

Department of Trade

ACCIDENTS INVESTIGATION BRANCH

**Cessna F 150 H G-AVSS and
Cessna F 150 G G-AVAB
Report on the accident near Guildtown,
Perthshire, on 22 November 1975**

LONDON
HER MAJESTY'S STATIONERY OFFICE

List of Aircraft Accident Reports issued by AIB in 1976

<i>No.</i>	<i>Short title</i>	<i>Date of Publication</i>
1/76	Sikorsky S-Blackhawk N671SA at Farnborough, Hampshire, England September 1974	April 1976
2/76	Hughes 269C Helicopter G-BABN at Beech Farm, Nr Barnby Moor, Notts January 1975	April 1976
3/76	Hot Air Balloon G-BCCG at Saltley Trading Estate, Birmingham October 1974	June 1976
4/76	Handley Page Dart Herald 203 G-BBXJ at Jersey Airport, Channel Islands December 1974	<i>(forthcoming)</i>
5/76	Aero Commander 680 G-ASHI near Rochester City Airport February 1976	June 1976
6/76	Douglas DC6B. OO-VGB at Southend Municipal Airport, Essex October 1974	May 1976
7/76	Cessna 310 G-APTK at Norwich Airport, Norfolk October 1974	May 1976
8/76	Turkish Airlines DC-10 TC-JAV in the Ermenonville Forest, France March 1974	June 1976
9/76	Piper PA25 Series G-BCAK at Wootton nr Woodstock, Oxfordshire June 1975	July 1976
10/76	Piper PA28 Model-140 G-AVLA south of Biggin Hill Aerodrome, Kent May 1975	August 1976
11/76	Wessex 60 Series 1 G-ATSC in the North Sea north-east of the River Humber Estuary March 1976	November 1976
12/76	Piper PA 28 Series 180 (Cherokee) G-AVSB at Denham Aerodrome, Bucks June 1975	October 1976
13/76	Boeing 747 Series 136 G-AWNB north-west of Prestwick Airport, Scotland May 1975	November 1976

<i>No.</i>	<i>Short title</i>	<i>Date of Publication</i>
14/76	Piper PA 23-250 Turbo Aztec 'D' N6645Y at Arkley, Hertfordshire November 1975	December 1976
15/76	Piper PA-31 Model 350 G-BBPV at Little Sandhurst, Berkshire October 1975	February 1977

Department of Trade
Accidents Investigation Branch
Shell Mex House
Strand
London WC2R ODP

24 January 1977

The Rt Honourable Edmund Dell MP
Secretary of State for Trade

Sir,

I have the honour to submit the report by Mr G C Wilkinson an Inspector of Accidents, on the circumstances of the accident to Cessna F 150 H G-AVSS and Cessna F 150 G G-AVAB which occurred near Guildtown, Perthshire on 22 November 1975.

I have the honour to be
Sir
Your obedient Servant

W H Tench
Chief Inspector of Accidents

Accidents Investigation Branch
Aircraft Accident Report No. 16/76
(EW/C546)

Operator: Air Service Training

Aircraft: Type: Cessna 150

Model: Aircraft 1: F 150 H

Aircraft 2: F 150 G

Nationality: Both aircraft were British

Registration: Aircraft 1: G-AVSS

Aircraft 2: G-AVAB

Place of Accident: Near Guildtown, Perthshire

56° 27' 40" N 03° 24' 10" W

Date of Accident: 22 November 1975 at 1041 hrs

All times in this report are GMT

Synopsis

The accident was notified by the operator to the Department of Trade on 22 November 1975. The Accidents Investigation Branch carried out an investigation and the following groups were established: operations, engineering and pathology.

The aircraft were on local training flights from Perth Aerodrome. G-AVSS was approaching the aerodrome from the north at approximately 800 feet above ground level (agl), G-AVAB descended out of cloud and collided with it. Both aircraft fell to the ground and were destroyed. The pilot of G-AVSS was killed in the ground impact and the pilot of G-AVAB was seriously injured.

The report concludes that the collision occurred when an aircraft with an inexperienced pilot made an uncontrolled descent out of cloud with insufficient time available for the pilot to see and avoid the other aircraft flying just below the cloud base. The rapid deterioration of the local weather that occurred at the time is considered to be a contributory factor.

1. Factual Information

1.1 History of the flights

Both aircraft were being flown on solo training exercises by cadet pilots from the Air Service Training flying school at Perth.

1.1.1 G-AVSS

The pilot of this aircraft had been briefed to carry out stalling exercises away from the circuit and navigation approaches to the aerodrome. The aircraft took-off on Runway 22 at 1031 hrs and immediately afterwards the pilot requested, and was cleared for, a right turn out. There was no further communication from him.

