

ACCIDENTS INVESTIGATION BRANCH
Department of Trade and Industry

Hawker Siddeley HS 104 Dove,
Series 8, G-AVHV
of McAlpine Aviation
Report on the accident near
Pendeford Airfield, Wolverhampton
on 9 April 1970

List of Civil Aircraft Accident Reports issued by AIB in 1971

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Department of Trade and Industry
Accidents Investigation Branch
Shell Mex House
Strand
London WC2

May 1971

*The Rt. Honourable John Davies MBE MP
Secretary of State for Trade and Industry*

Sir,

I have the honour to submit a report by Mr N S Head, an Inspector of Accidents, on the circumstances of the accident to HS 104 Dove, Series 8, G-AVHV, which occurred near Pendeford Airfield, Wolverhampton on 9 April 1970.

I have the honour to be

Sir,

Your obedient Servant,

V A M Hunt
Chief Inspector of Accidents

Accidents Investigation Branch
Civil Accident Report No. EW/C 343/01

Aircraft: HS 104 Dove, Series 8, G-AVHV
Engines: Two HS Gipsy Queen 70, Mk 3
Owner: Dowty Group Services Limited, Cheltenham,
Gloucestershire
Operator: McAlpine Aviation, Luton Airport, Bedfordshire
Crew: Commander – Captain J E Miller – killed
Co-pilot – First Officer R J Davall – killed
Passengers: Nil
Other persons: Mrs N Hilton, Redhurst Drive,
Wolverhampton – killed
Place of accident: Near Pendeford Airfield, Wolverhampton
Date and Time: 9 April 1970 at 0902 hrs.
All times in this report are GMT

Summary

The aircraft was 'positioning' from Luton to Wolverhampton to pick up passengers for a flight to France. Weather conditions were poor at Wolverhampton and from the evidence available it appears likely that the pilot experienced difficulty in positioning the aircraft for landing. Whilst making the third attempt to land the aircraft stalled, struck a house approximately 600 yards from the aerodrome and caught fire. Two pilots on the aircraft and an occupant of the house were killed.

1. Investigation

1.1 History of the flight

G-AVHV, a Hawker-Siddeley 104 (Dove) Series 8 aircraft, flown by Captain J E Miller, with Mr R J Davall as trainee co-pilot, departed Luton at 0800 hrs to fly empty to Wolverhampton (Pendeford) Airfield, where two members of the management of Dowty Rotol Ltd. (the owners of the aircraft) were to be picked up and flown to France, with a call at Lydd for Customs clearance. Before leaving Luton the pilot had received a weather forecast covering en-route and terminal weather, and had also been given a route and destination briefing by the Senior Training Captain of his operating company (McAlpine Aviation).

The flight to Wolverhampton was made under a visual flight rules (VFR) clearance. Approaching Daventry the pilot contacted Birmingham Approach Control and obtained clearance to fly through the Birmingham Terminal Control Area (TCA) direct to Wolverhampton at 2,500 feet. As suggested to him during the briefing by his Senior Training Captain the pilot asked Birmingham whether they would be able to provide radar assistance to position him over Wolverhampton airfield; the Birmingham controller agreed to do this.

Nearing Birmingham the aircraft entered cloud and was cleared to continue flying at 2,500 feet in instrument meteorological conditions (IMC). When about 7 miles from Wolverhampton, and under radar observation, the pilot was advised of his position and cleared to commence a descent to break cloud over Wolverhampton; he was also advised that during his descent radar contact would be lost.

The first attempt to find Wolverhampton was unsuccessful and the aircraft climbed back to 2,500 feet and the pilot contacted Birmingham again and requested assistance for another attempt. The second attempt was also unsuccessful and the aircraft again climbed back to 2,500 feet. Following this attempt the pilot contacted Wolverhampton, and when he returned to the Birmingham R/T frequency he informed the controller that the Wolverhampton visibility was just over half a mile, that Strip 25 was in use and that he would like radar assistance for one more attempt to break cloud. The controller agreed to try and position him approximately for an approach to Strip 25.

This third attempt was successful and the aircraft broke cloud slightly east of the airfield. At this time the pilot informed Birmingham that he could now see the airfield and would stay at low level and make a circuit before landing. The pilot did not make any further R/T contact with either Birmingham or Wolverhampton.

