



DEPARTMENT OF TRADE AND INDUSTRY

## CIVIL AIRCRAFT ACCIDENT

Report on the accident  
to British Midland Airways Ltd  
Vickers Viscount 815 G - AVJA  
at Manchester Airport, Wythenshawe, Manchester  
on 20 March 1969

LONDON: HER MAJESTY'S STATIONERY OFFICE

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1970

From 20 October 1970 the Department of  
Trade and Industry assumed the  
functions of the Board of Trade

Board of Trade  
Accidents Investigation Branch  
Shell Mex House  
Strand  
London WC2

September 1970

*The Rt Hon Michael Noble MP  
President of the Board of Trade*

Sir

I have the honour to submit the report by Mr R C Warren, an Inspector of Accidents, on the circumstances of the accident to British Midland Airways Ltd, Vickers Viscount 815 G-AVJA which occurred at Manchester Airport, Wythenshawe, Manchester on 20 March 1969.

I have the honour to be

Sir,

Your obedient Servant,

V A M HUNT  
*Chief Inspector of Accidents*

ACCIDENT INVESTIGATION BRANCH

Civil Accident Report No EW/C310/01

*Aircraft:* Vickers Viscount 815 G-AVJA  
*Engines:* Four Rolls Royce Dart Type 530  
*Owner:* Hawker Siddeley Aviation Limited  
*Operator:* British Midland Airways Limited  
East Midlands Airport, Leicestershire  
*Crew:* Commander - Captain I D Wallace - Killed  
Co-pilot - First Officer R A Weeks - "  
Stewardess - Miss S Wallis - "  
Stewardess - Miss J Timson -  
Uninjured  
*Passengers:* Nil  
*Place of Accident:* Manchester Airport, Wythenshawe, Manchester  
*Date and Time* 20 March 1969 at 1558 hrs  
All times in this report are GMT

## Summary

*The aircraft was taking off from Manchester for a flight to Edinburgh when the accident occurred. No passengers or freight were being carried and the commander decided to carry out some co-pilot training which is believed to have included a simulated engine failure during the take-off phase.*

*As the aircraft became airborne, it was seen to yaw sharply to starboard and then level off momentarily as the yaw was arrested or corrected. Almost immediately afterwards, the aircraft went into a second and steeper climb and at the same time began to roll and turn to starboard. The aircraft eventually became inverted and dived steeply into the ground. Both pilots and one of the stewardesses were killed; the other stewardess was uninjured.*

*The report concludes that the accident was due to a loss of control following a simulated engine failure on take-off. The reason for the loss of control has not been determined.*

# 1. Investigation

## 1.1 History of flight

The aircraft had arrived at Manchester the evening prior to the accident, having diverted there because of bad weather at Castle Donington, the planned destination. Captain Wallace and his crew remained overnight at Manchester with the aircraft.

No maintenance was carried out on the aircraft during its time on the ground at Manchester other than routine servicing and the replacement of a defective starboard navigation light.

At 1430 hrs on 20 March the crew began briefing for a flight to Edinburgh, where the aircraft was to be flown empty to position for a later service to Castle Donington. Just prior to starting the engines at 1546 hrs, the commander informed the two stewardesses that he intended to use the flight for co-pilot training and that they should not be worried if the handling of the aircraft appeared to be somewhat rough. He gave permission for Miss Wallis, one of the stewardesses, to occupy the jump seat on the flight deck to observe the training. The other stewardess, Miss Timson, elected to remain in the main cabin and occupied the rearmost passenger seat on the port side.

Shortly before engine start-up, Miss Wallis returned momentarily to the cabin and in the course of conversation with Miss Timson told her that Captain Wallace appeared to be giving the co-pilot a very thorough briefing.

Whilst the aircraft was taxiing out to the take-off point for runway 06, Captain Wallace informed the Air Traffic Control (ATC) of his intention to carry out some training, and added that they should not be concerned if they saw anything abnormal happening during the take-off. ATC acknowledged this information and alerted the fire service for a training standby, which is the standard procedure at Manchester whenever there is an aircraft carrying out training.

