10 straight-in NA.

90154.

PP MAAP13
.SYDONOF 250450ON/VDU REF ON2867A/25
OOG9448 INTAMN A/EGLL ACT/ALL B/WIE C/05252359
E/CHILTERN NDB -CI.
OPR ON NEW FREQ OF 277.0 KHZ. JEPP CHARTS AWAITING UPDATE.

*** END OF REPORT **

SYSTEM MAINTENANCE
PROCESSED 25 MAR. 90
CHECKED 25 3 90

QU LHROXQF
.HDQOXQF 260501OX
OPERATIONAL DATA PART: 5 TO BE CONTINUED
QFA 743 EGLL VTBD 0002 257

EGLL ----- LONDON HEATHROW AIRPORT ----- EGLL

QOG9448 INTAMN A/EGLL ACT/ALL B/WIE C/05252359
E/CHILTERN NDB -CI
OPR ON NEW FREQ OF 277.0 KHZ. JEPP CHARTS AWAITING UPDATE.
-------- ---------- REF. CY21370 ISS. 250449

QOG3313 INTAMR QOG3263 A/EGLL ACT/ALL B/03200001 C/05012359
E/AIRPORT PROCEDURES -CI
CAT 1 ILS RWY 09L NOW 800M VIS OR RVR.
CAT 1 ILS RWY 23 800M VIS RAISED TO 1200M VIS/1000M RVR.
-------- ---------- REF. CF16400 ISS. 060105

C803 ----- C.A.V. INTAM ----- C803

QOR9015 INTAMR QOR0592 A/C803 B/WIE C/UFN
:/C.A.V. 03/88 - LHR/BKK IS TO BE PLANNED WITH AN ADTNL 4000KG
OF FUEL SUBJECT TO A BRW LIMITATION OF - B747RR FULL RATING.
-------- ---------- REF. AU07689 ISS. 202028

UUUU ----- MOSCOW (RUSSIAN FIR S - GEN.) ----- UUUU

QON2286 INTAM A/UUUU B/WIE C/UFN
E/RUSSIAN ROUTING
NOTAMS COULD BE ISSUED AT SHORT NOTICE DE-ACTIVATING AWY G3.
WHEN THIS OCCURS ROUTING VIA B143 WILL BE PLANNED.
-------- ---------- REF. IV29099 ISS. 221012

WMKK ----- KUALA LUMPUR AIRPORT ----- WMKK

QOG3402 INTAM A/WMKK ACT/ALL B/WIE C/05122359
E/AIRPORT PROCEDURES.
PILOT REPORT - QUOTE - AT 2500-3000 FT ON KUL R/W 33 ILS FULL
SCALE LEFT DEFLECTION INDICATED ON LOCALISER DEVIATION BAR
SLOWLY RETURNED TO CENTRE LINE. FOLLOWING DEVIATION BAR TOOK
AIRCRAFT OFF CENTRE LINE. UNABLE TO CONFIRM ANY FAULTS WITH ATC
OR ANY OTHER AIRCRAFT - UNQUOTE. CONSEQUENTLY PILOT CAUTION IS
ADVISED WHEN USING R/W 33 ILS AND ANY UNUSUAL DEVIATIONS ADVISED
TO SUPT LINE OPERATIONS B767 BY TELEX TO SYDOZQF.
-------- ---------- REF. CL20390 ISS. 190457

260504 LHX 029
@NNNN

ATTACHMENT B TO PART II. — CONSIDERATIONS AFFECTING THE DEPLOYMENT OF LF/MF FREQUENCIES AND THE AVOIDANCE OF HARMFUL INTERFERENCE

1. Particularly in areas of high density of NDBs, it is recognized that efficient planning is essential in order to: a) ensure satisfactory operation of ADF equipments, and b) provide the most efficient usage of the limited frequency spectrum available for the NDB service. It is axiomatic that regional meetings will so plan facilities as to ensure that all facilities will receive the best possible protection from harmful interference. Nevertheless, in certain regions, congestion of facilities has been such that regional meetings have had to plan in terms of a *minimum* protection ratio.

Regional meetings include in their planning consideration of such factors as:

a) the possibility of reducing the number of NDBs required, by co-ordination of system plans;

b) the possibility of reducing the coverage where a lesser grade of service than that obtainable within the rated coverage is acceptable;

c) the characteristics of ADF equipments in use;

d) the atmospheric noise grades, appropriate to the area concerned;

e) ground conductivity;

f) interference protection required at the edge of the rated coverage.

Of the foregoing factors, that which is most susceptible to improvement of a technical kind is c).

2. The 1979 World Administrative Radio Conference adopted regulations concerning the assignment of frequencies for aeronautical radio beacons operating in the LF/MF frequency bands. A minimum protection ratio (wanted/unwanted signal ratio) of 15 dB is to be used as the basis for frequency assignment planning (RR 2854). The following data concerning the attenuation characteristics of ADF equipment was used in the EUM region to aid in the frequency assignment process:

Frequency difference (kHz)	*Attenuation (dB)*
0	0
1	1
2	6
2.4	10
3	20
3.6	30
4.3	40
5	50
6	65
7	80

The above figures (or distance separation criteria derived from them) have also been applied in other regions in determining the minimum protection ratio.

Where a bearing accuracy of plus or minus 5 degrees is required at the edge of cover, a minimum protection of 15 dB by day should be used as the basis for LF/MF channel assignment planning.

3. In view of the fact that in many regions there is a need to improve the planning criteria it is considered that the main source from which improvement can be derived is recognition of higher attenuation figures than those given above. Regional meetings are accordingly advised that, when the congestion is such that the use of the above figures no longer permits efficient planning of the LF/MF frequency spectrum available, the following figures represent from a technical point of view the best that can be accepted in determining distance separation criteria:

Frequency difference (kHz)	*Attenuation (dB)*
0	0
1	6
3	35
5	65
6	80

When using these figures, it should be noted that the RF selectivity of modern ADF equipment is in general better than these figures and that, while the RF selectivity of older ADF equipment is not better than these figures, consideration of the dynamic characteristic of these older equipments shows this to be better. It could therefore be expected that frequency planning based on the new figures would considerably improve the service provided to users of modern equipment, and would not materially reduce the service presently provided to those aircraft using the older equipments.

Nevertheless, in their planning, regional meetings would need to consider this question most carefully.

4. It is further noted that, in certain regions, many NDBs are used with voice channels and that this usage is aligned with the Note at the head of Part I, 3.4.6. It is expected that regional meetings will take this fact into account when establishing criteria for frequency planning.

CAPTAIN'S VOYAGE REPORT

REQ'D REPLY YES / NO

SECTOR FROM: LHR TO: BKK DATE: 27APR90 PLACE: LHR

SERVICE NO: QF002/ A/C TYPE: 747 VH: ____ SUBJECT: NAV AID IDENT

ONE REPORT FOR EACH SUBJECT IF POSSIBLE

CAPTAIN: _____

(Please print clearly in CAPITAL LETTERS with black ball point pen).

NOTE: SAFETY AND SECURITY SUBJECTS MUST BE TELEXED THROUGH LOCAL AIRPORT MANAGERS' OFFICE (SEE INSTRUCTIONS BELOW).

USE TECH LOG OR CABIN CONDITION LOG OR MULTIFILE INDEX REF FORMS IF SUBJECT IS APPLICABLE. CROSS REFERENCE THESE FORM NUMBERS IN VOYAGE REPORT IF VOYAGE REPORT IS ALSO NECESSARY.

TEXT	FOLLOWING	RECENT	INCIDENT	AND	INVESTIGATION
AYE	CHECKED	OLD	CHILTERN	NDB	FREQ
279 KHZ	ON	GROUND	HEATHROW	LOUD	CLEAR
IDENT	CHT	WAS	RECEIVED	WITH	SOME
HASH	AND	ABOUT	800	CYCLE	TONE
NEEDLES	WERE	POINTING	GENERALLY	EAST	NORTH
EAST.	CORRECT	FREQUENCY	277 KHZ	TUNED	ALSO
GAVE	GOOD	IDENT	ON	ABOUT	800 CYCLE
TONE	NEEDLES	POINTED	FURTHER	NORTH.	AYE
ADVISED	ATC	THROUGH	COMPANY	AND	WAS
ADVISED	COMPLAINT	HAD	BEEN	PASSED	TO
TELEGRAMS	FOR	ACTION.	THIS	ERROR	HAS
IMPLICATIONS	FOR	PREVIOUS	INCIDENT	AND	POSSIBLE
ERRONEOUS	UPDATING	ON	EMC	AIRCRAFT.	

