No. 19

Silver City Airways Ltd., Bristol aircraft, G-AICS, crashed near the summit of Winter Hill, 5 miles SE of Chorley, Lancashire, on 27 February 1958. Report released by the Ministry of Transport and Civil Aviation (UK). C.A.P. 152.

Circumstances

The aircraft, operated by Manx Airlines Ltd., took off at 0915 hours from Ronaldsway Airport, Isle of Man, on a flight to Ringway Airport, Manchester. It carried 39 passengers and a crew of 3. At approximately 0945 hours the aircraft crashed near the summit of Winter Hill, killing 35 of the 42 persons aboard. The pilot was seriously injured.

Investigation and Evidence

The Route and Procedure

The route which was chosen for the first part of the flight is known as ADR 159 (see Figure 15). It is an advisory route and brings aircraft from the Isle of Man to a point - marked as "Reporting Point" - which is over the sea about 3 miles from Squire's Gate, Blackpool. An aircraft coming to the Reporting Point off Squire's Gate must obtain a clearance from the Air Traffic Controller in Manchester Control Zone before it may enter the Zone. This clearance is given to the aircraft by the Air Traffic Controller at Northern Air Traffic Control Centre, Preston. Preston Control obtains the necessary clearance from the Air Traffic Controller at Manchester Control Zone and passes it on to the aircraft. When the aircraft has passed into the Manchester Control Zone, having obtained its clearance, any further instructions come to the aircraft direct from Manchester Control, which is located in Antrobus.

The route chosen for G-AICS was ADR 159 to the boundary of the Manchester Control Zone. From the Reporting Point the intention was to fly to Wigan Beacon and from there there were two possible routes either of which might have been ordered by Manchester Control to Ringway Airport.

Wigan Beacon is one of a number of beacons in the Manchester Zone. It is a non-directional beacon and has a range of approximately 25 miles. Its frequency is 316 kilocycles and its recognition signal is the letters MYK transmitted in morse code. One of the other non-directional beacons in the Manchester Zone is Oldham Beacon, which is also shown on Figure 15. It is considerably more powerful than Wigan Beacon, having a range of about 50 miles. Its frequency is 344 kilocycles and its recognition signal is MYL.

On the chosen route no ground within 5 miles of the track is higher than 567 ft above sea level. Between 7 and 8 nautical miles from Wigan Beacon, in a northeasterly direction, lies Winter Hill on which the aircraft crashed. Its summit is 1 498 ft above sea level and on the summit there is a television station and mast. The mast is 445 ft high, so that the top of the mast is 1 943 ft above sea level.

The captain had flown a number of times previously on the intended route

from Ronaldsway to Manchester. On most previous occasions he had either flown the whole way at a height of 2 500 ft or 3 500 ft or, if he crossed the sea at a lower height, he had been sent up to at least 2 500 ft before entering the Manchester Zone. On one previous occasion he had flown this route at 1 500 ft the whole way. The first officer had not previously flown to Manchester via the Wigan Beacon. He had flown to Manchester on a number of occasions by the "Red Three" route, via Wallasey.

On this flight, it was intended to fly at 3 500 ft and the first officer, with the captain's approval, had made out his flight plan accordingly. In fact, the flight was made at 1 500 ft. for the following reason.

Prior to take-off, in order to avoid delay, a clearance to fly at 1 500 ft was offered and accepted. In the light of past experience the captain anticipated that he would be cleared to a higher altitude on crossing the English coast.

Between Ronaldsway and the Reporting Point at Squire's Gate the flight was made below cloud practically all the way. Visibility was reasonably good. When approaching the Morecambe Bay Light Vessel the captain obtained a bearing from Ronaldsway - this showed that the aircraft was very slightly to the North of its planned course. He then went below to talk to the passengers for approximately a five minute period. During his absence the first officer flew the aircraft, kept a lookout and tried to set up the Decca apparatus. It is probable that during this time, unknown to the captain, he made what he describes as an "S turn", to bring the aircraft slightly further south towards the Reporting Point. It was also during this brief period that the first officer set the radio compass on what he thought was Wigan Beacon, but, was in fact, Oldham Beacon.