The aircraft was next seen shortly before the collision occurred approaching the aerodrome from the north-west. It was flying straight and level at a normal speed and at a height of approximately 800 feet agl.

1.1.2 G-AVAB

The pilot of this aircraft had been briefed to carry out navigation approaches to the aerodrome and practice circuits, and took-off from Runway 22 at 1032 hrs. According to the pilot, after take-off the aircraft climbed straight ahead on the runway heading to 2,000 feet on the sea level barometric pressure setting (QNH). During the climb the aircraft remained clear of cloud.

The pilot recalls that shortly after he had reached 2,000 feet, the aircraft suddenly entered cloud. He was uncertain what action to take and thought that if he descended he was in danger of colliding with the high ground and if he turned back he was in danger of colliding with aircraft taking-off. He therefore, attempted to maintain 2,000 feet and requested a magnetic bearing to steer (QDM) and, at 1036 hrs, he was given a QDM of 350° on which heading he steered; to the best of his recollection remaining at 2,000 feet and out of sight of the ground. He considered at the time that Air Traffic Control (ATC) would be able to give him instructions to get clear of the clouds although he did not know how this would be accomplished. At 1040 hrs he requested a further bearing and was given a QDM of 160° on to which heading he thought he may have turned. He has no recollection of subsequent events until after the accident.

1.1.3 The collision

The noise of an accelerating aircraft engine caught the attention of some witnesses on the ground. They saw G-AVSS heading towards the aerodrome but considered that the engine noise did not originate from that aircraft. As they watched a second aircraft, G-AVAB, emerged from the clouds, travelling at a relatively high speed in a descent, and collided with G-AVSS.

After impact the two aircraft started to disintegrate with both airframes locked together. After a short period of time they became separated and G-AVSS dived into the ground while G-AVAB descended in a relatively slow, flat spiral and came to rest inverted.

The accident was witnessed by the pilot of another school aircraft flying in the vicinity who saw the tail of one of the aircraft become detached in the air as a result of the collision. He reported the accident to ATC on radiotelephony (RTF) and circled the area until he saw persons and vehicles going to the scene; then he returned to the aerodrome.

The pilot of G-AVSS was killed by impact and the pilot of G-AVAB was seriously injured. Both aircraft were damaged beyond economic repair. There was no fire.

1.2 Injuries to persons

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Others</i>
Fatal	1	—	—
Serious	1	—	—
None	—	—	—

1.3 Damage to aircraft

Both aircraft were destroyed by the combined effects of collision damage and ground impact.

1.4 Other damage

None.

1.5 Personnel information

1.5.1 G-AVSS

Commander	Aged 24 years
Licence	East African Private Pilot's Licence
Last medical examination	3 December 1974 Valid to 2 December 1976
Restrictions	None
Certificate of test/Instrument rating	Not applicable
Total flying hours	In command 63 hours 30 minutes Under instruction 63 hours 55 minutes.

1.5.2 G-AVAB

Commander	Aged 19 years
Licence	Not applicable (Student pilot)
Last medical examination	10 October 1975 Valid to October 1977
Restrictions	None
Certificate of test/Instrument rating	Not applicable
Total flying hours	In command 6 hours Under instruction 19 hours 35 minutes

The hours under instruction include one introductory flight to instrument flying of 55 minutes.

1.6 Aircraft information

1.6.1 General

The following pertinent information has been extracted from the aircraft records:

	<i>G-AVSS</i>	<i>G-AVAB</i>
Constructor's number and date of manufacture	F 150 H No 0233	F 150 G No 0155
	Date: Sept 1967	March 1967
Certificate of registration	No R9763/1	R9254/1
Certificate of airworthiness	No 2470	2141
Valid until	18 Nov 1977	19 March 1976
Total flying hours	5,429 hours 55 minutes	6,729 hours 25 minutes
Engine type	Continental O-200-A	
Engine hours	3,709 hours	5,386 hours 45 minutes

Both aircraft were equipped with the necessary instruments to enable them to be controlled in instrument meteorological conditions (IMC). They had a good all round field of view from the cockpit although this was restricted above and to the rear by the wing centre section.

Both aircraft had been maintained to an approved maintenance schedule.