QU SYDOZQF SYDONQF SYDOGQF LHROXQF
.LHROXQF 2712260X/VDU REF QX4673/27APR90
ATT —AERODROME PROCEDURES AND DUTY ANALYST/LHROPS
COPY CAPT
CAPT OPERATING QFA2/27 LHR-BKK REPORTS THAT CHT NDB HERE IS RADIATING ON THE OLD FREQ 279KHZ STILL AS WELL AS THE CORRECT FREQ 277KHZ. HE ADVISES THAT THIS IS UNSAFE. ATC HERE HAVE BEEN ADVISED LOCALLY.
REGARDS

If report not telexed place this form in crew documentation satchel. SIGNATURE: _____

FOR TELEXING OF SAFETY/SECURITY SUBJECTS, INCLUDE THE FOLLOWING ADDRESSEES.

ORIGINATOR IN 7 LETTER CODE	PRIORITY	FLT OPS	FLT OPS	FLT OPS	SAFETY	SECURITY	CUST RELNS	CABIN SVCS
	QU	SYDOOQF	SYDOBQF	SYDOKQF	SYDBSQF	SYDDSQF	SYDSRQF	SYDHCQ!

THIS COPY TO LOAC MA11 AFTER TELEX TRANSMISSION

Qantas Form No. 1853 (9/86) 91DS

APPENDIX 'B'

- Jeppesen SID Chart 10-3B, London Heathrow
- Computed ground track of VH-EBY generated from digital flight data recorder
- Flight Simulator data, estimated ground track of VH-EBY
- B747 Standard Take-off procedures

Brookmans Park Dep All Rwys: LONDON Control 125.80
Daventry Dep All Rwys: LONDON Control 128.90

TRANS LEVEL: BY ATC
TRANS ALT: 6000'

BROOKMANS PARK, DAVENTRY

GENERAL INSTRUCTIONS

All SIDs include noise preferential routes. Initial climb straight ahead to 580' QNH (500' QFE). Cross appropriate Noise Monitoring Terminal at a minimum of 1080' QNH (1000' QFE), thereafter maintain a minimum climb gradient of 243' per nm (4%) to 4000'

Gnd speed - Kts	75	100	150	200	250	300
243' per nm	304	405	608	810	1013	1215

Cruising levels will be issued after take-off by London Control.

BROOKMANS PARK, DAVENTRY (RWY 27 R/L & 23)

TAKE-OFF

Brookmans Park Three Foxtrot (BPK 3F)
Daventry Three Foxtrot (DTY 3F)

Rwy 27R: Straight ahead, intercept Burnham R-122 by London 4 DME fix, proceed towards Burnham VOR. Thence

Brookmans Park Three Golf (BPK 3G)
Daventry Three Golf (DTY 3G)

Rwy 27L: At 09R ILS MM turn RIGHT, intercept Burnham R-122 by London 3 DME fix, proceed towards Burnham VOR. Thence

Brookmans Park Two Hotel (BPK 2H)
Daventry Two Hotel (DTY 2H)

Rwy 23: At London 2 DME fix turn RIGHT, intercept Burnham R-122, proceed towards Burnham VOR. Thence

DEPARTURE

Brookmans Park (BPK 3F, 3G, 2H)

At London 6 DME fix turn RIGHT, 058° bearing to Chiltern NDB, turn RIGHT, intercept Brookmans Park R-247 inbound to Brookmans Park VORDME then along airway R-123/ R-12 (eastbound). Cross London R-302 above 3000'. Chiltern NDB above 4000'. Brookmans Park VORDME at 6000'.

Daventry (DTY 3F, 3G, 2H)

At London 7 DME fix turn RIGHT, follow Burnham R-359, intercept Bovingdon R-230 inbound to Bovingdon VORDME, continue on Bovingdon R-050 to Bovingdon 5 DME fix, then turn LEFT on Daventry R-130 inbound to Daventry VORDME, then along airway A-2, A-47, B-3, B-4, A-20 (northbound). Cross Burnham VOR (London 8 DME fix) above 3000'. Bovingdon VORDME and Bovingdon 5 DME fix at 6000'.

BROOKMANS PARK, DAVENTRY (RWY 09R/L & 05)

TAKE-OFF

Brookmans Park Two Juliet (BPK 2J)
Daventry One Juliet (DTY 1J)

Rwy 09R: At 27L ILS MM (London R-135/2 DME fix) turn LEFT, 054° track. Thence

Brookmans Park Two Kilo (BPK 2K)
Daventry One Kilo (DTY 1K)

Rwy 09L: At London R-119/1.3 DME fix turn LEFT 054° track. Thence

Brookmans Park Two Lima (BPK 2L)
Daventry One Lima (DTY 1L)

Rwy 05: Straight ahead. Thence

DEPARTURE

Brookmans Park (BPK 2J, 2K, 2L)

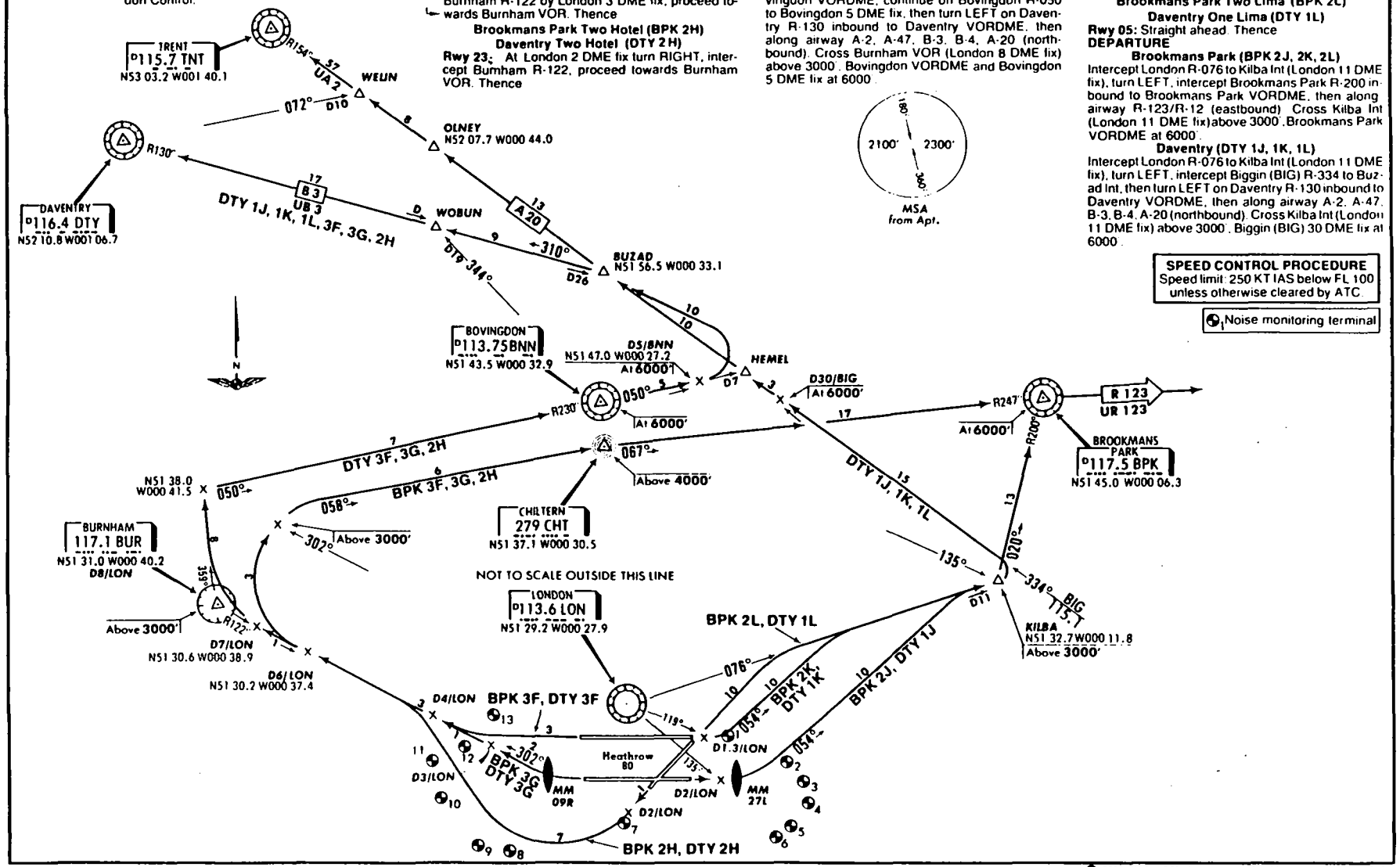
Intercept London R-076 to Kilba Int (London 11 DME fix), turn LEFT, intercept Brookmans Park R-200 inbound to Brookmans Park VORDME, then along airway R-123/R-12 (eastbound). Cross Kilba Int (London 11 DME fix) above 3000'. Brookmans Park VORDME at 6000'.