On his return to the cockpit the captain took over the piloting of the aircraft and continued to do so until the crash occurred. When he took over he assumed that the radio compass was tuned in to Wigan. At this time he looked at the magnetic compass and the course being flown appeared to him to be consistent with a course to Wigan. Thereafter he concentrated his attention on the radio compass.

Shortly after the captain took over, a series of messages was exchanged between the aircraft and Preston Control for the purpose of obtaining a clearance into the Manchester Zone. The ATC Officer (Preston) was the one who had arranged with Ronaldsway Control the original offer of a clearance at 1 500 ft which had been accepted. Just prior to 0938 hours the aircraft reported to Preston Control "abeam Blackpool at this time estimating Wigan at 43". Having received this message, the ATC Officer, Preston, spoke to Manchester Control to ask for a clearance for the aircraft into the Manchester Zone. Because of other traffic in the area, the Zone Controller, Manchester, gave the ATC Officer, Preston, a clearance, to be offered by him to G-AICS, at 1 500 ft. What was offered was a clearance to Wigan Beacon at 1 500 ft, "visual contact" or "contact". Two points must be emphasized. First, the clearance offered was to Wigan Beacon only. A further clearance would have been required from Wigan Beacon onwards to Ringway Airport. This clearance might have been given before or after the aircraft reported at Wigan Beacon. If it had not received a further clearance before arriving over Wigan Beacon, it would have had to have "gone into a holding pattern"; that is, circled northwest of Wigan Beacon until a further clearance was given. In fact, no further clearance, in the events which happened, was ever given. Secondly, it is to be noted that the clearance was subject to the condition of "contact" or "visual contact".

When the ATC officer (Preston) had been given this clearance by the Zone Controller (Manchester), he immediately passed it on to the aircraft. At 0939 he said to G-AICS: "You are cleared to Wigan 1 500 ft remaining contact. Call Manchester Zone ... for onward clearance." The captain accepted the clearance as offered. His acceptance was reasonable and proper in the circumstances as they were known to him, including the meteorological information which he had been given at Ronaldsway, his knowledge of the terrain over which his supposed course would take him, and the actual weather conditions as they then appeared - all on the assumption that he was homing on Wigan Beacon. The aircraft, flying over the sea at 1 500 ft, had been about 500 ft below the cloud base; visibility had been reasonably good; and, so far as the captain could see and estimate, visibility would remain reasonably good as far as Wigan Beacon, so that he would be able to see the ground, without cloud interference, all the way, preserving his height of 1 500 ft.

When this clearance was passed to the aircraft the Barnsley QNH should normally also have been included. The ATC Officer (Preston) said that his decision not to give the Barnsley QNH was deliberate and that it was based on his interpretation of the Regulations. It may be that if the Barnsley QNH had been given to G-AICS this accident would, fortuitously, have been avoided. The Barnsley QNH at that time was 1 021 millibars. The Holyhead QNH, to which the altimeters of the aircraft had been set, was 1 024 millibars. If the captain had received the Barnsley QNH he would have reset his altimeters 3 millibars lower than they were in fact set, which would have made a difference of 90 ft. If the captain's altimeters had been set 90 ft lower, he would, in attempting to maintain a height of 1 500 ft, probably have been flying 90 ft higher than he was in fact flying. The crash occurred at a height of approximately 1 460 ft, 38 ft below the summit of Winter Hill. An extra 90 ft of height would have resulted in the aircraft clearing the summit of the hill with some 50 ft to spare, but the possibility of collision with the television mast would have remained. The primary responsibility for this error lies with the ATC Officer. However, the captain is also concerned, since it was his duty to ask for the Barnsley QNH, if it was not given to him by the traffic controller.

