No. 37

Linee Aeree Italiane, DC-3, crashed into Pale Perse (Monte Giner - Presanella Group) on 22 December 1956. Report released by Ministero della Difesa - Aeronautica, Italy.

Circumstances

The aircraft, I-LINC, took off from Ciampino Airport, Rome, at 1508Z on a VFR flight plan from Ciampino to Elba and an IFR plan from Elba to Milan-Malpensa along airways A3 and A9, which involve flight over the Elba, Genoa and Lombardia beacons. The cruising altitude was 10 500 feet. At 1520Z the flight plan was changed from VFR to IFR. The radio communications exchanged between the aircraft and Rome and Milan area controls were normal until approximately 1702Z when the aircraft confirmed that it was maintaining altitude 9 500 as instructed by Milan ACC. After 1714Z, attempts by Milan control to contact I-LINC were unsuccessful. The aircraft crashed at approximately 1720Z on the northern slopes of Monte Giner. All 4 crew members and 17 passengers were killed instantly.

Investigation and Evidence

From an analysis of the times reported for crossing of specific points, the route appeared to be that entered in the flight plan. As shown further on, however, the aircraft was not flying along the route it had given in the flight plan but was on a more easterly route which led it eventually into the Val di Nambrone. The crash occurred beyond this valley at latitude 46° 14' 45" N, longitude 10° 43' 53" E.

The weather conditions at the time of the accident were generally unsettled over Northern Italy.

From statements of witnesses, it appears that the weather at the scene of the accident was partly cloudy and that the flight over Val di Nambrone was conducted clear of cloud which leads to believe that there were large openings.

The meteorological information and the weather forecast for the route, the destination aerodrome, and the alternates were supplied to the pilot as usual before departure.

The actual weather conditions on the Rome-Milan route via Amber 1 - Amber 3 - Amber 9 between 1400Z and 1800Z on 22 December were as forecast.

The weather situation over central and northern Italy between 1400 and 1800 hours was such that navigation could be carried out between 1 500 and 3 000 metres in and out of clouds along the Rome-Elba sector. Over the second sector, Elba-Milan, cloud coverage increased and clouds in stratified formation occurred more frequently. Over the Valley of the Po, the cloud base was down as low as 500 - 600 metres.

Concerning icing, it is thought that after the report on icing (moderate to heavy) transmitted at 1648Z, by the aircraft, no such danger was feared since it would have been the subject of a further communication.

The efficiency of the radio aids over the Rome-Milan segment was checked by responsible authorities. No aircraft had reported any deficiencies or irregularities.

In addition to the communications between the aircraft and the Rome and Milan ACC's, no assistance was requested by the aircraft from other D/F stations. The aircraft transmitted routine position reports and no difficulties or complaints were mentioned.

Examination of the wreckage of the radio equipment did not yield any data of value. The 372 kc/s frequency setting found in the wreckage of the radio compass receiver panel of the radio operator does not correspond to any radio beacon frequency in use over the Po Valley.

Fires broke out following impact but were limited to the areas of the nacelles where fuel had spilled.

In view of the nature of the accident, the possibility of the aircraft's fire fighting equipment having been used must be excluded.

Wreckage was scattered in an area 30 metres in diameter at the same point where the aircraft crashed into the 45 degree slope.

The crew cockpit was completely crumpled against the slope and flattened against it. No technical data was obtainable from the instrument panel or from the position of the controls. The passenger cabin was completely destroyed. The tail assembly was found only slightly damaged, owing to the cushioning effect produced by the bending and failure of the forward part of the aircraft.

The condition of the wreckage and in particular that of the fuselage, completely destroyed up as far as the bulkhead level with the door to the lavatory, indicated the violence of the impact.

The absence of any trace along the area preceding that where the wreckage was found indicates that the aircraft did not come in contact with the ground before the impact.

The first part of the aircraft to strike the mountain was the nose and the left half wing, which were broken off approximately at the point of impact, while the other parts were thrown forward towards the right as a result of the rotation following the sudden stop of the left half wing.

No useful information was obtainable from the piloting and navigational instruments, from the radio equipment or from the controls, because of the condition of these parts. The only thing that it was possible to observe was that the magneto switch was in the "BOTH" position for both engines.

The technical examination of the wreckage did not reveal any data or information leading to the possibility of mechanical or structural failure.

Messages exchanged between the aircraft and Rome and Milan Area Controls indicate the following:

With Rome Control

1546Z ... gave its time of departure from Rome, destination, estimated time of arrival at Milan, flight conditions, flight altitude, true track of 330° and requested the QNH for Pisa and relay of the message to Milan ....