Daventry (DTY 1J, 1K, 1L)

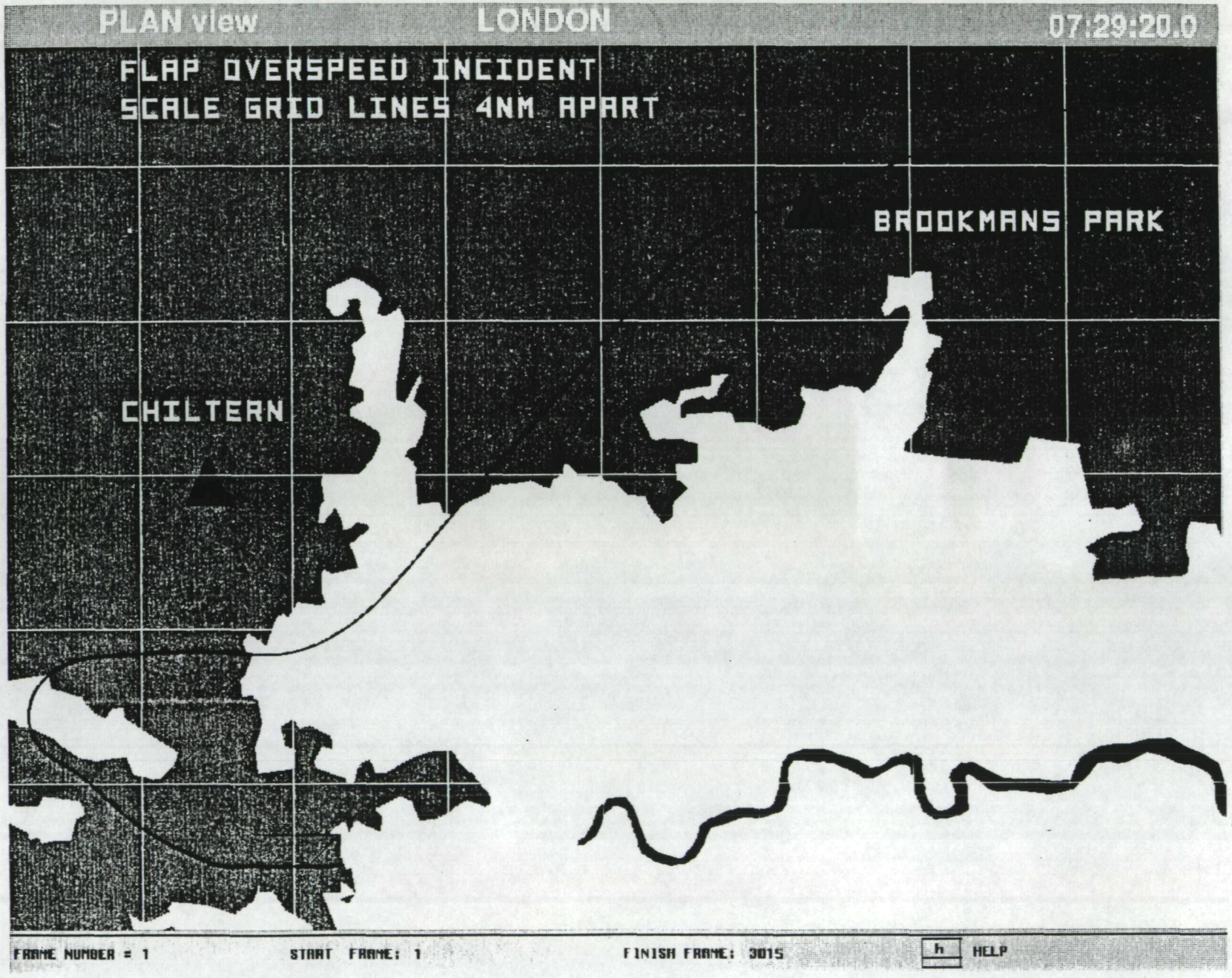
Intercept London R-076 to Kilba Int (London 11 DME fix), turn LEFT, intercept Biggin (BIG) R-334 to Buzad Int, then turn LEFT on Daventry R-130 inbound to Daventry VORDME, then along airway A-2, A-47, B-3, B-4, A-20 (northbound). Cross Kilba Int (London 11 DME fix) above 3000'. Biggin (BIG) 30 DME fix at 6000'.

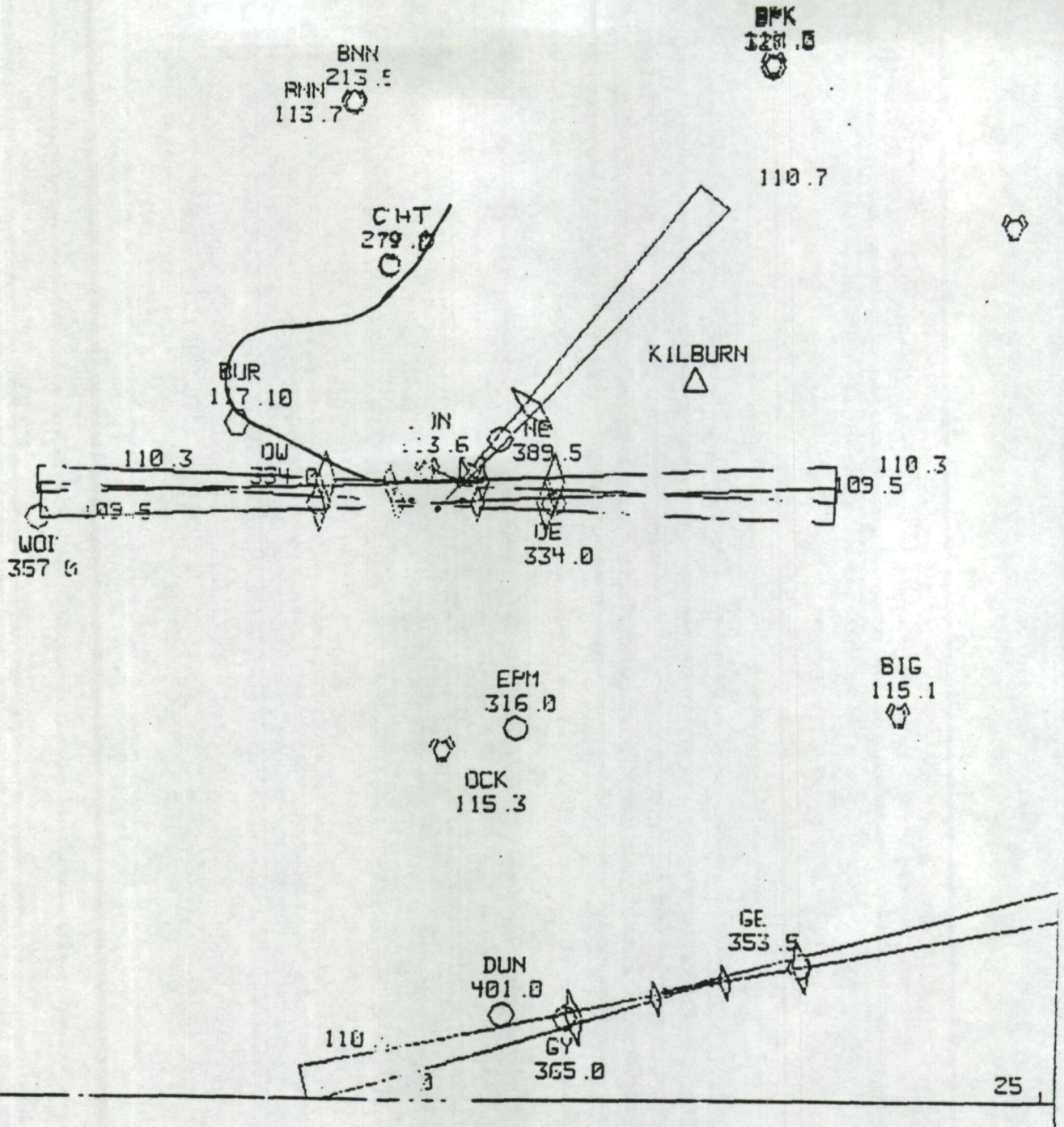
SPEED CONTROL PROCEDURE
Speed limit: 250 KT IAS below FL 100 unless otherwise cleared by ATC.

