

No. 43

British Overseas Airways Corporation, Argonaut aircraft, G-ALHL, crashed on landing at Idris Airport, Tripolitania, United Kingdom of Libya, 21 September 1955.  
Report released 15 October 1955 by Ministry of Communications, Libya.

Circumstances

The aircraft was operating the Rome-Tripoli sector of a scheduled flight London-Rome-Tripoli-Kano and Lagos. The accident occurred during the fourth attempt to land at night on Runway 11 at Idris Airport in conditions of strong wind and poor visibility. During the last approach the aircraft struck trees and crashed 1 200 yards short of runway 11, at 2223 hours Greenwich Mean Time and fire broke out before it came to rest. Of the 7 crew members and 40 passengers on board 15 were killed instantly and 21 were injured.

Investigation and Evidence

The captain and first officer stated that throughout the flight and at the time of the accident there was no malfunctioning of any part of the aircraft, its controls, instruments, engines or equipment.

The Meteorological Office, Idris Airport, issued the following weather reports to Air Traffic Control during the evening of 21 September.

<u>TIME</u>	<u>WIND SPEED &amp; DIRECTION</u>	<u>CLOUD</u>	<u>WEATHER</u>	<u>QNH</u>	<u>VISIBILITY</u>
2100	110° 17 kts, gusting 25	No low cloud	Rising sand	1014 mbs.	2 n. m., 4500 yards
2205	100° 20 kts, gusting 27	Nil	Rising sand	1012.8 mbs.	0.9 n. m.
2224	120° 20 kts, gusting 28	Nil	Rising sand	1012.7 mbs.	2000 yards.

The 2205 hours report was not transmitted to the aircraft. It was taken to the Air Traffic Control Tower by the Meteorological Observer at 2209 hours at which time the Approach Controller on duty was speaking to the aircraft. The Aerodrome Controller was out by the runway with a Very light pistol ready to assist the aircraft by firing signal cartridges. The Air Traffic Control Clerk was temporarily absent. The Meteorological Observer, therefore, left the report on the Aerodrome Controller's desk and it was not seen until after the accident. The 2224 hours

weather report was made at the request of Air Traffic Control immediately after the accident.

Note: The Q.N.H. is, briefly, the setting which if set on the sub-scale of the altimeter ensures that the instrument indicates height above mean sea level. Thus, with this setting, when the aircraft lands the altimeter should indicate the approximate height of the airport above mean sea level.

The Q.F.E. is, briefly, the setting which if set on the sub-scale of the altimeter ensures that the instrument should read approximately zero when the aircraft lands.

Prior to the flight the captain visited the Meteorological Office at Ciampino Airport, Rome and obtained a route and terminal forecast for the flight to Idris Airport. The terminal forecast gave the expected visibility at Idris Airport between 1800 and 2100 hours as 16 km, with the possibility of it decreasing to 6 km. in 'suspended sand'. The wind was given as likely to be 120° at 20 kts. He also visited the Air Traffic Control Office at 1825 hours and filed a flight plan giving an elapsed time for the flight to Idris Airport of 3 hours 4 minutes; his endurance was 6 hours 6 minutes and his declared alternate aerodromes were Malta, Nice and Naples. The aircraft took off at 1855 hours with an estimated time of arrival at Idris Airport of 2159 hours. During the climb, icing conditions were encountered and at one stage power had to be increased to maintain the climb; but after passing through the cloud the ice gradually cleared and the flight proceeded normally to Palermo, whence Malta Flight Information Centre gave it a direct clearance to Idris Airport at 18 000 feet. The weather for the remainder of the flight was 'fine'. During the whole of the flight and during the approaches to Idris Airport ultra-violet and dimmed red lighting were used to illuminate the aircraft instruments.

Approximately 90 miles from Tripoli, at 2137 hours, the aircraft began to communicate direct on VHF/RT with Idris Airport

Approach Control on a frequency of 119.7 m/cs. It was given clearance for an unrestricted descent and flight to the airport, and was requested to report both when it was abeam Wheelus Field and when it had Idris Airport in sight. The aircraft crossed the Libyan coast at an altitude of 7 500 feet and when cleared to descend below 4 500 feet it received from Idris Airport the weather report for 2100 hours. The aircraft was also informed that two runways, 11 and 18, were available. The captain elected to land on runway 11 as he knew that there would be a strong crosswind on 18. He also considered that his landing weight of approximately 71 000 lbs., together with the strong wind blowing down runway 11 would ensure that the length of that runway (1 600 yards) would be more than sufficient. On a previous occasion in a strong wind he had landed on runway 11 without having to use propeller braking. He was fully aware that there were no lead-in or approach lights to runway 11 which was equipped with an electric flare path with 4 sodium lights at each end. Auxiliary gooseneck lighting had also been laid along it earlier that night.

