

No. 19

Continentale Deutsche Luftreederei, G. m. b. H., Douglas C-54 (B-DC), D-ABEB, accident 2 NM from the threshold of runway 07, Kano Airport, Nigeria on 17 June 1961. Report released by The Ministry of Transport and Aviation, Nigeria.

Circumstances

The aircraft was on a charter flight from Hamburg, Germany to Leopoldville, Congo via Luxembourg, Tripoli and Kano. It carried a pilot-in-command, two co-pilots, two mechanics and two passengers. The passengers boarded the flight at Luxembourg when some cargo was taken on as well.

During a night approach to Kano Airport the aircraft undershot runway 07 and crashed at 2223 hours GMT about 2 NM from its threshold. Fire broke out. One of the passengers was killed, and a mechanic was seriously injured.

Investigation and EvidenceThe Crew

The pilot-in-command has considerable flying experience. His log book was lost in the accident, but he states that his total flying hours amount to about 13 000 of which 3 500 - 4 000 hours were as pilot-in-command and co-pilot on DC-4 (C-54) aircraft. In the last six months he has flown 500 - 600 hours and in June, the month of the accident, he had flown 80 hours up to the time of the accident.

He holds a German Airline Transport Pilot's Licence valid until 1 October 1961, which contains a current instrument rating renewed on 30 April 1961 and is endorsed for DC-4 aircraft as pilot-in-command.

The co-pilots

Both first officers, who shared the duties of co-pilot during this flight, have

valid German Commercial Pilot Licences with current instrument ratings and are endorsed as first officers on DC-4's. They have flown 3 000 and 1 100 hours in all, of which 600 and 300 hours respectively were flown on DC-4's.

The Aircraft

Since manufacture the aircraft had flown 32 850 hours, 800 of which had been flown since last overhaul for the renewal of the Certificate of Airworthiness. About 18 hours had been flown since the issue of a Certificate of Maintenance on 16 June 1961. The aircraft had been maintained in accordance with the maintenance schedules.

Loading

The distribution and securement of the cargo had been supervised by one of the co-pilots and checked by the captain. The latter had refused to load a ground power unit and two wing jacks, totalling 950 kg, at Luxembourg.

No arms or ammunition were carried on the flight.

On take-off from Idris Airport for Kano the aircraft's weight was 32 845 kg, approximately 335 kg below the maximum gross take-off weight of 33 180 kg. Fuel for the trip was calculated as 4 765 kg, and the landing weight at Kano as 28 080 kg. Because of the extra 1 hr 23 min which the flight took, the landing weight at the time of the accident was estimated as 27 540 kg. The centre of gravity was calculated as being within the prescribed limits.

Weather Conditions

At 1800 hours a line squall, about 120 miles east of Kano, was observed on the storm warning radar screen at Kano Airport. Its rate of movement westwards was approximately 30 kt at this time, but by 2000 hours it became clear that the line was speeding up, and it was then estimated that it would reach Kano at 2100 hours.

When the squall was about 20 miles east of Kano it appeared that about a 10-mile section of the line east to northeast of the station was weakening. At 2110 hours active storm cells passed about 5 miles north and 5 miles south of the airport with squally winds at the station gusting to 45 kt from the southeast, and the visibility was reduced to 300 yd by dust. When it became clear that the more active storms had bypassed the station, an amorphous radar echo could be seen, whose western edge was 7 miles east of the airport. This precipitation area moved slowly to affect the field at about 2153 hours. Although the echo of this precipitation area was tracked on the radar screen, visual observation of the area was only possible during lightning flashes from surrounding storms; no electrical activity was observed from the area itself. The precipitation area produced very little rain at the station.

It was clear from Air Traffic Control tape recordings that the aircraft was kept fully informed of the development and movement of the storms in the Kano area. As a result, the aircraft turned back when some 40 miles from the airport to await an improvement in the Kano weather.

The rain area that moved in from the east to affect the airport at about 2153 hours produced 0.04 inches of rain in 20 minutes with the wind swinging between east and south at speeds of 6 - 33 kt. The intensity of the rain was 0.12 inches per hour and, therefore, relatively light. It seems likely that this rain area was over the scene of the crash at the relevant time.

