

CIVIL AVIATION (INVESTIGATION OF ACCIDENTS) REGULATIONS 1969

**Review of the Aircraft Accident
Report on the collision which
occurred at Hamble between Piper
PA-28 Series 180 (Cherokee) aircraft
G-AVBD and G-AVBI on
27 February 1970**

Report

before
R M Yorke, QC
and
Captain R R Critchley, MBE
Technical Assessor

Gray's Inn Chambers
Gray's Inn
London WC1
01 - 242 5226

15 November 1972

*The Rt Hon Peter Walker MBE MP
Secretary of State for Trade and Industry
1 Victoria Street
London SW1*

Sir

I have the honour to submit my Report upon the Review of the aircraft accident report on the collision which occurred at Hamble between Piper PA-28 Series 180 (Cherokee) Aircraft G-AVBD and G-AVBI on 27 February 1970.

In doing so I desire to place on record the invaluable and unfailing assistance which I have received throughout the Review and in the preparation of the Report from the Technical Assessor, Captain R R Critchley MBE.

I have the honour to be
Sir
Your obedient Servant

Richard Yorke

Appearances

Mr B J Davenport

(Instructed by the Treasury Solicitor) appeared as Counsel on behalf of the Review Board

Mr J Mitchell

(Instructed by Cameron Kemm Nordon & Co) appeared as Counsel on behalf of Captain J Proctor

Mr J Mitchell

(Instructed by Brian Livingstone & Co) appeared as Counsel on behalf of Mr W Skellon

Mr A J Barrowclough

(Instructed by Mr Bernard Wood) appeared as Counsel on behalf of the College of Air Training, Hamble

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2. Template of vision from pilot's seat of Cherokee	(Paragraph 22)
3. College of Air Training Standing Order	(Paragraphs 75, 87)
4. Inspector's aircraft tracks with overlay of Captain Proctor's tracks	(Paragraph 93)
5. Periods when BI could have seen BD	(Paragraph 112)
6. The Inspector's report	(Part A)

Part II – Transcripts of Evidence and other documents (Not published)

For the titles of the documents submitted to the Review Board see 'Appendix Part II. List of documents' pp 29-30

List of documents

Treasury Solicitor

Statement by Mr Peter Fisher

Statement by Mrs B Newman (and addendum)

Statement by Mr B Wakeman

Statement by Mr S Watkins (and addendum)

Statement by Mr G S Lyne

Statement by Mrs J Skinner

Statement by Mr J James

Treasury Solicitor's Proof – Mr G Holloway

Treasury Solicitor's Proof – Captain A Jackson

Statement by Captain R Street

Treasury Solicitor's Proof – Mr P Duff-Mitchell

Treasury Solicitor's Proof – Captain JD Lowry

Accident Investigation Branch – Civil Aircraft Accident Report 8/71.
Chipmunk DH C 1 Series 22 G–AOTH. Report of the accident at Fawley,
Buckinghamshire on 6 February 1970. HMSO, 1971.

College Data from technical log analysis and Aircraft in Circuit – Mr Head

Extract from movements Log Royal Naval Air Station, Lee-on-Solent 27.2.70

Statement by Mr W D Higginson

Photographs (5) of PA-28 Cockpit

Statutory Instrument 1969 No 216, Civil Aviation Rules of Air Traffic
Control Regulations 1969

Statutory Instrument 1966 No 1184, The Air Navigation Order 1966

Photographs (4) Aerial from Cherokee Cockpit by Mr Head

Mr Skellon

Statement of Aircraft in Circuit

Captain Proctor

Report – Norman Head, suggested amendments to
Data Used in Construction of Air Tracks
Letter and enclosure of number of aircraft in circuit
Statement of John William Keen
Statement of David Wallace Stealey
Statement of Andrew Gino Newton
Analysis and Comments – Captain Proctor on cockpit sighting graph
Statement by Mr J Rhind
Extract from *Manual of Air Traffic Control*
Graph: Vertical range of sighting looking left from BD cockpit
Graph: Sightings looking right from BI cockpit
Letters: Typed copies of letters written by Mr Rhind
Sighting: Diagram from cockpit of BI

College of Air Training, Hamble

Statement by Mr Cecil Pearce
Statement by Air Vice-Marshal Bates
Copies of Control Logs
Extract of Operations Manual
Memorandum on Air Traffic Control Problem from Duff-Mitchell to
Principal of the College of Air Training at Hamble
List showing total aircraft flying hours – College of Air Training, Hamble

Preliminary

Accident

- 1 On 27 February 1970 at 1405 GMT at Hamble Aerodrome Piper Cherokee G—AVBI collided with Cherokee G—AVBD at a height of approximately 900 feet. Both aircraft crashed to the ground. Both pilots were killed, most probably having been rendered unconscious at the moment of collision.

Investigation

- 2 The Chief Inspector of Accidents ordered Mr N S Head, an Inspector of Accidents, to carry out an investigation into this accident. Mr Head, with the assistance of other officers and technical staff of the Inspectorate, carried out a study of the facts and prepared his report for submission to the Secretary of State for Trade and Industry. A copy of the proposed report was, pursuant to Regulation 11, served on the fathers of the two dead pilots.
- 3 Each father gave notice that he wished the findings and conclusions in the report to be reviewed by a Review Board under Regulations 12 and 13.
- 4 The College of Air Training sought and were granted leave to appear at the Review under Regulation 13(7).

Proceedings of review board

- 5 On 12 June 1972 a Preliminary Meeting was held and attended by all interested parties or their representatives at which directions were given for the preparation and conduct of the Review.
- 6 On 13 June Captain R R Critchley MBE (Technical Assessor), Mr Brian Davenport (Counsel for the Review Board) and I went to Hamble Aerodrome to obtain a general view and to fly Cherokee aircraft over tracks approximate to those flown by BD and BI as reconstructed by the Inspector and by Captain Proctor, the father of one of the pilots.
- 7 The Review Board sat in public in London at 47 Parliament Street to hear evidence and argument for five days: 3rd, 4th, 5th, 6th and 9th October, 1972. Oral evidence was given by:

Mr G Holloway, Air Traffic Controller, Hamble

Mr S Watkins, Air Traffic Controller, Hamble

Captain A Jackson, Flying Instructor, Hamble

Captain J D Lowry, Deputy Flight Manager, Hamble

Mr N Head, Inspector of Accidents

Captain R Street, Flying Instructor, Hamble

Mr J Rhind, formerly Air Traffic Controller, Hamble

Captain J Proctor, British European Airways

Captain P W M Duff-Mitchell, formerly Chief Flying Instructor,
Hamble

8 Evidence of certain other witnesses was, by general consent, read.

Facts

General

- 9 As the Review progressed it became apparent that there was an increasing congruence of what had hitherto been disparate views. To this, two matters particularly contributed. Firstly, Captain Proctor and Mr Skellon (the father of the other pilot) satisfied themselves that there was no conflict of interest between them and that they were accordingly able to instruct the same Counsel. Secondly, in technical matters Captain Proctor and Mr Head were able to work together during adjournments – as they had done under the Regulation 11 procedure and earlier – either to reach agreement or to limit the ambit of disagreement.
- 10 For this reason it is both possible and desirable to state the effect of the evidence without, in most cases, having to resolve conflicts. It is unnecessary to go into detail on certain matters which once loomed large in importance before fading into irrelevance.
- 11 It is also important to remember throughout that this Review was concerned solely with a small low-wing monoplane with side by side seating. Other factors may have relatively greater significance with other types of aircraft; eg high-wing, or tandem seaters.

The collision itself

- 12 At the moment of collision BD, piloted by Cadet Proctor, was near the end of a climbing turn right to circuit height after having taken off from Hamble Aerodrome about 73 seconds earlier. BI, piloted by Cadet Skellon, was in level flight on crosswind leg re-joining the Hamble circuit from Lee-on-Solent. The two aircraft were on converging tracks. BI was horizontally overtaking BD; BD was climbing up into the path of BI. Neither pilot saw the other. Indeed, in the last few seconds (probably 10 seconds for BI, and up to 20 seconds for BD) it was for all practical purposes impossible for either pilot to have seen the other.
- 13 A similar accident, largely irrespective of particular aircraft types, could happen again. Captain Duff-Mitchell, the Chief Flying Instructor at Hamble at the time, said (Day 5, 7.6, 8.1):

I have talked this over with many many people in an effort to sort of say: 'Well, you know, is this inevitable? Do we have to have one of these now and again?' Now, quite honestly, I have not come up with an answer as to how to prevent the same thing happening.

I have been almost in the same position since that accident at least twice in two different circuits it was a question of taking avoiding action.

and Captain Duff-Mitchell had 35 years and 13,500 hours experience.

Hamble College of Air Training

- 14 The College of Air Training is owned by, and trains pilots for, BEA and BOAC. It is one of the four professional flying schools in the United Kingdom. Both the dead pilots were cadets at the College.
- 15 No criticism whatever was made of the competence of the instructional staff. Criticism was made of the operational methods of the College in three respects:
- (1) The method and provision of Air Traffic Control (ATC);
 - (2) The density of circuit traffic;
 - (3) The non-installation of a recording device for ATC two-way communications.
- 16 The first criticism is not supported by the evidence; the second is irrelevant to the facts of this case; the third is in my opinion valid but no blame attaches to the College.

Hamble Aerodrome

- 17 The College also owns and is the licensed operator of Hamble Aerodrome. Aircraft other than College aircraft, including RAF Chipmunks flown by the Southampton University Air Squadron, can use Hamble Aerodrome with prior permission.
- 18 Hamble Aerodrome is a grass field. Its dimensions are slightly more than 1 mile by ½ mile; these will assume some significance later (paragraphs 46-8). It has no permanent runways. Landing and take-off areas (which it is convenient to refer to as 'runways', although Mr Rhind correctly but pedantically demurred) are defined by portable markers.
- 19 The Aerodrome lies on the eastern edge of the Bournemouth Control Zone, with the inbound traffic lane to Southampton Airport about 3½ miles to the west. There are free lanes in and out of the zone, forming a flat keyhole shape centred on the Aerodrome (Appendix 1). Lee-on-Solent, a Royal Naval Air Station regularly used for training, lies 5 miles SE on the Solent shore.
- 20 On 27 February 1970 the runway in use was 02 as the wind was from the NNE at 10-14 knots. This runway was not often used.

The aircraft

- 21 The Inspector's report describes the Piper Cherokee thus:
- The Piper PA-28 aircraft is a single engine low-wing monoplane with an enclosed cabin. The non-transparent roof of the cabin meets the front windshield at a position just above the pilot's head. There are two windows on either side of the cabin which extend back about 6 feet from their junction with the windscreen. Dual controls are provided and the pilots sit side by side; solo flying is carried out from the left hand seat. From the left hand seat the field of vision to the right is restricted, particularly in a downward direction.
- 22 At the Review, a template was produced (Appendix 2) showing the visibility from the pilot's (left hand) seat. This had been constructed in America with a binocular camera; it was possible to calculate that the notional pilot would have been about 5 feet 10 inches tall.

- 23 This template shows dramatically how poor is the field of vision to the right, being less than 30 per cent of that to the left and being cut off a few degrees below the horizontal. Nevertheless, it must be treated with caution because comparatively small movements by the pilot of his head and body result in large increases in the angles subtended by the coaming, window frames, and wings and thus in corresponding increases in the field of vision.
- 24 It is, however, impossible to doubt that the comparative difference between the fields of vision to left and right is a significant factor in safe operation of these aircraft. How widely this is appreciated is another matter. For example:

Q Are there any specific instructions which you give to student pilots about precautions they must take flying a righthanded as opposed to a lefthanded circuit?

A No, I must confess I have never made any great differential in terms of lookout in that way, except to point out a general disadvantage of sitting on that side. We do stress quite a lot the looking behind and through the rear side windows. This is a point we do frequently make.

(Captain Jackson, Day 2, 19.7)

- 25 This sort of answer seems to indicate that the increased hazards of modern light aircraft with reduced visibility have not been thought through in terms of differentiating between left hand and right hand circuits.

The weather

- 26 The weather was good, as described in the Inspector's report at paragraph 1.7. It was not a factor in the accident.

The pilots

- 27 Mr John Miles Skellon, the pilot of BI, was 22. He held a private pilot's licence originally obtained at the Lancashire Aero Club in July 1964. Since then he had done only a dozen or so hours flying before he joined the College in November 1969 and commenced flying training on 5 February 1970. At the time of the accident his total flight experience was 62 hours, 35 of which were as pilot-in-command, and 12.30 on Cherokees.
- 28 He was described thus by his Instructor, Captain Lowry (Day 2, 28, 9-10; 31.7):

I consider Mr Skellon was a 'high average' cadet, bearing in mind that he had got previous experience. Nevertheless, he was 'high average'.