1.6.2 Aircraft loading

Both aircraft

Centre of gravity limits (C of G)	32.87 inches to 37.5 inches aft of datum
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Maximum all up weight (AUW)	1,600 lb (725.75 kg)
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Estimated loading at time of accident

G-AVSS	C of G – 34.59 inches aft of datum AUW – 1,367 lb (620.06 kg)
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G-AVAB	C of G – 34.76 inches aft of datum AUW – 1,381 lb (626.41 kg)
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1.7 Meteorological information

There is no meteorological office at Perth aerodrome and details of the current synoptic situation and area and route forecasts were normally prepared by Prestwick Met. Office and sent to Perth by telex. The following information was passed to Perth on the day of the accident:

'Area Edinburgh-Falkirk-Denny-Dunblane - Crieff-Blairgowrie-Stonehaven-East Coast to Edinburgh, Period 22/0800 – 16000Z. Special features of Met. situation. The warm front over Northern Ireland and Western Scotland is moving east – rather slowly in the south but at about 20 Kt in the north.

Winds and Temps (Deg. True, Kts., Deg. C.)
20 260 15-20 Ps 03 Bec later 220 20-30 Ps 07
50 280 15-20 Ps 02 Bec later 220 20-30 Ps 06
100 300 20 Ms 04 Bec later 240 30 Ms 03

Cloud (lowest layer) Patches of stratus base 1,000 ft bec later in rain 3-6 ST base 600-1,000 ft covering hills.

Cloud (higher layer) 5-7 ST base 1,500-2,000 ft top 4,000-6,000 ft 6-8 ACAS base 8,000-10,000 ft top 12,000-18,000 ft in thin layers later bec thick layers.

Surface vis. generally 8-15 Km but in slight mist and haze patches and later in any rain 4-8 Km. Nil in hill fog patches.

Weather cloudy with some patches of slight mist and haze at first. Later occasional rain is likely in the west and perhaps also in the east with hill fog patches.

Ht of 0 deg C isotherm 6,000 ft rising to 8,000 ft later. Airframe icing light bec later locally moderate. F/C pressure changes falling and later falling quickly.

All heights are AMSL

TAFS EGPT 0816 22010 9999 5SC020 7AC100 TEMPO 0810 5000
PROB20 TEMPO 1316 5000 60RA 7SC015

TOO 0635'

An appreciation of the weather situation in the Perth area at the relevant time was later prepared by Prestwick meteorological office and reads as follows:

'Soon after dawn the wind became SW at 5 to 10 knots and a stratocumulus (SC) sheet, base 1,500 ft AMSL, spread in from the SW gradually lowering. The visibility fell fairly quickly during the morning so that by 1100 hrs conditions were probably of the following order:

Wind	SW 8 to 12 knots
Visibility	4 to 8 Km
Cloud	7/8 SC Base 1,200 ft AMSL
QNH	1023 Mb.

It should be noted that a lack of reports from the area render this somewhat speculative as regards visibility and cloud base.'

Based on the above information, the QFE at Perth would have been 1010 Mb at the relevant time.

Significant changes of meteorological information (SIGMETs) and forecast QNH's are passed to Perth from Edinburgh, Turnhouse Airport Meteorological Office. No SIGMET was issued from Edinburgh on the day of the accident.

All meteorological information received at Perth was available at ATC and in the operations room where it could be considered by the duty instructor when briefing the cadets. The meteorological information was also displayed, as received, on the pilot's notice board in the operations room and all pilots were instructed to brief themselves fully on the weather situation before every flight. Before the day's flying commenced, it was part of the duty instructor's duties to make an assessment of the local weather and, if necessary, to carry out a weather test flight. Such an assessment was made on the day of the accident and the weather was such that the duty instructor considered that a weather test was not necessary.

In view of the area forecast, the supervising instructor for Cessna 310 aircraft at Perth, two of which were detailed for solo cross country flights on the day of the accident, sought assurance that the weather would be suitable for the return of his aircraft later in the day. He went to the control tower and, as he was unable to speak to Edinburgh Airport Meteorological Office at the time, he telephoned Glasgow Airport Meteorological Office at 1030 hrs and was given the latest Glasgow actual which was:

Time	1018 hrs
Surface wind	050°T/04 Knots
Visibility	1,500 metres
Weather	Drizzle
Cloud	3/8 400 feet 8/8 600 feet
Temperature	Ps 04° C
QNH	1024 Mb
QFE	1023 Mb

As a result of this information, the two Cessna 310 aircraft pilots were instructed to shorten their cross country flights. The 310 supervising instructor considered that the weather at Perth at that time was still suitable for solo flying.

A short time later the 310 instructor, in consultation with the duty ATC controller, came to the conclusion that the cloud base at Perth was falling below acceptable limits. He telephoned the Cessna 150 duty instructor and passed the Glasgow and local weather information to him. As a result, the recall of the Cessna 150s was ordered.