At the time of the procedure approach to runway 07 (about 2210 hours) the weather conditions were believed to be:

cloud	{	2/8 St 1 500 ft, 4/8 Sc
		1 800 ft
		3/8 Cb 2 000 ft, 8/8 As
		9 000 ft

visibility 6 NM

wind 120° - 150°/15 - 20 kt

QNH 29.92"

slight thunderstorm, turbulent conditions, rain.

The turbulent conditions did not constitute a hazard to an aircraft making a correct angle of approach.

None of the reports of the meteorological conditions at the time of the accident as seen from the airport makes any reference to an active cumulonimbus cloud in the vicinity of the airport, although there were active storms in the distance in several directions, and there was high level cumulonimbus overhead.

The following report was made by the pilot of a United States Air Force C-124 aircraft flying in the area around the time of the accident:

"When we turned inbound on our finals at about 2 000 ft QFE we had quite a turbulent ride. This was within 3 minutes of the crash. The visibility from 2 000 ft was good - over 10 miles - and I could clearly see the runway and approach lighting. There was no cloud at all on the approach, in fact, we encountered no cloud whatsoever from 5 000 ft QNH down to the ground."

The Flight

The aircraft had been chartered to carry spare engines, equipment and two

passengers of Inter-Ocean Airlines Ltd. from Luxembourg to Leopoldville, Congo. It departed Hamburg at 2111 hours (16 June) for Luxembourg where it landed at 2311 hours on the same day. The duties of co-pilot were shared by the two first officers. During take-offs and landings one occupied the co-pilot's right-hand seat and the other the 'jump' seat opposite the central control pedestal. The co-pilot in the right-hand seat read out the check list, and the other took the executive action. At Luxembourg the aircraft was refuelled and cargo was loaded.

It took off at 0449 hours for Tripoli, where it landed at 1201 hours and remained there for 1-3/4 hours for refuelling and customs inspection. The co-pilots prepared the flight plan and obtained the meteorological forecast for the flight to Kano. The forecast showed good weather to Kano with isolated thunderstorms en route. Zinder was to be the alternate as the captain had been advised at Luxembourg that he should use it. He did not know that Zinder had only emergency lighting at 6 hours' notice and says there was no mention of this fact in the flight guide carried in the aircraft.

The aircraft left Tripoli at 1346 hours and the greater part of the flight was flown at flight level 100 (10 000 ft) instead of the planned flight level 80 (8 000 ft).

At 2044 hours the aircraft communicated with Kano Tower on 118.1 Mc/s giving its estimated time of arrival at Kano as 2124 hours. It continued its approach to Kano until about 2111 hours when it was advised to turn north and hold 60 - 70 miles from the airport until a storm passed through. At 2137 it was given permission from Kano ATC to make another approach to the KA beacon and turned south again.

After approaching the airfield on a VOR radial of 201°, the procedure approach to runway 07 was commenced over the KA beacon outbound at 5 000 ft QNH at 2214 hours. Runway 07 at Kano

is 8 610 ft. The conditions were very turbulent, and a rate of descent of 300 - 500 ft per minute was maintained until the procedure turn was completed. The captain steered 246°M for 1-1/2 minutes instead of two minutes because of the tailwind. He then turned onto a track of 291°M and had to steer 270 - 280° to maintain it. After tracking 291° M for one minute he commenced a rate one turn to the left. At 2216, just before this turn was commenced, the aircraft reported "beacon outbound" and shortly after the turn was started "leaving 4 000 ft now". When the procedure turn was completed the aircraft reported "beacon inbound" at 2219, and the captain states that they were at 3 500 ft QNH. He ordered the "gear down" and the final landing check.

Although the aircraft was equipped with both VOR and a radio compass, it obtained four true bearings from Kano VDF during the inbound approach. The radio compass was unreliable as the electrical storm was moving the needle in all directions, and the VDF bearings were requested in order to check the aircraft's VOR heading.