Extremely keen. He took great pains to make sure that he understood things and used to find out things that he did not understand.

In general Mr Skellon was well versed in the rules of the air and circuit procedure, and his airmanship was excellent.

- 29 Nothing in the detail evidence detracts from that assessment, which I accept.
- 30 Mr Anthony James Proctor, the pilot of BD, was 19. He held a student pilot's licence. He was on the same course as Cadet Skellon and had commenced flying training on the same day (having previously flown 3 hours in a Chipmunk in July 1969). At the time of the accident his total flight experience was 18.30 hours, 2.50 of which were as pilot-in-command, and all but the 3 hours in July on Cherokees. He had gone solo for the first time four days before the accident.

31 He was described thus by his Instructor, Captain Street (Day 3, 12.10; 13.6):

As far as this particular day is concerned, I was quite satisfied that he was fit, that he was keen and that he was able to do the task that I gave him.

I would assess him as 'high average' at this stage.

32 Again, there is nothing in the evidence to detract from that assessment, which I accept.

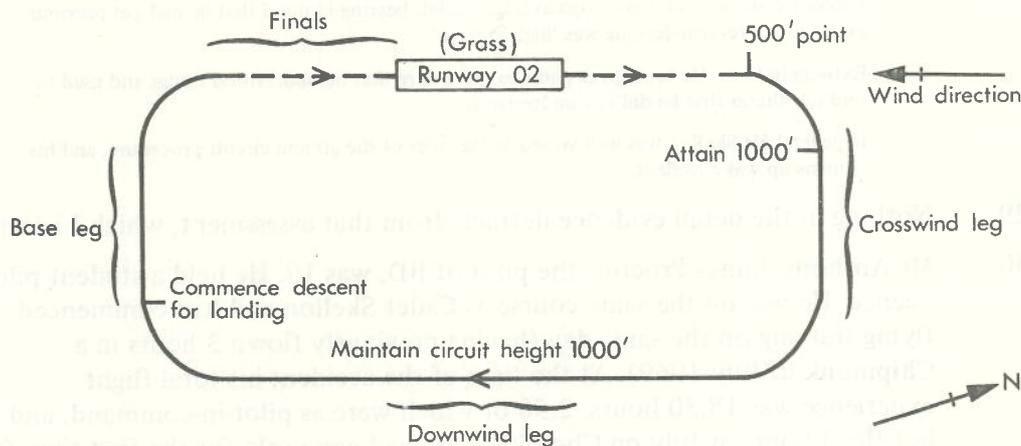
Fatigue

33 It was at one stage suggested that Cadet Proctor's training programme on the day of the accident was so intensive that he might have been suffering from fatigue. Captain Street gave evidence in detail about this (Day 3, 12-23). I am satisfied that Captain Street had the question of students' work loads properly in mind, that Cadet Proctor was young and fit, and that Captain Street rightly assessed him as 'physically fit to go on' (Day 3, 13.7). Fatigue played no part in this particular accident.

Aerodrome circuit

34 When the runway in use is 02 the Hamble circuit is right handed to keep aircraft away from Southampton Airport traffic.

35 The circuit procedure, in which all pilots were instructed, was to climb straight ahead after take-off to 500 feet QFE and then make a climbing turn to achieve the circuit height of 1000 feet crosswind before turning level onto downwind leg.



36 The exact circuit time was not precisely established, but was probably a little over 5 minutes. At a maximum circuit density of 10 aircraft, this would yield a mean circuit spacing of 30 seconds between aircraft.

37 There was, however, no time check on aircraft taking off in order to control circuit density. (Captain Duff-Mitchell, Day 4, 55.1) Cadets were taught:

to wait until the previous aircraft is well and truly airborne, probably about 200 or 300 feet.

(Captain Street, Day 3, 16.1)

This could result in a separation at take-off of little more than 20 seconds, and in strong wind conditions even less, and consequent 'bunching' in the circuit.

38 If that happened then:

Once you see bunching occurring – I am talking as someone who is airborne – you have to manoeuvre your aircraft in such a way that you slow up or move out of the circuit to prevent this.

(Captain Duff-Mitchell, Day 4, 55.4)

39 It did not happen often, probably because:

Pilots are warned constantly when keeping a lookout in the circuit that it is no good getting close to the aircraft in front because one of them will have to give way, and once you start bunching you are not going to get any flying done. This is indoctrinated into them right from the beginning. [But] I am afraid bunching happens. It happens in my present job at various airfields twice or three times a week.

(Captain Duff-Mitchell, Day 4, 55.3)

40 It did, however, happen on 27 February 1970 and was a factor which led to this accident.

41 It was at one time contended that the circuit was 'saturated', that there were too many aircraft in the circuit. At an early stage, I indicated to Counsel that the mere number of aircraft in the circuit, as opposed to the positions and spacing of particular aircraft, did not appear to me to be causally related to the accident: in particular aircraft on finals, south of the field, or taxiing on the ground had nothing to do with an accident in the air to the northeast. The matter was not thereafter pursued.

Right hand circuits

42 It was also suggested at one stage of the Review that because of their inherent dangers, right hand circuits should be prohibited, at any rate for training purposes. However, I discouraged this from being pursued in the light of the Technical Assessor's intervention pointing out their necessity in real life (Captain Proctor, Day 5, 36.2-3, 5-6 and 10-11):

Q Start from the beginning and tell the Board what exactly would have happened that did not happen or conversely what would not have happened that did? What do you envisage would actually have taken place?

A Let me say that if I was a tower controller I would not accept the right hand circuit.

Q That is one point: there would not have been a right hand circuit?

A No, there would not have been a right hand circuit.

The Assessor: Might I put another question? When you say that there would not have been a right hand circuit, even in airline operations there are right hand turns?

A There certainly are.

Q Do you think it reasonable at some stage in basic training that a cadet should be taught right hand approaches? It is difficult to line oneself up with the runway centre line, in a right hand turn, unless you have had reasonable practise at it?

A I am dead against right hand circuits, Sir. I am biased against them and always have been, particularly in Cherokees where the vision downwards to the right is very, very poor indeed.

...

The President: You are linking the right hand circuit with density of traffic?

A Yes.

Q You agree with Captain Critchley that you may have to have right hand circuits in training but you relate them, or say that they should be considered in relation to the density?

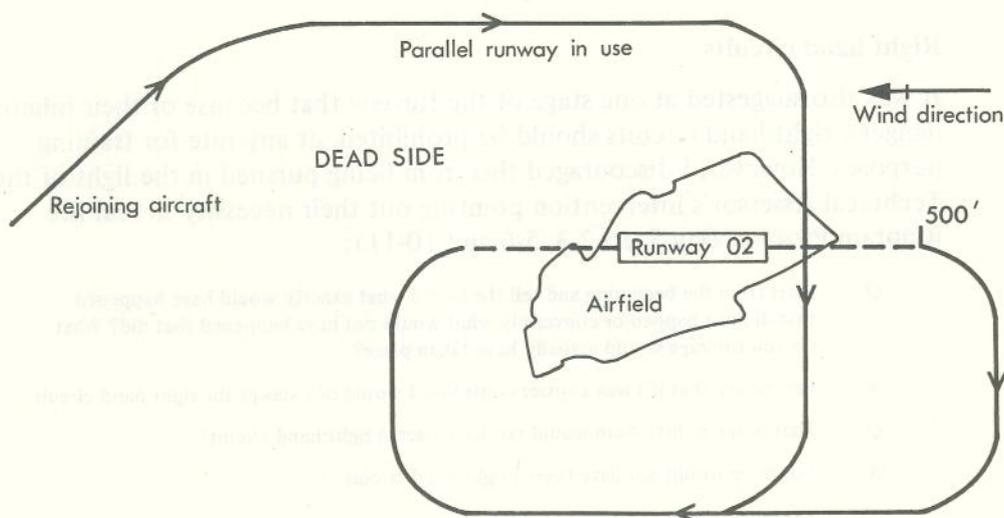
A Yes.

The President: That is a different point.

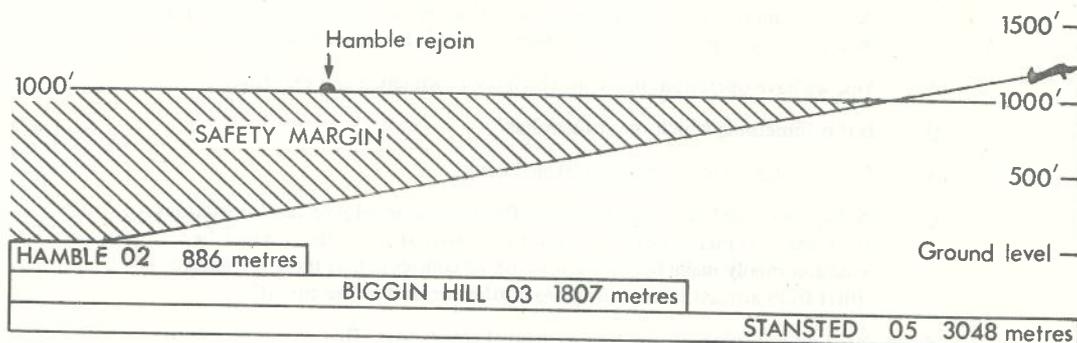
- 43 I accept the Technical Assessor's advice that it is neither practical nor desirable to ban right hand circuits in training or otherwise. However, as this Report demonstrates, there are sound reasons with modern aircraft for not treating right hand circuits as indifferently equivalent to left hand circuits.

Circuit joining procedure – 1

- 44 There are two basic methods by which aircraft may join an aerodrome traffic circuit under VFR. One, the 'RAF standard joining procedure', has certain differences which are irrelevant to this Review. At Hamble the joining procedure, which is a standard civil procedure, is for the re-joining aircraft to join on the 'dead' side of the circuit (ie the side opposite to the circuit traffic) parallel with the runway in use, turn crosswind over the upwind end of the airfield, and then turn into the circuit on the downwind leg.



- 45 Two matters have to be particularly noted about this procedure. Firstly, the re-joining aircraft must parallel the runway in use 'far enough to the left to see taking-off traffic' (Captain Jackson, Day 2, 11.2).
- 46 Secondly, the choice of the upwind end of the airfield as the crosswind leg is a convenient local rule for small airfields such as Hamble. Given the size of the airfield and the performance of the aircraft, it should put the crosswind aircraft 500 feet or so above aircraft climbing out after take-off.
- 47 It is, however, obvious that at larger airfields with longer runways or higher performance aircraft such a rule would produce very different results.



- 48 In other words it is only a fortunate coincidence if an aerodrome happens to have such an easy ground reference point to identify the crosswind leg for a standard join. At many airfields, especially unfamiliar ones, the pilot must
- generally review the situation and make up your mind on the best approach path.
This is ordinary basic training anywhere; it was not just Hamble.

(Captain Duff-Mitchell, Day 4, 56.3)

Circuit joining procedure – 2

- 49 Even where there is a known convenient reference point a pilot may have reason to think that it is undesirable to turn there:

- Q* His dilemma arises when he finds that in his judgment it is not safe, or not desirable, to make his turn there because of obstructions ahead of him, or congestion ahead of him. He then has to decide which of three or four courses he is going to take?
- A* Yes.
- Q* In fairness to him would you accept that was, for someone of his experience, a tricky decision?
- A* I do not think that decision is ever easy, no matter how much experience you have had.

(Captain Jackson, Day 2, 11.9.10)

50 In the light of that answer, it is worth reproducing four others.

Q The situation may have arisen where Cadet Skellon thought – it does not matter whether he be right or wrong – that he might be in difficulties if he turned across the northern boundary of the airfield, because he might get too close to another aircraft or more than one aircraft. Had any instructions ever been given to him about what to do if he thought he was getting too close to other aircraft in front which would bring him too close to one in particular?

A I cannot recall that there were any detailed instructions as to what to do with such a predicament, because situations vary all the time – you cannot cover every eventuality.

(Captain Lowry, Day 2, 31.7)

Q Are there either operations manuals or written instructions at Hamble where there are laid down joining procedures so that the student can go and look at them, or is he required to look at them as part of his paper work?

A Yes, we have operations manuals which lay down entry and exit lanes.

Q Is this something which the student has?

A Every student is issued with a personal copy.

Q Perhaps we could have a look at that. Does that manual give any instructions as to what a student pilot or any pilot is to do if at the point at which he would normally make his turn crosswind he considers that there is a hazard either from aircraft taking-off or from other aircraft in the circuit?

