No. 7

Belgian International Air Services, Douglas DC-6B, OO-ABG accident at Milan-Malpensa Airport, Italy on 18 February 1966. Summary of accident report released by the Ministry of Transport and Civil Aviation, Italy

1.- Investigation

1.1 History of the flight

The aircraft had taken off from Brussels at 0010 hours GMT on 18 February 1966 on a cargo flight to Milan-Malpensa, Italy, to transport 214 calves.

The flight was routine until the aircraft arrived over the Saronno VOR/NDB at 0148 hours. It was then cleared by Milan ACC to fly directly to the Malpensa radio beacon with a 6 000 ft "clearance limit" and to contact Malpensa APP directly.

The aircraft was duly transferred to this latter unit at 0150 hours.

At 0153 hours the aircraft was over NDB Malpensa at 6 000 feet and was cleared by Malpensa APP to carry out a STANDARD/ILS (SIA) approach procedure to runway 35R. The aircraft was also provided with complete meteorological data for Malpensa Airport; runway visibility was given as 250 m.

The aircraft left the 6 000 ft level at 0153:20 hours outbound on track 155° as specified in AIP/ITALY MAP/050/1.

At 0157:33 hours the pilot reported on approach inbound (352°) at 4 000 feet.

At 0159:49 hours the Malpensa airport PAR controller provided the pilot with the current parameters: distance 7 NM/on track/ on the glide path.

At 0200:44 hours the pilot reported 2 000 ft at the outer marker. It was cleared by Malpensa APP to land on runway 35R and instructed to report runway in sight. The ground/air/ground communications log indicates that the approach procedure was being carried out correctly and at 0202:50 hours the radar controller informed the pilot that he was over the approach end of the runway. This was the last contact between the aircraft and the control services.

The aircraft had actually carried out a night-time final approach phase procedure in extremely critical visibility conditions because of fog, and in such conditions it had crossed the threshold of runway 35R deviating about 8° to the right in relation to the runway centre line; it then continued alongside the runway for about 2 400 m and struck the top of a group of trees beyond which it crashed to the ground approximately 3 000 m from the runway threshold and 435 m from its centre line. The aircraft caught fire following fuel spillage after impact with the ground. All the occupants were killed and the cargo was destroyed. The accident occurred at 0254 hours GMT (at night).

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	3	1	
Non-fatal			
None			

1.3 Damage to aircraft

Completely destroyed.

1.4 Damage to cargo

Practically all destroyed.

1.5 Crew information

(a) Pilot-in-command: HOLEMANS Roland, aged 31

- holder of airline transport pilot licence No. 2190/839, still valid
- last medical check on 30.9.65
- last instrument flight proficiency test on 12.9.1965
- restricted radiotelephone operator's certificate
- flying experience: total: 6 770 hours 14 minutes, of which
  - 1619 hours 40 minutes on DC-6B
  - within last three months: 160 hours and 50 minutes
  - within last 48 hours: 6 hours and 40 minutes.

(b) - Co-pilot: DE BARE DE COMOGNE Roger, aged 42

- held valid airline pilot licence
- last medical check on 22.9.65
- flying experience: total: 6 958 hours and 40 minutes
  - from October 1964 to 5.4.1965 he had logged
  - 25 hours and 5 minutes day-time flying
  - 33 hours and 5 minutes night-time flying

- from 5.4.1965 up to the time of the accident:
  - 35 hours and 30 minutes on DC-4
  - 21 hours and 10 minutes on DC-6
- during last 48 hours : 12 hours and 30 minutes

(c) - Mechanic, RENE DESMET, aged 32

- born 13.9.1934 at UCCLES
- held a valid flight mechanic's licence
- instructor rating on 31.1.1966
- total flying time : 4 343 hours 10 minutes

1.6 Aircraft information

The aircraft held a Certificate of Airworthiness valid until 29.6.1966. It had operated efficiently throughout the flight with all systems in good order.

All inspections and mandatory modifications specified by the FAA had been carried out on the aircraft.

The cabin layout for the carriage of the calves was in accordance with the system specified by the BIAS Company, i.e. the cabin had been divided into five sections by bolting together a framework of wooden rails and bars about 1.20 m high. The rails were attached with hooks and chains to similarly constructed wooden railings built against the sides of the cabin. This arrangement was meant to ensure stability of the cargo and to prevent any significant longitudinal displacement.