Noise monitoring terminal



CHANGES: BPK 2F, 2G and DTY 2F, 2G departures redesignated BPK 3F, 3G and DTY 3F, 3G.


PLAN view
LONDON
07:29:20.0
FLAP OVERSPEED INCIDENT
SCALE GRID LINES 4NM APART
BROOKMANS PARK
CHILTERN
FRAME NUMBER = 1
START FRAME: 1
FINISH FRAME: 3015
h
HELP



DIT
CHO

JT	343176	WIND	330/ 6
FUEL	139151	CL BS	35000
CG	15.7	VIS	80000
SAT/T	7/ 7	QNH	1024
1:55		F.TEMP	7.0
13 MA			

EBT

19

747
OM/FCTM JUNE/84

STANDARD TAKEOFF
INCLUDES NOISE ABATEMENT

CLIMB THRUST SETTINGS

PW Above 280,000 BRW
- AT VFFR - Max Climb Thrust
- At Flaps Zero - Climb Thrust

Below 280,000 BRW
- At VFFR - Climb Thrust

RR Full Rating Takeoff
- At VFFR - Max Climb Thrust
- At Flaps Zero - Climb Thrust

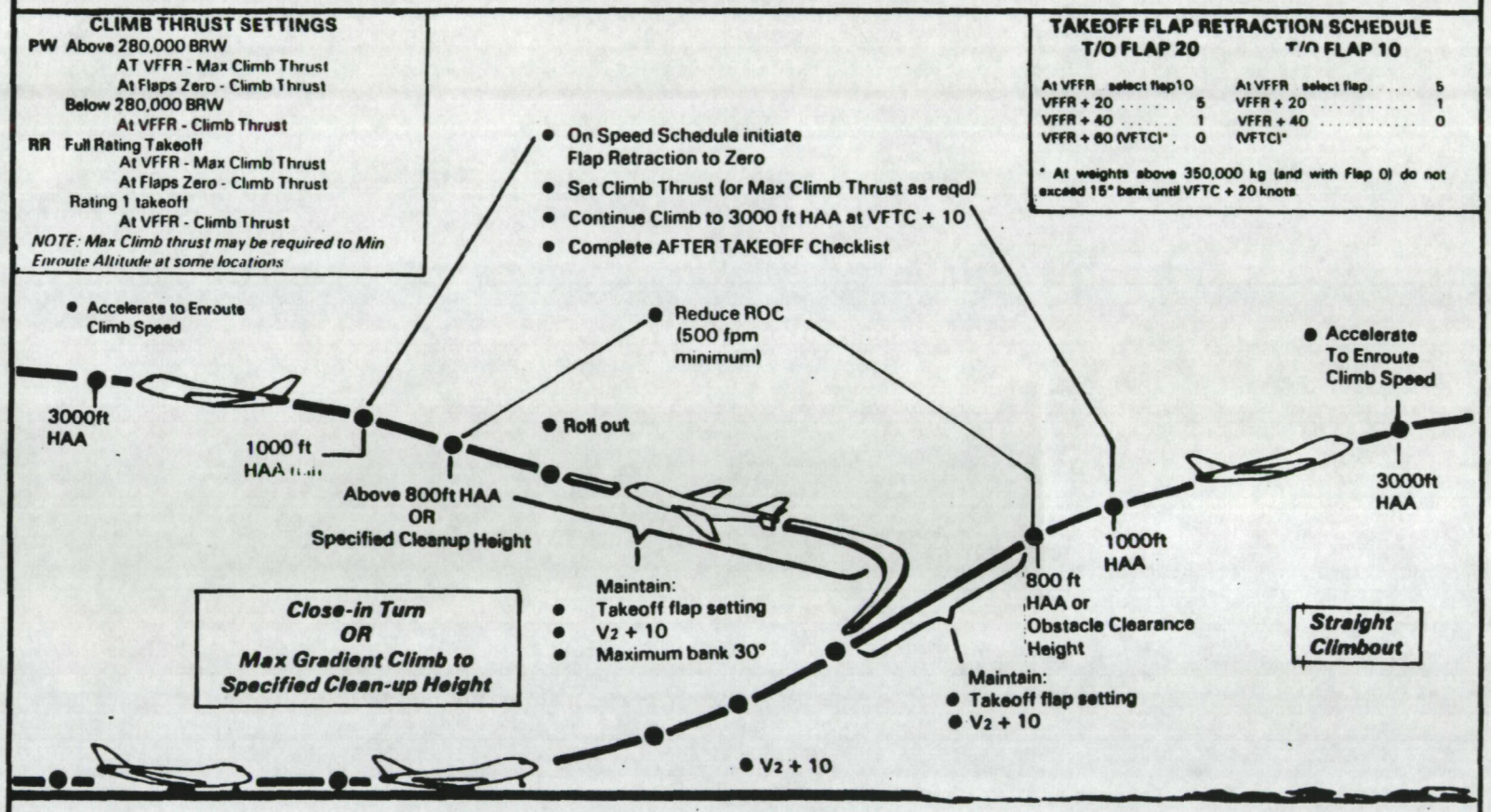
Rating 1 takeoff
- At VFFR - Climb Thrust

NOTE: Max Climb thrust may be required to Min Enroute Altitude at some locations

TAKEOFF FLAP RETRACTION SCHEDULE

T/O FLAP 20		T/O FLAP 10	
At VFFR select flap10		At VFFR select flap	5
VFFR + 20	5	VFFR + 20	1
VFFR + 40	1	VFFR + 40	0
VFFR + 60 (VFTC)*	0	(VFTC)*	