A photograph taken of the aircraft as it was taxiing out shows it to be outwardly normal and this was confirmed by the runway controller who made his customary checks that all doors and hatches were closed. He also noted that the flaps were apparently set to the take-off position.

At the request of the commander, ATC gave approval for the aircraft to commence its take-off run from the original

threshold of runway 06, that is about 1,100 feet in from the actual threshold.

The take-off appeared to be quite normal and straight. After a ground run of approximately 3,000 feet, the aircraft was lifted-off in what was described as a positive manner. During the take-off and initial climb, some observers heard a change of engine note as if one or more of the engines was being throttled back, though none of the propellers was observed to slow down or feather. Opinion differed as to when the change of engine note occurred. The runway controller, who was observing the aircraft from astern and who knew that training was in progress, considered that it happened when the aircraft was approximately half way along its ground run. Another observer positioned abeam the aircraft considered the change of engine note occurred at about the moment of lift-off.

Almost immediately after take-off, when the aircraft was at about 10-15 feet, it was observed to yaw markedly to starboard, though remaining laterally level. The yaw appeared to be corrected very promptly, almost harshly as one witness (a Viscount pilot) described it. At the same time as the yaw was being corrected, the aircraft appeared to level off momentarily. It then commenced a second and steeper climb, during which it also began to roll and turn to starboard. The initial rate of roll was slow but it increased rapidly so that by the time the aircraft was at approximately 150-200 feet, the wings were vertical. The aircraft continued to roll and the nose then began to drop until the aircraft hit the ground inverted in a steep dive approximately 200 yards south of runway 06 and just to the west of runway 28/10. The time was 1558 hrs. The aircraft was destroyed by impact and a severe fire which broke out immediately. The two pilots and Miss Wallis were killed instantly. Miss Timson was uninjured and escaped through the rear cabin door. The fire and rescue services were on the scene within a minute and were able to contain the fire.

#### 1.2 Injuries to persons

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Others</i>
Fatal	3	-	-
Non-fatal	-	-	-
None	1	-	-

#### 1.3 Damage to aircraft

The aircraft was largely destroyed by the impact and the subsequent fire.

1.4 Other damage

Nil

1.5 Crew information

*Captain Ian Douglas Wallace*, aged 45, held a valid airline transport pilot's licence endorsed for command of HS 114, Dakota C47, Canadair C4, Dart Herald and Viscount aircraft. His last competency check on Viscount 815 aircraft was on 11 March 1969 and his last line check was on 19 March 1969 ie on the flight immediately preceding the accident flight.

His total flying experience was approximately 13,720 hours of which about 1,100 were on Viscount aircraft. He had flown 18 hours and 25 minutes in the last 28 days and had been free of duty for 18 hours before reporting for this flight.

He had served with the Royal Air Force as a pilot during the 1939-1945 war and subsequently as a pilot with British Overseas Airways Corporation and with British United Airways before joining British Midland Airways (BMA) in 1965. He was a training captain on Viscount aircraft and was also Air Safety Officer for BMA.

*First Officer Roger Anthony Weeks*, 26 years held a valid commercial pilot's licence endorsed for co-pilot duties on Viscount aircraft. His last competency check was on 19 November 1968 and his last line check was on 13 January 1969.

His total flying experience was about 618 hours of which about 368 were on Viscount aircraft. He had flown 38 hours 15 minutes in the past 28 days and had been free of duty for 18 hours previous to the accident flight.

Mr Weeks had joined BMA in February 1968 following his completion of an approved flying training course with the London School of Flying at Elstree during which he obtained his commercial pilot's licence and instrument rating.

Mr Weeks underwent a co-pilot's base check on 19 September 1968 during which a failure of No 4 engine was simulated during take-off. He was failed by the Check Captain for allowing the aircraft to swing 20° towards the dead engine. He was tested again on 25 September 1968, on this occasion by Captain Wallace, and was failed for allowing the aircraft to yaw badly and the speed to get dangerously low following a simulated failure of No 4 engine during take-off. Later the same day, Mr Weeks was re-tested by Captain Wallace and on this occasion his performance was satisfactory.