The aircraft approached Idris Airport at 2 000 feet at approximately 2200 hours. The airport lights could be seen from this height but not the actual runway lights. The aircraft commenced a left-hand circuit and flew to the south of the airfield. A descent was made to 1 200 feet QNH, and the flaps were lowered to 15°. Both the captain and the first officer had the 2100 hours QNH set on their altimeters. The aircraft flew towards the downwind or western end of runway 11; as it came abeam of the runway at 1 200 feet the captain could see the runway lights. He flew downwind for 1 minute but before turning left onto base leg he lost sight of the lights. He turned on to base leg slowly descending in the turn to 650 feet QNH which height he then maintained with power settings of 48 inches of manifold pressure and 2 650 r.p.m. As the aircraft came round on to a heading of 110° he saw the runway lights again but he was then 300 yards to the left of the runway. It was impossible to attempt a landing and the captain decided to overshoot and carry out another circuit (time-2206 hours). During this first circuit considerable turbulence was experienced which made good instrument flying difficult and this was particularly so to the west of the airport.

The captain went through the same circuit procedure again with similar results, except that on this second circuit the aircraft arrived slightly nearer the runway on its final approach. On this second and subsequent circuits the captain was given VHF/DF radio bearings to help him line-up with the runway. The captain has said

that after these two unsuccessful approaches he was not at all apprehensive about continuing to attempt to land on runway 11. He felt his only difficulty was in lining up with the runway in the poor visibility. He estimated that at the time of his second overshoot he could spend a further 30 minutes over Idris Airport without encroaching on the fuel reserve necessary to take him to his first alternate aerodrome - Malta. After the second overshoot (time 2210 hours) the approach controller told the captain he would assist him to line-up by sending someone to the threshold of runway 11 with a Very light pistol to fire lights as the aircraft made its final approach.

On the third circuit, the aircraft was better aligned with the runway but by the time the runway lights were sighted it was too high and too close in for the captain to attempt a landing. He therefore took overshoot action again (time-2218 hours) and flew low up the runway to assess for himself the visibility conditions for landing. During the low level run up the runway, the first officer reminded the captain that they were flying with QNH settings on their altimeters (implying that their altimeters did not therefore indicate their height above the runway). The captain replied to the effect that he was aware of this. He decided to carry out a low visibility runway approach procedure and climbed to 1 300 feet. The captain instructed the first officer to keep a close look-out for the runway lights during the procedure turns of the runway approach procedure. The up-wind timed turn was completed at a height of about 1 300 feet QNH, and before the aircraft commenced its downwind run the whole length of the runway lights could be seen. This indicated that the visibility was then at least 1 600 yards which was well above B.O.A.C.'s minimum visibility for landing. (Note: B.O.A.C.'s visibility minimum for landing at Idris Airport at night on all runways is 1 000 yards; the crosswind component must not exceed 26 knots. This minimum and this maximum are contained in the Corporation's Operations Manual). As the aircraft approached the downwind threshold of runway 11 at 1 200 feet the captain turned 45° to the right, turned back 10° - 15° to correct for drift, and then continued on the new heading for 45 seconds before commencing a turn to the left. Again the aircraft encountered the more severe turbulence to the west of the airfield. During this turn the captain reduced power and gradually descended to 650 feet QNH; after its completion, in order to maintain height at 125 - 130 knots, he increased power first to 52 inches manifold pressure

and then reduced this to 48 inches. During the procedure turn the first officer had completed the landing check which included lowering the undercarriage.

Shortly after the completion of the turn, the first officer reported 'runway ahead' and the captain looked at his altimeter and saw that it was indicating 610 feet (i. e. about 350 feet above the level of the runway). Having a clear view of the lights he decided to make a visual approach and reduced power to 40 inches using this setting because of strong wind conditions and the necessity of making a flat approach. He considered that he would have to do a slight turn to port to line-up with the runway and he estimated that it was about a mile ahead. Shortly after commencing the visual approach, he was about to call for the first officer to switch on the landing lights when he partially lost sight of the runway lights and saw what he thought to be a cloud of billowing sand. Having lost his visual reference he reverted to instrument flying and perturbed by what he saw reached for the throttles to climb. At that moment the first officer called "Look out. Climb", and simultaneously the aircraft shuddered and a series of impacts followed. The aircraft crashed through lines of trees, hit the ground, and came to rest on fire in an olive grove.

The whole aircraft was ablaze within two minutes. The majority of the passengers who survived escaped through the starboard emergency exits, and the crew escaped through the crew door on the starboard side of the flight deck.