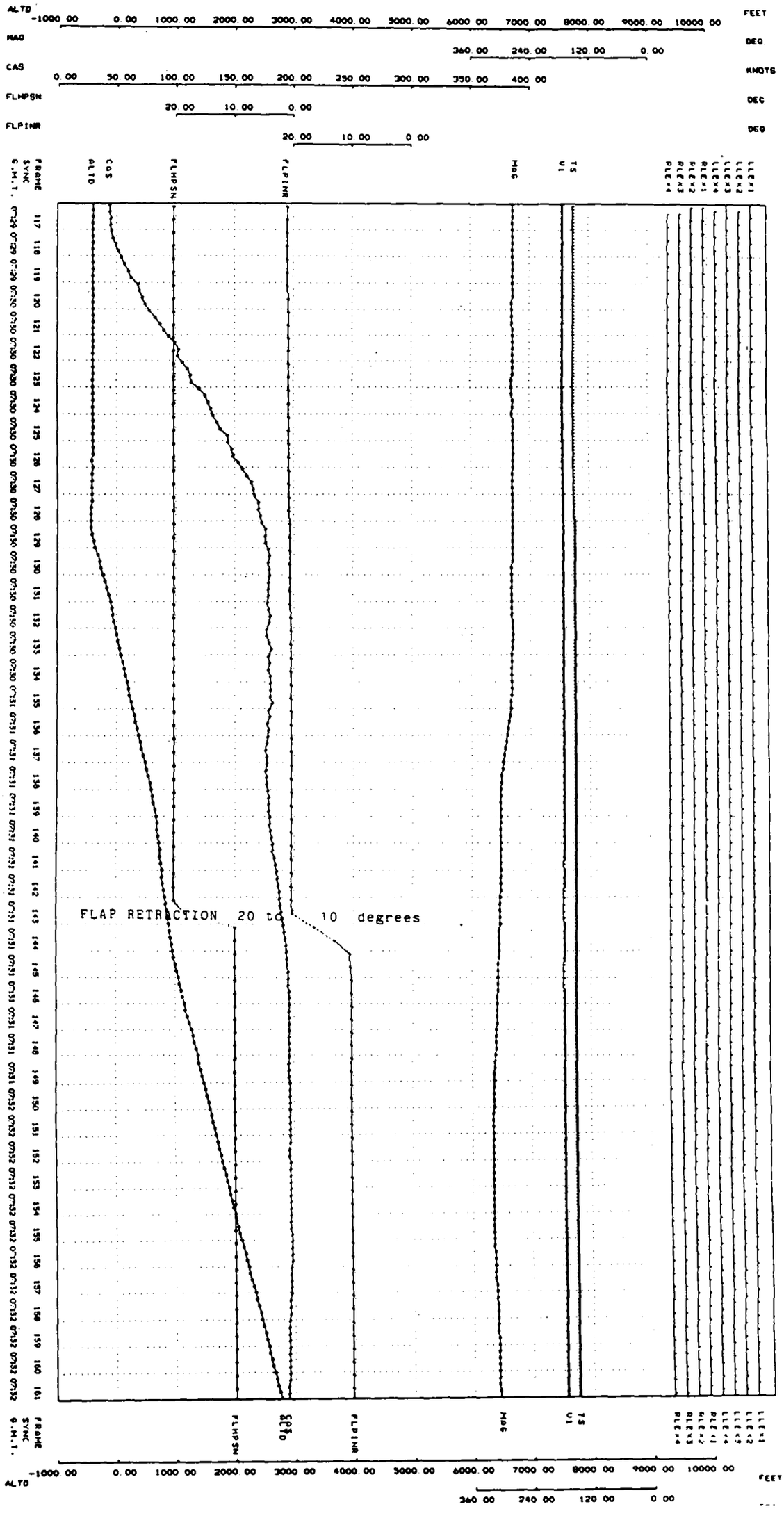
* At weights above 350,000 kg (and with Flap 0) do not exceed 15° bank until VFTC + 20 knots

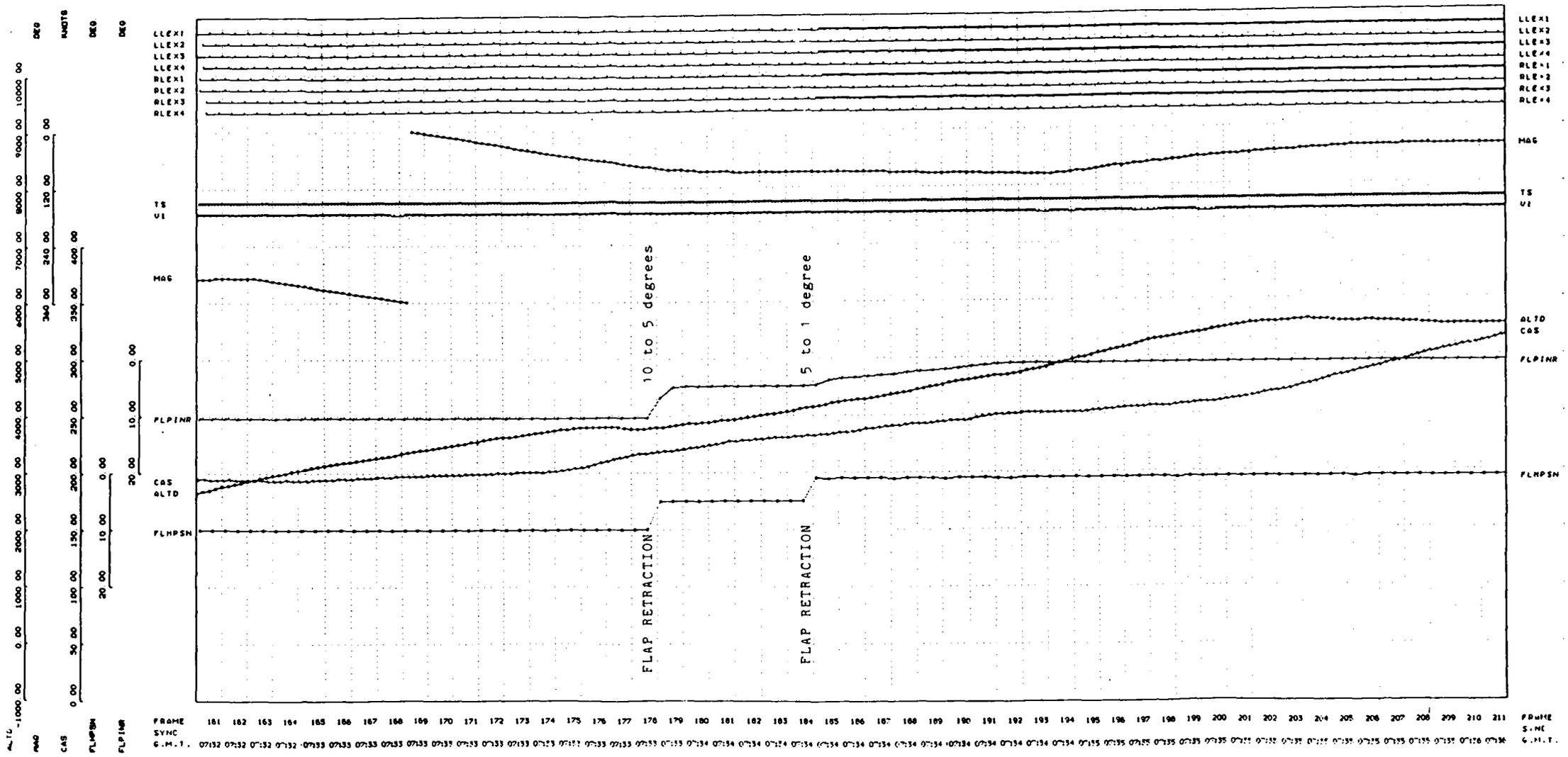


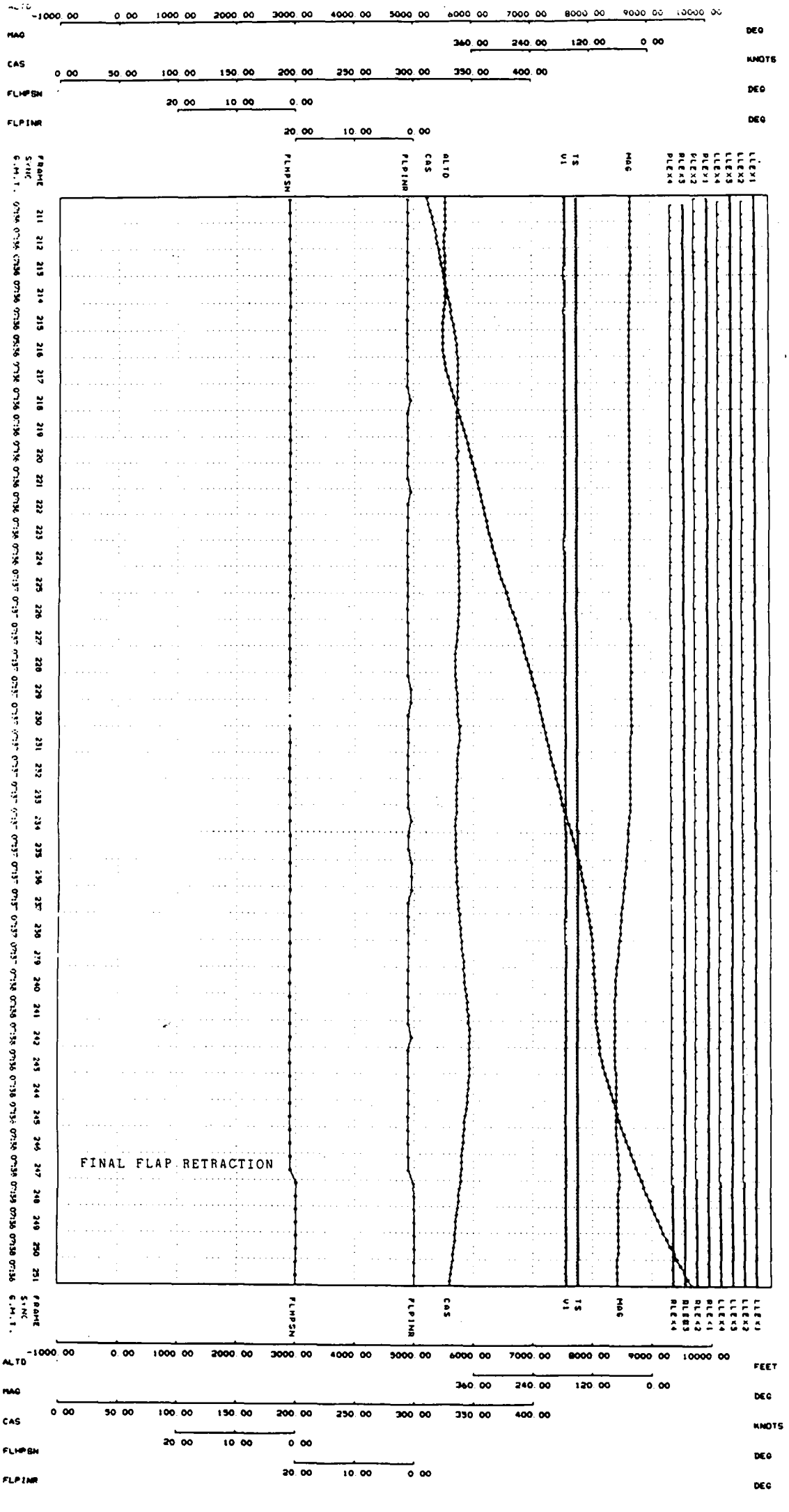
- Set takeoff thrust by 80 kts
- VR
- Rotate smoothly to initial climb attitude
- Positive rate of climb
- Gear up