During the final approach a power setting of 2 250 rpm and 28" MP was used; 15° flaps and indicated airspeed 125 kt. The captain estimated that it would take 3-1/2 to 4 minutes on the final approach to the runway threshold.

After the tower had switched on the high intensity lights, the aircraft reported that the runway lights were in sight. There was heavy rain, and the windshield wipers were switched on. The captain reached up to put on the landing lights, but heavy turbulence made him desist in order to control the aircraft.

The captain described the final part of the flight as follows: "Suddenly it was dark, it seemed as though we were in cloud, the altimeter was showing 2 200 ft (i. e. about 637 ft above Kano Airport elevation)... I had a feeling of being forced down and a strong light was in the cockpit. I pushed the throttles forward, and this was my last

action." The captain's last recollection after the aircraft had struck and just before it came to rest was the altimeter reading 1 850 ft.

Evacuation and Rescue

When the aircraft came to rest the captain, the two co-pilots and one mechanic got out through the right-hand cockpit sliding window. The two passengers had been sitting in adjoining seats in the second row port side forward of the passenger cabin. The port inner propeller had pierced the fuselage and struck one of the passengers. The other passenger, after trying in vain to extricate his fellow passenger, was finally forced to break down the door leading to the flight deck and got out through the port cockpit sliding window. Later he, the captain and one of the first officers re-entered the aircraft and attempted to rescue the injured passenger but were driven back by the flames. The captain and the uninjured passenger then tried to reach him through the hole torn in the fuselage side but found it impossible.

The second mechanic, who was sitting in a rear seat on the port side of the passenger cabin, had been flung out when the fuselage broke open and was severely burned by an exploding fuel tank.

The airport fire and rescue vehicles were alerted by the Kano Air Traffic Controller when the accident occurred and proceeded to the scene of the accident as quickly as possible. Civilian rescuers were first to arrive.

The Scene of the Accident

The first point of impact was two trees 12 100 ft from the threshold of runway 07 and 1 925 ft to the north of the extended centreline. The point of impact was measured and found to be 60 ft above the official aerodrome elevation of Kano Airport (1 563 ft amsl) and the wreckage trail was on a heading of 97°T. The wreckage trail extended for about 230 yd. The two trees had been struck by both landing

gear legs about 6 ft above ground level and indicated that the aircraft had been banked slightly to starboard at the time. The starboard wing had afterwards been severed outboard of No. 4 engine by striking another tree, and this had caused the aircraft to slew round with the result that the tail had been severed from the fuselage when it struck a tree 120 yd further on. The remaining forward section of the fuselage, with the port wing still attached, had finally come to rest in an upright position. When the starboard wing became ruptured fire broke out immediately, and there were traces of fire the full length of the wreckage trail. The main wreckage sustained extensive fire damage, and the main forward fuselage and cockpit were burned out. The length of the wreckage trail indicated that the impact speed had been of a comparatively low order - probably less than 120 kt.

All the instruments were severely damaged by fire and, with the exception of the two altimeters which were both found set to 29.92 in. Hg. provided little useful evidence.

The domes of the four propellers were removed, and their blade settings on impact were checked. They were found to be in the fine pitch range about 30° and their damage indicated that they were operating under a high degree of power on impact.

The Final Approach - Discussion of Evidence

Because of the tape recorded messages between Kano Tower and the aircraft it was possible to plot with reasonable accuracy the position of the aircraft along the final approach.

Considering all available evidence, the Board was of the opinion that the rate of descent of the aircraft during the final approach was around 470 ft per minute, which agreed with the pilot's statement "between 300 and 500 ft per minute", and that the accident occurred within a few seconds of 2223:25 hours.

The procedure approach carried out by the aircraft was not in accordance with the standard procedure laid down by the State. The aircraft, having elected to carry out a procedure approach, was instructed by the tower to report outbound over the KA beacon at 4 000 ft, heading 246° magnetic. At this time the aircraft had already passed the KA beacon at 5 000 ft having approached on a VOR radial of 201°. It had then turned onto 246° magnetic to commence the procedure approach and its descent. It actually reported "beacon outbound" two minutes later, immediately followed by "leaving 4 000 ft" when it was in the procedure turn. This careless reporting meant that the aircraft was not where the tower controller had been led to believe it was, at a time when the controller was having to use the positions and heights reported to effect separation between D-ABEB and another aircraft.