The first vehicles from Idris Airport Fire Service reached the scene of the accident approximately 7 minutes after the crash. They took a route made difficult by soft sand dunes through olive groves directly across country from where they had been stationed in readiness adjacent to runway 11. By the time they arrived much of the structure of the aircraft had been consumed by fire, and all survivors were out of the aircraft. The fire party immediately concentrated on putting out the fire. Shortly afterwards, a large number of Royal Air Force personnel from the R.A.F. Station at Idris Airport arrived and together with the Airport Fire Service personnel rendered all possible assistance to the survivors, some of whom were seriously injured. They also made a linked-arm search in the darkness and flying sand for possible missing survivors.

Inspection at the scene of the accident showed that the aircraft had crashed on a soft, sandy cultivated area to the west of Idris Airport about 1 200 yards short of the threshold and 485

yards to the left of the extended centre line of runway 11. The ground at this point is 12 feet below the level of the threshold of runway 11.

The initial impact was with lines of eucalyptus trees bordering a narrow unmade road running east-west. These trees varied in height between 28 and 42 feet and had been cut off about 20 feet from the ground over a distance of 168 feet. The appearance of the gap so formed in the lines of trees suggested that the aircraft was approximately laterally level at the moment of impact.

Commencing 185 feet beyond the line of trees was a series of three ruts made by the landing gear of the aircraft. These ruts were on a heading of 130° and a line joining them with the point of impact with the trees indicated that the aircraft's angle of descent was about 4°.

About 400 feet beyond the initial impact with the trees, the aircraft crossed a second tree-lined sunken road running north-south. A gap 105 feet wide was torn in this second double line of trees; the trees at the left-hand side of the gap were cut 25 feet from the ground, and the trees at the right-hand side of the gap at 10 feet from the ground.

The right main and nose landing gear were torn out of the aircraft structure on first impact with the ground and this caused the right wing to drop and drag the ground resulting in the breaking away of the two right propellers. The right wing was torn away from the aircraft at about this point and its further disruption was the result of passing through the trees lining the second road. The aircraft which had already commenced to yaw to the right, was slewed round still further as a result of the right wing dragging the ground and breaking away so that it passed sideways through the trees lining the second road with the left wing leading.

The fuselage and left wing finally came to rest about 550 feet beyond the first point of impact with the trees, the fuselage having slewed round 90° to the right.

Both left propellers had broken off at their reduction gear casings and lay between the second road and the main wreckage. The left wing had been torn off at the root, and lay parallel to the fuselage, and close to it. It was inverted and with the wingtip towards the tail. The left main landing gear lay burnt-out in the inner wing, having folded inwards.

Both left engines had broken away from the wing; the outer engine having been driven inwards lay burnt-out in the remains of the wing leading edge. The inner engine had become detached from the wing and had also been driven inwards and lay burnt-out in the remains of the fuselage. When the aircraft was travelling sideways with the left wing leading, the wing broke away at the root and turned over. This led to the detachment of the propellers and the breaking away of the engines in an inward direction. The detached left wing, engines, and fuselage travelled forward together and as they came to rest, the left inner engine was driven up into the fuselage from below floor level. The floor of the forward passenger cabin must have been considerably displaced upwards and this resulted in the death or injury of the majority of the occupants.

Fire broke out before the aircraft had crossed the second road and the first evidence of burning was in the wreckage trail about 220 feet beyond the initial impact with the trees. At the time of the crash the aircraft held about 600 gallons of fuel distributed between the main tanks. On first impact with the trees, the integral tanks in the wings of the aircraft were torn open thus releasing quantities of fuel which became ignited before the aircraft came to rest. The detached left and right wings were severely burnt and the fuselage had been almost completely destroyed. The exceptionally severe fire damage was due to the fact that the fuselage came to rest close alongside and on the downwind side of the left wing which contained about 300 gallons of fuel. The rapid outbreak of fire within the fuselage was due to the fact that the left side of the fuselage had been torn open by the left inner engine thus providing entry to the fire already started at the left wing.

Examination of the wreckage showed that at the time of impact the landing gear was fully extended and the flaps partially extended. Due to impact damage it was not possible to determine the precise flap angle but it has been established that it could not have been less than 10°. The condition of the propellers indicated that the engines were developing power at impact, and examination of their pitch change mechanisms showed that they were all set at the fine pitch end of the normal constant speed range. There was no evidence that any mechanical failure of the engines had occurred prior to impact. No evidence was found which would suggest any malfunctioning of the flying control circuits. The remains of the captain's altimeter were recovered and by comparison with a similar instrument it was established that the millibar

scale was set at 1014. The remains of the first officer's altimeter were recovered, but it had been so severely damaged by fire that its setting could not be established. The pitot/static system had been completely burnt out and it was not possible to carry out any check of the system or to establish whether it was selected to normal or alternate source.