The ATC controller at Perth at the time of the accident was not a qualified meteorological observer. Although one of his colleagues and the Senior ATC officer are so qualified, they were not on duty at the time. However, the latter was on the scene of the accident within a few minutes and, in his opinion, the cloud base at the time was approximately 800 feet agl and the visibility was 5 km. Other cadet pilots who were flying at the time also encountered clouds as low as 600 to 800 feet agl with poor visibility below. The accident occurred in daylight.

1.8 Aids to navigation

The aerodrome was equipped with very high frequency direction finding (VDF) facilities, the receiving antennae of which were adjacent to the threshold of Runway 22. All cadets were instructed to use the VDF equipment, including the obtaining of practice QDMs whenever the occasion arose. The VDF facility, which may be operated on either the approach control or tower frequencies, was switched to the tower frequency of 119.8 MHz on the day of the accident. It had been reported as being unserviceable at the time, with a fault which caused it to function intermittently although it gave satisfactory bearings when it was working. There was no reported cessation of operation during the period of the accident flights.

Although there is a non-directional radio beacon (NDB) at Perth, neither of the aircraft was equipped with automatic direction finding (ADF) receivers.

1.9 Communications

Satisfactory RTF communications between both of the aircraft and Perth ATC were maintained on 119.8 MHz. Communications are not considered pertinent to the accident.

1.10 Aerodrome and ground facilities

Perth Aerodrome is situated approximately 2 miles SSE of the accident site. It is grass surfaced with two tarmac runways, one of 2,800 feet orientated 04/22, the other of 2,000 feet orientated 10/28. The aerodrome elevation is 397 feet amsl.

1.11 Flight recorders

Not required and not fitted.

1.12 Wreckage

1.12.1 Distribution

The general alignment of the wreckage trail was south-easterly and the distance from the first piece of wreckage, the left wing tip of G-AVSS, to the last piece of debris, the left wheel of G-AVAB, was approximately 850 feet. G-AVSS had struck the ground in a 40° nose-down attitude at an estimated speed of 80 mph. G-AVAB had been inverted at impact and had struck the ground slightly nose-down at an estimated speed of 30 mph. The wreckage distribution indicated that the outer left wing of G-AVSS and the entire left wing and tail unit of G-AVAB had become detached in the air as a result of the collision.

1.12.2 Detailed examination of the wreckage

G-AVSS

Damage in the air, as a result of the collision, was limited to the severance of the outer 6 feet of the left wing which was found, with the wing tip, at the beginning of the wreckage trail.

The aircraft structure received very extensive damage in the ground impact including deformation of the cockpit, compression damage to both wings and fracturing of the tail unit. Examination of the structure and control system showed no evidence of pre-crash failure or malfunction and all damage found was consistent with either collision or ground impact forces.

The engine was severely damaged in the ground impact and all control settings were consequently considered unreliable. No evidence was found of any pre-collision failure or malfunction. All the aircraft instruments were extensively damaged; the only reliable information obtained was the altimeter sub-scale barometric setting which was 1008 mbs.

G-AVAB

Most damage to the structure occurred in the air as a result of the collision. The left wing, which was broken off into five main portions, the tail unit and the left wheel became detached from the fuselage which then became inverted before spiralling, comparatively slowly, to the ground. Propeller cuts were found on the lower left side of the fuselage, left underside of the tailplane and elevator and the left wheel. Due to the slow rate of descent, very little further damage was caused by ground impact. Examination of the structure and control system revealed no evidence of pre-crash failure or malfunction and all damage found was consistent with either collision or ground impact.

Examination of the engine of this aircraft showed very limited accident damage. The engine could be turned by the propeller and it was noted that accessory drives were operative. No pre-collision defect or malfunction was found and a quantity of fuel remained in the right tank.

The following control settings were noted on G-AVAB

Throttle lever	Closed
Carburettor heat	Cold
Mixture control	Rich
Flap indicator	Flaps up
Fuel cock	On
Ignition switches	Both on
Pitot heater	Off
Beacon	Off

Electrical system and instruments

The electrical fuse serving the instrument lights, fuel quantity indicators and the turn indicator was found 'blown'. The fuse was of the correct value. The turn indicator was rig tested and found to function satisfactorily.

The artificial horizon was tested and the gyro system responded satisfactorily except for the horizon bar which remained at the top of the instrument – giving an indication of 'nose-down' attitude. After the test the instrument was opened up and examined for evidence of internal defect. No indication was found of mechanical or electrical failure which could have caused the horizon bar to malfunction.