APPENDIX 'C'

- Digital Flight Data Recorder Readout


ALTD
-1000.00
0.00
1000.00
2000.00
3000.00
4000.00
5000.00
6000.00
7000.00
8000.00
9000.00
10000.00
FEET
MAG
360.00
240.00
120.00
0.00
DEG
CAS
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
KNOTS
FLMPSN
20.00
10.00
0.00
DEG
FLPINR
20.00
10.00
0.00
DEG
FLAP RETRACTION 20 to 10 degrees


LLEX1
LLEX2
LLEX3
LLEX4
RLEX1
RLEX2
RLEX3
RLEX4
MAG
TS
VI
ALTD
CAS
FLPINR
FLMPSN
10 to 5 degrees
5 to 1 degree
FLAP RETRACTION
FLAP RETRACTION
FRAME
SYNC
G.M.T.
ALTD
MAG
CAS
FLMPSN
FLPINR
DEG
KNOTS


ALTD
-1000.00
0.00
1000.00
2000.00
3000.00
4000.00
5000.00
6000.00
7000.00
8000.00
9000.00
10000.00
FEET
MAG
360.00
240.00
120.00
0.00
DEG
CAS
0.00
50.00
100.00
150.00
200.00
250.00
300.00
350.00
400.00
KNOTS
FLHPSN
20.00
10.00
0.00
DEG
FLPINR
20.00
10.00
0.00
DEG
FRAME
211
212
213
214
215
216
217
218
219
220
221
222
223
224
225
226
227
228
229
230
231
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245
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249
250
251
FINAL FLAP RETRACTION

APPENDIX 'D'

- B747-338 Maximum Airspeed Limits
- B747 Mach Airspeed Indicator Diagram

MAXIMUM AIRSPEED LIMITS

FLAP PLACARD SPEEDS

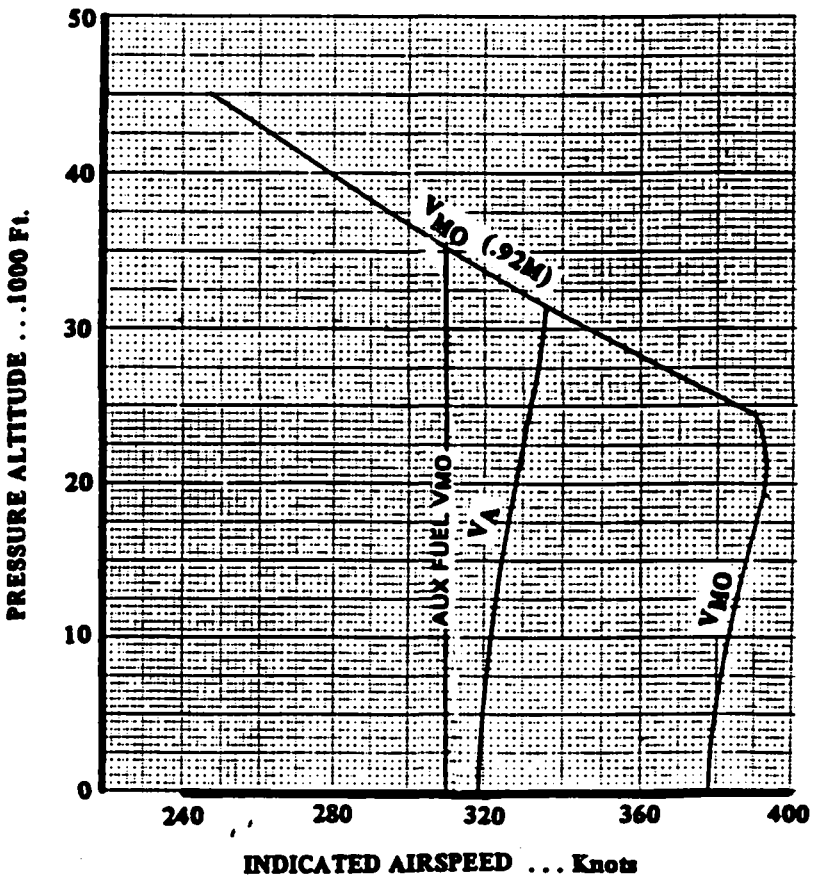
V_{FE} (Knots IAS)
Flap Position 1 = 275 Kt
5 = 250
10 = 238
20 = 231
25 = 205
30 = 180

LANDING GEAR OPERATING

V_{LO} = 270 Kt. (IAS)
M_{LO} = .82

LANDING GEAR EXTENDED

V_{LE} = 320 Kt. (IAS)
M_{LE} = .82



NOTE: 1. VA is the maximum speed at which full application of rudder, elevator or aileron will not overstress the aeroplane.

NOTE: 2. VMO is the speed which will not be deliberately exceeded in any flight regime.

NOTE: 3. AUX FUEL VMO applicable to airplanes with numbers 1 & 4 auxiliary extended range fuel tanks. Select aux fuel VMO until fuel in these tanks is expended.

AVIONICS

MAXIMUM OPERATING AIRSPEED POINTER

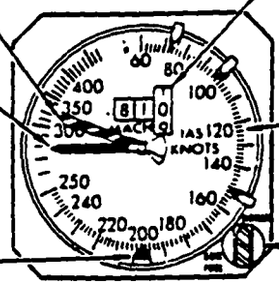
Displays V_{MO}

INDICATED AIRSPEED POINTER

Displays indicated airspeed derived pneumatically from pitot-static pressures.

COMMAND AIRSPEED BUG

Set by autothrottle (A/T) speed selector.



PILOTS' PANELS

MACH NUMBER INDICATOR

Displays computed mach number from central air data computer. Yellow flag covers digits when central air data computer or mach indicator fails.

INDICATED AIRSPEED SCALE

Linear from 60 to 250 knots only.

MAX AIRSPEED WARNING SWITCH (EBJ & Later, EC Series & SP)

NORMAL — Position used when aux 1 & 4 or Res 2 & 3 fuel tanks are empty.

AUX FUEL - Position used whenever fuel is present in Aux 1 & 4 or Res 2 & 3 tanks. The maximum operating airspeed pointer will be reset to indicate the maximum operating airspeed of 310 KIAS on JT9D or 342 KIAS on RB211.

MACH A/S WARNING SWITCH

NORM — Tests maximum airspeed warning (no Aux 1 & 4 or Res 2 & 3 fuel)

AUX FUEL — Tests airspeed warning for lower setting when Aux 1 & 4 or Res 2 & 3 fuel is carried.