A No, I do not think the operations manual covers that. That would be left to each individual Instructor to clarify.

(Captain Jackson, Day 2, 18.4-6)

Circuit joining procedure – 3

51 The pilot of an inbound aircraft would normally call Hamble Approach before joining dead side. College aircraft inbound from Lee-on-Solent might, for want of time, omit an Approach frequency call. Whether such a call is made or not the inbound aircraft is required to call Hamble Tower 123.5 as soon as possible after crossing to the dead side of the extended centreline of the runway in use.

52 This call announces the aircraft's presence not only to the Tower Controller and aircraft already in circuit but also to aircraft on the ground waiting to take-off. Before lining up such aircraft are facing the dead side, and the student pilots are taught from the beginning to identify an aircraft making a dead side call. Thereafter:

... if that aircraft called and says he is dead side it is then, in this case, Proctor's duty to make sure he can see him before he commences take-off.

(Captain Street, Day 3, 18.8)

Cadet Proctor was briefed not to roll until he had seen that aircraft

(Captain Street, Day 3, 18.4)

53 Captain Street was later asked what happened if the aircraft on the ground had already started (Day 3, 22.4).

Q Suppose at the moment that that call is made he is already commencing his take-off run do you expect him to abort?

A No, I think if the call is made in the correct place on the dead side then I would not have thought there would have been a collision risk, although I would expect the taking-off aircraft to make every effort to see the dead side aircraft as soon as it is comfortably airborne. Sitting on the left hand side he has probably got reasonable vision.

- 54 For its part the aircraft on the ground will call 'lining up for take-off', and this is also a warning to joining aircraft.

VFR/VMC

- 55 All the aircraft were flying under Visual Flight Rules in Visual Meteorological Conditions. Under these Rules the responsibility for the avoidance of other aircraft is firmly on the pilot. As it is sometimes colloquially, but accurately, expressed the rule is 'see and be seen'.
- 56 Since all pilots will fly some of their time VFR, and some pilots will fly all of their time VFR, it is of vital importance that nothing should lower the standards of lookout which pilots must learn as students and maintain throughout their flying careers. Captain Duff-Mitchell emphasised the importance of this (Day 4, 53.10, Day 5, 8.1):

Q First of all, there is the question of cadets being taught at Hamble 'see and be seen'. We know they are taught that. Can you say anything about the importance or otherwise attached to that principle in the teaching of cadets at Hamble?

A The importance is that unless you teach it at the very beginning of a person's flying career he will never have the opportunity to correct a fault once he gets into an airline type of aircraft, which has poor visibility, and secondly of course people on basic training are operating in what we call the local flying area and carrying out flying exercises and it is important they keep a good lookout at all times. This expression 'see and be seen' has been with basic flying for a very long time and we put great emphasis on it. We remind people about it at least once a week in the early morning briefing, particularly on those days when the visibility is poor.

I can only say that one has got to go on persevering more and more with this 'see and be seen' attitude, in the hope that this remains with the pilot for the rest of his career, and if you do not do it at that early stage then you will never get him to look out. When he is in an aeroplane with less windows, such as the present day airliners, you do get this false sense of security that you are in your own little airspace and you do not bother to look out at all.

and Captain Lowry said of the initial training (Day 2, 28.11):

Q We have heard of the expression see and be seen and the importance of keeping a lookout. Is this a matter which you explained to the cadets?

A Yes, indeed, with considerable emphasis. The term I invariably use with basic cadets is that they have 'got to screw their necks round and see the tail plane of the aircraft'. It has got to be instilled from the word go.

- 57 Thus, although ATC Controllers may pass information, advice and instructions to pilots, they cannot detract from the pilots' fundamental responsibility. This is recognised in the *Manual of Air Traffic Control*:

2.5.1.1 When operating in VMC it is the responsibility of the pilot to avoid collision with other aircraft. However, due to the restricted space on and around manoeuvring areas and the restricted view from some aircraft, it is often essential that traffic information be issued to aid the pilot in avoiding collision between other aircraft in flight or obstructions on the ground.

2.7.2.1 Clearance to enter a traffic circuit is issued when the aircraft is still some distance from the airfield in order that the pilot may conform with the traffic circuit, pending clearance to land. Information concerning landing direction or runway in use and any other necessary instructions are given at the same time so that the pilot may intelligently position himself in the traffic pattern.

and Air Traffic Controllers are careful not to assume a responsibility which is not theirs.

- 58 Otherwise, there is a danger of breeding a false sense of security in pilots. It was described by Captain Duff-Mitchell (Day 5, 7.1):

Pilots I have seen who have been brought up under full R/T are told to line up, and they move straight on and line up; they do not even look to see if the Controller has made a mistake, to see if someone is coming in on the approach. They feel that they have a sort of screen round them which is their airspace, and it does tend, I think, to teach them bad habits.

Air Traffic Control – 1

- 59 The system of Air Traffic Control in operation at Hamble on 27 February, 1970 was known as limited R/T. It is not necessary to describe this in detail, save to say that so far as aircraft in circuit are concerned, their position calls, as opposed to joining or departing calls, on Tower frequency were not responded to by the Tower Controller. The advantages claimed for this system, which was only operated in good weather conditions, are that it reduces the work load on the student pilot, that there is less radio chatter to distract the student or interrupt any instruction he is being given, and that full R/T in the early stages of training could give student pilots a false sense of security and so reduce the efficiency of their lookout. Whether these advantages are real, and whether there are any corresponding disadvantages, it is unnecessary to decide.
- 60 For the purpose of this Review, the relevance is that it was contended:
- (1) had full R/T been in operation the accident need not have happened;
 - (2) by not operating full R/T the College were
 - (a) in breach of Rule 55 of the then *Rules of the Air and Air Traffic Control Regulations 1969*; and
 - (b) conniving at a breach by the pilots of Rule 36(2)(b) of the same Regulations.

- 61 The first contention is one of fact, the second one of law.

Air Traffic Control – 2. Full R/T

- 62 The principal evidence in support of these contentions was that of Mr James Rhind. Mr Rhind was a highly qualified Air Traffic Controller with experience over 27 years in civil and military aviation both in the United Kingdom and abroad.
- 63 He had been an Air Traffic Controller at Hamble from September 1968 to November 1969. The reason for his short stay was that he resigned upon the very issue of limited R/T, which he sincerely believed to be an inadequate service as well as a breach of the Regulations which could jeopardise his licence. He pressed his views upon his superiors in correspondence which was produced at the Review and, not being content with their replies or with the fact that the system was known to and not disapproved by the Southern Division of the then Board of Trade (the airfield licensing authority), he resigned. It was an ironic and tragic coincidence that on the day of the accident the College wrote a letter rejecting his views.

64 Mr Rhind undoubtedly knew 'the book', the *Manual of Air Traffic Control*, thoroughly. But his thinking seemed to me and to the Technical Assessor to be directed towards Air Traffic Control for IFR flights, where the ground control responsibility for separation is positive, and not towards VFR flights in VMC where the primary responsibility is upon the pilot.

65 However, he was asked the critical question by Mr Mitchell in carefully neutral language:

Q Now, the question I want to ask you is this. Do you consider that, if there had been such a full system of aerodrome control service in operation on the 27th February 1970 it would have had any bearing upon this particular accident?

A Well, my submission is that this accident would not have happened insofar as, instead of an aircraft lining up and saying he is departing, he would be required to request take-off clearance and then in the time taken to obtain this take-off clearance, assuming a velocity of 150 feet per second, he would have moved away from the position of the collision by at least one second, perhaps 10 seconds, with a distance of 150 feet to 1500 feet, and the length of a Cherokee is 22 feet 6 inches.

(Day 4, 28.2)

66 It requires only a moment's thought to realise that, even if all Mr Rhind's assumptions were correct, and no other parameters varied, then the accident could have been averted only by coincidence and not by any virtue of full R/T. Had BD lined up a second or two earlier then, on Mr Rhind's hypothesis, the delay due to full R/T would have caused the accident (Day 4, 35.4-6; 36.1). I therefore reject the first contention insofar as it is based upon this part of Mr Rhind's evidence.

67 Mr Rhind also supported the contention in a second way. He argued that 'with a full aerodrome control service, to provide local traffic information' (Day 4, 28.3) the aircraft in circuit or wishing to join the circuit would somehow be positively controlled either to prevent a critical situation arising or to rectify it once it had. He was, however, unable to explain logically how this would be so, either in general or on the facts of this particular accident (Day 4, 38.2-7). At the end of his evidence he was pressed to identify the call which a Tower Controller could have made under full R/T which might have prevented the accident. He was not able to do so. (Day 4, 39.1-2; 40, 2.9-10). Nor indeed could anyone else (Day 2, 18.9). He retreated into the assertion that with full R/T there would, or might have been, fewer aircraft in the circuit (Day 4, 40.10-11).

68 I found Mr Rhind's evidence unconvincing. He was patently sincere and truthful, but he gave me the clear impression that he believed as an article of faith that if the book was followed (on the construction he gave it) then nothing could go wrong. Having this faith he did not find it necessary to rationalise into problems of logic or causation. Conversely, if the answer was not in the book then Mr Rhind felt that the situation should not be allowed to exist. This was neatly illustrated in his answers to three questions in cross-examination by Mr Barrowclough (Day 4, 36.7-9):

Q Surely it is not the function of an Air Traffic Controller, for example, to achieve separation between departing aircraft?

A Yes. Again, there is a requirement here, but the direction given in the *Manual of Air Traffic Control* is related to operation from a runway. 'An aircraft will not be permitted to begin take-off until the preceding departing aircraft is seen to be airborne. . . and all preceding landing aircraft are clear of the runway in use'. This was not operating on a runway at Hamble. There was not a runway in use at Hamble. It was an expanse of natural surface.

- Q There was nothing in the *Manual of Air Traffic Control* which applied?
- A With the system of multi-landings and multi-take-offs simultaneously.
- Q This was a situation which the *Manual of Air Traffic Control* did not cater for?
- A There was no direction given in the Manual of how to handle traffic. There had to be one aircraft at a time, unless there was an authority to use parallel runways.

Mr Barrowclough: I do not think I will pursue this.

- 69 I reject the first contention as founded on this basis also. I am therefore satisfied that the system of R/T control in use at Hamble on 27 February 1970 had no bearing on the accident.

Air Traffic Control – 3. Rules of the Air

- 70 The second contention, that the College were (a) in breach of Rule 55, and (b) conniving at a breach by pilots of Rule 36(2)(b) is a question of law. The relevant provisions in force at the time (which are largely the same in preceding and subsequent legislation) were: *Rules of the Air and Air Traffic Control Regulations 1969*

Rule 36(1) An aircraft shall not fly within a zone which the commander of the aircraft knows or ought reasonably to know to be the aerodrome traffic zone of an aerodrome where an air traffic control unit is for the time being notified as being on watch. . . unless he has the permission of the appropriate air traffic control unit.

(2) The commander of an aircraft flying in the aerodrome traffic zone of an aerodrome where an air traffic control unit is for the time being notified as being on watch, or moving on such an aerodrome shall --

- (a) cause a continuous watch to be maintained on the appropriate radio frequency notified for air traffic control communications at the aerodrome, or, if this is not possible, cause a watch to be kept for such instructions as may be issued by visual means;
- (b) not taxi on the apron or manoeuvring area or take-off or land anywhere in the zone except with the permission of the air traffic control unit.

Rule 55(1) At every aerodrome. . . which is provided with means of two-way radio communication with aircraft and is situated in a control zone. . . the person in charge of the aerodrome shall cause air traffic control service to be provided at all times when the aerodrome is open for the take-off and landing of aircraft.

(Note: This part of Rule 55(1) is obviously intended to provide the overriding authority in a control zone with the means of regulating the flow of traffic into and within the zone).

Air Navigation Order 1966

Article 83(1) 'Air traffic control unit' means a person appointed by the Board or by any other person maintaining an aerodrome to give instructions or advice or both instructions and advice by means of radio signals to aircraft in the interests of safety and 'air traffic control service' shall be construed accordingly.

- 71 At Hamble, the Air Traffic Control consisted of an Approach Controller on frequency 125.0, an Aerodrome Controller (usually called 'Tower Controller') on 123.5 and a Ground Movement Controller on its own frequency. The former two were in the Control Tower, with an assistant to cope with telephone messages, flight plans etc. The latter was not, but was connected to the Tower by a tie line. All the Controllers were appropriately licensed, as was the radio station.