The altimeter, although it responded correctly, could not be tested fully due to a cracked case. Examination of the bellows and operating mechanism revealed no evidence of any pre-crash damage or mechanical failure. The sub scale setting was 1007 mbs.

1.13 Medical and pathological information

The pilot of G-AVSS died as a result of multiple injuries. There was no medical evidence of any pre-existing disease or condition which could have had a bearing on the accident.

1.14 Fire

There was no fire.

1.15 Survival aspects

Both pilots were wearing lap straps. Although, fortuitously, the pilot of G-AVAB survived both the collision and ground impacts, normally the accident would be classified as non-survivable.

1.16 Test and research

None

1.17 Additional information

1.17.1 *Operational matters, records of cadets' proficiency*

The proficiency of cadets rostered for solo flying could be assessed by reference to their 'Phase Cards'. These are maintained for each cadet by his instructor and provide a precise record of all exercises satisfactorily completed. Phase cards had been maintained up to date for both the subject pilots.

When a cadet was rostered for solo flying on a Saturday, his detailed briefing on the exercises to be carried out would be given by his own instructor on the previous day. He would also be given a supplementary briefing on the Saturday morning which would take account of the weather, aerodrome conditions etc.

A particular cadet's limitations could be indicated by his instructor writing the letters 'GW' opposite the cadet's name on the day's Flying Programme Board, this annotation indicating that the particular exercise should only be carried out in good weather. There was no such annotation against any cadet's name on the day of the accident.

1.17.2 *Duty instructor*

The responsibilities of the duty instructor, contained in the Notice to Instructors, read, in part, as follows:

'The Instructor detailed as the Duty Instructor (Day) will be responsible for the following during his tour of duty:

- (i) Check the weather before the first solo detail. This may involve a weather check flight if conditions are doubtful; in which case the flight must be carried out early enough . . . for a decision to be made to allow the programme to commence on time.
- (ii) Ensure that duty Cadets are programmed and are available at all times and supervise their duties.
- (iii) Liaise with Air Traffic, Engineers, Radio section and Catering as necessary.
- (iv) Acquire and display all relevant weather and Air Traffic information . .
- (v) Supervise solo flying in accordance with Weather Minima and special circumstances (eg Students of limited experience or ability).'

The duty instructor at the time of the accident collected the local area and route forecasts and put them on display in the operations room. After consideration of the forecast and making his observation of the local weather, which was good, the duty instructor decided that a weather test was not necessary and that conditions were suitable for solo flying. As a possible later deterioration of the weather was forecast, he also asked ATC to keep an eye on the weather to the south and west and advise him of any deterioration. The duty instructor then started checking the individual cadets' understanding of the exercises for which they had been briefed and examining their phase cards where necessary.

The policy of the flying school was that the first aircraft should start taxiing soon after 0930 hrs and, if no snags are reported, the last aircraft should be taxiing by 1000 hrs. Flying periods were normally of 1½ hours duration and the briefing of the cadets and flight authorisation was based on this understanding. In accordance with the normal school procedure, cadets were instructed to brief themselves on the displayed weather and navigation warnings. Nevertheless, in view of the possible weather deterioration on the day of the accident, the duty instructor reminded each cadet that he should keep the

weather situation under observation and be prepared for a recall if necessary. The duty instructor's place of duty was in the operations room; some distance from, but in telephonic communication with, the control tower.

So far as the duty instructor was aware, flying proceeded normally until he received the telephone call from the 310 instructor in the tower giving details of the Glasgow weather and the lowering cloud base at Perth. The duty instructor immediately ordered the recall of all Cessna 150 aircraft. The first recall message was transmitted at 1033 hrs.

1.17.3 *Air Traffic Control*

ATC at Perth is staffed by qualified personnel employed by the flying school.

Aircraft movements are presented to the controller by means of a display board with discs, representing aircraft, being placed in 'boxes' labelled, 'Taxi', 'Holding Point', 'Landing', etc. The discs, which are lettered with the aircraft callsign, are moved in accordance with aircraft position reports or ATC instructions.

Except for the information provided by the display board, aircraft reports and visual observation, controllers would not normally know the position of the aircraft in the area.

In addition to meteorological observations made from the control tower, information of flight conditions in the area were usually obtained from airborne aircraft. Significant information was then passed to the duty instructor for appropriate action; ATC did not normally initiate recall messages, nor restrict flying activities at Perth.

In the event of a general recall being ordered, the intention was for aircraft to be brought in individually to avoid 'bunching' on the approach. Except where specified by the duty instructor, the order in which aircraft were recalled was the responsibility of ATC who would prevent aircraft taking-off, or instruct pilots to return, in the most convenient order. ATC have no knowledge of the skill of individual pilots. There are normally no more than 12 to 14 aircraft in the local area at any one time, all of which should be recalled within the space of approximately 20 minutes.