The weight and balance of the aircraft were within the specified limits both during flight and at the time of the accident.

1.7 Meteorological information

Conditions conducive to the formation of radiation fog had developed in the Po Valley.

The sky was still visible through the fog which covered the airport, either because the fog blanket was rather thin, or, because it decreased in thickness from the ground upwards.

In any event, the fog was thicker near the ground, since the continuous cooling of the ground increased the process of water vapour condensation.

In such conditions visibility varies with the location of the observation point. For an observer at ground level, visibility is minimum in a horizontal direction, and increases progressively in an upward direction to reach its maximum value directly overhead.

Therefore, for anyone flying at night over an airport covered by this type of fog, the higher his flight level the more visible would appear the runway lights.

The total absence of wind and the temperature inversion between ground level and the 700 m height excluded the presence of turbulence near the surface and in the lower layers.

The temperature in the fog bank was around freezing point, however the Commission ruled out the possibility of aircraft icing because the limited thickness of the fog indicated that the water content of the air, in both liquid and solid state, was low. However, as no preventive action had been taken, the possibility of carburettor icing was not ruled out.

1.8 Aids to Navigation

Operating normally.

1.9 Communications

Operating normally.

1.10 Aerodrome and ground facilities

Operating normally.

1.11 Flight recorders

None installed.

1.12 Wreckage

The aircraft wreckage consisted of a large number of separate parts, sections and fragments scattered over a 200 m strip of land next to the runway. The axis of this strip was at an angle of about 40° to the runway centre line, with the mid point located approximately 2 700 m from the south end of the runway and 400 m from the centre line of the runway itself.

The trail of wreckage over this strip of land showed that the breaking up and separation of power plant components, etc. was followed by the outbreak of fire which destroyed the main part of the aircraft, i.e. the main section of the fuselage and the centre wing section.

It was determined that about 340 m before the first point of impact with the ground, the aircraft struck a large number of slender trees (acacias and birch), dragging along the tops and breaking the branches at a height of 4 to 7 m.

On the ground below were found small fragments of the skin and pieces of silver-plated glass from the wing landing lights.

Beyond this point, the aircraft brushed against another group of trees, knocked one down, and then, about 10 m further on, the right wing tip struck the grassy terrain digging a narrow furrow some 50 m long which became progressively deeper and more distinct.

It was obvious from the ground marks that during the last phase of the accident and until impact with the ground, the aircraft was in a sharp right bank attitude.

1.13 Fire

Although the alarm was sounded immediately and the airport fire-fighting services dispatched at once, nevertheless the visibility conditions and the consequent difficulty in locating the wreckage reduced the effectiveness of these services.

2. - Analysis and Conclusions

2.1 Analysis:

The approach procedure for landing at Milano-Malpensa airport was carried out in accordance with the procedure published in AIP/ITALY - MAP/050-1. The aircraft had carried out a complete standard ILS procedure assisted by the Malpensa GCA. The speed during the initial approach phase was 119 Kt with a rate of descent of 570 fpm. It was subsequently reduced to 106 Kt during the final phase. The GCA controller started monitoring the flight 7 NM before the touchdown point. At 0201:12 hours the aircraft was 3 NM from the touchdown point, slightly above the glide path and 100 feet to the right. At 2 NM the aircraft was perfectly aligned and on the glide path.

At 0202:43 hours the aircraft was at 0.5 Km, on the glide path, and slightly to the left of it.

The aircraft maintained this position thereafter, as confirmed by the testimony of a witness, namely the aerologist on duty who was at the meteorological station located 175 m from the runway threshold and 100 m to the left of the extended runway centre line.

According to his testimony the aircraft was appreciably displaced to the left when it passed over the station, it then made an approximate 20^{o} right bank turn flying over the right section of the threshold lights.

This is in agreement with the last position given by the radar controller who at 0202:50 hours placed the aircraft over the runway threshold.

The examination and technical investigation of the wreckage ruled out the hypothesis that the accident was caused by a technical failure. The aircraft had in fact carried out its flight normally up to the runway threshold, and obviously if any failure had occurred at that moment the aircraft would have landed immediately. Furthermore, the detailed examination of the wreckage did not yield any evidence substantiating the suspicion that a failure occurred in the last moments of the flight. The breaks and fractures examined were definitely attributable to the violent impact of the aircraft with the ground and to the effect of its subsequent brief and disastrous travel over rough terrain.