It has been found impossible to plot the outbound track of the aircraft with any reasonable accuracy. At the time it completed its procedure turn, it should have been 7-1/2 NM from the KA beacon; in actuality, at the time it reported "beacon inbound" at 2219:28 hours it was approximately 8-1/2 NM from the KA beacon and 1 mile north of the extended centreline of runway 07; but before this, at 2218:06 hours, when it obtained a bearing of 240°T it was approximately 10-1/2 NM from the KA beacon and just south of the extended centreline. (See Figure 9).

Due to the bearings that the aircraft obtained during its final approach it has been possible to plot its inbound track. (See Figure 9). It will be seen that the aircraft tracked away from the centreline until it was about 1-1/2 NM north of the centreline at a distance of 4-3/4 NM from the threshold of runway 07. It later appears that the aircraft did not turn in towards runway 07 until just after the last bearing 255°T, when it reported it had the runway lights in sight. This evidence is in accord with that of eyewitnesses of its final approach, and with the heading of the aircraft when it first impacted.

The Board examined the captain's and co-pilot's claim that just before the accident the altimeter read 2 200 ft QNH (i. e. about 637 ft above official aerodrome level at Kano); they entered cloud; a down-draught affected the aircraft, and that they were struck by lightning.

As both altimeters were found set at the correct QNH (29.92 in. Hg.) after the accident, the Board cannot accept the possibility that both instruments malfunctioned at the same time. Technical considerations render the possibility too remote. It is more than likely, however, that the captain saw this height indicated just before he saw the runway lights, and that he then concentrated on keeping the lights in view, and did not refer to his flight instruments again.

The darkness or cloud that the aircraft is said to have entered just before the accident was probably a simulated effect caused by it descending to the level of the trees and out of sight of the runway lights.

That there was lightning about during the final approach is not questioned. After considering the evidence of witnesses who watched the aircraft approach, and those on board the aircraft, the Board thinks that it is unlikely that the aircraft was struck when it was at a very dangerously low height. They consider that the light that illuminated the cockpit was very possibly caused by fuel igniting after the integral wing fuel tanks had been ruptured by the trees.

The Board accepts as a fact that the flying conditions on the final approach were turbulent and sufficient to vary the rate of descent to the amounts claimed by the captain and the co-pilots. But the captain did not have to vary his power during the final approach until just before the impact. At this point the aircraft was critically low as noticed by a senior airline captain who watched the approach from a position in front of Kano Airport and stated: "... Large cumulonimbus with continuous lightning to port of approach path Runway 07 at a distance of approximately 5 to 6 miles. The

aircraft anti-collision light first appeared beneath this Cb and shortly afterwards the port light came into view. It was immediately apparent that the aircraft was very low and this drew my attention to it . . . The aircraft was descending in a very shallow descent the whole time, and it was obvious that it would hit the ground if it continued in the same direction without checking the rate of descent (possibly about 200 ft per minute). . . " At such a low altitude the aircraft may have been affected by additional turbulence from ground obstructions, and it may well be that a down-draught occurred during the last few seconds before the impact.

Fatigue

Consideration was given to whether the captain's judgement may have been affected by tiredness during the procedure approach brought about by the length of his flying duty period since leaving Hamburg. In considering this question, the Board has taken into account the fact that the crew stated that the aircraft carried a bunk for their use and that there were two co-pilots, though neither of them was qualified by his licence to act as commander of the aircraft during the captain's absence from the cockpit.

Allowing one hour for pre-flight preparation at Hamburg, the flying duty period before the accident was 26 hours 12 minutes and, making allowance for the captain's claim that he slept for 4 hours at Luxembourg in the airport building while the aircraft was being loaded, the flight duty period after leaving Luxembourg was 17 hours 34 minutes including the 1-3/4 hours stop at Idris Airport during which he was with the customs officials when they searched the aircraft.