The aircraft was seen to fly across the airfield in a westerly direction at a height estimated as 600 to 700 feet, passing just south of the control tower. After crossing the western boundary the aircraft turned left and flew a partial left-hand circuit maintaining an estimated height of 600 to 700 feet. The aircraft appears to have kept rather close in to the airfield boundary but nothing else unusual was reported except for one witness in a position on the western side of the airfield who stated that he thought the aircraft was being flown in a markedly tail-down attitude whilst on the down-wind leg of the circuit.

About two-thirds of the way along the down-wind leg witnesses heard a power reduction and the aircraft began to descend. One witness in a room on the seventh floor of a nine-storey block of flats near to the northeast corner of the airfield saw the aircraft pass her window sufficiently close for her to be able to distinguish that the pilot in the left hand seat was looking towards the airfield whilst the other was leaning forward in his seat and looking ahead. From the position where this witness was sitting, and from her recollection of the position of the aircraft as it passed her window, it was possible to establish reasonably accurately that at this time the aircraft could not have been flying at more than 200 feet; it was slightly banked to the left and, from her description of the engine noise level, was being flown at a reduced power setting.

About 260 yards further along its flight path the aircraft passed directly over the house of another witness where its height was estimated as between 50 and 150 feet. In relation to the threshold of Strip 25 the aircraft was then about 600 yards away from it, flying on an approximately northwesterly heading, ie about 90° to the runway centreline, and on a line about 25° to 30° before that centreline; the wings of the aircraft were then either level or slightly banked to the left.

At this point there occurred what an eyewitness with some aviation experience described as a very tight, flat and yawing turn to the left which brought the aircraft on to an approximately westerly heading. The aircraft seemed to lose both speed and height during this turn so that by this time it was only about 20 feet above the roofs of the houses. The left wing then momentarily dropped a little, followed by the right wing dropping 60° to 90° . There was a sound of a considerable power application whilst the aircraft continued to descend into an area of small gardens between the backs of two rows of houses, still right wing down and still on a westerly heading.

The right wing tip then struck a wall almost at ground level and the aircraft pivoted round to the right and into the rear of one of the houses; there was a major explosion and fire broke out immediately. The aircraft and the house it struck were largely destroyed by the crash and subsequent fire and there was some damage to the immediately adjacent houses on each side. Both pilots and one of the three occupants of the house were killed; the other two occupants of the house escaped by jumping from a second storey window on the front face of the house and sustained minor injuries and shock.

Wolverhampton City Fire and Rescue Services were very quickly on the scene and were able to confine the fire and eventually extinguish it without injuries to other persons or serious damage to other property.

1.2 Injuries to persons

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Others</i>
Fatal	2	—	1
Non-fatal	—	—	2
None	—	—	—

1.3 Damage to aircraft

The aircraft was severely damaged and partially destroyed by the impact and the subsequent fire.

1.4 Other damage

One house was destroyed and there was some damage to the houses immediately adjacent to it on each side.

1.5 Crew information

Captain John Eric Miller, aged 46, held a commercial pilot's licence endorsed for command of HS 104 Dove aircraft. His last competency check was on 20 January 1970 and his last instrument rating check was on 14 August 1969. He had a total flying experience of about 8,000 hours, of which 40 were in Dove aircraft; he had completed a conversion course on to this type of aircraft in March 1970. So far as is known he had been to Wolverhampton (Pendeford) only once previously, in November 1969; during that flight he had occupied the right-hand seat of a Dove aircraft as an observer and did not handle the flying controls during the landing or the subsequent take-off.

Captain Miller had been a pilot in the Royal Air Force and prior to leaving the service in August 1968 had been flying Percival Prince type aircraft with the RAF Metropolitan Communication Flight based at Northolt. He joined Hunting Surveys in October 1968 and between then and April 1969, when he joined McAlpine Aviation, he had flown about 500 hours in Dakota type aircraft engaged in low-level survey work. In the period between joining McAlpine Aviation in April 1969 and January 1970 when he began converting to the Dove type aircraft, he had flown Beech Baron and PA 23 type aircraft.