At 0942 hours Manchester asked G-AICS: "What was your estimate for Wigan again please?" The reply was, "Forty-three". At this moment the aircraft should have been very close to the Wigan Beacon. In fact, it must, as a result of the wrong setting of the radio compass, have been already too far to the east, and to have been heading for the neighbourhood of Winter Hill on its course to Oldham.

At approximately 0944 the aircraft was in cloud and out of contact with the ground. A message from Manchester Control at this time was, "Charlie Sierra will you make a right turn immediately on to a heading of two five zero. I have a faint paint on radar which indicates you're going over towards the hills." Shortly thereafter in the course of making the right turn as ordered, the aircraft crashed on the northeast slope of Winter Hill, at a height of approximately 1 460 ft.

The Setting of the Radio Compass

The control unit of the radio compass in this aircraft was in the roof of the cockpit, above and perhaps slightly behind the first officer's seat. In order to bring the radio compass into use for the purpose of "homing" on a particular beacon, the procedure is:- first, turn the selector switch on the control unit to the position marked "ANT" (meaning "antenna"); then turn the tuning handle on the same control unit, until it indicates the frequency in kilocycles of the particular beacon. If the aircraft is within range of the beacon's transmission, the operator in the aircraft will then hear the recognition

signal, in morse, of the particular beacon, repeated at intervals. The selector switch is then moved from the "Antenna" position to the "Compass" position, and the volume of sound may be lessened by turning a control called "Audio". The recognition signal can probably still be heard, but probably only with difficulty and indistinctly. The pointer of the radio compass itself, which is in the instrument panel in the front of the cockpit will then point to 0° when the aircraft is flying directly towards the beacon.

There is thus a double check that the radio compass has been set on the intended beacon:

1. there is the setting to the particular frequency of the desired beacon;

2. there is the recognition signal.

The frequencies and recognition signals of all beacons in a particular area are given in a book known as the "Aerad Flight Guide" which was carried in the aircraft and used by the first officer on this occasion. If he had looked correctly at the entries opposite "Wigan", he would have found that the frequency was 316, and the recognition signal "MYK". If he had set the tuning scale to 316, he would have received signals from Wigan and not from Oldham, and he would have heard the recognition signal "MYK"; whereas if he had tuned on Oldham (frequency 344 kcs) and listened for the recognition signal, he would have heard the recognition signal "MYL". The letter "K" in morse is -.- (dash dot dash); the letter "L" is .-.. (dot dash dot dot); and no one with experience of the morse code should have confused the two. Of course, if he had failed to listen for the last letter of the call sign he would have heard only the letters MY in morse, and these are the first two letters of both stations.

Unfortunately, there can be no doubt but that the first officer for some reason tuned the radio compass to Oldham Beacon and not to Wigan Beacon. After the accident it was found that the frequency setting on the tuning scale of the control unit was 344 kilocycles (Oldham Beacon frequency) and, by test, that the actual frequency of the instrument was 344 kilocycles. Moreover, the position of the loop aerial and the reading on the bearing indicator are both consistent, having regard to the probable extent of the starboard turn which had been made before the crash, with the radio compass having been set on the Oldham Beacon at the time of the crash.

It appeared to the investigator that the most probable explanation of the error was that the first officer, without realizing it, had in his mind some, possibly subconscious, association between Oldham and Wigan and that, therefore, in looking at the Guide and running his eye down the page, when he saw the name "Oldham" he momentarily assumed that that was the place which he required and therefore deliberately, although of course without realizing that he had made this mistake, took the Oldham frequency from the Guide and tuned in the radio compass to the Oldham frequency, and heard the very recognition signal which he thus expected to hear.

This explanation was strengthened by the following:

1. the first officer's conversation with a Transmitter Maintenance Engineer in the Television Station shortly after the accident when he took the initiative in mentioning Oldham, though he may have mentioned other towns in the neighbourhood as well;

2. by his statement to an Inspector of Accidents the day after the accident, when, on being asked "Which beacon would you go to in the Manchester Zone?" - he replied -"I think you get Blackpool, Oldham, etc."