A total of 6 emergency exits are provided in an Argonaut, 3 on each side of the fuselage. There are 4 of these exits in the front passenger cabin and 2 in the rear. The mechanism of the centre emergency exit on the left hand side was found in the closed position. The remains of the other emergency exits were not identified.

No useful evidence was obtained from the remains of the passenger seats; they had been so badly burned that only the steel components remained. The floor of the passenger cabins had also been consumed so that it was impossible to assess the behaviour of the seat structures during the crash.

The remains of the crew door were found with its operating mechanism in the open position. The main passenger door had been completely destroyed by fire and the position of its operating mechanism could not therefore be determined.

The aircraft's automatic crash fire extinguishing system had operated but the discharge of extinguishing media had little effect on the outbreak of fire which was remote from the areas covered by the installation.

The captain's decision to use runway 11 was justifiable. A civil DC-6 aircraft landed without difficulty on this runway in similar conditions approximately 1 hour after the accident. Although the cross-wind component on the long runway 18 was less than the Corporation's permissible maximum it was sufficiently strong to warrant the rejection of that runway in favour of the shorter runway 11. However, having failed on three occasions to line-up and land on runway 11, it is considered that the captain should have revised his decision not to use runway 18 which had better approach aids namely, lead-in lights, a locator beacon, and the VHF/DF more favourably positioned.

During the final procedure turn, the captain gradually reduced height from about 1 200 feet to 650 feet QNH. The undercarriage was lowered in the turn. On the completion of the turn the captain increased power to check his descent and maintain height, and almost



immediately afterwards the first officer reported 'runway ahead'. The captain noticed at that moment that his altimeter was indicating 610 feet. He immediately reduced power to commence a visual approach and descent. The conditions were turbulent which made accurate flying difficult. Within a short space of time - a few seconds - the captain saw the billowing sand ahead and the aircraft struck the trees before he could climb. The height of the ground where the aircraft struck the trees is 243 feet above mean sea level, which is 12 feet below the level of the threshold of runway 11. This indicates that the aircraft lost approximately 350 feet in a short space of time. It would appear, therefore, that the aircraft's descent was never fully checked after the completion of the procedure turn, and that the rate of descent increased after the captain reduced power to make his visual approach. It is significant that after noting the 610 feet and after commencing his visual approach the captain apparently did not refer again to his altimeter. It is apparent that he did not realize that his approach path had become too steep and the aircraft was becoming dangerously low.

The use of a QNH altimeter setting means that in order to obtain the true height above the aerodrome a pilot must subtract the known altitude of the aerodrome from the altitude indicated by his altimeter. When a QFE setting is used the height above the aerodrome is read directly off the instrument. A pilot must, therefore, be quite clear in his mind whether he has a QNH or QFE setting. The Board has considered the possibility that the captain having a QNH setting on his altimeter treated it on the final approach as a QFE setting; and, indeed, this would appear to be the most logical explanation of the accident. The captain stated that he had on occasions used a QFE setting for landings. However, on the overshoot after the third attempt to land, the first officer reminded the captain that he was flying with a QNH setting on his altimeter and the captain confirmed that he was aware of this. The captain, therefore, appeared to be fully aware of the type of setting he had on his altimeter, and in the absence of further

evidence to the contrary the Board must accept that he made his final approach with no confusion in his mind as to the type of altimeter setting he was using.

The Board is aware of the circumstances which led to the non-transmission of the 2205 hours weather report, which included a reduction of 1.2 mbs. in the QNH. Had the captain received the amended QNH and made the adjustment to his altimeter, it is assumed that he would have carried out his instrument procedures approximately 30 feet higher, but it is considered that this adjustment would have had little effect on his visual final approach. Consequently, whilst the omission to transmit this report cannot be condoned, the Board considers that an adjustment of 1 mb. during his attempts to land would not have materially affected the course of events. The aircraft crashed 1 200 yards short of the runway on ground that is 12 feet below the level of the runway threshold whilst it was descending at a relatively steep angle. At this distance from the runway, assuming a  $2\frac{1}{2}^\circ$  glide path and a touch-down point 100 yards up the runway, the aircraft should have been at least 170 feet above the ground.

The trees struck by the aircraft in no way constituted an obstruction to the runway (as defined in ICAO Annex 14, part 5, Chapter 1, para. 1).

#### Probable Cause

The accident was the result of an error of judgement on the part of the captain who having made three unsuccessful attempts to line-up and land on runway 11 on his fourth attempt allowed his desire to keep the runway lights in view to affect his judgement, in that during a visual approach to the runway he failed to make adequate reference to his flight instruments. In the restricted visibility the runway lights gave him insufficient guidance as to attitude, height and angle of approach and unknowingly he permitted the aircraft to descend below its correct approach path.

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