First Officer Richard James Davall, aged 20, held a commercial pilot's licence endorsed for command of PA 28/32 and Cessna 337 type aircraft. He completed a course of training leading to the issue of his commercial licence in December 1969 and had joined McAlpine Aviation in February 1970. He had a total flying experience of about 230 hours and had done very little flying with McAlpine Aviation.

Mr Davall was on board the aircraft as a trainee co-pilot, essentially to obtain general route experience, and would not have participated in the operation to any material extent because McAlpine Aviation operate the Dove as a single pilot aircraft. Mr Davall held a radio telephony licence and it is, therefore, possible that he may have assisted Captain Miller with communications but except for this possibility Mr Davall cannot be considered as directly involved in the operation or the eventual accident.

Captain Miller's last medical examination was on 29 March 1970 and Mr Davall's on 28 November 1969. Nothing from these examinations or from the post-accident pathological examination suggested that any medical factor could have been contributory to this accident.

1.6 Aircraft information

The HS 104 Dove aircraft is a twin-engined, low-wing, light transport aircraft of all metal construction except for the ailerons, elevators and rudder which are fabric covered metal framework. G-AVHV had been constructed by Hawker-Siddeley Aviation Limited at Broughton in 1967 and bought new by Dowty Group Services of Cheltenham in 1967; it had been operated on behalf of the owners by McAlpine Aviation and began service with them in 1968.

The aircraft had been maintained to an approved schedule and at the time of the accident had flown a total of 1,098 hours since new. There was a current certificate of airworthiness in the transport category (passenger) and a current certificate of maintenance; the original engines and propellers were still fitted and all mandatory modifications had been embodied. The aircraft had flown 475 hours since the last certificate of airworthiness renewal and 6 hours since the previous check 1 inspection. There were no defects recorded in the technical log and except for some relatively minor difficulties which had previously been experienced with the VHF R/T equipment the aircraft had had an almost trouble-free record since construction.

The aircraft was fitted with dual flying controls and had two flight instrument panels although it was usually operated by McAlpine Aviation as a single pilot aircraft and was being so operated on this flight from Luton to Wolverhampton.

De-icing for the leading edges of the wings, tailplane and fin and for the propellers is provided by a TKS fluid system supplied by an electrically driven pump, together with a separate hand pump system for the pilots' windscreen; an ice detector fitted under the aircraft nose gave warning of airframe icing by illuminating a red warning light on the central instrument panel.

The engine air intakes in the wing leading edge immediately to the left of each engine, are fitted with wire mesh stone guards and during flight in anticipated icing conditions a shutter behind the guard can be moved to an alternative position to allow air to be drawn from a rearward facing opening. This prevents any reduction of the air supply to the engines should the screens become blocked with snow or airframe ice. The engines themselves are fitted with injector-type carburettors which supply metered fuel into the eye of the supercharger impeller, whilst the throttle butterfly and the throat-chamber are heated by engine oil. Provided that the intake shutters are placed in the alternative entry position on entering anticipated icing conditions it is virtually impossible for the Gipsy Queen Mark 70 engines to suffer from the effects of either airframe or engine icing. The lever operating the intake shutters is on the pilot's central pedestal and the pilot's check list contains an instruction to select these to the alternate position by moving the selector lever to the 'ON' position when icing is expected.

1.7 Meteorological information

Before his departure from Luton the pilot received an en-route and terminal forecast, the Wolverhampton landing forecast being as follows:

0800 hrs to 1000 hrs:

Wind velocity	310° at 05 knots
Visibility	6 km
Cloud	6/8 stratus, base 800 feet

becoming gradually:

Visibility	8 km
Cloud	6/8 cumulus, base 2,000 feet

Relevant portions of the aftercast prepared by the Meteorological Office show that the Midlands area was covered by an unstable northwest to north airstream and was generally cloudy with occasional light snow, although none fell in the immediate vicinity of Wolverhampton airfield. Visibility was generally poor, being of the order of 1,000 to 2,000 metres whilst the freezing level was between surface and 500 feet; airframe icing would have been moderate but possibly severe locally in cumulus-nimbus cloud.

There is no meteorological observer at Wolverhampton airfield and no recording or measuring instruments with which to make observations. However, the airport manager estimated that at the time of the accident the surface wind was from about 250° at about 10 knots, the visibility rather more than $\frac{3}{4}$ mile and the cloud base 600 to 700 feet. Although there had not been any snow the grass surface of the airfield was partly covered with residual hoar frost from the overnight conditions, the ground temperature being about plus 1°C.