Another possible explanation, though less probable, is that, in turning the tuning switch, he somehow missed, or overran, the Wigan frequency of 316 kilocycles which he intended to select, and, when the switch was in the neighbourhood of 344 kilocycles, the Oldham call sign came in strongly. He then assumed that he had got Wigan Beacon, and failed to listen carefully to the recognition signal, so that he did not notice that he was getting "MYL", instead of "MYK", which on this hypothesis, he would have been expecting.

It was suggested on behalf of the first officer that one of the factors contributing to the mistake may have been that he was trying to do too much. He was, at the time of setting the radio compass, also flying the aircraft, keeping a lookout, and trying to set the Decca apparatus. He ought not at that time to have allowed himself to be distracted by the Decca apparatus. As it could not in any case have been brought into use until Wigan Beacon, he should not have done anything about it while he was actually flying the aircraft.

Ballast and Inaccuracies in the Load and Trim Sheet

Errors and carelessness in connection with these subjects were criticized. However, they did not contribute to the accident.

The Failure to Give to G-AICS the Barnsley QNH

The primary purpose of the QNH is not related to the clearance of an aircraft from terrain obstacles, but to the preservation of sufficient space between aircraft themselves, flying at different levels.

It is believed that the conception of the Air Traffic Controller, Preston, was that as the aircraft's flight was at 1 500 ft and, possibly also, because therefore it was not at 1 500 ft above aerodrome level), the pilot would not require, or use, the Barnsley QNH and should not be given it. This was regarded as a misconstruction of the Regulations, even when read in the light of the QNH altimeter setting procedures. Apart from any other consideration, it was by no means certain that the aircraft would not be sent above 1 500 ft on a further clearance by Manchester Control.

As it now appears that doubt can arise in the minds of Air Traffic Control Officers as to the construction of the Regulations in particular circumstances, the wording of the Regulations, and the "procedures", should be carefully reconsidered in order to remove any possible ambiguity. This is already under consideration by the Ministry of Transport and Civil Aviation. The error of the Air Traffic Controller, which ought in any event to have been rectified by a request from the pilot, cannot properly be regarded as having contributed to the accident, except fortuitously.

Weather

Prior to the flight a forecast issued at 0820 hours was obtained from the Meteorological Officer at Ronaldsway. It showed that the wind velocity at 1 500 ft was expected to be 300°/25 knots. The lowest layer of cloud was forecast as 1/8 to 3/8 stratus, base 600 to 1 000 ft. The second layer, stratocumulus, was expected to have its base at 2 000 to 3 000 ft. The surface visibility was shown as 3 to 6 nautical miles, locally 1 to 3 miles. The general weather was given as "Cloudy, periods of rain". The aerodrome forecast for Manchester showed "rain" with a first layer of cloud of 4/8 stratus at 800 ft and a second layer of 8/8 stratocumulus at 1 500 ft.

With such a forecast there would be, at the least, a strong possibility of low and dense cloud existing or developing on hills. There was no change in the

weather conditions, as given in the forecast before departure such as to require special notification to G-AICS.

Responsibility of the Pilots

The first officer admitted, in the light of the evidence, that he must have inadvertently tuned the radio compass to the wrong beacon. He could not himself give any real explanation for the mistake. The Court, after full consideration, concluded that no possible explanation could be consistent with the skill and care which the first officer ought, in the circumstances, to have shown.

There are two possible grounds on which the responsibility for the accident might be attributed to the captain. They are as follows:

1. the first depends on the suggestion that he continued to fly on his supposed course after weather conditions had become such that he ought to have realized that there was danger, or that the condition of "contact" in the clearance which he had been given was no longer being fulfilled;

2. the second is that he had a duty to check that the radio compass was in fact tuned on Wigan Beacon, and that he made no effective check.