## 1.6 Aircraft information

G-AVJA was constructed by Vickers Armstrong (Aircraft) Limited at Weybridge in 1959 and went into service initially with Pakistan International Airlines Corporation. After a total of 18,455 hours flying it was removed from the Pakistan register and returned to the United Kingdom where it was registered as G-AVJA in May 1967.

It started service with British Midland Airways Limited on 2 June 1967 and remained in service with them until this accident; at that time it had flown a total of 21,670 hours since manufacture.

The certificate of airworthiness was valid until 1 June 1969 and the certificate of maintenance issued on 4 March 1969 was still valid at the time of the accident.

The maintenance records showed that the aircraft had been maintained in accordance with an approved schedule and there were no items of relevance outstanding in the technical log.

The engines were Rolls Royce Darts, Type 530 and the propellers were Dowty Rotol type R179/4-20-4/33. At the time of the accident the running hours of the four engines and their associated propellers were as follows:

<i>Since new:</i>	<i>No 1</i>	<i>No 2</i>	<i>No 3</i>	<i>No 4</i>
Engine	15,327	17,159	15,212	8,705
Propeller	15,829	14,001	1,402	14,661

*Since last complete overhaul:*

Engine	3,215	3,545	73	3,695
Propeller	2,548	1,738	N/A	3,696

All engines and propellers had been maintained in accordance with an approved maintenance schedule.

## 1.7 Meteorological information

The only information of relevance to this accident is the 1600 hrs meteorological observation for Manchester airport; this was as follows:

Surface wind:	108 <sup>0</sup> (M) at 07 knots
Visibility:	3 kilometres - smoke
Cloud:	4/8 at 1,800 feet, 8/8 at 6,000 feet
Weather:	Nil
Temperature:	Plus 5 <sup>0</sup> C
Pressures:	QNH 1023, QFE 1014.

Except possibly for the slight cross wind effect during the take-off on runway 06 (059<sup>0</sup>M), the weather is not considered to have been a factor in this accident.

1.8 Aids to navigation

Not relevant to this accident.

1.9 Communications

Communications between the aircraft and air traffic control were confined to the exchange of messages on the tower frequency of 118.7 MHz. In addition to the normal messages the commander informed the tower controller of his intention to conduct a training exercise in the following words:

"we shall be using this empty flight for training and so if you see anything abnormal happening on take-off don't be surprised."

1.10 Aerodrome and ground facilities

Runway 06 which was used for the take-off is 9,250 feet long, 150 feet wide and averages 230 feet above mean sea level. The pilot elected to start the take-off at what had originally been the runway threshold before the runway was extended; about 8,200 feet of runway was, therefore, available for the take-off.

The runway surface was dry and it is not considered that the runway or any other of the aerodrome or ground facilities are relevant to the accident.

1.11 Flight recorder

The MIDAS flight recorder with which the aircraft was fitted, contained no information concerning the accident flight. A read out of the tapes, which were undamaged, showed the recorder to have been functioning correctly up to the time when the aircraft arrived at Manchester the previous evening.

It was not possible to establish if the recorder had been switched on at the time of starting the engines. This should occur automatically with the operation of the engine master start switch, provided that the associated circuit breakers are made and the control switch placed in the "ON" position.

A detailed examination of the remains of the flight recorder system did not indicate any unserviceability to account for its failure to function.

1.12 Examination of the wreckage

Despite an exhaustive and detailed examination of the wreckage, the extent of the damage was such that it was only possible to establish the following:

- (a) The aircraft had struck the ground inverted, in a steep dive and at a slow speed. Initial impact had been on a heading of  $108^{\circ}$  M at a point approximately 500 feet south of the centreline of runway 06 and adjacent to the western edge of runway 28/10. After impact the aircraft had pivoted clockwise about No 1 engine, which was embedded in the ground, and came to rest on a heading of  $200^{\circ}$  M. Initial impact had been taken by the roof of the cockpit and almost simultaneously by No 1 engine and the port outer wing.
- (b) Flaps were set to the take-off setting of  $20^{\circ}$  and the undercarriage was down and locked.
- (c) Full aileron to port was being applied at impact and an undetermined amount of port rudder. Although part of the flying control system of cables and levers had been totally destroyed by fire there was no evidence of any defect or malfunction and the elevators were still free to move. Trim tab settings were in the normal range.
- (d) The engine and propellers were stripped and examined by their respective manufacturers under the general supervision of the Accidents Investigation Branch. It was concluded that the engines were rotating at reduced rev/min at the time of impact and that the propeller blade settings indicated a transient state, probably a result of a slam deceleration. Although the propellers had been severely damaged, microscopic examination of the ball races indicated that the pitch settings at impact were as follows:

