

No. 15

Aerolíneas Argentinas, Douglas DC-3 aircraft, crashed on 23 April 1954 at Sierras de Vilgo (Province of La Rioja). Argentine Aircraft Accident Investigation Report No. 324, (Boletín Informativo de Accidentes de Aviación No. 3) issued on 30 July 1954

Circumstances

The aircraft, engaged on a scheduled flight between Mendoza and Córdoba, Argentina, on 23 April 1954, took off from Mendoza at 1847 hours local time with a crew of 4 and 21 passengers. At 2026 hours local time the aircraft reported that it was diverting to La Rioja as it was impossible to approach Córdoba owing to considerable turbulence. The flight at 2125 reported descent and an estimated time of arrival at La Rioja at 2140. No further contact with the aircraft was made. The aircraft was located on 26 April, in a locality known as Sierras de Vilgo. It was completely destroyed and there were no survivors.

Investigation and Evidence

The meteorological conditions at the departure aerodrome at the time of take-off were as follows: cloudy with low and medium-height clouds; ceiling: 600/1 000 m; visibility: 20 km; wind: light; atmospheric pressure at 1 000 m: 989.9 mb; QFE: 931.2 mb; temperature: 16°C; relative humidity: 83%.

As additional information the pilot-in-command was informed before take-off of the following conditions by the assistant forecaster at the Mendoza airport and by the airline dispatcher: "A cold front which is located south of San Luis is moving northward at a speed of approximately 40 km.h. This front might make it difficult to land at Río Cuarto because of low clouds, but it will not, however, affect the Córdoba area and a safe alternate would be Mendoza rather than Marcos Juárez or Buenos Aires, because the latter points will be affected by the eastern portion of the front."

The flight plan prepared at Mendoza Airport named "Mendoza and Marcos Juárez" as alternate aerodromes. At 1917 hours local time the aircraft reported its position (QTH) over Lagunas de Guanacache. At 1934 hours local time it reported its passage (QTH) over Pampa de las Salinas; at 1950 hours local time the aircraft requested the Córdoba and La Rioja weather reports and at 2002 hours local time it gave its position (QTH) over Villa Dolores. At this point it sent the following radiotelephony message to the control tower at Córdoba: "In 15' QGL (control zone) 3300 if it is possible to pass between two cumulonimbuses where there is some turbulence; otherwise, QRF (I am returning) to Mendoza or Rioja". At 2024 hours local time the following message was sent to the Córdoba control tower: "Two cumulonimbuses right and left with considerable turbulence" and at 2026 hours local time the pilot reported that he was heading for La Rioja because it was impossible to make an approach and that he was climbing to 3 600 m.

At 2048 hours local time he reported his position (QTH) over Tabaquillo and at 2125 hours over Salina La Antigua at an altitude of 3 300 m. He reported that he was coming down and estimated his time of arrival at La Rioja at 2140 hours local time. At 2136 hours local time the control tower at the La Rioja Airport listened on 118.1 Mc/s but transmission was suddenly stopped. Further efforts to establish contact with the aircraft having failed, it was declared to be in distress. The wrecked aircraft was located on the morning of 26 April 1954 in a locality known as Sierras de Vilgo.

The aircraft crashed at 29°55'S, 67°30'W at an elevation of approximately 1 600 m. The only part of the wreckage permitting identification were the assembly with its vertical and horizontal stabilizers in an asymmetrical position at an angle of approximately 40°/140°, a small section of the tail cone and the left wing.

The survey of the scene of the accident made it possible to reconstruct the aircraft's final path which was on a true heading of 20°.

In order to determine the probable course of the aircraft after its position report over Tabaquillo, and considering that that point had been given as an estimate and that the aircraft may have flown a straight course between the scene of the crash and the air lane which joins Villa Dolores and Tabaquillo, an investigation was carried out on the ground to check the aircraft's course by questioning the public and officials along the route which the aircraft was presumed to have followed up to the moment of the accident. Witnesses reported that they had heard the aircraft in the neighbourhood and had even been able to distinguish the position lights.

It was thus established that the aircraft had followed a route to the scene of the accident parallel to that which connects Tabaquillo and La Rioja Airport. Two theories in explanation of this diversion were possible.