When the aircraft was in the position which we now know was over Euxton or Chorley, it began for the first time to run into patches of cloud and there was light rain. Possibly it was, rather, patches of cloud below the aircraft. After that, there was a deterioration of visibility, and then a sudden complete envelopment in cloud. Up to the moment of sudden envelopment in cloud the captain had not, according to his interpretation of the phrase, lost "contact"; since, apart from momentary obscuring by patches of cloud, he had not hitherto been prevented from seeing substantially the whole of the ground beneath him.

It will be borne in mind that the captain was firmly under the impression that he was on the direct course to Wigan, and it never crossed his mind that he could be less than about 7 miles from Winter Hill. He was waiting for Wigan Beacon to show on the needle of the radio compass and he was from moment to moment expecting the needle of the compass to swing round, showing that he had crossed the Beacon. It is clear that he did not know, from any observation of the ground, precisely where he was.

Bearing in mind the doubt and ambiguity as to the meaning of the word "contact" in clearances such as this the investigator acquitted the captain of blame in respect of his continuing to fly for as long as he did without seeking further instructions from Manchester Control or reporting loss of "contact", or taking other action. After he had reported loss of "contact", the order to turn immediately followed. It was considered that the phrase "contact" should always connote sufficient forward visibility, in relation to all obstructions on, or within 10 miles of, the course. However, the captain did not so interpret it.

When the captain understood some time before the aircraft arrived at the Reporting Point that the first officer had set the radio compass on Wigan Beacon, he took no steps whatever to check the setting himself, other than to compare his radio compass course with the magnetic compass. He took no steps to ensure that the first officer checked, or re-checked the radio compass setting.

It is at all times the duty of the captain of an aircraft to ensure its safe navigation. It may be too high a standard to lay down that a captain should check every beacon tuned in by his first officer. There are, however, certain occasions when it is the absolute duty of the person in command to check the identification

of radio aids. Checking is required when making an instrument approach to land, or when flying in a control zone, or when flying below the minimum safe altitude for the area, or when the particular radio aid is the only navigational aid available and there is no means of effective cross-checking by reference to something else. At least two of these factors existed on this flight from the Reporting Point to Wigan. The captain failed to check the correct tuning of the radio compass as he should have done. Had he done so, the mistake probably would have been detected and the accident prevented.

Probable Cause

The accident was attributed to the error of the first officer in tuning the radio compass on Oldham Beacon instead of on Wigan Beacon.

A contributory cause was the failure of the captain to check that the radio compass was tuned on the correct beacon.

Recommendations

Location of Equipment

It was suggested that in this aircraft the position of the radio compass control instrument was inconvenient in that it involved some difficulty for the first officer to operate it, reaching over his left shoulder to the roof of the cockpit; and greater difficulty for the captain to operate. In aircraft such as this, fitted with only one ADF, the control box should be within comfortable reach of both the captain and the first officer while actually flying the aircraft from their appropriate seats.

In G-AICS it was not altogether easy for the captain to speak into his microphone. It should be possible for the two pilots to communicate freely at all stages of the flight when both are in the control cabin. In aircraft which have a high noise level in the cockpit, consideration should be given to the advisability of the pilot at the controls wearing some type of boom microphone or, at the very least, having a hand microphone so mounted that it can be reached and used without any difficulty from his natural position while flying the aircraft.

Recognition Signals of Navigational Aid Stations

A number of navigational aid stations in the area in question have recognition signals beginning with the same letters, "MY", and still more of them have "M" for their first letter. This may contribute to errors of identification. It might be better if the recognition signals bore some general identification with the names of the respective stations. At the same time, it would undoubtedly be helpful if the "rate of coding" were to be increased. At the time of the accident, Wigan Beacon gave its recognition signal only twice in one minute, i.e. the pilot seeking identification may have to wait for 30 seconds before he can identify the station. It was thought that a rate of coding of less than six per minute was not really satisfactory. It is recommended that these matters be given urgent attention by the Ministry of Transport and Civil Aviation.