Another hypothesis which was considered was a loss of control of the aircraft following sudden and massive shifting of the load towards the tail section as a result of excessive nose-up attitude during the final landing phase. However such an important shifting of the load was materially impossible since the passenger cabin had been subdivided for the transport of the calves into five separate sections by installing solid cross-barriers attached to the sides of the fuselage with hooks and chains in such a way as to prevent completely and effectively any longitudinal shifting of the load. Bearing

in mind that the calves had very little freedom of movement in each of these 5 sections because they occupied virtually the entire floor space, it is obvious that any degree of shifting in the load would have been insignificant from the point of view of stability and control of the aircraft, especially since the centre of gravity of the aircraft at the end of the flight was about 20% MAC and therefore was well within the extreme aft position which is 32% MAC.

2.2 Conclusions:

The weather conditions prevailing at the time were certainly a main causal factor of the accident. At about 0200 hours there were cloud banks over the airport area which, although they did not prevent upwards visibility because of their reduced vertical thickness, were nevertheless thicker near the surface, limiting forward visibility to 250/300 m.

This meteorological situation was known to the pilot who had been duly provided with the relevant weather reports.

It should be pointed out that the pilot did not comply with the company "visibility minima" specified for the subject aircraft. The BIAS Company specifies, for this type of aircraft, a minimum forward visibility of 500 m for an ILS procedure at the Milano-Malpensa airport.

In any event the aircraft carried out a normal approach procedure, using the ILS with GCA monitoring right up to the final phase. The Commission believes that the pilot, because of the sudden appearance of the threshold lights, was definitely aware that he was displaced to the left with respect to the runway centre line. He therefore reacted by turning to the right in an attempt to align himself. It should be pointed out that this manoeuvre was carried out while continuing his descent path, which resulted in a further loss of height of the aircraft.

This is confirmed by the testimony of the aerologist who, from the meteorological station, saw the underside of the wing of the aircraft illuminated by the green threshold lights.

However, since the runway threshold was very near, the turn brought the aircraft to the right of the threshold and the pilot immediately lost sight of it because of the fog.

Since it was impossible to realign himself, the pilot interrupted his turn and brought the aircraft on a heading which diverged 15^{o} from the runway centre line.

It is believed that the pilot, who was still attempting to obtain visual contact with the runway, lost a certain number of seconds during this phase. Return to instrument flying accounted for a further loss of time in adjusting.

During this phase the pilot was deprived of:

- ILS assistance;
- radar assistance;
- visual reference to the runway lights which were hidden by the fog.

It is assumed that, having lost any hope of being able to land, the crew initiated the appropriate missed approach manoeuvres while the aircraft was flying on the new heading. Landing gear was retracted, flaps retracted to the appropriate setting and the aircraft continued along the new track diverging from the runway until it struck the tops of a group of trees located approximately 2 300 m after the runway threshold, and 250 m to the right of the runway centre line.

The Commission believes that the aircraft did not gain sufficient height to clear the trees because of the following factors:

(1) The adjustment time between abandonment of visual contact flight and transfer to instrument flight after losing sight of the runway lights, and the consequent delay in the decision to initiate the go-around.

(2) The time required for the execution of the missed approach procedure.

(3) Gradual recovery of speed to achieve a better climb angle.

(4) The difference in elevation between the south runway end (elevation 691 ft) and the north runway end (elevation 767 ft) was 76 ft to which the height of the trees (22 ft) must be added. This gave a total difference in elevation of 98 ft between the south end of the runway and the point of the first impact with the tops of the trees.

Upon striking the tree tops the pilot instinctively nosed up the aircraft and at the same time throttled up in order to gain height. This sudden manoeuvre placed the aircraft in a stall attitude and the right wing dipped. The aircraft crashed to the ground and dragged along the ground on its right wing tip about 100 m, turned over and burst into flames.

Cause or
Probable cause(s)

The Commission attributed the accident to the following causes:

(1) Failure of the pilot to comply with the Company's "minima";

(2) Subsequent belated decision to execute the missed approach procedure.

3. - Recommendations

The Commission recommends the adoption at every national airport of "State minima" based on the type of radio facility used, as is done in other foreign states.

Non-scheduled international
Landing-go around
Collision-trees
Pilot - continued IFR below minima

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