OVERHEAD PANEL
(EBJ & later, EC Series & SP)

MACH AIRSPEED INDICATOR AND WARNING TEST

APPENDIX 'E'

- Recorded Speech Transcript, VH-EBY

10

lational Air Traffic Services

CAA IN CONFIDENCE

COPY No 1

RECORDED SPEECH TRANSCRIPT

Sheet No 1 of..4.. sheets

File SJC/L/25/079T

Reason for Extract	*INCIDENT* *AIRCRAFT: QFA 2A*
Extract reference No	*3(SUBJECT AIRCRAFT ONLY)*
Ground station	*LONDON (HEATHROW) AIRPORT*
Callsign	*HEATHROW TOWER*
Frequency or Telephone	*118.5 MHz*
Facility	*AERODROME CONTROL (TOWER)*
Operation of Recorder	*CONTINUOUS*
Period Covered by Extract	From..*0720*..To..*0732*..UTC..*March 26,1990*

Officer i/c...M. M'Varone... Date *April 9, 1990*

LATCC Transcription Unit
Room 305
London Air Traffic Control Centre
Porters Way
West Drayton
Middx UB7 9AX

...tional Air Traf... Services

CAA IN CONFIDENCE

CORDED SPEECH TRANSCRIPT TEXT SUBJECT: AIRCRAFT QFA 2A

Sheet 3 of 4 sheets
Extract Ref. No. 3

...1	Col.2	Col.3	Col.4	Col.5	Col.6
...e	To	From	Recorded Intelligence	UTC	Remarks
1			(0720)	0720	Channel quiet
2					
3	QFA 2A	HEATHROW TOWER	QANTAS TWO ALFA YOU HAVE MISSED YOUR SLOT TIME		
4			I'LL GET YOU THE NEXT AVAILABLE		
5					
6	HEATHROW TOWER	QFA 2A	QANTAS TWO ALFA ROGER		
7					
8			(0721)	0721	Channel quiet
9					
10	QFA 2A	HEATHROW TOWER	QANTAS TWO ALFA SLOT TIME ZERO SEVEN THREE		
11			ZERO		
12					
13	HEATHROW TOWER	QFA 2A	QANTAS TWO ALFA THANKYOU		
14					
15			(0722)	0722	
16					
17	HEATHROW TOWER	QFA 2A	QANTAS TWO ALFA YOU WANT US TO KEEP TAXIING		
18			STRAIGHT UP ON THE RIGHT		
19					
20	QFA 2A	HEATHROW TOWER	YES STAY ON THE RIGHTHAND SIDE		
21					
22	HEATHROW TOWER	QFA 2A	THANKYOU		
23					
24	QFA 2A	HEATHROW TOWER	QANTAS TWO ALFA YOU'LL BE GOING BEFORE THE		
25			AUSTRIAN M D EIGHTY AND WHEN THE BRITISH		
26			SEVEN FIVE SEVEN ON YOUR LEFTHAND SIDE DEPARTS		
27			LINE-UP TWO SEVEN LEFT		
28					
29	HEATHROW TOWER	QFA 2A	QANTAS TWO ALFA ???		??? Unintelligible word
30					
31			(0723)	0723	
32					
33			(0729)	0729	Channel quiet
34					
35					

CA2089

..1	Col.2	Col.3	Col.4	Col.5	Col.6
ie	To	From	Recorded Intelligence	UTC	Remarks
6	HEATHROW TOWER	QFA 2A	QANTAS TWO ALFA THE SURFACE WIND THREE THREE		
7			ZERO SIX KNOTS CLEARED FOR TAKE-OFF TWO SEVEN		
8			LEFT		
9					
10	HEATHROW TOWER	QFA 2A	QANTAS TWO ALFA		
11					
12			(0730)	0730	
13					
14			(0731)	0731	
15					
16	QFA 2A	HEATHROW TOWER	QANTAS TWO ALFA CONTINUE WITH LONDON CONTROL		
17			GOODBYE		
18					
19	HEATHROW TOWER	QFA 2A	QANTAS TWO ALFA GOODBYE		
50					
51			(0732)	0732	

I certify that this extract, consisting of 4 sheets, each of which bears my signature, from the Radiotelephony Recording Log kept at London (Heathrow) Airport by the Civil Aviation Authority has been prepared under my direction and has been examined and checked by me; that Column 4 thereof is a transcription of the recording (relevant to the subject aircraft only) believed by me to be accurate in all respects.

April 9, 1990

M.M.Vowles

Officer i/c
L.A.T.C.C. Transcription Unit.

12

13

National Air Traffic Services

CAA IN CONFIDENCE

COPY No 1

RECORDED SPEECH TRANSCRIPT

Sheet No 1 of 5 sheets

File SJC/L/25/079T

Reason for Extract	INCIDENT AIRCRAFT: OFA 2A
Extract reference No	4 (SUBJECT AIRCRAFT ONLY)
Ground station	LONDON AIR TRAFFIC CONTROL CENTRE
Callsign	LONDON CONTROL
Frequency or Telephone	125.8 MHz
Facility	TMA (N) (OUT NE)
Operation of Recorder	CONTINUOUS
Period Covered by Extract	From 0731 To 0740 UTC March 26, 1990

Officer i/c M J Vance Date April 9, 1990

LATCC Transcription Unit
Room 305
London Air Traffic Control Centre
Porters Way
West Drayton
Middx UB7 9AX

PAGE.014

...itional Air Tra... : Services

CAA IN CONFIDEN...

CORDED SPEECH TRANSCRIPT TEXT SUBJECT: AIRCRAFT QFA 2A

Sheet 3 of 5 sheets
Extract Ref. No. 4

L.1	Col.2	Col.3	Col.4	Col.5	Col.6
ne	To	From	Recorded Intelligence	UTC	Remarks
1			(0731)	0731	
2					
3	LONDON CONTROL	QFA 2A	LONDON CONTROL QANTAS TWO ALFA IS PASSING ONE		
4			THOUSAND THREE HUNDRED CLIMBING (0732) BR	0732	
5			INITIALLY SIX THOUSAND		
6					
7	QFA 2A	LONDON CONTROL	QANTAS TWO ALFA GOODMORNING MAINTAIN SIX		
8			THOUSAND FEET ON REACHING NO A T C SPEED		
9			RESTRICTION		
10					
11	LONDON CONTROL	QFA 2A	QANTAS TWO ALFA SIX THOUSAND NO A T C SPEED		
12			RESTRICTION		
13					
14			(0733)	0733	
15					
16	QFA 2A	LONDON CONTROL	- QANTAS TWO ALFA THERE'S NO SPEED RESTRICTION		
17			NOW		
18					
19	LONDON CONTROL	QFA 2A	QANTAS TWO ALFA		
20					
21			(0734)	0734	
22					
23			(0735)	0735	
24					
25	QFA 2A	LONDON CONTROL	QANTAS TWO ALFA MAKE YOUR HEADING ZERO FOUR		
26			ZERO		
27					
28	QFA 2A	LONDON CONTROL	QANTAS TWO ALFA LONDON MAKE YOUR HEADING ZERO		
29			FOUR E- ZERO FOUR ZERO		- Momentary break in transmission
30					
31	LONDON CONTROL	QFA 2A	CONFIRM ZERO FOUR ZERO		
32					
33	QFA 2A	LONDON CONTROL	THAT'S CORRECT WHERE WERE YOU GOING		
34					
35					