According to the recording of the pilot's R/T communications with Birmingham he understood the Wolverhampton visibility to be 'possibly just over half a mile'. Barometric pressure is not measured at Wolverhampton and no value for the local QNH or QFE was passed to the aircraft nor did the pilot request this information. During the en-route stage of his flight he had been informed that the Birmingham QFE values being given to other aircraft as 989.5 mb for touchdown on Runway 15 and 988.5 mb for touchdown on Runway 33.

1.8 Aids to navigation

There are no aids to navigation at Wolverhampton.

Birmingham radar provided assistance to position the aircraft overhead Wolverhampton but contact was lost by the time the aircraft had descended to about 1,500 feet on each of its attempts to break cloud; the pilot was aware of this height limitation on the assistance which Birmingham radar could provide.

In the event radar assistance was sufficient to enable the pilot to make a successful cloud break at the third attempt and at this point the part played by Birmingham radar must be considered as terminated. Except for the lack of approach and landing aids at Wolverhampton, and the consequential effects of a landing in poor visibility, aids to navigation are not considered to be causal factors in this accident.

1.9

Airfield information

Wolverhampton (Pendeford) Airfield is approximately two nautical miles north-northwest of Wolverhampton; it is owned by Wolverhampton Corporation and operated by them and by Don Everall Aviation Limited under a joint management agreement.

The airfield is grass surfaced and has three landing strips having directions and dimensions as follows:

<i>Director(^oT)</i>	<i>Nominal (^oN)</i>	<i>Length</i>	<i>Width</i>
011/191	02/20	1,090 metres (3,575 feet)	122 metres (400 feet)
062/242	07/25	975 metres (3,200 feet)	122 metres (400 feet)
098/278	11/29	780 metres (2,560 feet)	122 metres (400 feet)

Except for light aircraft the airfield is operated on a 'prior permission' basis and there are no formal air traffic control facilities although VHF R/T communication operated by the airport manager is available 'on request'. Prior notification of the intended arrival of G-AVHV had been given the previous evening and this communication facility was, therefore, available and used to give the pilot the landing direction in use and an estimate of the visibility and the cloud base. The manager also undertook to fire a white Very light to indicate that he could see the aircraft over the airfield and this was done when the aircraft flew westward across the airfield after the third and successful attempt to break cloud.

Except for the airfield boundary marker boards adjacent to the perimeter hedges, there are no lights, strip markers or threshold markers which define the positions of the landing strips. The adjacent areas to the north and south are mainly open countryside whilst the west side contains the old control tower, several hangars and a number of single-storey office buildings and work-shops. The eastern side abuts the built-up area of Wolverhampton which includes some blocks of flats up to nine storeys in height. In the northeast corner, adjacent to the approach area of Strip 25, there is a large area of grass sports-field and parkland. At the time of the accident the grass surfaces of the airfield and adjacent grass areas were partially covered by residual hoar frost from overnight.

To minimise flying over the built-up area to the east of the airfield the direction of the airfield circuit is varied according to the local surface wind; the direction in use is indication on a signal square adjacent to the old control tower which is on the west side of the airfield. This variable circuit restriction is noted in the *Air Pilot* and at the time of the accident the signal indicating a right-hand circuit was on display; it is not known whether the pilot observed this signal but during its westward crossing of the airfield the aircraft was in a position from which the pilot might reasonably be expected to see it.

The local barometric pressure is not measured at Wolverhampton and the *Air Pilot* shows the airfield elevation as 352 feet above mean sea level. The pilot was aware of the QNH for Birmingham which has an elevation of 323 feet amsl and may also have heard the Birmingham QFE values for touchdown on Runways 15 and 33 there. The *Air Pilot* shows these two touchdown elevations at Birmingham as 299 feet and 324 feet amsl respectively.

1.10 Flight recorders

The aircraft was not required to carry this equipment and none was fitted.