A Descent Through Cloud (QGH) procedure for Perth aerodrome was promulgated but this is not considered relevant to the accident.

1.17.4 *Training and instructions to cadets*

Instructions for cadets are contained, *inter alia*, in the Flying School Order Book. Both pilots had initialled the Signature page of the Order Book to indicate that they had read and understood the contents.

Appropriate extracts from the Order Book are printed below:

'Annex A(2)

B *Cadet Solo Flights*

- 3 *VMC/IMC.* With the exception stated below, cadet pilots on solo or mutual flights *must* remain VMC AT ALL TIMES. Cadet pilots may request special VFR into or out of a Control zone provided the visibility is not less than 5 n.m. (9,300 metres).
- 4 *Flights near Base or Cloud Tops.* Flights are not to be maintained within 300 feet of the cloud base or cloud tops.

5. *Flights over Broken Cloud.* Flights over broken cloud may only be maintained if the total cloud cover does not exceed 2/8 and there is a maximum clearance between the ground and cloud base of 1,000 feet. A careful watch must be kept to ensure that the cloud amount is not increasing.
6. *Flights over Mist or Fog.* Flights over banks of mist or fog are only permitted if the pilot could conform to the requirements of Para. A(1)10, (Public Transport Flights – Ability to glide to a point 1,000 feet above a place at which a safe forced landing can be made), in the event of engine failure.
7. *Showers, Rain, Snow.* The terms 'light', 'occasional' or 'scattered' showers indicate that a flight can be made with only occasional minor diversions. The terms 'severe', 'heavy', 'widespread' and 'extensive' indicate unacceptable weather unless the forecast cloud base in showers will enable the flight to be continued at not less than 1,000 feet AGL and the visibility in showers is not less than 3 n.m. (5,600 metres).
8. *Visibility*

By Day

Local Flights	3 n.m.	(5,600 metres)
Mutual Flights	3 n.m.	(5,600 metres)
Special VFR Flights	5 n.m.	(9,300 metres)

Circuits

By Day Pre-Prog. II	3 n.m.	(5,600 metres)
Post-Prog. II	1½ n.m.	(2,800 metres)
Cross-country Flights Pre-Prog. II	5 n.m.	(9,300 metres)
Post-Prog. II	3 n.m.	(5,600 metres)

9. *Circuit Flying (within 2 n.m. radius of Aerodrome)*

(a) Aircraft must keep clear of cloud.

(b) *At Perth Minimum Circuit Height*

By Day

- i. Pre-Prog. II 800 ft. AAL
- ii. Post-Prog. II on Runway 22R and 04L 500 ft. AAL
- iii. Post-Prog. II on other Runways 800 ft. AAL
- iv. By Night 1,000 ft. AAL
- (c) At other Airfields, minimum height 1,000 ft. AAL

- 10 *Cross-country Flights.* Must be planned and conducted so that the provisions of Para. A(1)10 can be complied with.
- 11 *Cloud Base.* Minimum base of significant cloud (2/8 or more) must be such that flights can be conducted VFR and in accordance with the following:-
 - (a) Local cross-country flights Pre-Prog. II at not less than 1,500 ft. AGL.
 - (b) Local cross-country flights Post-Prog. II at not less than 1,000 ft. AGL.'

The pilot of G-AVAB was of Pre-Prog. II standard. (This is an indication of a standard of proficiency used at the school). The pilot of G-AVSS was the holder of an East African PPL and, therefore, equivalent to Post-Prog. II standard.

During the *ab-initio* flying syllabus at Perth, which has been evolved over a number of years, cadets are taught to fly the aircraft by outside reference alone. When proficiency is gained in visual handling, they are given instructions in instrument flying. It was impressed upon the cadets in the course of their instruction that they should never enter cloud when flying solo and they should modify exercises or abandon them altogether when the weather was unsuitable. No written instruction was given as to the procedure to be followed should they inadvertently enter cloud.

1.18 New investigative techniques

Nil.

2. Analysis

The evidence indicates that the accident occurred when G-AVAB descended on to G-AVSS and both left wings collided. No evidence was found of any pre-collision defect or malfunction of either aircraft which might have contributed to the collision.

In this analysis it is necessary to consider the factors related to the despatch of the aircraft and the ensuing conduct of the flights in deteriorating weather conditions.