- 72 There being no room for criticism of the staff or installation, the alleged breaches must be sought in the provision of Limited as opposed to Full R/T.
- 73 It is not in dispute that Limited R/T does not produce the service described in the *Manual of Air Traffic Control*, Chapter 2 'Aerodrome Control Service'. It appeared to be Mr Rhind's view that the procedures in the Manual had force of law (Day 4, 31.5-6) but Mr Davenport, Counsel for the Review Board, contended that the Manual was an advisory document, not compulsory (Day 4, 37.9-10). In his closing speech, Mr Mitchell did not press the point.

74 In my judgment, Mr Davenport was correct. I was not referred to, nor have I been able to find, any provision in the then current *Air Navigation Order* or subsidiary legislation which makes compliance with the Manual, in particular Chapter 2, mandatory.

75 This is a manual of procedures for use by intelligent, highly-trained, regularly-tested, professional controllers. It is therefore not surprising that some flexibility is permitted, rather than imposing drill-sergeant rigidity. Where such flexibility consists of the omission of certain radio-calls which are not essential in conditions of good visibility to aircraft operating under VFR I cannot see that there is even a breach of the spirit of the law, let alone the letter. (The situation might be otherwise if procedures were introduced which involved positive acts in conflict with those in the Manual.) This view is fortified by the fact that the College's standing order on Circuit States and Limitations provided:

There is nothing to prevent the aerodrome Controller introducing the 'Full R/T' state. . . .
If he so desires ie traffic reasons. . . .

(CAT 4)

- 76 The Controllers were at all times able to give 'instructions or advice' to aircraft within the meaning of the *Air Navigation Order*, and thus to achieve the intention of the rule.
- 77 In my judgment, there was no breach of Rule 55.
- 78 Having said that, it is worth reproducing a short passage from Mr Head's Report (2.1.3):

Following the accident a general review of safety measures was carried out by the safety officer of the College. Modifications have been made to the aircraft which will improve visibility. Arguments for and against full R/T control were considered and it was finally decided to introduce full R/T for a trial period after which the system will again be reviewed.

The College, at the time of the Review, had not completed its trials.

Air Traffic Control – 4. Rules of the Air

- 79 As to the alleged breach of Rule 36, it is apparent from the concluding words of sub-rule (2)(a) that non-radio aircraft operation is contemplated.
- 80 Once non-radio operation is envisaged it is likely that the pilot of a non-radio aircraft at an aerodrome with an air traffic control unit will obtain the Tower Controller's permission for his detail in person before going to his aircraft. Such a permission could well be for several circuits 'touch and go', and there

is nothing in the Rule to say that additional permission must be obtained by standard light signals for taxi, take-off, or landing. Of course, any signals actually given would have to be obeyed.

81 If such a general permission could be given personally to a non-radio aircraft, why not also to a radio-equipped aircraft? The draftsman did not limit sub-rule (2)(b) with any such words as 'such permission to be obtained by radio in the case of aircraft suitably equipped'.

82 Once it is realised that such permission can be given, and that sub-rule (2)(b) does not demand more than a listening watch, it is obvious that the permission could be in the form 'very well, you may make as many circuits touch and go as your Instructor authorises, provided you make the usual position calls. Do not expect me to acknowledge your calls, but I shall be listening to them'. If the permission can be in that form there is no logical distinction between such a provision being given individually or as a standardised procedure for all aircraft at a particular aerodrome.

83 There was thus no breach of Rule 36(2)(b) by any pilots. If there was no breach of the Rule by the pilots then there was nothing for the College to connive at. In fact, as Mr Barrowclough demonstrated in a cross-examination of inexorable logic (Day 4, 34-5) the connivance alleged was that of the Tower Controller and such connivance necessarily involved his assent to the pilot's action: which is what the sub-rule required!

84 In my judgment there was no breach or connivance at a breach of Rule 36(2)(b).

Air Traffic Control – 5

85 There remains one further point, raised initially by the Technical Assessor. The Inspector's and my task would have been simplified, indeed this Review might have been unnecessary, had there been available a recording of the radio transmissions. No provision was made for such recordings at Hamble. The College took the view that they were not legally obliged to provide recording equipment, and this view was confirmed by Southern Division.

86 By the then current *Air Navigation Order 1966*, Article 65, (unchanged in Article 70 of the 1972 Order):

65(1) The licensee of every aerodrome licensed under this Order which is provided with means of two-way radio communication with aircraft and . . . with very high frequency direction finding apparatus for the purpose of providing holding aid, let-down aid or approach aid, shall provide at the aerodrome apparatus which is capable of recording the terms or content of any radio message or signal transmitted to any aircraft. . . . or received from any aircraft, by the air traffic control unit at the aerodrome.

(2) The apparatus provided in compliance with this Article shall –

- (a) be of a type approved by the Board in relation to the aerodrome;
- (b) be installed in a manner so approved;
- (c) always be maintained in serviceable condition; and
- (d) be in use at all times when any navigation services are being provided by the air traffic control unit at the aerodrome to any aircraft flying for the purpose of the public transport of passengers.

(3)

(4)

- (5) The licensee of the aerodrome shall preserve any record made in compliance with this Article for a period of 30 days from the date on which the message or signal was recorded or for such longer period as the Board may in a particular case, direct and shall, within a reasonable time after being requested to do so by an authorised person, cause it to be produced to that person.

87 The College did possess a very high frequency direction finding apparatus of the CRDF type. The air traffic control log recorded each morning that the CRDF was checked and in working order. Mr Rhind, whose truthfulness was not in doubt, said (Day 4, 41.3-4):

The Assessor: I have one question. At the time in question was there available CRDF?

A Yes.

Q For what purpose?

A For bearings if they were requested and in my latter part of time there to practice VDF let-down.

The accuracy of his evidence was corroborated by a limitation in the 1969 edition of the College's Standing Orders (CAT 4) when cloud base was below 1000 feet and visibility less than 6 kilometres: 'no practice VDF let-downs', and by Mr Barrowclough's concession (Day 5, 79) that if a student in difficulties requested a QDM he would be given it.

88 Although the College possessed CRDF equipment, and used it for the purpose of providing VDF let-downs, they said they were not obliged to have recording apparatus for three reasons (Day 5, 77-8):

- (1) the CRDF facility was not publicly notified;
- (2) the facility was only used for instructional purposes;
- (3) an approach using the facility was always discontinued early. Mr Barrowclough described it as 'a partial approach, usually without any loss of altitude at all. It was simply an approach towards the aerodrome'.

Counsel for the Review Board, Mr Davenport, supported Mr Barrowclough's submissions, particularly submission (2).

89 Notwithstanding the persuasiveness with which these arguments were put, I am not convinced by them. The words of the article are plain and the golden rule of construction is that words bear their ordinary English meaning. I do not accept that the words used in Article 65(1) will bear the gloss 'but not including approaches or let-down for training' or else 'but not if the pilot doesn't lose very much height'.

90 The one argument which gave me pause was on Article 65(2)(d) which only requires the apparatus to be switched on when navigation services are being provided for public transport aircraft. No-one was able to assist as to the origin of this provision. If the better investigation of accidents, potential accidents and in-flight discipline – which is presumably the object of the Article – requires a record to be kept, it seems somewhat cynical to say that the need does not apply to privately operated aircraft. In the absence of any cogent explanation for the provision I am bound to say that it seems mistaken and deserves to be reconsidered.

91 In my judgment, the College were in breach of the *Air Navigation Order 1966*, Article 65(1), in not having suitable recording apparatus. However, no blame can be attributed to them for this because their erroneous interpretation of the Article was confirmed by Southern Division. In any event, the effect of Article 65(2)(d) is that, though they ought to have had it, they need not have had it switched on at the time of the accident because no public transport aircraft required the CRDF facility.

The aircraft tracks

- 92 A great deal of time and effort was expended during the investigation of the accident by Mr Head, during the dialogue with Captain Proctor under the Regulation 11 procedure, and at the Review, in endeavouring to establish with precision the tracks flown by the two aircraft.
- 93 In the Appendix 4 to this Report there is a reproduction of the approximate tracks as reconstructed by Mr Head in his report with a transparent overlay of Captain Proctor's fifth and final reconstruction. There are two major and one minor differences between the two.
- 94 The first difference is one of less than 600 feet in the exact position of the collision. This is partly accounted for by Captain Proctor's reconstruction of the mechanics of the collision, which involved a double impact over 4-6 seconds during which the aircraft were travelling together, though not locked.
- 95 The second difference is in the final tracks of the two aircraft, especially that of BI, where there is a conflict of about 30°. This is partly a consequence of the third difference.
- 96 The third difference is that on Captain Proctor's track for BI Cadet Skellon is shown as making a shallow curve to the right, instead of the 30° banked turn he had been taught. (Captain Jackson, Day 2, 15.13). This has the effect of putting BI further behind BD at any particular moment and closer together once the turn in is started: the latter, because of vertical angles, making it more difficult for either pilot to see the other.
- 97 As to the track of BD, the differences are trivial. Certain assumptions were made on both reconstructions (principally that there was no correction for drift after take-off, and applying the 2000 feet wind throughout) which do not need reconsideration as they do not affect the result in the end. Both incorporate the important eye witness evidence of Captain Jackson that BD delayed its turn right, ie past the 500 feet point, and turned rather more steeply than normal later in the turn.
- 98 The discrepancies between the two tracks for BI are more substantial. However, notwithstanding the effort, care and skill which has gone into them, I do not find it necessary to resolve the discrepancies. If I had to, I would prefer Mr Head's for three reasons. Firstly, because the witnesses with substantial aviation experience all say that BI was established on its crosswind/easterly heading for several seconds before the impact. This is more likely to have been observed on his track than on Captain Proctor's. Secondly, Captain Proctor's track involves Cadet Skellon flying a slovenly track (which he himself thought unlikely, Day 5, 62.8) when he was not only a good airman but had been taken over the correct joining procedure for 02 earlier that day by Captain Jackson. Thirdly, Captain Proctor's careful and detailed calculations based upon the mathematical properties of circles demand, when applied to aircraft, that the pilot flies at constant speed without slip or skid, in an inelastic medium: an improbable combination. However, since both Captain Proctor and Mr Head agreed that their reconstructions could be subject to errors of 10° or more, it is possible that the historic truth lies somewhere between the two.

The extension of the dead side leg

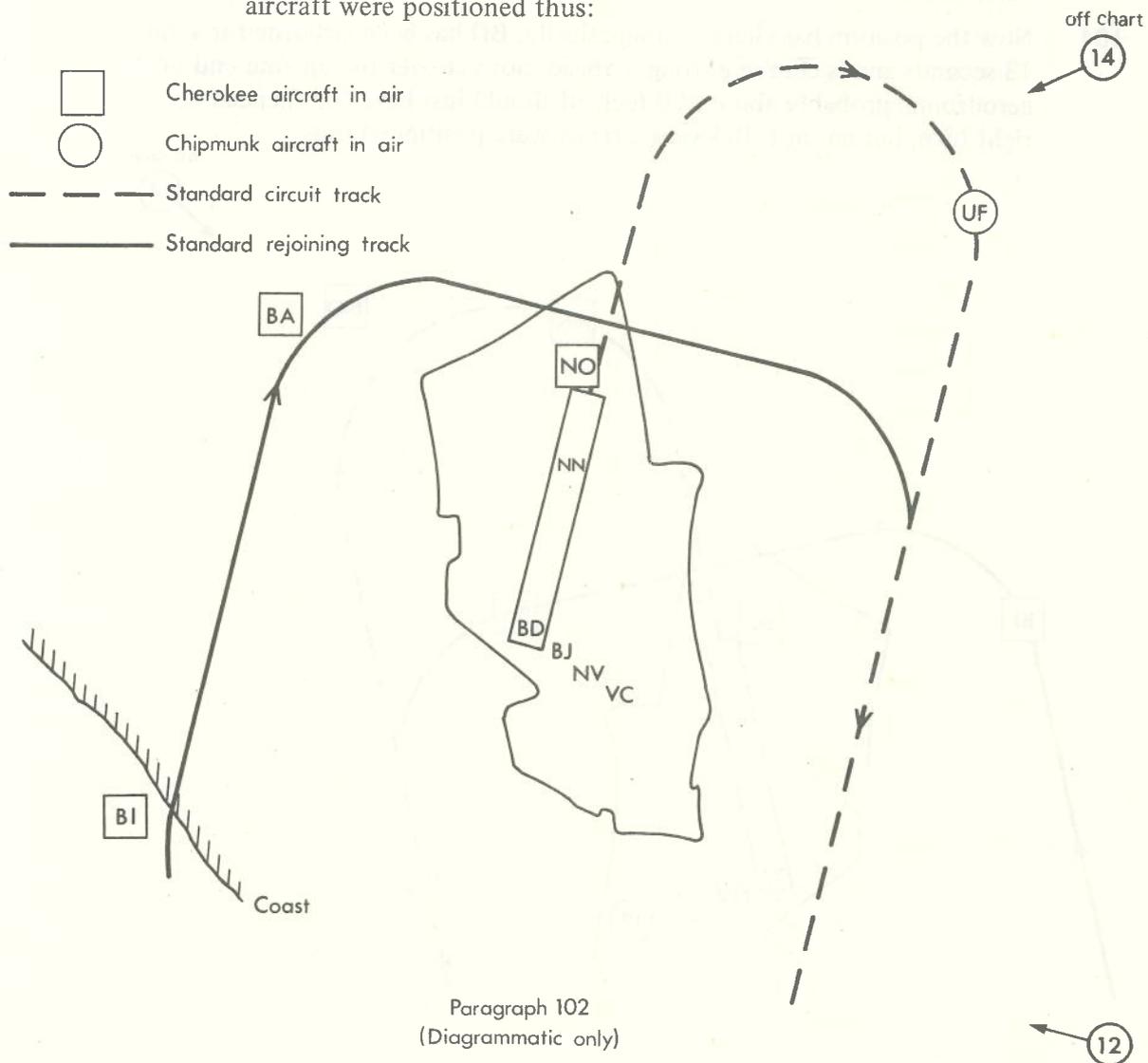
- 99 What is both crucial and common to both reconstructions is that at the point where Cadet Skellon in BI would normally have commenced his right turn on to crosswind leg, he stood on for about 20 seconds, or about half a mile.