The first is the possible confusion of La Rioja radio LV-14 and another radio station operating on the same frequency which may have been picked up on the route. The second is that dead reckoning navigation was being used.

The possibility that the LAR radio beacon which had been used as a radio aid was discarded because it was turned on at 2120 hours local time.

In an attempt to corroborate the first of the theories a test flight between Villa Dolores and La Rioja was made on 22 and 23 June, following the route which the aircraft was presumed to have taken on the day of the accident, through the co-operation of the Air Transport Command of the Argentine Air Force and using an aircraft of the same type. The experiment produced the following result. Up to at least 20 minutes before its arrival at La Rioja, an aircraft on the Córdoba-La Rioja route can tune in on the 1 330 kc/s frequency and hear CX-40 Radio Fenix from Montevideo, and without checking the call letters or the commercial announcements it is easy to confuse this broadcast with that of the LV-14 La Rioja station.

A common drawback of automatic radio compasses is their 180-degree ambiguity in bearing indication, and if not carefully checked they can cause error. In the present case it may reasonably be assumed that upon tuning to the 1 330 kc/s frequency and obtaining the inverted bearing indication the flight personnel of the aircraft were misled into believing that they were on true course for La Rioja. On the other hand during the test flight it was verified that the bearings taken ahead and to the rear were inaccurate and erratic and that no bearing could be obtained at the scene of the accident. Bearing in mind that on the date of the accident weather conditions made reception difficult it was assumed that any bearings taken by the aircraft might have been very inaccurate.

The second theory mentioned, namely, that the flight was being carried out by dead reckoning, would be supported by the difficulty in securing accurate radio bearings en-route and in such a case the navigation error could be attributed to bad calculation.

An analysis of the flight from the time of the aircraft's departure from Mendoza Airport revealed the following facts: the position reports given by the aircraft up to and including Villa Dolores are in complete accord with the flight plan prepared by the airline dispatcher and approved by the pilot-in-command. The flight plan had in fact estimated the following time for portions of the scheduled journey:

Mendoza - Lagunas de Guanacache	29 min.
Lagunas de Guanacache - Pampa de la Salina	16 min.
Pampa de la Salina - Villa Dolores	28 min.
Villa Dolores - Córdoba	24 min.

The flight followed this schedule:

Mendoza - Lagunas de Guanacache	75 nm 30 min.
Lagunas de Guanacache - Pampa de la Salina	42 nm 17 min.
Pampa de la Salina - Villa Dolores	72 nm 28 min.
Villa Dolores - Córdoba (segment not completed)	

The speeds were 150, 148 and 154 knots respectively.

Up to the Villa Dolores position report there was a difference of 2 minutes between the flight plan and the actual flight.

The communications log-book in the control tower at Córdoba indicated that the aircraft made contact with the tower at 2015 hours local time and reported that it was 15 minutes flying time from the control zone. According to this last report which was tantamount to a correction of its earlier position report over Villa Dolores, the aircraft had just then reached the point, which would mean that its actual air speed up to that time had been 130 knots. The aircraft continued its flight, reporting that it intended to pass through two layers of very active cumulus clouds and if this were impossible, it intended to head for Mendoza or La Rioja.

At 2026 hours local time the aircraft reported that it was heading for La Rioja it being impossible to approach Córdoba; the aircraft next reported its position over Tabaquillo at 2045 hours local time and a speed of 150 knots. The approximate distance from Villa Dolores to the point at which it was assumed the aircraft reached the mountains and thence to Tabaquillo is 120 km, and the approximate straight line distance from a point in space between Villa Dolores and Córdoba, along the probable route of the aircraft between Mendoza and Córdoba, to Tabaquillo is 85 km. The aircraft would cover the distance in 20 minutes in the first case and 18 minutes in the second.

On the theory that the flight was progressing according to the figures given and that in fact the aircraft was flying over Villa Dolores at 2002 hours, the time taken to reach Tabaquillo, that is 45 minutes, exceeded by 18 minutes the flight time required to cover that distance at 150 knots. Bearing in mind the history of the flight and the report made to the control tower at 2015 hours local time, the aircraft was over Villa Dolores, at that time, at about 90° from this point and had travelled 354 km at a speed of 130 knots. Assuming that this was the actual speed of the aircraft, it would have needed 29 minutes to cover the 120 km to Tabaquillo. According to this last calculation the aircraft would have reached Tabaquillo at 2048 hours local time if the flight had continued with no loss of time.