The captain maintains that he was not tired. It is, however, well-known that a pilot's reactions become progressively slower the longer he is subjected to mental and physical strain.

In the captain's case he had been subjected to over an hour's flying in turbulent conditions at the end of a very long flying duty period (26 hours), and the Board considers that the procedure approach carried out by the captain was not of the quality that would have been acceptable for an instrument rating test, and was not of the type that the captain would have carried out if he had not been tired, bearing in mind that he had been an instrument flying instructor. The Board was of the opinion, therefore, that the captain's tiredness was a contributory factor to the accident.

Landing lights

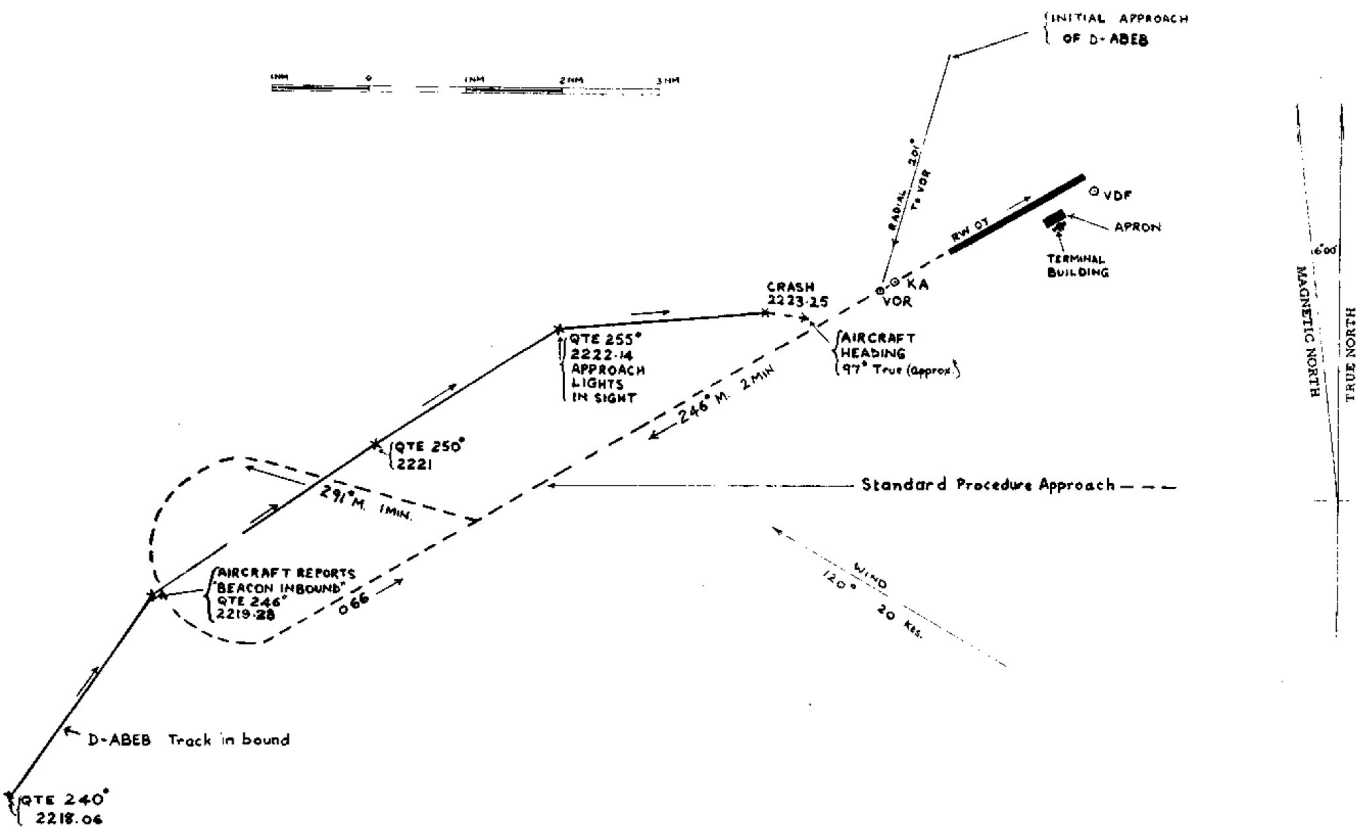
It is left to the discretion of the pilot-in-command whether or not he uses his landing lights during a final approach to land. On this final approach, it was clearly the intention of the captain to use them after he had the runway lights in sight, for he reached up to switch them on but was prevented from doing so as he had to control the aircraft in the turbulence. There was no reason, however, why he did not instruct the co-pilot to illuminate them, and had he done so there is a possibility that the accident would not have occurred as he would have obtained ground reference.