It was suggested that this was 'momentary inadvertence'. I cannot accept this; principally because it is contrary to the evidence as to Cadet Skellon's qualities and experience as a pilot, and also because the inadvertence lasted too long to be explained away as momentary.

- 100 Something caused Cadet Skellon to decide to overstand the normal turning point. In order to identify what that was, it is necessary to attempt to re-create the position of certain other aircraft at two crucial times; the zero second and the 30 second point (these and all subsequent timings are based on Mr Head's timings. The result would be substantially the same if Captain Proctor's timings were used).
- 101 By the fourth and fifth day of the Review, when all parties were concentrating on the position and separation of relevant aircraft, a consensus of opinion emerged. It is, in fact, possible to state positions with a sufficient degree of accuracy.

Aircraft positions – 1. At zero seconds

- 102 Zero seconds is the moment at which BD commenced its take-off run. At that moment BI was crossing the shore line southwest of the field and was due to make its dead-side joining call on Tower frequency. It was turning onto, but probably not yet established on, its track parallel with Runway 02. Relevant aircraft were positioned thus:

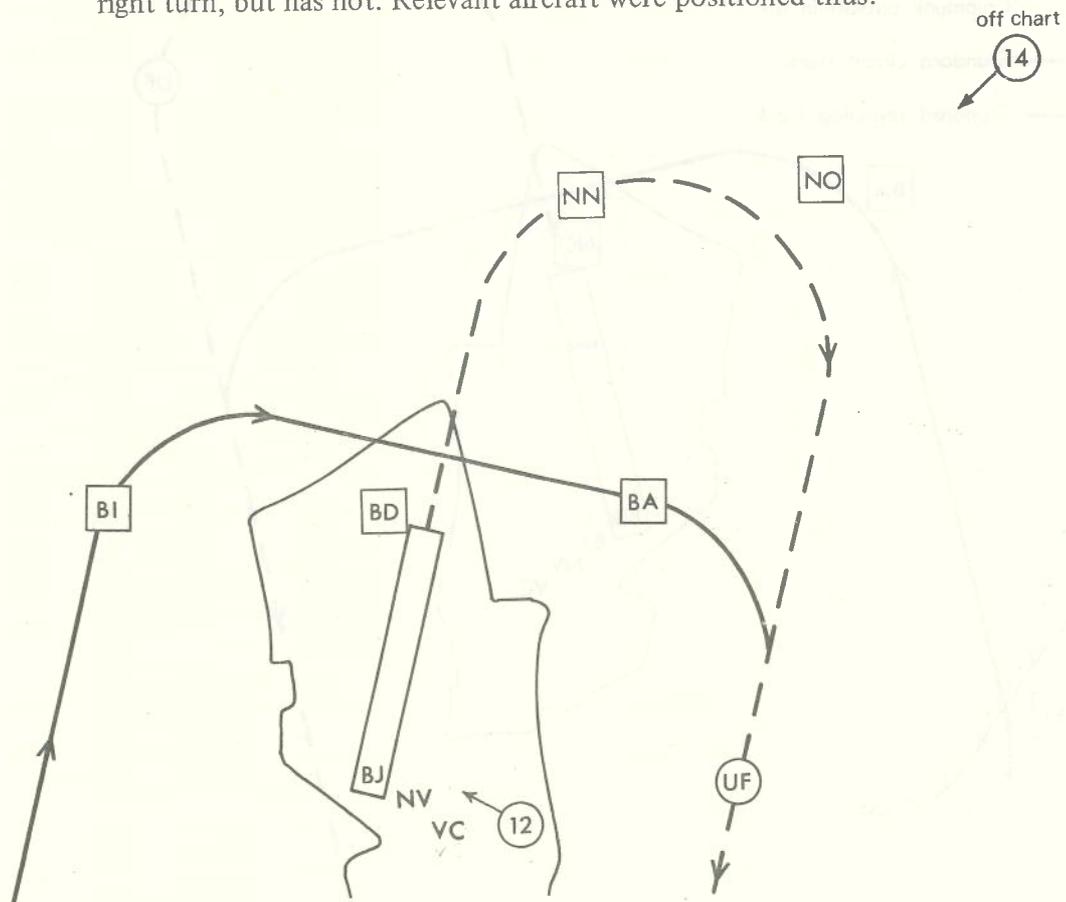


103 The other aircraft were:

- BA Cherokee, (Cadet Westray) re-joining from Lee-on-Solent turned crosswind in normal place. He would pass comfortably overhead.
- NO Cherokee, (Cadet Gurney) airborne at about 200 feet intending to depart to the east on a cross-country flight to Seaford.
- NN Cherokee, (Captain Kortens/Cadet Garrod) was taking-off to fly circuits. It was taking-off close behind NO but this was not unsafe because they would have known that NO was clearing the circuit.
- UF Chipmunk, (Captain Noyes/Cadet Buchanan) on downwind leg.
- 12 Chipmunk (Cadet Buckley, SUAS) was re-joining at a higher altitude crossing the airfield east to west.
- 14 Chipmunk, (F/Lt Maltby) was off the chart to the NE about 3 miles or so, tracking towards the field, also at a higher altitude.
- BJ, NV, VC were all on the ground waiting to take-off.

Aircraft positions – 2. At 30 seconds

104 Now the position has changed dramatically. BD has been airborne for about 13 seconds and is climbing straight ahead, not yet over the upwind end of the aerodrome, probably about 200 feet. BI should just have commenced his right turn, but has not. Relevant aircraft were positioned thus:



(Diagrammatic only)

- 105 To the northeast of the aerodrome, around the commencement of the downwind leg is an apparent bunching of three aircraft BA, NN and NO. In fact one of the three, NO, is leaving the circuit, but Cadet Skellon in BI was not to know this. What he saw, and would have observed developing in the preceding seconds as BA flew inside the circuit flight paths of NN and, apparently NO, was a clutch of aircraft which would have to space themselves out if they were to get into a practical landing sequence. Flight Lieutenant Maltby in his Chipmunk was now closer in (he saw the collision, initiated a May Day call, and directed emergency services from the air). I doubt if Cadet Skellon in fact saw this aircraft, but if he did it would have served to reinforce his assessment of the hazard.

The decision to extend the leg

- 106 Since the spacing out would have to be done either by slowing down, which is not very effective with this type of aircraft, or by flying wide of track, or both (Day 4, 55.4) a sensible pilot in Cadet Skellon's position might properly have regarded the apparent bunching as a potential hazard and decided that the prudent course was to leave the three aircraft room to manoeuvre, and not add to the congestion. This could easily be done by prolonging his dead side leg to a point where he could turn across and join the circuit well clear of the bunching traffic; the two Instructors who were asked agreed that this is the course that they would have advised. (Captain Jackson Day 2, 12.2-3; Captain Lowry, Day 2, 37.1-2.)
- 107 It is important to remember that the lightest aircraft moves fast. A Cherokee in level flight has an airspeed of 105 knots, or 120 mph which is 2 miles a minute. Therefore, as with all aircraft, a pilot who sees a potentially hazardous situation should react to it at once, and not wait to confirm that the hazard is actual. The point arose in the course of Mr Barrowclough's speech and I intervened (Day 5, 73):

The President: I have just had a word with Captain Critchley and he is of the view that a prudent airman when he sees what appears to be a hazard reacts to it immediately; he does not waste time making sure it is a hazard. If Cadet Skellon saw what he thought was a hazard he would continue as if it was a hazard and take action as a prudent airman would.

- 108 To this intervention Captain Proctor, Mr Head, and the other Instructors present all indicated their assent.
- 109 Accordingly, I find that the pilot of BI, Cadet Skellon, as he was coming up to the point where he would normally have commenced his crosswind turn, saw what seemed to be a potential hazard developing and prudently decided to take avoiding action by prolonging his upwind leg. For this he cannot be criticised. He was in much the same position as that described by Captain Duff-Mitchell in paragraph 13, above, which I now set out in full (Day 5, 8.1):

I have been almost in the same position since that accident at least twice in two different circuits with full R/T, and in both cases I was in fact turning over the right part of the airfield, there was bunching going on and so forth, but it was a question of taking avoiding action. There was full R/T in force and there was nothing the controllers could do about it.

The risks involved – 1

- 110 I have already recorded the absence of specific instructions to student pilots as to what to do when their normal crosswind turn is baulked (paragraph 50) although that decision is never easy 'no matter how much experience you have had'. No blame is to attach to the College for this because there is no evidence to suggest that this problem has been specifically considered at any training establishment. It was during this Review that three distinct risks were brought sharply into focus.
- 111 Firstly, each student pilot is taught to fly his dead side leg so that he can see the runway in use in order to observe aircraft taking-off and climbing out. Cadet Skellon did this. But a Cherokee flying level up the dead side is 30 knots or more faster than the aircraft taking-off and climbing out. If the dead side aircraft can turn in the normal place this is unimportant because all relevant aircraft can be seen until he passes clear overhead.
- 112 But if the aircraft has to prolong its dead side leg then, in a right hand circuit, the slower aircraft drops back out of sight. This is illustrated in the present accident by marking on Mr Head's chart of the tracks the times when, on his calculations, the pilot of BI could have seen BD in the theoretical sense that visibility was possible if the pilot was free to, and did, look (Appendix 5). Mr Head considers that BD could have been visible from BI from zero seconds to about 29 seconds and again from 49 seconds to about 64 seconds. But 29 seconds is just about where BI began the extension of the dead side leg instead of turning crosswind. In other words, BD passed out of sight from the moment BI continued beyond the normal turning point and remained out of sight throughout the 20 second or so extension. There is nothing in this situation peculiar to Hamble Aerodrome.