While there is no information on the history of the flight between Villa Dolores and its presumed position at Tabaquillo, it is assumed that the aircraft was not flying on any definite course near the mountains. Since the Tabaquillo position report was given nineteen minutes after the decision to return to La Rioja, it is to be presumed that at 2026 hours local time the aircraft was located on the straight line between Mendoza and Córdoba at approximately 85 km from Tabaquillo, with the estimated speed of 150 knots.

The aircraft's passage was seen and heard between the clouds by people on the ground at points located in a line running parallel to and approximately 70 km to the south of the normal air route from Tabaquillo to La Rioja.

Since it would take 17 minutes to cover 70 km at a speed of 130 knots, it would appear in the light of the above analysis that the aircraft did not reach Tabaquillo but a point located approximately 70 km to the south thereof. From there it altered course to 310° and followed the route leading to the scene of the accident.

Both theories revealed that neither of them should be discarded or accepted finally in the absence of any concrete evidence. On the other hand, the fact that the crew had been in constant radio contact with Córdoba and La Rioja and had not needed or used the route beacons would appear to indicate that they did not consider these radio aids necessary.

Although the flight plan prepared at Mendoza and approved by the pilot-in-command named the departure aerodrome as alternate, the pilot had the final decision for the flight and his selection of La Rioja must be accepted as a consequence of conditions which arose during the flight and of his interpretation of reports received.

Another fact which must be considered is the descent recorded in the aircraft's flight. At 2125 hours local time on giving its position (QTH) over Salina La Antigua at 3 300 m the aircraft also reported descent and estimated its arrival at La Rioja at 2140 hours local time. In the section relating to night flying operations the Airline Operations Manual reads: "The en-route altitudes to be maintained while flying contact or on instruments shall not be less than the minima authorized for instrument flying". Also, No. 175 (1) of the Regulations for Flight and Air Traffic Control (RAF. 7) reads: "In-flight altitudes shall not be less than the following safety minima: 1°) The minimum altitudes established by commercial airlines for their own aircraft".

The airline had established the following minimum altitudes for the La Rioja-Córdoba route: 3 000/9 000 feet or 3 000 feet for day flight and 9 000 feet for night flight. The instructions in the Manual, which require the same minima for night flight as for instrument flight, make it clear that the maximum descent en-route was to an altitude of 9 000 feet. The aircraft should have reached the airport zone at this altitude and if unable to make a visual approach (as was the case on the night of the accident because the ceiling was only 600 m) it should have flown over the radio beacon at 8 000 feet, circled down to 5 000 feet and from this altitude carried out an instrument approach as defined by the airline.

It was concluded from the foregoing that the descent of the aircraft below the minimum altitude prescribed by the airline contributed to the accident, since had the aircraft maintained the prescribed altitude, the bearing which was apparently taken on beacon LAB shortly before the crash and which presumably determined the 20-degree change in course, would have been obtained at sufficient height above the obstacle and made it possible to avoid crashing into it.

It was noted that according to evidence regarding flights prior to the accident, the crew had flown 13:37 hours on 21 April, or 1:13 hours in excess of the 12 hours maximum permissible in 24 consecutive hours as laid down in Department of Civil Aviation Resolution No. 124/52, so that the crew rested for only 16:40 hours and not 27 as required. On 22 April they started work at 1414 hours and finished at 0113 on 23 April, with a total of 8:21 hours flight time. On the same day the crew began work at 1523 hours local time following a rest of 14:10 hours, flying 05:18 hours up to the time of the accident. The crew had flown a total of 27:16 hours on 21, 22 and 23 April.

Probable Cause

For reasons which could not be determined the aircraft deviated from the prescribed route and followed a course which led it to crash in mountainous terrain.

Contributing factors:

The pilot-in-command's decision to descend below the minimum altitude specified for weather conditions requiring an instrument approach, contrary to the provisions of the Airline's Operations Manual.

Probable contributing factor:

Probable fatigue of aircraft crew.