Regulations Regarding QNH

It is recommended that consideration be given by the Ministry of Transport and Civil Aviation to a clarification - if possible by way of simplification - of the wording of the U.K. Air Traffic Control Instructions as to Altimeter Settings and of the QNH altimeter setting procedures in the "U.K. Air Pilot".

Definition of "Contact" in Relation to Clearances.

In the present case, a clearance was issued containing the words "1 500 ft

remaining contact". That clearance, in the view of the investigator, was intended to be and was acted upon as a clearance under the Special Visual Flight Rules. It was, and was understood to be, a clearance in weather conditions which did not permit an ordinary Visual Flight Rules clearance, subject to two conditions. These were first, that the aircraft should fly at a height of 1 500 ft above sea level and second, that it should at all times "remain contact". Different meanings to the word "contact" were given by different witnesses.

There were those who thought that "contact" implied ability to navigate by reference to the ground; those who thought that it implied ability to fix one's present position at any given moment by reference to observation of the ground; those who thought that it referred only in varying degrees to the ability to see the ground beneath one. It is noted that the captain did not apparently know his position, by reference to the ground, when he flew over Chorley, already well off his course, though he regarded himself at that stage as still "remaining contact".

It ought to be recognized that if a "contact" clearance is ever given, an essential condition of that clearance is that the pilot has, and will continue to have, adequate forward visibility.

It was considered whether it ought to be recommended that if the word "contact" is to continue in use as a condition of clearances, the word should be defined so as to include specifically a particular minimum range of forward visibility. It was concluded that such a specific and universally applicable definition would be undesirable for a number of reasons. First, it might properly be regarded as infringing the vital principle of the pilot's responsibility for terrain clearance. Secondly, it would be impracticable to lay down a satisfactory range of forward visibility which should be applied universally and in all circumstances. Thus, that which would be a safe forward visibility for a slower aircraft might be less than safe for a faster aircraft; or that which would be safe for one height or one area might be unsafe for another height or another area. Thirdly, if a universally safe minimum were to be prescribed, it might involve, in certain areas and for certain traffic, an undue interference with the movement of aircraft, without a countervailing additional safety factor.

It is strongly recommended that the MTCA should, by whatever is the appropriate means, bring to the attention of all concerned that, whenever a "contact" clearance is given, it is the responsibility of the pilot at all times to ensure that he not only keep contact with the ground but also that he should continue to fly on that clearance only so long as the forward visibility remains sufficient for safe navigation in all the circumstances of the particular flight. Those circumstances include the height and speed at which he is flying and the existence of obstructions not only on his direct course but also within a distance of at least 10 miles on either side of his direct course, whether or not he has any reason to suppose that he may be off his direct course.

It should be clearly understood by any pilot who is offered a "contact" clearance for a flight at 1 500 ft from Blackpool to Wigan Beacon that in flying on this clearance it is his responsibility to ensure that his forward visibility is never less than is sufficient to give him an adequate margin of safety, bearing in mind that Winter Hill, with a height of over 1 500 ft, is within 10 miles of his direct course. He will thus need to have - and continue to have - at all times a longer range of forward visibility than would be required in the case of a "contact" clearance in an area where there is no high ground within 10 miles of the direct course.

The MTCA should consider the whole question of Special VFR Clearances with a view to making it clear that a Special VFR Clearance should never be initiated by Traffic Control but should be offered only if it is specifically requested by the pilot; and, of course, even if it is requested by the pilot, it should be offered by Traffic Control only if the latter is satisfied that it is safe from the point of view of separation of aircraft. The U.K. Air Pilot, RAC 12, paragraph 6, shows that a Special VFR Clearance is to be regarded as a concession. It may be desirable to strengthen the concessionary concept in the way in which it has been suggested; since a pilot specifically requesting Special VFR will be more acutely aware of his responsibility in setting aside the protections of IFR or VFR than he might be if he were merely attempting to comply with a course of action suggested by Traffic Control.