1552Z ... it had passed over Orbetello at 1551Z and was flying in and out of cloud at 10 500 feet

1614Z ... over the Elba radio beacon and flying in cloud

after 1614Z and before 1624Z

... the following message was entered in the aircraft station log (parts of which were recovered) for transmission to Rome Ciampino:

"NR2 ESTIMATES ARRIVAL ABEAM PISA RADIO BEACON 1628Z FLIGHT ON TOP CLOUD AT 10 500 FT IFR ACKNOWLEDGE - ETA MILAN/ MALPENSA 1730Z K"

(The time of transmission is not entered in the aircraft station log, which leads to believe that the message was never sent. In fact, there is no record of it having been received by Ciampino).

With Milan Control

1648Z ... had overflown the Pisa radio beacon at 1628Z and was flying through cloud with average to moderate icing at 10 500 feet

Milan ACC asked the aircraft whether it wanted a lower altitude - it replied that it wished a lower altitude after Genoa

1651Z ... was instructed to remain at 10 500 feet and to call back when over Genoa - aircraft asked whether after crossing the Genoa beacon it could fly directly to the Malpensa radio beacon without overflying VOR Lombardia

1653Z ... was informed by another aircraft (I-LOVE) that weather conditions over Genoa were such that lights of the city could be clearly seen

1659Z ... reported over Genoa radio beacon at 10 500 and requested permission to fly to VOR Lombardia at 6 500 feet

ACC Milan authorized descent to 9 500 feet and instructed the aircraft

to maintain that altitude; it also gave the value for altimeter setting and the estimated time of the beginning of its approach (1728Z) to Malpensa.

1701Z ... I-LINC asked whether the ILS at Malpensa was operative

1702Z ... requested clearance from ACC Milan to descend to 6 500 feet on the VOR Lombardia. ACC denied the request.

1709Z ... the tape of channel 125.3Mc/s registered an unintelligible mutilated word, repeated twice; this word is inserted between an exchange of communications between an Air France aircraft and Milan Control and could not be identified nor therefore attributed with certainty to aircraft I-LINC;

1714Z onwards

repeated calls from Milan control and from I-LOVE were unanswered.

Until 1702Z communications with the aircraft were normal. After that time from evidence gathered, it appears that the position lights were on, which indicates that electric power was available. Witnesses who heard the aircraft did not notice any malfunctioning of the engine.

The place at which the aircraft crashed in relation to the duration of the flight and to the average speed of the aircraft leads to the belief that the track made good by the aircraft was altogether east of the planned track.

On the basis of messages sent by the pilot of I-LINC, it appears that the flight was conducted continuously in cloud. In particular, at 1648Z the aircarft reported moderate to severe icing. These meteorological conditions are in sharp contrast with those encountered and reported by other aircraft flying at about the same time on the airways indicated in the flight plan of I-LINC, which reported fair conditions. It must be assumed, therefore, that the aircraft followed a course further to the east where the weather conditions as reported in the forecast correspond to those reported by the pilot.

The message sent by the pilot, reporting that he was over Genoa at 1659Z cannot be accepted as accurate if it is considered that the impact occurred at approximately 1720Z in the Giner area, 250 kilometres distant from Genoa, a distance which could hardly be covered in 21 minutes.

It was reported by the D.A.T. Command* that two control radars observed traces of an unidentified aircraft on their scopes.

The first radar had observed at 1640Z a blip 20 kilometres west of Bologna and had followed it in its flight along a track to the north until 1658Z, south of Verona.

The second radar had observed a trace in the same area at 1659Z and had followed it until 1705Z in the vicinity of Mori.

In view of their position, the time of sighting and the direction of displacement of the two traces, the authorities concluded that they referred to the same aircraft.

Since the data concerning the position and the time which can be deduced from the reports are in agreement as to the hour and to the time of the crash, it is believed that the traces were those of aircraft I-LINC.

The second radar estimated the altitude of these traces at 14 000 feet and the speed at 210 knots.

These estimates do not appear acceptable, however, unless it is assumed that the aircraft, in contrast with the clearances received to maintain the cruising altitude of 10 500 feet, decided arbitrarily to climb first to an altitude of 14 000 feet and then to descent at a speed of 210 knots. This assumption appears entirely improbable.

In the message sent at 1546Z to Rome control, the aircraft reported that it was flying on a true heading of 330°. This heading does not correspond to that of airway Amber 1 which it should have been following, but corresponds closely to the direct route Ostia-Malpensa or Civitavecchia-Malpensa.

The request by the pilot at 1650Z to initiate descent after Genoa may indicate that he believed that he was in a mountain area presumably east of Genoa.

* Difesa Aerea Territoriale

The request by the aircraft at 1650Z to fly to Malpensa without passing over Lombardia NDB-VOR may be explained only if the aircraft thought it was following a route which did not pass by Genoa, since Malpensa, VOR Lombardia and Genoa are on the same alignment.