1.11 Wreckage examination

Eyewitness evidence confirmed that the final flight path had been approximately parallel to and between the backs of two rows of two-storey semi-detached houses known as Redhurst Drive, the aircraft having descended into this area in a markedly right wing down attitude. Marks near to the accident site showed that the right wing tip had scraped the ground about five yards before the final impact which had occurred when the aircraft swung round to the right into the rear of one of the houses. At final impact the aircraft had been banked approximately 60° right, the starboard engine had broken through into the ground floor of the house whilst the front fuselage and the port engine broke into the upper storey and the roof area respectively.

The main impact and the subsequent fire destroyed the forward fuselage as far back as the wing leading edge. From the wreckage it was established that the fuel selectors had been in the normal position for landing, ie left tanks to left engine and right tanks to right engine; engine cooler selection had also been normal. It was established that the air intake filter selector had been in the 'ON' position, appropriate for anti-icing but, except for these points, nothing of the flight deck instrumentation remained to provide any useful information.

The port wing was almost completely destroyed by fire except for the tip and the outboard end of the aileron which was still attached; the starboard wing had been severely damaged but was essentially complete. Both sets of main spar attachments were intact and in good condition. The flying control system suffered very severe damage, the port control column being completely destroyed and only the lower half of the starboard column remaining. All cable pulley groups forward of Bulkhead No 4 were destroyed and only one rudder pedal out of the four was found. The aileron control and differential pulleys had been ripped out of both wings at impact but all cable lengths were recovered and all turnbuckles and connections were found to be secure except for the forward ends of the rudder cables and the end fittings which had been consumed by ground fire.

The flying control surfaces and their associated trim tabs had suffered various degrees of damage or destruction from impact or fire but from markings on the control surfaces it was possible to establish that at the moment of impact full left rudder, full right aileron down and full up elevator were being applied. The starboard elevator trim tab had been destroyed by fire but the port tab was undamaged and was in a position equivalent to about two-thirds of the total travel in the 'aircraft nose-up' sense. Whilst due allowances must be made for possible movement of this tab as a result of possible pulling of its control cables during the impact sequence it is nevertheless usual in such circumstances that a tab is pulled to a full extremity position before its cables finally separate; an undamaged tab which is at some intermediate position such as this one may, therefore, be considered as being a rather more valid indication. However, some reserve in making such a judgement is appropriate. There was nothing of significance found in either the aileron or rudder trim tabs.

The flaps had been at the 20° setting which is appropriate for an approach in this type of aircraft whilst the undercarriage had certainly been retracted at the moment of impact. There was somewhat contradictory eyewitness evidence as to the position of the undercarriage shortly before the accident but since this undercarriage is capable of extension or retraction in not more than 5 seconds this possible conflict of evidence is not considered to be of great significance.

The fuel and oil contents of the aircraft had been consumed by fire but there can be no doubt that there was ample fuel on board the aircraft which had left Luton only one hour previously with sufficient fuel for approximately five hours flying. The normal settings of the fuel selectors may be considered an indication that there had been no obvious pre-crash disruption of the fuel supplies to the engines.

The engines and the propellers were stripped and examined in detail by their respective manufacturers who independently reached the conclusion that these were indicative of some degree of power being applied at the moment of impact and that, except for damage immediately attributable to impact, there was no evidence of any other damage or malfunction. Corroborative evidence of this was provided by a number of witnesses who stated they had heard the sound of a considerable power application in the brief period between the stall and the final crash.

Despite detailed examination of the wreckage the extent of the damage and the partial destruction make it impossible to state positively that there could not have been any pre-crash damage or malfunction of the aircraft, its engines or its ancillary equipment.

1.12 Fire

There was no evidence of any pre-crash fire but there was a fire of major proportions immediately after the accident. In addition to the fire consequent on the ignition of the aircraft fuel supplies there were contributory effects from the house electricity and gas sources. Prompt and efficient action by the Wolverhampton Fire Service enabled them to confine the fire to the aircraft and the house it had struck, together with comparatively minor damage to the two immediately adjacent houses.

1.13 Survival aspects

Post-accident pathological examination did not disclose anything which suggested that any medical reasons could have been contributory to this accident. This was a non-survivable accident in respect of the two pilots and the occupant of the ground floor room in the house struck by the aircraft. The other two occupants of the house, who were in an upstairs room on the opposite side, were able to escape by jumping from a second storey window on to a grass forecourt, and sustained only minor injuries and shock in the process.

1.14 Tests and research

None.