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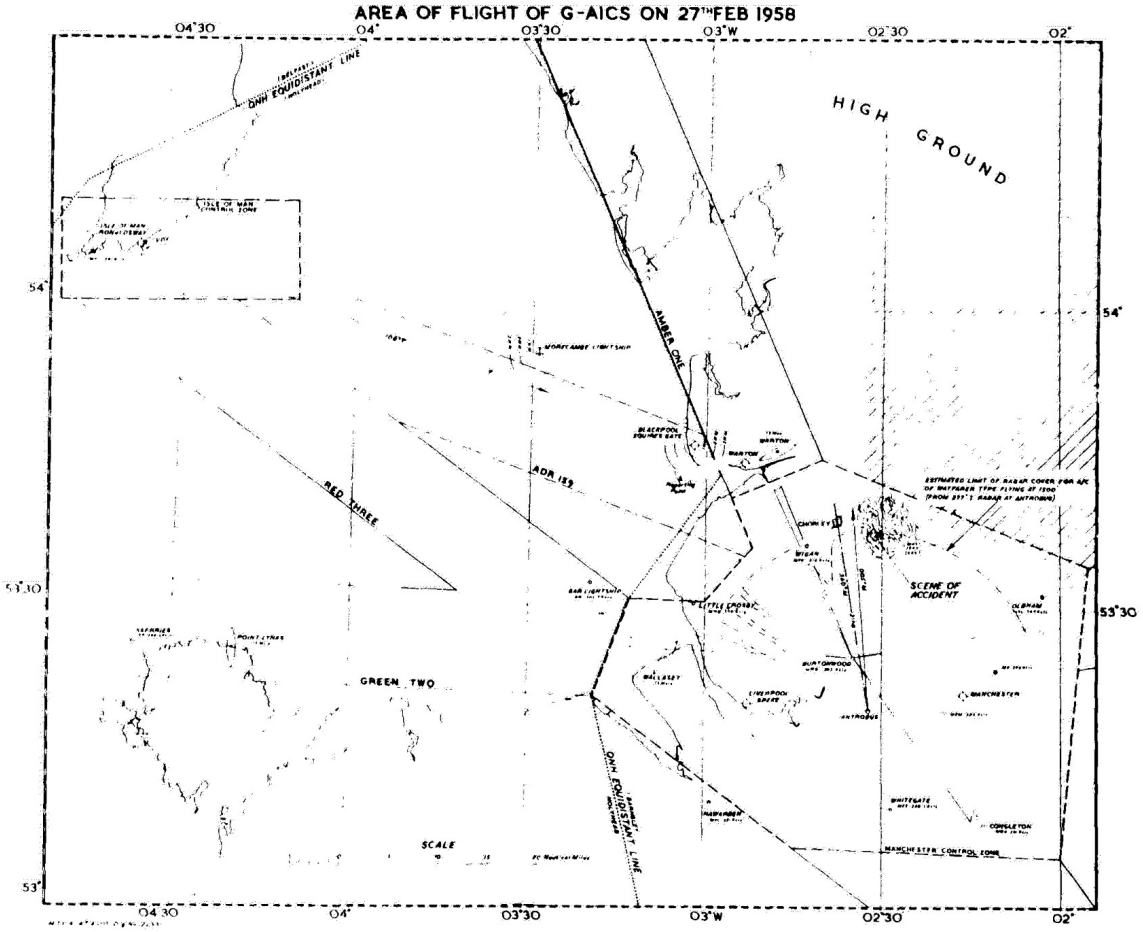
AREA OF FLIGHT OF G-AICS ON 27TH FEB 1958
04°30
04°
03°30
03°W
02°30
02°
54°
53°30
53°
HIGH GROUND
AMBER ONE
RED THREE
GREEN TWO
AOR 153
SCENE OF ACCIDENT
SCALE
MANCHESTER CONTROL ZONE

FIGURE 15