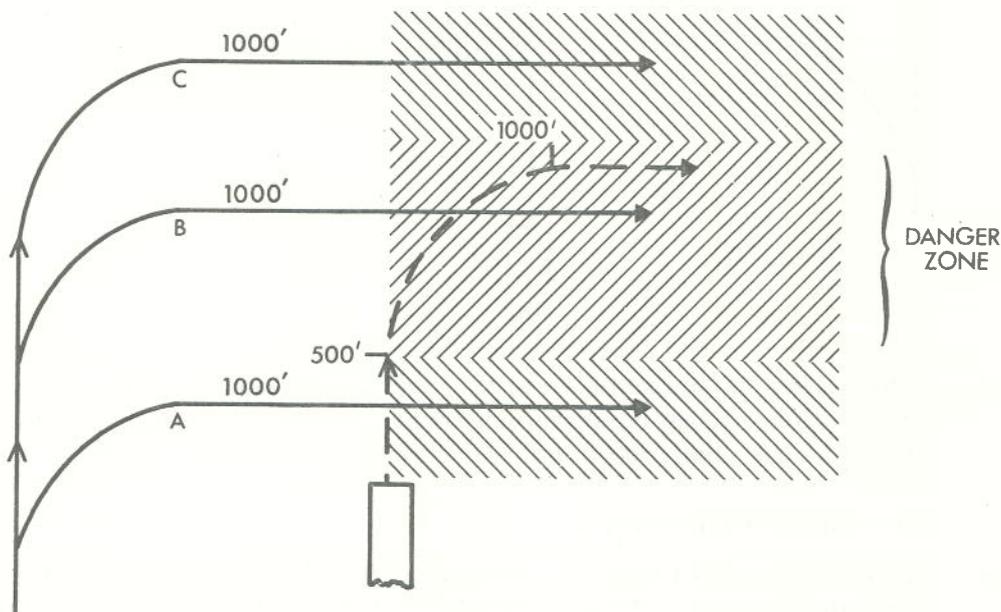
The risks involved – 2

- 113 A student pilot who has identified one potential hazard and is taking avoiding action may be forgiven if he fails to identify other potential hazards. His attention tends to concentrate on the one hazard he knows. Captain Proctor's evidence was (Day 5, 64.2-4):
- A I would like to answer by saying that I would not like to criticise Cadet Skellon in any way. I think that if his attention had been distracted or taken up by this hazard and there was a possible sighting and he missed it, I do not think he could be criticised.
- Q You have had 17,000 flying hours. You must know other pilots with great experience who when they have identified a danger find that it fixes their attention and they do not maintain the same watch for other sources of danger as they otherwise would, having found the first?
- A This is quite true.
- Q It is overstating to say that they are hypnotised by the first snake, but having seen one it takes a very experienced pilot to continue looking for snakes?
- A Yes.

- 114 This is a problem of training and experience to which there is no easy answer. When the work load on a student pilot is high it may be unrealistic to hope for him to identify more than one hazard at a time.
- 115 In my opinion – it can only be an opinion – this factor played a part in this accident. Having decided to prolong his dead side leg Cadet Skellon judged his turn by positioning himself carefully (Day 5, 63.5) in relation to BA and NN which were still close together even after NO had departed on its cross-country. During all that time he could not have seen BD. In the 15 seconds (49-64) that he could have seen BD, his attention was likely to have been fixed on BA and NN, and had he looked right and down it might have been BJ that caught his eye. It is possible, as Captain Proctor suggested (Day 5, 68.3) that in seeking to re-identify the taking-off aircraft which he had originally identified (BD) he saw BJ and mistakenly thought one was the other.

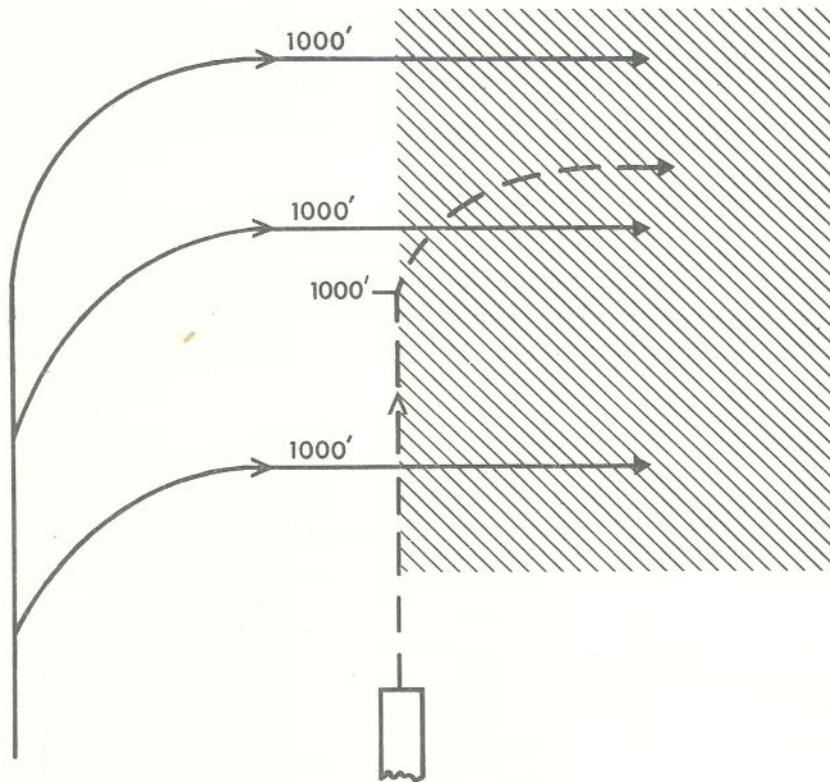
The risks involved – 3

- 116 The most serious risk involved in extending a dead side leg is that it can, with present standard circuit and joining procedures, lead directly to the fatal convergence of this accident. This can best be illustrated by considering one of the two circuit procedures put to Mr Head when he was recalled (Day 5, 67-8):



- 117 Under the present procedure an aircraft commences its climbing turn right at 500 feet. If a joining aircraft turns crosswind before it is level with that point, then it will pass overhead clear and will always be ahead (track A). If it continues beyond the point at which the climbing out aircraft has reached circuit height and is itself crosswind, then again there is no danger and the joining aircraft will always be behind (track C).

- 118 But if the joining aircraft turns crosswind in the intermediate zone then it will be horizontally overtaking the other aircraft, while that aircraft may be climbing vertically into its path (track B). This is so whether or not there are other factors, such as visibility and right hand circuits, to aggravate the danger.
- 119 A possible solution to this was put to Mr Head, and he could see no immediate objection to it. This involved the extension of the climb out to circuit height and a level turn onto crosswind leg. The same diagram then narrowed the risk, or danger, area to nil.



- 120 There is here no horizontal or vertical overtaking, and the climbing out pilot gets to circuit height before turning his back on joining traffic. Each pilot therefore has a better chance of seeing the other.

How the accident happened

- 121 I am satisfied that BI made its dead side call on Tower frequency at about the right time and place. With Limited R/T and the positions of the aircraft in circuit at the time, Cadet Skellon would not have been unduly delayed in his transmission. There is no reason why Cadet Proctor should not have heard that call, but it came just as he was starting his take-off run when, with his limited experience, his work load was high. Even assuming he was able to obey his instructions to try to identify the joining aircraft (he was not expected to abort) he physically could not have seen BI for the next 24 seconds. By that time, having failed to identify the calling aircraft, he was probably more

concerned with flying the aeroplane and, in any event, he knew he was about to pass the end of the airfield where the joining aircraft would cross. He was not to know that BI was prolonging his leg, and I do not think he can be blamed for failing to identify BI at any time after passing the boundary: he simply had no reason to expect BI to be there (Day 3, 22.4).

- 122 It is more likely that, as he approached the boundary, his attention was attracted by the development of bunching to his right (NO, NN, BA) and this could explain the way he was seen to extend his straight climb before turning. (Day 2, 21.3, 22.1). I am quite sure he never did see BI, and died without knowing there had been an accident.
- 123 Cadet Skellon was too good a pilot not to have flown upwind with the runway in sight. I therefore think he must have seen BD at some stage. However, he then saw the apparent hazard developing and took a prudent decision in the way I have described (paragraphs 99-109). Thereafter, (paragraph 112) he could not help losing sight of BD until after he had commenced his turn, during which he would be concentrating on flying his aircraft and positioning clear of NN and BA. Had he had time to look for BD he might have misidentified BJ (paragraph 115). As soon as he rolled out of the turn, 10 seconds before the collision, however hard he looked to try and regain sight of the aircraft he had spotted earlier, he could not possibly have seen BD rising underneath. No blame can attach to him.

Factors contributing to the accident

- 124 On this analysis the initial cause of the accident was the development of an apparent hazard in the bunching of three aircraft northeast of the field. In fact, there was no hazard because one of the three would depart to the east but neither BI nor BD knew this. Nevertheless, an apparent hazard requires a prudent airman to take appropriate avoiding action. In this case appropriate avoiding action was taken. It led to the accident for a combination of reasons:
- 1 The circuit was right handed, severely hampering the pilots' view from aircraft joining dead side of aircraft taking-off and climbing out.
 - 2 The standard climb out procedure requiring aircraft to commence their climbing turn right at 500 feet meant
 - (1) that the pilot turned his back on possible crosswind aircraft;
 - (2) that the aircraft climbing from 500 feet to circuit height 1000 feet would be ascending into the track of possible crosswind aircraft;
 - (3) that aircraft turning crosswind, being in level flight, would be flying faster than and therefore overtaking the aircraft climbing up from below.
 - 3 As this circuit was right handed then in these Cherokees, for the last 10 seconds at least, the higher aircraft could not possibly have seen the lower (neither could the lower see the upper, but this would still be so in a left hand circuit).

4 The comparative inexperience of the pilots may have resulted in their workload not leaving much time for looking out for other aircraft in (from BD's point of view) an unexpected place or (from BI's point of view) while concentrating on positioning to avoid an apparent hazard. If this were so, then the situation was aggravated by:

- (1) the lack of any real identification of the specific dangers of right hand circuit
- (2) the lack of specific instructions as to the procedure to be followed by a joining aircraft baulked from making its crosswind turn in the usual place – (this is corroborated by the absence of any suggestion that Cadet Skellon's flight track infringed any instructions given to him).

Action to prevent similar accidents in future

125 As was to be expected, action to avoid a repeat of this accident did not wait upon either the Inspector's report or this Review. The College modified all its Cherokee aircraft by fitting transparent panels in the roof. All its aircraft have anti-collision beacons, though these are not mandatory.

126 Evidence was given, principally by Captain Duff-Mitchell, of other safety devices which were under consideration, and not only at Hamble. All were intended to improve the chances of aircraft seeing each other. (It is important to remember that because of the constant bearing principle aircraft on collision courses, like ships, may have little or no relative motion to catch the pilot's eye. It is the speck which does not appear to move which is the danger.) These included:

- (1) the painting of training aircraft in startling colours. International orange is generally recognised as the most appropriate.
- (2) 'Day-glo' paint, which is apparently very good but there are difficulties in maintaining it.
- (3) the fitting of stroboscopic lights on wing tips which flash visibly in daylight. These may have associated electrical problems.
- (4) the occasional use of landing lights as an identification aid.

127 All of these are welcome, as are any suggestions which may lead to greater safety in the air. But since standardisation of equipment is itself a safety factor it would go beyond the function of this Review to make recommendations on matters which need detailed investigation and experiment in varied conditions before the CAA, ICAO or any other authority makes them mandatory.

Aircraft manufacturers

128 Having said that, I am bound to observe that I gained the impression from many of the professional witnesses that they were constrained by the limitations of the aircraft itself. Put bluntly, which the witnesses did not, this is saying the manufacturers of aircraft have not done all that they might to make their aircraft suitable for the purpose for which they are sold: that is, as a comparatively unsophisticated first aircraft, and therefore suitable for training.

- 129 Nevertheless, the unanimous view of the Instructors who gave evidence about it was that a (mini-)airliner cockpit could give a pilot a false sense of security. This, coupled with the restricted visibility, blends psychological with actual danger. It may be that the manufacturers could consider a transparent roof (as in the French Rallye range) as an optional alternative as initial equipment. They could also consider whether the window coamings could be deepened. They might even offer a high visibility 'trainer' livery. Anything which furthered the ability of student and inexperienced pilots, and experienced pilots for that matter, to 'see and be seen' could be priceless in terms of human lives.
- 130 But I must record that the manufacturers were not represented at the Review, and Counsel for the Board expressly conceded that there are many other training aircraft with worse visibility problems than the Cherokee. There may well be complete answers to every suggestion here put forward. But it is no answer that this is the first accident of its kind in hundreds of thousands of hours. Cherokees replaced Chipmunks at the College of Air Training in 1967. This accident happened within 3 years. It almost certainly would not have happened if a Cherokee had a Chipmunk's visibility. One accident that could have been prevented is one too many.