At 1656Z the pilot of I-LOVE gave the weather conditions over Genoa to I-LINC.

At 1659Z I-LINC reported being over Genoa, whereas, on the basis of the considerations mentioned ..... re the crash occurring at 1720Z in the Giner area, 250 kilometres distant from Genoa, a distance which could hardly be covered in 21 minutes ..... it could not have been at that position and therefore, it could not observe Genoa as had I-LOVE.

The fact that the pilot was not concerned about this leads to the belief that he was aware that he was not over Genoa.

Analysis of the information available leads to the reconstruction of the route followed as:-

1508Z	take-off Rome
1516Z	Ostia
1640Z	20 kilometres west of Bologna
1643Z	Castelfranco Emilia
1659Z	Verona
1705Z	Mori
1720Z	crash.

(pressure altitude 9 500 feet corresponding to true altitude of 8 500 feet = 2 600 metres at temperature of -30°C.)

The route from Castelfranco Emilia to impact is confirmed by data available.

The fact that the aircraft crashed into Monte Giner on a southerly track is due to the change made by the pilot after flying over Val di Nambrone on a northerly track, as evidenced by statements of witnesses.

It appears that the sector Ostia (1516Z) to Castelfranco Emilia (1643Z) was covered in 1 hour and 27 minutes. This time on the basis of an average speed of 230 kilometres per hour represents a distance of 330 kilometres. Since this corresponds to the distance between Ostia and Castelfranco Emilia, it may be concluded that the track followed by the aircraft coincides approximately with the line joining these two points. It appears, therefore, that the track followed by the aircraft departed considerably from the route requested and authorized in the flight plan.

The pilot must have been aware that he was on a different route from that of the assigned airways, for the reasons already indicated and also because of the lack of radio checks over the compulsory crossing points. The pilot instead reported that he had flown over these points. Any failure of the radio compass would have been noticed at the latest upon overflying the first radio beacon along the route.

On the basis of his flight plan, the pilot should have followed three airways:

- AMBER 1 (radio beacon Ostia, radio beacon Civitavecchia, radio beacon Orbetello, radio beacon Elba);
- AMBER 3 (radio beacon Elba, beam radio beacon Pisa, radio beacon Genoa);
- AMBER 9 (radio beacon Genoa, radio beacon VOR Lombardia, radio beacon Malpensa).

Along this route he would have had available all the elements to check his route, speed, position, drift and therefore to correct any errors in his navigational instruments and of the airborne radio equipment. A reconstruction of the flight leads to the conclusion that the pilot, from the beginning of the flight, intended following a direct route from Ostia to Malpensa instead of that indicated in the above-mentioned flight plan.

It was ascertained that the pilot did not request any D/F fixes from the ground stations to establish his exact position along the route, nor, on the basis of the flight itself, does it appear plausible that he himself took any D/F bearings from the aircraft to ascertain his position.

While it is not improbable that the pilot did take lateral bearings in flight, these were not sufficient to permit him to determine his position along the route.

In all probability, therefore, the pilot navigated on the basis of an erroneously deduced reckoning and on the basis of the indications of his compass and directional gyro.

The crosswinds along the route, possibly of higher intensity than those reported to the pilot, the disturbed weather conditions which the aircraft encountered along the route and the simultaneous occurrence of irregularities in the functioning of the instruments (radio compass and directional gyro) may have caused the aircraft to deviate from the route selected by the pilot.

It should be pointed out that the D.A.T., after observing the presence of an unannounced aircraft in the Bologna-Modena area, and on the assumption that this was an aircraft that had deviated from airway AMBER 14 (Viterbo-Florence-Parma-Linate), communicated this information to Milan Control.

Milan, after analysing its traffic, excluded the possibility that this report could concern an aircraft under its control since at that moment all assisted aircraft, through the position reports, communicated that they were flying regularly along the assigned airways.

In particular, Milan could not imagine that the report concerned I-LINC, which a few minutes before had reported that it was flying on airway AMBER 3 along the Elba-Genoa sector.

It should further be pointed out that in this specific case, Milan control could not itself take any initiative on the basis of the communication received from the D.A.T., since its function is limited to providing assistance to reported aircraft flying under IFR conditions.

Probable Cause

The Commission concluded that the change in the route followed by the aircraft and the resulting accident may be attributed to the following:-

a) the pilot did not follow the airways assigned in the flight plan - which constitutes a violation of flight rules;

b) he did not check his direction and position along the new route;

c) unfavourable weather conditions and drift existed;

d) there was a possibility of error in the navigational instruments.

Recommendations

On the basis of the examination of the causes of the accident, the Commission recommended:

1) the instruction to all pilots to follow the airways assigned and entered in the flight plan should be enforced and pilots should be instructed to follow clearly the rules governing instrument flight;

2) that in all cases flight crews should avail themselves more fully of existing radio facilities and in particular the HF and VHF D/F aids available.