2.1 Briefing and flight despatch

At the time the cadets were briefed the local weather was good and the forecast was such that the duty instructor's decision not to carry out a check flight was reasonable. It is not known to what extent the approaching bad weather would have been apparent had he done so; there were no other reported indications from any sources that the deterioration was either as imminent, or likely to be as extensive, as it later proved to be. Following his study of the weather report and the cadets' phase cards, and bearing in mind that there were no 'good weather' only restrictions on any of the cadets, the duty instructor did not consider that any reservations concerning the day's flying programme were justified other than his warning that cadets should 'keep the weather situation under review and be prepared for a recall'.

The effective flight despatch of the two cadets involved in the collision occurred when the duty instructor examined their phase cards and authorised the flights. This would have been soon after 0930 hrs and some time elapsed before the flights actually took-off. However, this was not an abnormal occurrence and the pre-flight briefing was intended to cover the period up to the completion of such later starting details. In view of their more limited understanding of meteorology, it is considered unlikely that the cadets would have appreciated the possible extent to which the weather situation might change by their own study of the displayed forecast; particularly as the instructor's warning was of a general nature.

The presence, in the control tower, of the supervising instructor for Cessna 310 operations was reasonable as all his aircraft had been despatched and he could best monitor their operations from the tower. Whereas, to maintain effective supervision of his cadets, the duty 150 instructor remained in the operations room, his normal place of duty. All the instructors at Perth work together and, although the 310 instructor had no responsibility for 150 operations, his presence in the control tower may have provided some additional degree of reassurance for the duty 150 instructor against being 'caught out' by the weather. In any case, the local weather remained apparently suitable for local solo flying and the 310 instructor's telephone call to Glasgow was related to the return of his cross-country aircraft some time later. The telephone call to Glasgow was made at 1030 hrs and it was not until after that time that the first signs of a lowering cloud base were noted from the tower. No time was lost in notifying the duty 150 instructor of the changing conditions, or in his ordering a general recall, but, as G-AVSS took-off at 1031 hrs and G-AVAB one minute later, the weather deterioration had not become apparent soon enough to have prevented their take-off due to weather.

2.2 The weather

There is little doubt that the weather at Perth deteriorated very rapidly immediately prior to the collision. Up to the time that the last aircraft took-off, no adverse report of the weather had been made by any of the pilots flying in the vicinity and no deterioration had been observed from the control tower. The bad weather was moving towards Perth from the south-west so that, whilst conditions in the circuit were reasonable, a few miles upwind the weather was poor. This allowed the pilot of G-AVAB to take-off and climb to an altitude of 2,000 feet before suddenly entering cloud. The only aircraft to

take-off after G-AVAB, before the recall was ordered, also entered cloud unexpectedly, as indeed, did other aircraft flying in the vicinity of Perth as the bad weather moved into the area. Pilots encountered a cloud base of 600 feet agl associated with poor visibility below.

The shortage of weather reporting stations to the west of Perth presents a permanent problem, particularly as that is the direction of the prevailing wind. Taking into account the type of flying activity at Perth, with a high percentage of pilots with limited experience undergoing training and the fact that no instructor was flying, the duty instructor and ATC needed to be particularly alert to the possibility of rapid changes in the weather.

2.3 The conduct of the flights

2.3.1 G-AVSS

The pilot of this aircraft had the benefit of a reasonable amount of experience, including instrument flying. Although it has not been possible to establish the actual flight path followed after his request for a 'right turn out', the position of the collision is consistent with the pilot having turned right, in which case he would have turned away from the approaching bad weather. He was clear of cloud when he was seen approaching the aerodrome, shortly before the accident and there was no indication of any difficulties encountered during his flight, however it is considered unlikely that he did, in fact, maintain a vertical separation of 300 feet below the lowest cloud.

From the evidence obtained from the wreckage analysis, it is considered unlikely that the pilot in G-AVSS could have seen the approach of G-AVAB, even if he had been looking in the right direction, due to the restricted view from the Cessna 150 above and to the rear.

2.3.2 G-AVAB

The pilot of this aircraft was at an early stage in his flying training. His climb to an altitude of 2,000 feet would have been necessary in order to carry out the exercise for which he had been briefed, although the evidence indicates that his altimeter was still set on the QFE and not the QNH as he stated. There is no reason why he should not have decided to start his exercise from an extended climb out.