2A2068

Col.1	Col.2	Col.3	Col.4	Col.5	Col.6
ne	To	From	Recorded Intelligence	UTC	Remarks
6	LONDON CONTROL	QFA 2A	IT'S ER QANTAS TWO ALFA WE WERE HEADING TOWARDS CHILTERN AS PER THE SID		
8					
9	QFA 2A	LONDON CONTROL	OKAY YOU JUST PASSED ER FOUR MILES SOUTH OF CHILTERN BUT IT'S NO PROBLEM HEADING ZERO FOUR ZERO		
12					
13	LONDON CONTROL	QFA 2A	QANTAS TWO ALFA ROGER		
14					
15			(0736)	0736	Channel quiet
16					
17	LONDON CONTROL	QFA 2A	ER QANTAS TWO ALFA'S MAINTAINING SIX THOUSAND		
18					
19	QFA 2A	LONDON CONTROL	QANTAS TWO ALFA THANKYOU CLIMB FLIGHT LEVEL ONE THREE ZERO		
51					
52	LONDON CONTROL	QFA 2A	QANTAS TWO ALFA ONE THREE ZERO		
53					
54			(0737)	0737	Channel quiet
55					
56	QFA 2A	LONDON CONTROL	QANTAS TWO ALFA RESUME OWN NAVIGATION BROOKMANS PARK YOUR HEADING IS GOOD		
58					
59	LONDON CONTROL	QFA 2A	QANTAS TWO ER ALFA ROGER		
60					
61	QFA 2A	LONDON CONTROL	(0738) - QANTAS TWO ALFA LONDON	0738	
62					
63	LONDON CONTROL	QFA 2A	QANTAS TWO ALFA ROGER		
64					
65	QFA 2A	LONDON CONTROL	- ER TWO ALFA I WASN'T GETTING AT YOU PARTICULARLY BUT ABOUT ER TWENTY MINUTES AGO ANOTHER AIRCRAFT DID A VERY SIMILAR THING BUT EVEN WORSE HE TURNED RIGHT AND HEADED STRAIGHT FOR ER THE INBOUND TRAFFIC I WAS WONDERING IF THERE WAS SOME PROBLEM WITH TH- THE -		
70					- Continues on next sheet

...itional Air Tra...c Services

CAA IN CONFIDENCE

CORDED SPEECH TRANSCRIPT TEXT SUBJECT: AIRCRAFT QFA 2A

Sheet 5 of 5 sheets
Extract Ref. No. 4

Col.1	Col.2	Col.3	Col.4	Col.5	Col.6
ne	To	From	Recorded Intelligence	UTC	Remarks
71	QFA 2A	LONDON CONTROL	- EQUIPMENT THIS MORNING		- Continues from previous sheet
72					
73	LONDON CONTROL	QFA 2A	YEH IT'S QANTAS TWO ALFA ER THAT'S AFFIRMATIVE		
74			ER WE WERE GETTING NORMAL INDICATIONS UP HERE		
75					
76	QFA 2A	LONDON CONTROL	- OKAY THANKS I'LL ER KEEP MY EYES OPEN FOR		
77			LATER		
78					
79			(0739)	0739	Channel quiet
80					
81	QFA 2A	LONDON CONTROL	QANTAS TWO ALFA CONTACT LONDON ONE THREE THREE		
82			DECIMAL FOUR FIVE		
83					
84	LONDON CONTROL	QFA 2A	QANTAS TWO ALFA ONE THREE THREE FOUR FIVE		
85					
86			(0740)	0740	Channel quiet

I certify that this extract, consisting of 5 sheets, each of which bears my signature, from the Radiotelephony Recording Log kept at London Air Traffic Control Centre by the Civil Aviation Authority has been prepared under my direction and has been examined and checked by me; that Column 4 thereof is a transcription of the recording (relevant to the subject aircraft only) believed by me to be accurate in all respects.

April 9, 1990

M.H. Varnam

Officer i/c
L.A.T.C.C. Transcription Unit.

APPENDIX 'F'

- Technical Log entry, VH-EBY

Browse SAS data set: TECLOG.TLOG747 Screen

Command ===> Obs 835

FLIGHT ENGINEERS TECLOG BROWSE - 747 A/C

VH: EBY DEPART: 260390 SEQ: 468 _ DEPSTN: LHR ARRSTN: BKK SERVICNO: 002A

FRM: __ FRM CODE: __ __ __ ____ TQATA: __ TQNO: __ RELNOTE: _____

ATA: __ SUB: __ ITEM: __ S: _

DEFECT REPORT

R1: DURING DEPT FROM LHR A/C EXCEEDED FLAP LIMIT SPEED FOR FLAP 1 BY

R2: APPROX 25/28 KNOTS.

R3

ACTION TAKEN

A1: PHASE 1 FLAP INSPECTION AS PER MM 5-51-04 NIL APPARENT DEFECT OR

A2: DAMAGE.

A3: _____

REFER SEQUENCES SEQ_1: ___ SEQ_2: ___

PNUM_OFF: _____ SERL_OFF: _____ SERL_ON: _____

APPENDIX 'G'

- Flap Inspection Procedure

EXCEEDING FLAP DOWN SPEEDS CONDITION - MAINTENANCE PRACTICES (CONDITIONAL INSPECTION)

1. General
   A. Anytime flap down placard speeds have been exceeded, the Exceeding Flap Down Speeds Conditional Inspection should be completed.
   B. Exceeding Flap Down Speed Conditional Inspection is divided into Phase I and Phase II inspections.
      (1) Phase I inspection should be completed before next flight after exceeding flap down placard speed.
      (2) If damage is found in the Phase I inspection, Phase II inspection should be completed before next flight.
2. Referenced Procedures
   A. 27-51-22/401, Inboard Flap Inboard Track
   B. 27-51-25/401, Inboard Flap Outboard Track
   C. 27-51-27/401, Outboard Flap Track
3. Phase I Inspection

   WARNING: FLAP ACTUATION SYSTEMS SHOULD BE DEACTIVATED PRIOR TO INSPECTION. FAILURE TO COMPLY COULD CAUSE INJURY TO PERSONNEL.

   A. Trailing Edge Flaps Inspection
      (1) Examine inboard and outboard trailing edge flaps for external skin distortion and missing or pulled fasteners.
      (2) Examine flap support fittings, their attachment bolts and wing inspar surfaces in close proximity to flap support fittings for cracks, distortion, hole elongation, and pulled or missing fasteners.
      (3) On ALL EXCEPT 747SP,
      examine main flap carriages and links for cracks; bearings and mounting bolts for binding, cracks, distortion, or hole elongation.
      (4) On ALL EXXEPT 747SP,
      examine flap tracks for cracks or distortion, and track attachment points for cracks, distortion, or hole elongation.
      (5) On 747SP airplanes,
      examine crank arms, carrier beams,and links for cracks or distortion; examine attachment points for cracks distortion or hole elongation.
      (6) On ALL EXCEPT 747SP,
      remove and examine the fuse bolts at the forward attachment point of the flap tracks for offset deformation (crank shafting) (Ref 27-51-22/401, No. 4 and 5); (Ref 27-51-25/401, No. 3 and 6); (Ref 27-51-27/401, No. 1, 2, 7, and 8).

      NOTE: The fuse bolts need not be examined unless one of the following is true:

      (a) Placard speed has been exceeded beyond 30 knots for flap position 1.
      (b) Placard speed has been exceeded beyond 20 knots, for flap settings greater than 1, up through 5.

(c) Placard speed has been exceeded beyond 15 knots, for flap settings greater than 5, up through 10.
(d) Placard speed has been exceeded by any amount for flap settings greater than 10.

NOTE: If Service Bulletins 747-57-2177, 747-57-2206, and 747-57-2217 are required and have not been incorporated, the fuse bolt inspection should be performed before next flight regardless of the amount of overspeed or flap setting.

(7) On 747SP airplanes,
remove and examine fuse bolts for offset deformation.
(8) On ALL EXCEPT 747SP,
examine foreflap sequence carriages for cracks, distortion, and for cracked or broken rollers.

B. Leading Edge Flaps Inspection - Phase I

NOTE: If the leading edge flaps down placard speed has been exceeded by less than 15 knots, the Leading Edge Flaps Inspection is not necessary.

C. Examine leading edge flap No. 3, 7, 11, 12, and 13 on the left side and No. 14, 15, 16, 20, and 24 on right side as follows:
(1) Examine wing leading edge flap external skins for distortion and pulled or missing fasteners.
(2) Examine wing leading edge flap linkages for distortion.
(3) Examine Krueger flap rotary actuator arms (-200 airplanes) or ballscrews and gimbals (-100 and SP airplanes) for distortion and broken bolts.
(4) Examine variable camber flap rotary actuator arms for distortion and broken bolts.
(5) Examine fixed wing leading edge rib support tubes and attachments for distortion.

4. Phase II Inspection
A. Leading Edge Flaps Inspection - Phase II
(1) Complete the inspection of par. 3.B.(1) thru 3.B.(5) for all the remaining leading edge flaps and fixed structure that was not examined in Phase I.