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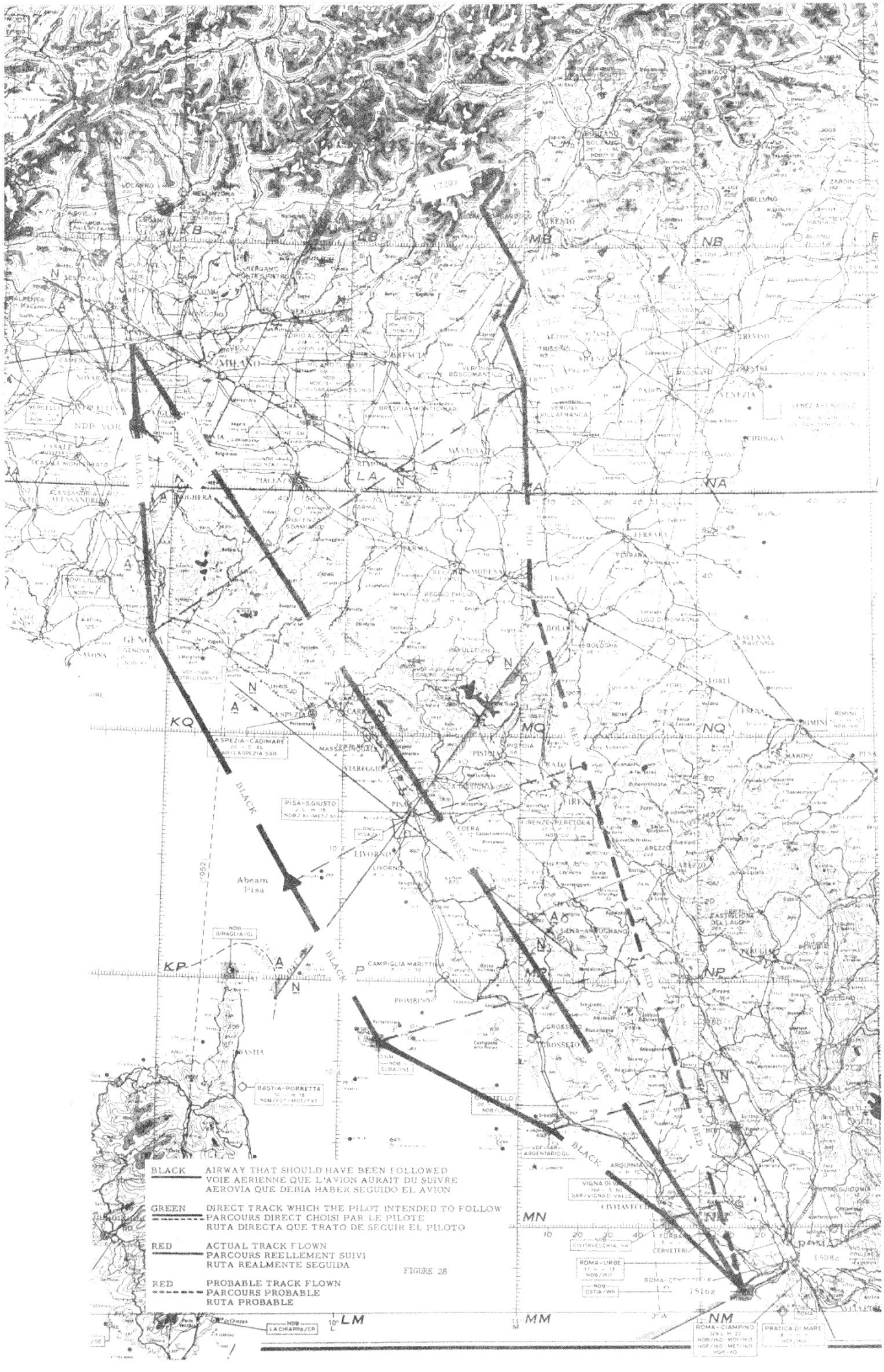
BLACK AIRWAY THAT SHOULD HAVE BEEN FOLLOWED
VOIE AERIENNE QUE L'AVION AURAIT DU SUIVRE
AEROVIA QUE DEBIA HABER SEGUIDO EL AVION
GREEN DIRECT TRACK WHICH THE PILOT INTENDED TO FOLLOW
PARCOURS DIRECT CHOISI PAR LE PILOTE
RUTA DIRECTA QUE TRATO DE SEGUIR EL PILOTO
RED ACTUAL TRACK FLOWN
PARCOURS REELLEMENT SUIVI
RUTA REALMENTE SEGUIDA
RED PROBABLE TRACK FLOWN
PARCOURS PROBABLE
RUTA PROBABLE
FIGURE 28