

No. 21

British European Airways, Argosy AW 650, G-ASXL, accident at Pecorara (Piacenza), Italy, on 4 July 1965. Report dated 10 October 1965, released by the Italian Ministry of Transport and Civil Aviation. Also published by the Board of Trade, United Kingdom as C.A.P. 268

1. - Investigation1.1 History of the flight

The aircraft took off from London Airport (Heathrow) at 1627 hours GMT on a scheduled international freight flight to Milan/Linate Airport, Italy, and the flight proceeded normally as far as the boundary of Milan TMA (Monteceneri NDB). Control of the aircraft was transferred to Milan ACC from Zurich ACC at FL 170, and after the first air-ground communication the aircraft was cleared to Linate Airport via Saronno and Linate NDB at 1844:30 hours GMT.

Before reaching Saronno VOR the pilot asked for and was given permission to make a slight diversion to the south-west in order to avoid a considerable thunderstorm formation which, as forecast, arrived over the area of Milan CTR at 1952 hours. At the pilot's request, the ATC cleared the descent with a clearance limit of 6 000 ft, confirming the previous clearance for descent. The pilot confirmed that he had received the clearance and reported that he was south-west of Saronno on a heading of 180°.

At 1855 hours, the pilot reported that he was still maintaining a heading of 180° to avoid the thunderstorm area; the estimate for Linate NDB was however 1904-1905 hours. Following this communication, the control at Milan ACC amended the previous descent clearance, limiting it to FL 130 in order to safeguard other air traffic south of the CTR.

At 1903 hours, the pilot unexpectedly reported that he was heading for Voghera VOR, without having been cleared for this by Control. After a few seconds he reported that he was over Voghera VOR at FL 130 and asked for further descent clearance which he was not given, in view of the unexpected and unorthodox position reported. He was asked to maintain FL 130 until he reached Linate NDB.

At 1909 hours, the pilot reported that he was close to Linate NDB at FL 130-135 in a severe thunderstorm. After 30 seconds he reported his position over Linate NDB with certainty and was therefore cleared to descend into the holding pattern down to 6 000 ft. At 1911 hours, Approach Control gave clearance for the descent to be continued down to 2 000 ft, the minimum safe altitude over Linate NDB.

At 1917 hours the pilot, speaking in a slightly agitated manner and sometimes with words which were incomprehensible, said repeatedly that he was not in fact certain of his actual position in relation to Linate NDB, that he was aligned with Linate ILS but that he was not able to establish his exact position in relation to the radio beacon, the latter being subject to considerable interference from the heavy electrical discharges due to the thunderstorm. The pilot also stated that he could not hear the ILS Outer Marker.

At 1919 hours, the pilot confirmed his uncertainty regarding his position and asked to maintain 4 000 ft for another holding pattern; he was again given the QFE and at 1922 hours reported that he had come down to 2 000 ft, that he was inbound and that he would call over the Outer Marker. After he had been given the clearance, there were no further communications and no reply to the repeated calls from Milan Approach Control.

It was subsequently found that the aircraft, which was aligned with the ILS localizer, struck the top of a hill at an altitude of 675 m, 35 NM from the threshold of runway 36, between 1923 and 1925 hours. The co-ordinates of the accident site were 44°51'30" N, 09°21'30" E.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal			
Non-fatal	2		
None			

1.3 Damage to aircraft

The aircraft was destroyed.

1.4 Other damage

There was no other damage.

1.5 Crew information

The pilot-in-command, aged 43, held a valid airline transport pilot's licence, with ratings for several aircraft, including the AW 650. He passed his last instrument rating check on 24 March 1965. He had flown a total of 9 823 hours, including 778 hours on the AW 650. During the last 90 days he had flown 111 hours. He had been involved in an undershoot accident on 12 December 1961, which resulted in the destruction of an aircraft when he was in command of a BEA passenger transport Rapide.

The co-pilot, aged 31, also held a valid airline transport pilot's licence. He had a pilot-in-command rating for AW 650 aircraft and passed his last instrument rating check on 24 September 1964. He had flown a total of 3 144 hours including 101 hours on the AW 650 and 82 hours during the last 90 days.

1.6 Aircraft information

The aircraft had a certificate of airworthiness which was valid until 18 January 1966. The last periodic check entered in the certificate of maintenance was made at the London Base on 24 June 1965. The inspection was certified by the BEA inspectors to be in accordance with the approved maintenance schedule. The period of validity of the certificate of maintenance was 45 days or 300 flying hours, whichever was the sooner.