1.15 Other information

The operation of the empty aircraft from Luton to Wolverhampton may be considered as having been a 'private' rather than a 'public transport' operation and, as a consequence, the terms of McAlpine Aviation's Air Operator's Certificate and of their operations manual were not necessarily strictly applicable as regards the weather minima to be used. However, McAlpine Aviation state that it is their policy that their pilots shall always operate strictly to the terms of their operations manual.

According to this manual the required weather minima for Wolverhampton on this occasion would have been circling limits, ie a height of 500 feet and a visibility of 2,000 metres. The manual also states that after two attempts to land in marginal weather conditions a pilot shall divert to his alternate aerodrome which, in this case, would have been Birmingham.

Damage to the flight instruments made it impossible to establish what altimeter setting had been in use.

2. Analysis and Conclusions

2.1 Analysis

It is clear from the evidence available that the accident resulted from a stall at a height from which recovery was not possible, but it is pertinent to consider whether this was caused by some malfunction of the aircraft or its engines or was simply the result of a flying error or misjudgement.

With regard to the former, whilst the extreme damage suffered by the aircraft made it impossible to say with absolute certainty that some malfunction did not occur, the evidence from the examination of the wreckage indicates this to be most unlikely. At impact with the ground the flying control surfaces were in the correct position to counteract the aircraft's attitude and from eyewitness evidence and the strip examination of the engines and propellers it was confirmed that considerable engine power had been applied in the brief interval between the stall and eventual impact. Thus all available evidence tends to confirm that the aircraft was serviceable up to its time of impact.

With regard to the second possibility, that the stall resulted from a flying error, there are several factors which merit consideration. On the one hand it is unlikely that such an experienced pilot would make such an error. Apart from considerable general flying experience he was more than usually practised at low level flying and in using small airfields with limited or no landing aids. Against this, however, he was comparatively inexperienced on the Dove and unfamiliar with the airfield at Wolverhampton. On this occasion visibility was poor and with hoar frost on the ground it would have been very difficult for the pilot to differentiate between the landing area and the surrounding fields. It may reasonably be assumed that it was this difficulty which led the pilot to make a close-in circuit in attempting to keep his intended touchdown point in sight. The evidence of one witness that the aircraft attitude was tail-down on the downwind leg, together with the supporting evidence of the position of the elevator trim tab could indicate that at this time its speed was low.

It is apparent that by the time the aircraft had nearly completed its downwind leg, it had descended to less than 200 feet. From this position, despite the close circuit, it seems possible that the pilot had either lost sight of or had misidentified the point of his intended touchdown. In any case, from that position and at that height, the aircraft was badly placed for a landing on Strip 25 and thereafter its position would have become progressively more unsuitable. Ultimately, at a height between 50 and 150 feet, and whilst heading about 90° to the centreline of the landing strip, the aircraft made "a very tight yawing left turn of about 45°, during which it appeared to lose both height and speed". A stall followed and the aircraft crashed.

Whilst the reason for the stall cannot be determined with certainty, after due consideration of the circumstances, it appears probable that whilst flying at a reduced airspeed and concentrating on his efforts to identify the runway threshold in difficult circumstances the pilot unwittingly allowed his speed to become eroded to the point where the initiation of a somewhat abrupt flat turn was sufficient to precipitate a stall.

2.2 Conclusion

(a) Findings

- (i) The documentation of the aircraft was in order.
- (ii) The aircraft was properly maintained and correctly loaded.
- (iii) During examination of the wreckage no evidence was found of pre-crash failure or malfunction of the aircraft, its engines or instruments.
- (iv) The pilot was correctly licensed and was nominally sufficiently experienced to carry out the flight. He was, however, relatively inexperienced on this type of aircraft and was also unfamiliar with Wolverhampton airfield.
- (v) In the weather conditions at the time, the pilot experienced difficulty in positioning his aircraft for a landing.
- (vi) The aircraft stalled at a low height during a turn manoeuvre which was apparently made as part of an attempt to position the aircraft for a landing on Strip 25 at Wolverhampton.

(b) Cause

The accident resulted from a stall at a height from which recovery was not possible. The precise reason for this has not been established.

N S Head
Inspector of Accidents

Accidents Investigation Branch
Department of Trade and Industry
May 1971