Recommendations and report

Recommendations to avoid accidents in future

- 131 For the reasons which are implicit in the preceding passages of this Report, I consider that accidents of this type are likely to happen again, and near misses of the same type have, in fact, happened. I therefore recommend that the following be considered by the appropriate authorities:
- 1 **The abolition of a climbing turn to circuit height and its replacement** by a straight climb out to circuit height: thence a level turn crosswind.
 - 2 The introduction of standard 'balked crosswind turn' procedures, which should be practised before a student goes solo off-circuit. (This is of less importance if Recommendation 1 is adopted.)
 - 3 Whether, whatever other limitations (eg weather or R/T) are in force, the circuit density for any particular aircraft types, or mix of types, should be considered and established separately for left hand and for right hand circuits. (It may be helpful to consider aircraft separation, rather than circuit density, as the governing concept.)
 - 4 Whether, particularly at aerodromes where basic flying training is carried on, the criteria for justifying right hand circuits should be reviewed.
 - 5 Whether, when right hand circuits are in operation Rule 18(4) of the *Rules of the Air* (which requires an overtaking aircraft to keep right) can possibly be obeyed with safety. It may therefore require amendment.
 - 6 Whether Article 70(1) of the *Air Navigation Order 1972* should be amended to require the recording of all radio communications associated with the navigation of aircraft at all aerodromes where the number of aircraft movements exceeds a specified figure (being shown at a level related to cost of providing and maintaining the equipment) and deleting so much of Article 70(2)(d) as limits the use of such equipment to public passenger transport aircraft operation.
- 132 I am aware that these Recommendations, particularly no. 1, question certain long established and well tried procedures. Those procedures were, however, established and tried with aircraft of very different visual characteristics and performance (such as Tiger Moths and Chipmunks) which also gave the pilot less to do in the cockpit (Captain Duff-Mitchell, Day 5, 9.1-4). It by no means follows that what was suitable for those aircraft can automatically be applied to the training aircraft of today.

The Inspector's report

133 It is apparent that I am in substantial agreement with, and confirm, most of Mr Head's careful report. Pursuant to Regulation 13(12) I now state the matters where I found that report to be in error:

- 1 *Paragraph 1.1 end.* There were in fact three Cherokees bunched not two. The missing Cherokee was NO, whose position was agreed once its detail (cross-country to Seaford) and circuit leaving procedure had been ascertained (Day 5, 49). This was also in accordance with the written evidence of Mr Higginson, an erratic witness on some matters, but who clearly saw a bunch of three aircraft (NO, NN, BA) separately from a bunch of two (BD, BI).
- 2 *Paragraph 1.5.2.* Omits Mr Proctor's 3 hours in a Chipmunk in July, 1969. The overall total is correct.
- 3 *Paragraph 1.16 end.* There was no evidence that the up-wind leg was flown closer than normal. Mr Head probably misunderstood the warning generally given not to stray too far west and thus impinge upon Southampton airport traffic.
- 4 *Paragraph 2.1.1 third paragraph.* The reason for the delayed turn is now known. Mr Head was, rightly, cautious when he could identify only two aircraft bunching. Once three are found the caution can be removed.
- 5 *Paragraph 2.1.3.* The limited R/T system in use at the time had no bearing on the accident. It was as likely to happen with full R/T. Accordingly, I do not support the recommendation at the end of the paragraph *as a recommendation consequential upon the ascertained facts.* The College have, as Mr Head records, been using full R/T since the accident as a trial. All safety research and trials are welcome.
- 6 *Paragraph 2.2(a) Finding (iv).* I would insert the opening words
'Having seen an apparent hazard developing which made it prudent to prolong his upwind leg. . . .'
- 7 *Paragraph 2.2(b) Cause.* I do not accept Mr Head's statement of the cause of this accident. I have recorded what I find to be the causes and the reasons and do not repeat them.

134 However, having seen Mr Head giving evidence for some time, and observed the physical signs of assent or dissent which he gave as other witnesses gave their evidence, I am quite sure that he did not intend his statement of the cause to cast any stigma of blame on the pilots. Indeed, it is plain from the last five lines of his paragraph 2.1.2 that he thought 'the restricted visibility to the right from the left hand seat' was one of the most important factors in the accident, yet it is not mentioned in his terse statement of the cause.

135 It is also fair to Mr Head to say that, after he had heard all the evidence subjected to analysis in examination and cross-examination, he was recalled and the substance of what I now find to be the reasons for the accident was put to him (Day 5, 65-8). I understood him to agree, and I therefore think that if Mr Head had had the advantages I have had he would have arrived at the same conclusions.

Other matters

Costs

- 136 On my reading of the Regulations, in particular Regulation 13(11), I have no power to make any Order as to costs save those of the Review Board. There are no grounds for ordering any person who appeared at the Review to pay such costs.
- 137 However, Captain Proctor and Mr Skellon must have incurred no little expenditure themselves in a matter wherein they were principally motivated by a desire to do all that they could to see that no young men died in future as their sons had died (Day 5, 81). If the Recommendations which, as a result of the holding of this Review Board, it has been possible to make have the effect of saving life in future then they have succeeded, and have done a public service. As the public will reap the benefit so should they bear the cost. If I had the power to order their costs out of public funds I would do so. As I do not have that power I can only express the hope that the custodians of the public funds will find themselves able to discharge the public's moral debt. Human lives are not to be weighed cheaply against pounds and pence.

Conduct of the review

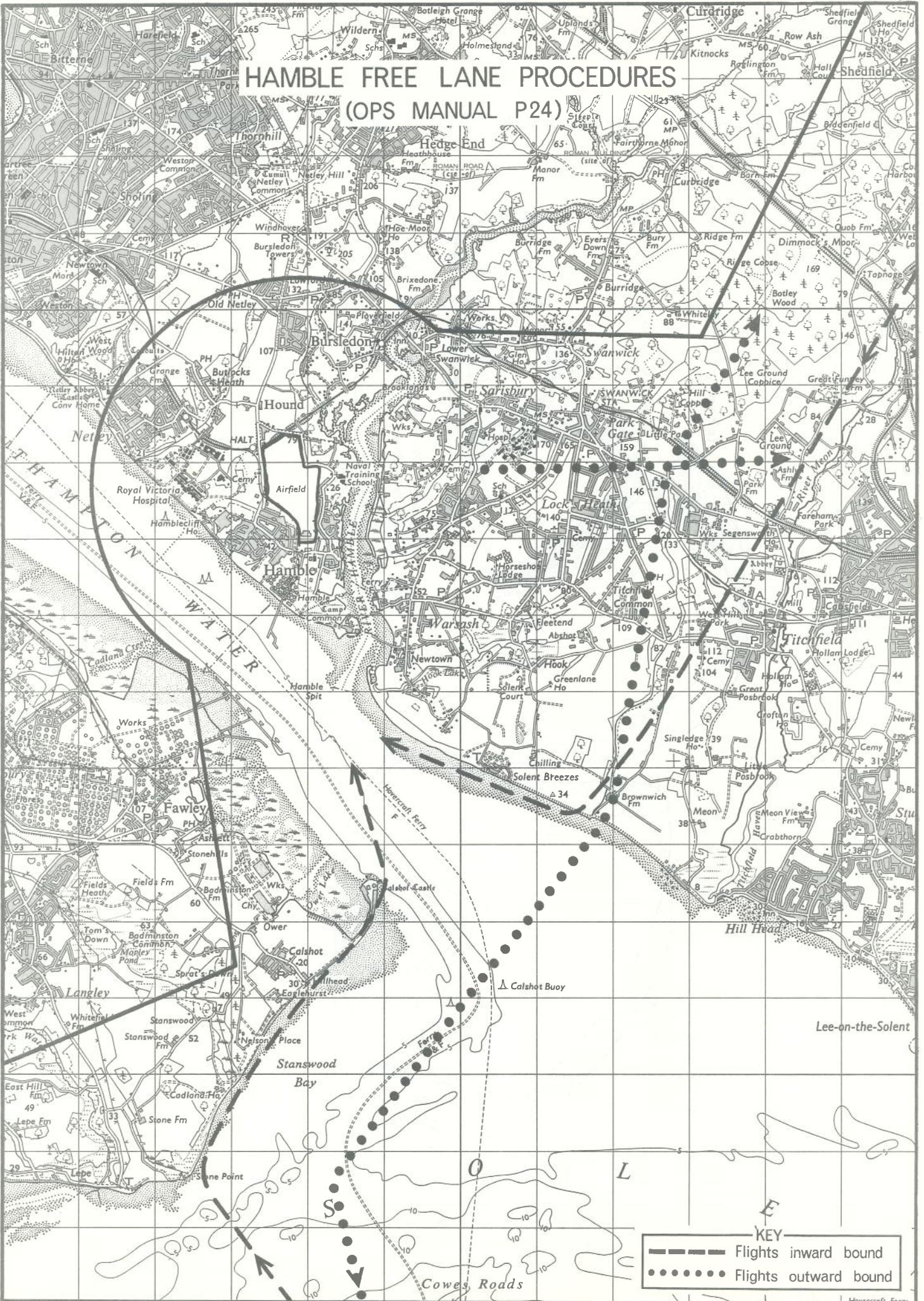
- 138 Finally, I am bound to record the assistance given by all the persons present and their Counsel to the conduct of this Review. In Mr Mitchell's apt phrase, there were no adverse parties in these proceedings. The informal spirit of inquiry and investigation in which the Review was conducted may have been some way removed from the nature of most proceedings of a quasi-legal character. That they could be so conducted was a tribute to all those who took part. I am asked by Captain Critchley to associate himself entirely with these remarks.

Richard Yorke, QC

I agree with the contents of this Report and with the Recommendations made.

Captain R R Critchley, MBE

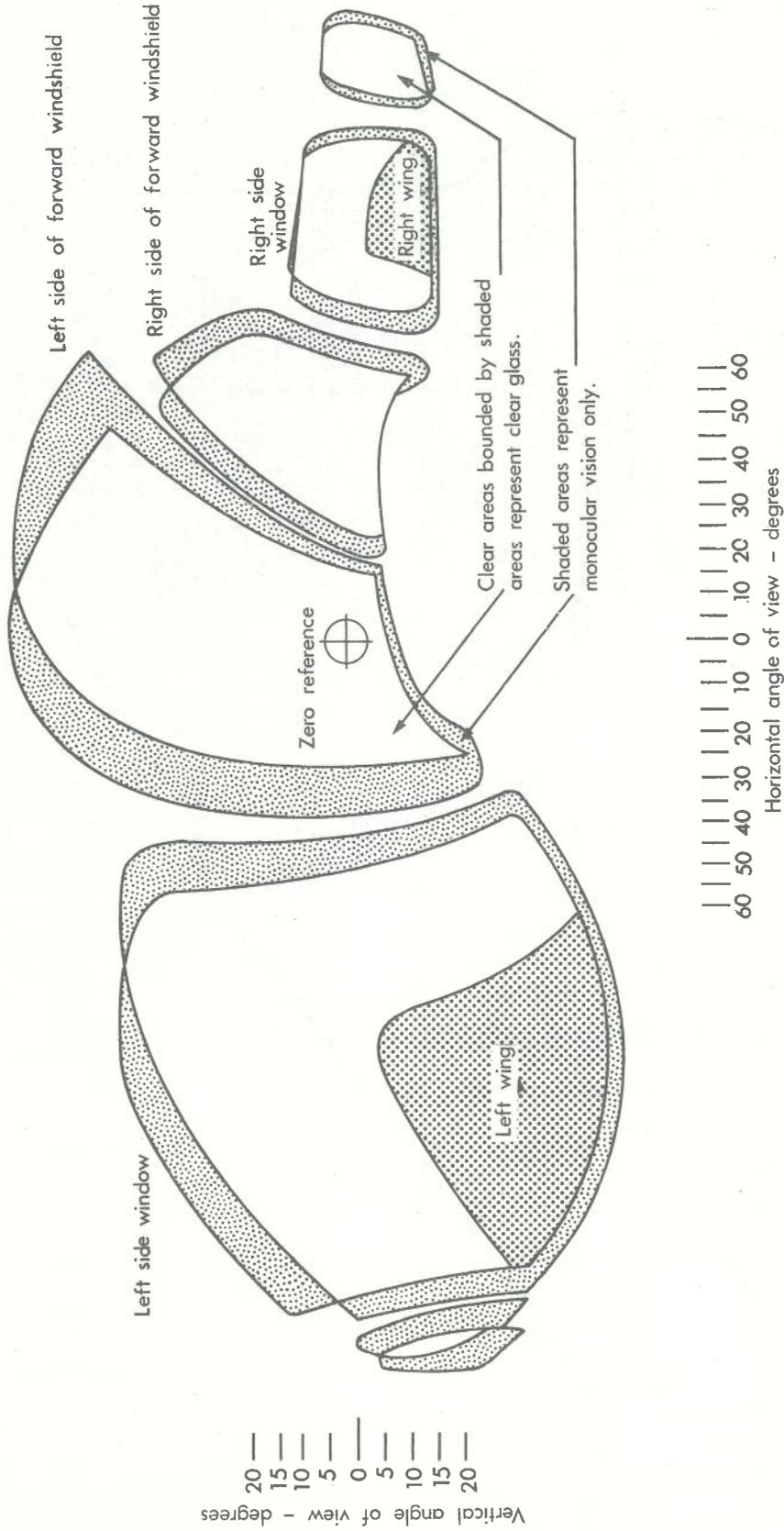
HAMBLE FREE LANE PROCEDURES (OPS MANUAL P24)



KEY

- Flights inward bound
- Flights outward bound

TEMPLATE OF VISION FROM PILOT'S SEAT OF CHEROKEE



CIRCUIT STATES AND LIMITATIONS

(Read in conjunction with attached page of Operations Manual

Par. 6 Weather 12)

also

Attached copy of Operations Order No.26

The Duty Aerodrome Controller will be responsible for deciding the R/T state and circuit limitations to be introduced. Any relaxation in this will be made only when:—

- (a) The visibility from the Control Tower
and
- (b) The cloud base reported by a flying instructor have both reached the required figures (See Ops Manual Sect. 111 Page 12.)