No 1	$28^{\circ}$
No 2	$29^{\circ}$ or more
No 3	$32^{\circ}$ to $35^{\circ}$
No 4	$32^{\circ}$ to $35^{\circ}$

These settings are all in the flight fine-pitch range.

### 1.13 Fire

A major fire broke out on impact and severely damaged the port wing and forward part of the fuselage. The prompt arrival of the airport fire service enabled them to prevent the spread of fire to the fuel which had escaped from the starboard wing tanks.

### 1.14 Survival aspects

The impact of the aircraft with the ground from a steep inverted dive crushed the forward part of the fuselage, killing the occupants of the flight deck instantly.

Because the aircraft pivotted about No 1 engine before coming to rest, the deceleration of the rear part of the fuselage, in which Miss Timson was sitting, was relatively gradual and the structure, including the seat attachments, remained intact. Miss Timson, who had her lap strap fastened, was uninjured. The fire did not immediately reach the area where she was seated, though there was a considerable spillage of fuel along the cabin roof.

Miss Timson experienced some disorientation after the aircraft came to rest and she became confused as to which direction she was facing having fallen on to the cabin roof after releasing her seat belt. Eventually she made her way to the rear cabin door, which had sprung open on impact, and jumped clear of the wreckage.

## 1.15 Tests and research

### 1.15.1 *Flight tests*

Some flight test results obtained in the normal course of training on a Viscount 700 were provided by the Empire Test Pilots School, Boscombe Down. The tests were made with the undercarriage down and 20° flap at an airspeed of 110 knots. Following a simulated failure of No 4 engine, only corrective aileron was applied and no rudder. This resulted in a 10° sideslip to port and at the same time it was noted that the indicated airspeed (IAS) fell by 3 knots and the vertical speed indicator (VSI) showed a descent of 400 feet per minute. A further set of results showed that if rudder was applied in the wrong direction following a simulated failure of No 4 engine but with aileron applied correctly to hold the wings level, 18° of sideslip resulted. This produced a strong nose-down change of trim and an apparent reduction of airspeed of 22 knots. The pilot concerned described it as a violent and unpleasant manoeuvre.

### 1.15.2 *Pathological tests*

A post mortem examination did not indicate any physical defect or disease in either of the two pilots which could have had any bearing on the accident.

## 2. Analysis and Conclusions

### 2.1 Analysis

#### 2.1.1 *Lack of positive evidence*

Although nothing was discovered during the wreckage examination to indicate any pre-crash technical malfunction, it was not possible to say with certainty that there had not been any such failure because the investigation was necessarily limited by the extensive nature of the impact and fire damage. Furthermore, the absence of any information from the flight recorder made it impossible to establish the precise nature of the flight path of the aircraft. Such evidence as is available is largely of a qualitative nature, and therefore the analysis of the accident is limited to a discussion of the various possibilities which could have led to a loss of control.

#### 2.1.2 *Purpose of the training exercise*

There is no doubt that the take-off sequence was intended by the captain to incorporate a training exercise, although its precise nature cannot be established with certainty. However, in view of the captain's comments to the stewardesses and to Air Traffic Control, it is reasonable to assume that a simulated engine failure during the take-off phase was intended. Further support for this conclusion is that the co-pilot is known to have had difficulties with this exercise on previous occasions, and Captain Wallace may well have considered it appropriate to concentrate on this aspect.