In common with other single engined aircraft, the forward, horizontal field of view is limited in the Cessna 150 in the climbing attitude and, almost immediately after levelling off and before he could take avoiding action, the pilot found himself in cloud. He was uncertain as to what action he should take; he was aware that it was contrary to instructions to enter cloud but it had occurred inadvertently and he had not been told what to do in such an event. He believed, with good reason, that if he descended he would be in danger of colliding with high ground but he lacked the instrument flying skills necessary to maintain full control of the aircraft without visual reference. Nevertheless, by requesting QDM's from Perth he showed good sense and, despite his inexperience, he appears to have used the bearings effectively to orientate himself with reference to the aerodrome. However he was in need of guidance in order to carry out a safe descent and, although he had some understanding of both ADF and QGH let down procedures, he had neither the airborne equipment for the former nor the necessary knowledge to initiate and carry out either of them.

Even if the pilot had informed ATC that he was in cloud, it is by no means certain that the outcome would have been different. It is evident that, although he was probably aware of his approximate geographical position and was flying towards the aerodrome at the time, the pilot was not maintaining a constant height and, when the collision occurred, the aircraft was in a, probably unintentional, descent.

Although it is possible that the pilot of G-AVAB could have seen G-AVSS immediately prior to impact, under the circumstances obtaining it is considered that he did not.

2.4 Air Traffic Control

It is evident that ATC had no knowledge of the low cloud in the vicinity of Perth until shortly after 1030 hrs. The recall was ordered shortly afterwards. Thereafter the controller was fully occupied in dealing with the recall progressively and controlling the aircraft still in the circuit. As part of the latter task, dealing with two requests for QDM's was not exceptional.

Since the duty controller had no means of knowing that a collision situation was developing, it is unreasonable to have expected him to take any action to prevent it.

2.5 Other factors

2.5.1. *Cadet's training syllabus*

The syllabus for *ab-initio* pilot instruction at Perth, which has been evolved over many years of experience, is of a high standard. The sequence of flying training exercises are designed to keep pace with the cadets' developing proficiency and instruction in instrument flying is withheld until the cadet has reached a standard where he will extract the maximum value from the tuition. Although maintaining this sequence has been found to yield the best results and, consequently no deliberate flying in cloud is attempted or authorised until the cadet has acquired the necessary ability; there may well be occasions, such as the accident case, where cloud may be entered inadvertently. In high density circuit traffic conditions this could pose an unacceptable risk and it is considered that the lack of instruction to the cadets as to what they should do if they enter clouds inadvertently, must be considered a pertinent factor.

2.5.2 *Instrumentation of G-AVAB*

- (a) Instrument system fuse. As the functional test of the turn indicator was satisfactory and the electrical continuity throughout was good, it is considered that the fuse had most likely failed due to severing and short circuiting of the fuel quantity electrical cables during the wing break-up.
- (b) Artificial horizon. From the post crash examination and testing it is concluded that the inertia forces during the break-up of the wing and impact with the ground interfered with the setting of the horizon bar mechanism and prevented the instrument from operating correctly during the tests.
- (c) Altimeter. It was evident from the tests and internal examination of the instrument that its malfunction resulted from the cracked case sustained in the crash damage to the instrument panel.

As there was no indication that any of the instrument defects noted above were present before the collision, instrument defects are not considered to have been a causal factor.

3. Conclusions

(a) *Findings*

- (i) At the time of the accident, both aircraft had been properly maintained, were correctly loaded and had valid certificates of airworthiness.
- (ii) There was no pre-collision failure of either aircraft.
- (iii) Both pilots were properly authorised and competent to carry out the flights. The pilot of G-AVSS was the holder of a valid private pilot's licence.
- (iv) The pilots were carrying out the training exercises for which they had been briefed.
- (v) There was a rapid deterioration of the weather in the Perth area prior to the collision.
- (vi) G-AVAB inadvertently entered cloud.
- (vii) No written instruction had been given to the pilot of G-AVAB as to what he should do if he entered cloud inadvertently and he had been given one introductory flight by way of instruction in instrument flying.
- (viii) G-AVAB emerged from clouds in a descent and collided with G-AVSS which was flying straight and level below the cloud base.

(b) *Cause*

The collision occurred when an aircraft with an inexperienced pilot made an uncontrolled descent out of cloud with insufficient time available for the pilot to see and avoid the other aircraft flying just below the cloud base. The rapid deterioration of the local weather that occurred at the time is considered to be a contributory factor.

4. Safety Recommendations

It is recommended that:

- (1) The arrangements for the assessment of the suitability of the weather at Perth be reviewed, particularly covering the occasions when cadets only are flying.
- (2) Consideration should be given to instructing ATC controllers at Perth to ask for altitudes and flight conditions from cadets requesting QDM's at all times, and to provide such other assistance as they are able when the weather conditions may be marginal.
- (3) Consideration should be given to instructing Cadets on the actions that they should take if they inadvertently find themselves in cloud.

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