All changes of circuit state will be recorded in the Air Traffic Log together with Registration letters of aircraft passing relevant cloud base information.

There is nothing to prevent the aerodrome Controller introducing the 'Full R/T' state for reasons other than weather if he so desires ie traffic reasons, such as dual landing/take-off directions, but should this be done then an entry in the log book should be made, giving the reason.

DEFINITIONS

Limited R/T This constitutes R/T calls made by the pilot of an aircraft to the A.D.C. Unit and are to be treated by that unit as 'advisory calls' made for the benefit of other Aircraft within the traffic circuit and traffic Zone, and will not be acknowledged by the A.D.C. Unit.

They will be those calls normally made by a pilot as in accordance with Par. 2.4. Chap. 2. A.T.C.I. No 3.

Full R/T This constitutes R/T calls made by the pilot of an aircraft as stated above to the A.D.C. Unit and will be acknowledged by that A.D.C. unit, and positive control will be established, and any instructions or clearances given by the A.D.C. unit will be complied with by the pilot of an aircraft.

ORDER NO. 26

RADIO-TELEPHONE PROCEDURES AT HAMBLE

As from Wednesday 29th May new arrangements concerning the use of R/T are to be introduced at Hamble.

From that date the state "Negative R/T" is to be entirely discontinued and the state "Limited R/T" is to be used at all times except when the state of the weather merits use of "Full R/T".

Pilots are reminded, that although no replies are to be expected from A.T.C. when Limited R/T is in use, the routine calls should be made at the standard positions in the circuit. The call "ROLLING" sometimes used after the throttles have been opened on take-off, is to be replaced forthwith by "Lining up for take-off", to be made at the appropriate time. This will allow A.T.C. to "hold" that aircraft should they wish to do so.

Air Traffic Controllers are reminded that to respond, occasionally, to Limited R/T and give Cleared to _____, when this was not specifically requested, causes considerable confusion and should be avoided.

Pilots are further reminded that should they specifically request "Take-off clearance" or "Am I clear to land", the most assistance they can reasonably expect from A.T.C. is "Continue at your discretion".

28th May, 1968.

CHIEF FLYING INSTRUCTOR

6.0 Circuit States and Limitations

In order to control the number of aircraft in the circuit area the following States and Limitations are laid down.

The "State" will be decided by the Duty Controller basing his decision on the visibility from the Control Tower and cloud base reported by a flying instructor.

Weather		R/T	A/C Permitted in circuit Aerodrome Traffic Zone	Other Limitations
Cloud Base	Vis.			
Above 1000'	and Above 6 Km.	Limited	10	Nil
800' to 1000'	and to 6 Km.	Limited	7	<ol style="list-style-type: none"> 1. No practice VDF let downs 2. No formation T/O's rejoins or stream landings (R.A.F.) unless specifically authorised by A.T.C. 3. When aircraft are on finals from FAW no T/O's or other than full stop landings.
Below 800'	or Below 3 Km.	Full	5	

Weather 12.

9.0 Weather Minima – Goodwood

(a) Instructor in Charge

	<u>Min. Cloud Base</u>	<u>Min. Vis.</u>
Circuit flying-Goodwood	1000' QFE	3 Km.
Local flying-Goodwood area	1500' QNH	4 Km.
Transit.	Provided aircraft can be flown in sight of ground or water and in accordance with the Rules of the Air regarding flights over congested areas and gatherings of people, they may transit maintaining the following minimum height requirements from the terrain or any structure:—	
	Flight vis. not less than 4 Km. Min Terrain Clearance	500'
	" " " " " 3 Km. " " "	1000'

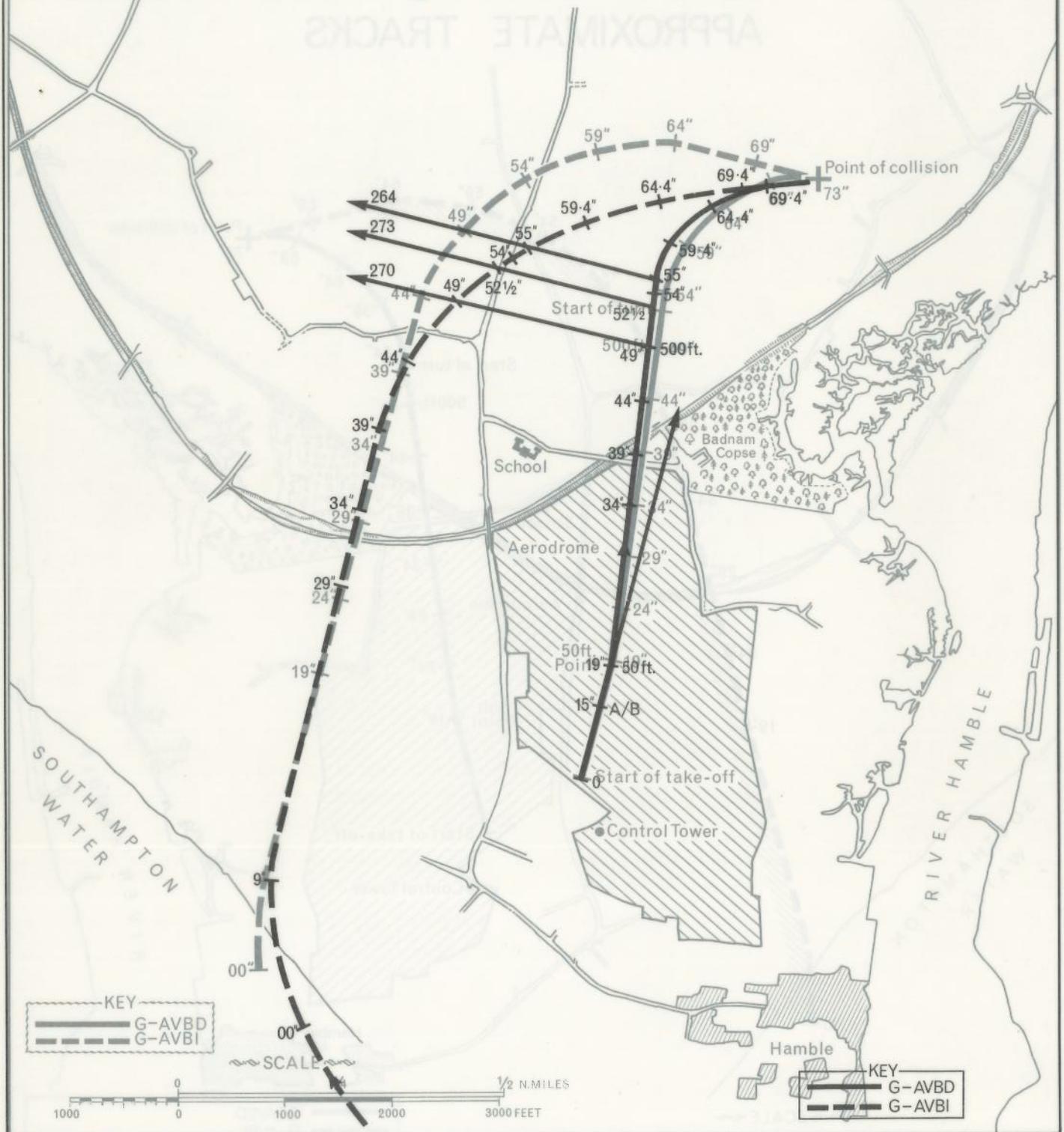
(b) Cadet in Charge

	<u>Min. Cloud Base</u>	<u>Min. Vis.</u>
Circuit flying-Goodwood	1000' QFE	3 Km.
Local flying-Goodwood area	1800' QNH	5 Km.
Transit-Hamble-Goodwood-Hamble	1600' QNH	6 Km.

Weather 11.

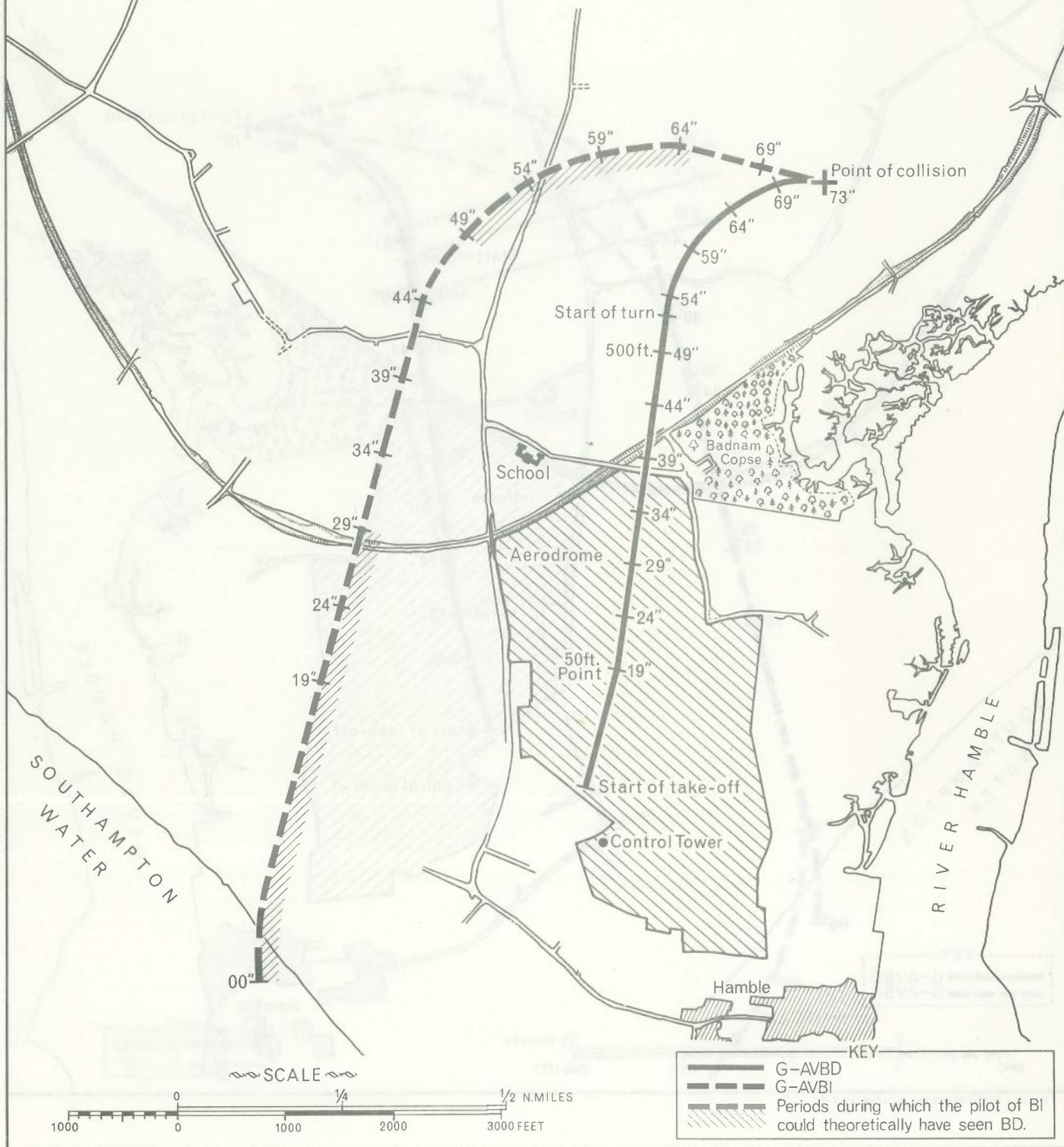
APPROXIMATE TRACKS according to Mr Head of page 17

Appendix 4



DTI (C.A.) C. Ops. 10 D.O. Drg. No. 6743 22-3-72

APPROXIMATE TRACKS



DTI (C.A.) C.Ops.10.D.O. Drg.No. 6743 22-3-72