At the time of the accident, the aircraft's gross weight and centre of gravity were within the permissible limits.

The type of fuel being used was kerosene.

1.7 Meteorological information

(a) Conditions over the scene of the accident

- (1) within Linate Control Zone: thunderstorm in progress with heavy rain and ceiling at 1 000 ft; visibility 15 km; no wind.
- (2) over the area of the accident: thunderstorm in progress with heavy rain and cloud in contact with the surface; zero visibility; strong local winds and turbulence.

(b) Weather forecasts

A SIGMET relating to thunderstorms forecast and observed was in force in the FIR for the period in question.

The Milan TAF, valid from 1200 to 2100 hours, forecast thunderstorms for the period 1500-2100 hours GMT over the airport area, as were in fact recorded.

The regional forecasts from the morning onwards referred to active thunderstorms in the Milan area with cumulonimbus extending up to an altitude of 10 000 m.

The Meteorological Watch Office did not receive any aircraft reports of conditions in flight over the Milan area during the period of time relevant to the present report.

(c) Weather conditions

(1) At the surface:

The Po Valley was located within a very large area of low pressure with centres over Piedmont and Lombardy at 1800 hours and over lower Lombardy at 2100 hours.

The depression was associated with an active cold front over the Po watershed of the Northern Apennines and extending along the Po Valley.

Throughout the Po Valley, there was extensive and intense thunderstorm activity. From 1200 to 24 hours the cold front was practically stationary.

There was in particular severe thunderstorm activity throughout the area under consideration, causing vortex phenomena, both north and south of the Po, with unpredictable results of an extremely serious nature.

(2) At altitude:

Over the whole of the Po Valley, the horizontal wind component was very moderate 5 to 15 kt and mainly southerly from the surface up to 1 500 - 1 800 m.

Above an altitude of 1 800 m, there were strong west-south-west currents and a jet stream between 500 and 150 mb/s (18 000 and 40 000 ft) with a maximum of 98 kt from 255° at 31 000 ft.

The altitude of the 0°C isotherm was 3 500 m.

In view of the widespread heavy damage caused and the frequency of thunderstorm phenomena, the effective local distribution of the pressure-temperature-humidity gradient doubtless led to extraordinary and certainly unusual horizontal and vertical wind speeds. It was not, however, possible to give any detailed values from the quantitative angle and even less to give any information regarding the location of the phenomena in question in time and space.

(d) Conditions reported by the pilot

The pilot reported that he had flown through a heavy hailstorm and operated the de-icing system. He also stated that he had encountered very heavy turbulence, in particular at the beginning of the descent from FL 130 to 4 000 ft and that it made instrument flying extremely difficult.

1.8 Aids to navigation

Radio aids within the Milan Terminal Area available for approach and landing at Linate Airport were:

Radio Beacons

- NDB Saronno
- NDB Trezzo
- NDB Voghera
- NDB Codogno
- NDB Linate

VOR

- VOR Saronno
- VOR Voghera

D/F Stations

- VDF/APP Malpensa
- VDF/APP Linate

ILS

Linate. This aid was flight checked on 26 June 1965 and on 7 July 1965 and was found to be operating properly.

SRE/PAR

- Linate
- Malpensa

The following radio navigation and communication aids were fitted to the aircraft: ILS, VOR, DECCA, radio compass, weather radar and radio transmitting frequencies.

1.9 Communications

No difficulties were reported.

1.10 Aerodrome and ground facilities

Conditions at Linate Airport were normal and the relevant installations were in operation.

1.11 Flight recorders

None mentioned in the report.

1.12 Wreckage

The wreckage was found on hilly ground traversed by ridges and dips of varying width and with considerable changes in level (about 1 to 6 m). The elevation of the accident site was 675 m.

The area comprised a small plateau with irregular surfaces and slopes, surrounded by mountains not higher than 2 500 to 3 000 ft forming the pre-Apennine area of the Po Valley.

The wreckage trail was orientated along a bearing of 360°.

1.13 Fire

After impact with the ground a localized fire broke out and destroyed part of the port wing.

The fire-fighting equipment was suitable and serviceable. It was not used, however, and the fire rapidly died out.

1.14 Survival aspects

No information was contained in the report.

1.15 Tests and research

Not mentioned in the report.

2. - Analysis and Conclusions

2.1 Analysis

Examination of the airframe structure, engines, instruments, radio and radar did not reveal any evidence of pre-crash mechanical defects, electrical defects or failures which might have contributed to the accident.