Probable Cause

The accident was the result of an error of judgement on the part of the captain who, after sighting the runway lights, concentrated on keeping them in sight and failed to make adequate reference to his flight instruments. As a result, he allowed the aircraft to descend below the obstacle clearance limit of 360 ft. In the darkness with no ground reference, the distant runway lights gave him insufficient guidance as to his height and angle of approach, and he was unaware that the aircraft had descended to ground level. The fatigue of the captain and the failure to illuminate the aircraft's landing lights were contributing factors.

C-54 (B-DC), D-ABEB
17/6/61

FIGURE 9



No. 20

Transcontinental S.A. de Transportes C.é I., C-46, LV-FTO accident near Buenos Aires Airport, Argentina, on 30 June 1961. Report No. 1477 released by The National Director of Civil Aviation, Argentina.

Circumstances

The aircraft was flying the last segment of a scheduled flight between Salta and Buenos Aires (Aeroparque) Airport with a stop in Córdoba. It carried 4 crew and 31 passengers. Departure from Pajas Blancas Airport, Córdoba was at 1846 hours*, and the aircraft flew at an altitude of 2 700 m making routine contacts until it approached Buenos Aires Airport where it was cleared for an instrument approach to runway 12. During the approach, approximately 1 300 m from the threshold of the runway and 175 m to the right of the extended runway centreline the aircraft hit a railway signal mounted on top of an 8 m support, which caused it to lose the outer part of its right wing. The aircraft turned about 45° to the right, hit a group of trees and telegraph lines with its propellers and left wing and fell in a public area where it caught fire due to fuel spillage. The time of the accident was about 2057 hours. Twenty-two passengers and the 2 pilots perished in the accident. The aircraft was destroyed.

Investigation and EvidenceThe Aircraft

A 6 000-hour inspection was carried out on the aircraft in February 1961, and the aircraft's airworthiness certificate was re-validated until 30 September 1961.

On 28 May 1961 another inspection was made at the time of the left engine change. The aircraft continued flying until the date of the accident. All the required periodic inspections were fully recorded

and on 30 June 1961 the aircraft had a total of 8 926:40 hours, of which 6 780 hours had been logged since the last major overhaul.

The authorized maximum take-off weight for this aircraft was 21 614 kg, and its maximum landing weight was 21 546 kg. The aircraft's actual gross weight at time of take-off from Pajas Blancas was 20 658 kg, i.e. within the permissible limits.

The Crew

Four crew members were aboard the flight - the pilot, co-pilot and two stewardesses. Only the two stewardesses survived the accident.

Both pilots held valid airline transport pilot licences. The captain had flown a total of 6 772 hours, and the co-pilot had logged a total of 3 816 hours. From various statements it appeared that the co-pilot was occupying the left-hand seat at take-off and was still in this position ten minutes before the accident. At no time had either pilot exceeded the maximum number of hours permitted.

Weather conditions

The weather forecast given at time of take-off (1846 hours) from Pajas Blancas, which was to cover the duration of the flight, was:-

overcast; rain 8/8; cloud type: stratus and numbostratus with a 100 m to 200 m ceiling; at 2 500 m there was an 8/8 overcast of altostratus; visibility was from 2 to 4 km. No turbulence was forecast.

* All times are local.