#### 2.1.3 *Simulated engine failure*

The assumption that a simulated engine failure was in fact carried out is based solely on the change of engine note heard by some witnesses during the take-off phase. Even then there was some difference of opinion as to when this occurred. If the simulated failure was initiated whilst the aircraft was still on the runway, then the appropriate corrective action must have been taken immediately and precisely because no detectable swing was observed by the runway controller who was in the most favourable position to see this had it occurred. Furthermore, when the aircraft lifted off, it did so without any noticeable yaw or roll, again indicating that precisely the right amount of control was being applied. In view of the co-pilot's previous difficulties with this exercise, it is considered unlikely that he would have achieved such precision of control following a simulated engine failure on the runway.

It is considered more likely that the marked yaw to starboard which occurred shortly after take-off was coincident with the throttling back of one of the starboard engines, most probably No 4. The absence of any roll in association with the yaw suggests that the pilot responded to the simulated engine failure by applying a considerable amount of aileron but insufficient rudder. This is not unusual with inexperienced trainee pilots on Viscount aircraft because in an asymmetric condition the roll appears to predominate. Because of the drag of the down-going starboard aileron, the yaw would be aggravated.

#### 2.1.4 *Effect of the yaw*

In a sideslip condition, a nose-down change of trim is normally experienced and it could well have been this feature which caused the aircraft apparently to level-off shortly after the yaw occurred and not because of the deliberate application of down elevator by the pilots. It is apparent from the Boscombe Down tests that the sideslip could also have resulted in the vertical speed indicator showing a rate of descent; the altimeter a loss of height; and the airspeed indicator a loss of airspeed. All these errors could have been relatively small, but, considered in combination with the nose-down-pitch, may have been sufficient to have convinced the pilot that the aircraft was descending towards the runway, even though it was in fact flying level at this stage. The pilot's instinctive reaction would have been to apply nose-up elevator control. The abrupt resumption of the climb may well have been due to a sudden correction of the yaw (possibly by the captain) at a time when the co-pilot was already applying up elevator to correct the nose-down change of trim.

#### 2.1.5 *Loss of control*

Whatever the reason for the aircraft entering the second and steeper climb, it was at this point that full control of the aircraft was lost as it began to roll and turn to starboard. If this loss of control was not due to a serious propeller or control malfunction, and no evidence of this was brought to light, then it can only have been due to the airspeed falling below the minimum control speed ( $V_{mca}$ ). The relative slowness of the manoeuvre, particularly in the initial stages, suggests firstly that full corrective aileron and rudder control was being applied. It also suggests that neither of the starboard propellers had entered the ground-fine-range, as this would have resulted in a greater rate of roll than appears to have been the case.

#### 2.1.6 *Summary of the analysis*

Because of the lack of positive evidence there are no firm conclusions that can be drawn from the investigation into this accident. Control of the aircraft

appears to have been lost by the pilots whilst carrying out a normal routine training exercise. The co-pilot's ability to handle the aircraft under asymmetric conditions had initially been poor. Captain Wallace was aware of this and it was he who had subsequently re-examined Mr Weeks and assessed him as having reached a satisfactory standard. Nevertheless, a degree of mishandling may have occurred which placed the aircraft in an irretrievable situation before Captain Wallace was able to prevent it. It is also possible that there may have been some unexpected mechanical failure in association with or following the simulated engine failure and which posed insuperable handling problems. Although no evidence was found to support this, the extent of the damage to the aircraft made it impossible to eliminate this possibility.

## 2.2 Conclusions

### (a) *Findings*

- (i) The documentation of the aircraft was in order and the aircraft was properly loaded.
- (ii) The aircraft had been maintained in accordance with an approved maintenance schedule.
- (iii) The crew were properly licensed and adequately experienced.
- (iv) Detailed examination of the wreckage revealed no evidence of pre-crash failure or malfunction.
- (v) The flight data recorder appears to have been inadvertently switched off prior to flight. It was otherwise found to be serviceable.
- (vi) At some stage during the take-off, a simulated engine failure was initiated, probably at or just after lift-off.
- (vii) Following the simulated engine failure, control of the aircraft was lost.

### (b) *Cause*

The accident was due to an unexplained loss of control following a simulated engine failure during take-off.

R W WARREN  
*Inspector of Accidents*

Accident Investigation Branch  
Board of Trade  
September 1970

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