No evidence of lightning strike was found on the radio, radar and Decca aeralis and associated equipment of the aircraft.

It was found that the aircraft hit the ground in a nearly level attitude with the undercarriage down and locked and the flaps at a setting of 12° corresponding to the take-off setting.

The flight was normal as far as a position abeam Saronno VOR where the pilot reported that he was deviating to the south-west in order to avoid extensive thunderstorm formations over Milan. In fact, the pilot headed for Voghera VOR without asking Control for prior clearance, although he knew that Voghera VOR was the principal starting point for the majority of approach procedures for Linate Airport.

From the reconstruction of the flight and according to the air-ground communications, subsequently confirmed by the statements of the pilots, the aircraft passed to the west of Voghera VOR, flying beyond it and continuing southwards until the pilot realized that he was considerably off track and instructed the co-pilot to change course towards the east.

When the aircraft was on radial 135° from Voghera VOR, the pilot-in-command told the co-pilot that they were far to the south of the presumed position and he assumed control of the aircraft, making a decisive turn towards the north.

According to the air-ground conversation, the pilot passed over Linate NDB at 1909:30 hours at FL 130. Subsequent statements, however, showed that on the contrary the pilot was not certain of being over Linate NDB, the signal of which was badly disturbed by the thunderstorm in progress. The co-pilot for his part stated that he never heard the audio signal of the Outer Marker and that he did not see the light signal. It was therefore presumed that the nearest actual position of the aircraft to Linate NDB was 10 to 15 NM south of the estimated position, although the said point was on the alignment of the ILS localizer.

The Commission concluded that the descent procedure, for which normal clearance was given by Milan Approach Control, was begun at that point, erroneously estimated by the pilot, and that the subsequent holding patterns were therefore flown further to the south, probably in order to avoid the more active thunderstorm area. Under these circumstances the pilot would have been anxious to fly the descent pattern in an area with less turbulence than that which he had already encountered in the area near Linate NDB, but he would have endeavoured to remain on the ILS localizer beam.

From examination of the wreckage and the configuration of the terrain at the scene of the accident, the Commission was led to think that a strong downdraught, probably associated with the presence of heavy cumulonimbus, represented an additional vertical component in the dynamics of the impact.

2.2 Conclusions

Findings

The crew were properly certificated.

The aircraft had a valid certificate of airworthiness.

The conduct of the flight over Italian territory was from the outset influenced by the exceptionally bad weather conditions: an extensive thunderstorm front with severe turbulence extended over the whole of Lombardy and had earlier assumed the proportions of a veritable cyclone, causing loss of life and extensive damage.

After entering Milan TWA, the pilot's first concern was in fact to remain outside the thunderstorm area by deviating to the south-west away from the planned track. His new route caused him to fly for a distance for longer than intended.

Having realized that he was exceptionally far to the south, the pilot instructed the co-pilot to turn eastwards and on reaching radial 135° of Voghera VOR he took over control of the aircraft in an attempt to reach a gap which his weather radar screen showed in the cumulonimbus.

The Commission considered that from this time onwards the conduct of the flight by the pilot-in-command was not in absolute accordance with the standards established for a correct procedure in that the pilot himself did not make use of those ground radio aids which were fully serviceable and would have enabled him to determine his position at any time. Once he had established that the NDB could not give him any reliable indications because of the thunderstorm conditions, the pilot could have checked his position by bearings taken from Voghera VOR, more particularly as he was aligned with the Linate ILS localizer. The Commission did not understand why the pilot did not make this check and why, in addition, both the VHF navigational aids were tuned to Linate ILS.

The Commission believed that the pilot did not have a positive indication from the Outer Marker: in fact, he relied solely on the audio indication to which he referred in his statement, overlooking any visual indication.

The co-pilot, on the other hand, stated that he neither heard nor saw the Outer Marker signals.

Obviously the pilot's manoeuvres must have been made much further to the south than presumed and based mainly on the certainty of the indication of the ILS localizer beam. It was moreover strange that during the approach and descent procedure, carried out in particularly severe weather conditions, the pilot-in-command did not request any assistance from the co-pilot who was engaged merely in making the normal landing checks.

Cause or Probable cause(s)

The Commission considered that the cause of the accident was a navigational error arising from the following omissions:

- (1) The failure to take the necessary bearings for a reliable determination of the aircraft's position in view of the particularly unfavourable weather conditions.

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- (2) The failure to make the fullest possible use of the services of the co-pilot.

3. - Recommendations

None were contained in the report.
