No. 2

KLM Royal Dutch Airlines, Douglas DC-6B aircraft, PH-DFO, crashed into the North Sea, 10 nautical miles west of Egmond, The Netherlands, on 23 August 1954. Report of Accident Investigation Bureau, Department of Civil Aviation of The Netherlands, adopted 14 November 1955.

(This report was received too late for inclusion in Digest No. 6 /1954 accidents/. Due to a 15-month period of intensive investigation it was not adopted until 14 November 1955.)

Circumstances

The flight departed New York on 22 August 1954 for Schiphol Airport, Amsterdam, with a stop at Shannon. On board were a crew of 9 and 12 passengers. At Shannon, following a briefing on the expected en route weather conditions, the crew filed an IFR flight plan, which indicated that the flight was cleared at a cruising altitude of 11 500 feet in Airway "Green 2" at a true airspeed of 256 knots. Take-off from Shannon was at 0929 hours Greenwich Mean Time. Permission was granted to fly direct from Tulsa to Rush-beacon by which the roundabout way via Athlone was cut. At 1122 the aircraft advised that the boundary of the Netherlands flight information region had been crossed. At 1125 the flight informed the area control centre at Schiphol that it was leaving the cruising altitude and descending to approach the beacon "Spijkerboor" (PHA) with an estimated time of arrival at 1137. The flight was then cleared to approach this beacon at 5 500 feet or above, later amended to 4 500 feet or above and then to 3 500 feet or above. Everything up to this point seemed to be quite normal and there was no indication of any difficulty on board. At 1135 the area control centre at Schiphol cleared the aircraft to descend to 2 500 feet but no answer was received. Half an hour later the alerting phase was declared by Schiphol followed by the emergency phase. An extensive search(hampered by low clouds, showers and heavy seas) was then started. Searching aircraft reported a big oil spot on the sea off Bergen on the Sea and at 1610 floating debris was reported, some of it showing the initials KLM. There were no survivors.

Investigation and Evidence

Weather conditions were not as favourable as expected before take-off from Shannon, but certainly not unfavourable for a flight on instruments. During the flight over the North Sea area the weather was as follows:

> extensive formations of clouds produced an 8/8 cover with its base at some hundred metres, and there were many showers below this level. Above this layer, which extended at a height of 1 600 - 1 800 metres (5 200 - 5 900 feet), many clouds existed and it is possible that there was a more or less solid cover up to some 3 500 metres (11 500 feet). Freezing level was at an altitude of 2 400 - 2 600 metres (7 900 - 8 500 feet).

Based upon observations of captains of other scheduled aircraft it is known that, in spite of these comprehensive formations of clouds, turbulence was only slight to nil, and almost no static in radio communication was experienced. Ice accretion was negligible. A study of the weather conditions led also to the conclusion that the presence of thunderstorms was highly unlikely. Wind at sea level was 260 - 290/14-18. At 14 500 feet the wind encountered was 320/15

Some people near the small town of Egmond, where airway "Green 2" crosses the coast of the Netherlands, informed the local police, that they had observed a four-engined passenger aircraft flying extremely low between 11 and 12 o'clock. A thorough investigation disclosed that this aircraft must have been PH-DFO. One witness could give a very accurate time check as his observation closely followed the end of a certain radio program to which he had been listening. He must have observed the aircraft at 1134 or 1135, which fits perfectly well with the time at which PH-DFO should have crossed the coast at that place. However, one witness, whose statement also seemed to be trustworthy had seen the aircraft flying in a direction which did not fit in the assumed pattern. Therefore, it was considered to be possible that the flight path

had been more complicated and an extensive search for more witnesses, which took several weeks, was initiated, resulting in some ninety dependable statements. Based upon these observations the path of PH-DFO over the northern part of Holland could be reconstructed approximately up to the time of 1201. At this time two quite independent witnesses made the same observation at the same time, which could be exactly established by comparison with the radio program. Then the aircraft flew in the direction of the sea, and no other witnesses are available for this part of the flight.

According to the statements, the plane flew at a height varying from about 100 to 1 200 feet and except for the low altitude no abnormalities were observed. The flight pattern, as performed by the aircraft, could only have been flown if the controls were more or less fully usable and if the aircraft was flown by hand.

On 24 August attempts to recover the wreckage of the aircraft were commenced. An area of 150 square miles was thoroughly and systematically explored by Navy ships and fishing boats. Sonor sweeps to locate the wreckage proved to be unsuccessful due to the great number of metal obstructions of wrecked ships and also of aircraft from the war. The best results were obtained by trawlers with reinforced fishing nets. In spite of the relatively shallow sea (approximately 60 feet), salvage action was hampered by rough seas throughout the autumn of that year, in which weather in general had an unsettled character. The last months of search activities were almost without result, and as by then the favourable season was over, the salvage action was stopped on 25 November 1954 when 45 to 50% of the aircraft had been brought ashore.

The aircraft had been broken into many thousands of pieces, of which the cabin door was the second biggest. All recovered parts were transported to Schiphol Airport where a detailed inspection of each fragment was carried out. Furthermore, a mock up of the fuselage was made by means of a framework, the tail and wing constructions being carefully laid out in their relative positions.

As fragments of nearly all main parts of the ship were available, the conclusion was reached that at the moment of impact the aircraft must have been complete and that no vital elements had been lost in flight. On the right hand main spar it was found that deformation was caused by forces in an upward and aft direction, the left hand wing failed in forward direction. Main parts of the engines No. 3 and 4 and some parts of engines No. 1 and 2 were found. The lower cylinders of the right hand engines were torn off, obviously by impact. Investigation revealed that engines 2, 3, and 4 must have been running at the moment of impact and that engine No. 1 might possibly have run. It was impossible to determine at what power they were running, there are indications that this was at low power or perhaps the power developed with closed throttles. From the propellers only separate blades could be recovered, two of these originating from propeller No. 4. The tips were missing and the blades were broken off in a backward direction near the hub.

The deformation of the wreckage indicated that the aircraft contacted the water with the nose slightly down and slightly banking to the right. Due to the fact that only minor parts of the systems could be recovered no conclusion about their function prior to the impact could be drawn. None of the parts showed any indication of fire. As no watch or boardclock was found the time of impact remained unknown.

The examination of the recovered bodies and personal properties of the victims gave no indication as to the cause of the accident. No traces of fire were found. The blood did not contain CO_2 and no particles of soot were found in the bronchial tubes. The injuries were considered to be partly vital and partly postmortal, but no conclusion about the minimum time elapsed between the vital injuries and the deaths could be drawn. Possibly both types of injury originated during the impact with the water.

The aircraft passed the Netherlands coast at the time expected, however, at a very low altitude. This leads to the conclusion that very shortly after the last radio contact the rate of descent, intentional or not, had been increased considerably. No clearance was requested for this descent and for flying under IFR conditions at such an altitude. It is obvious, that there must have been a reasonable ground for this action and it is believed that this part of the flight contains the key to the mystery. Furthermore, it has not been possible to find a reasonable explanation for the half-an-hour's flight over land without any radio contact, after the fast descent was made.

In the evidence available no indication could be found as to the cause of the accident. In the opinion of the Investigator of Accidents

it is highly unlikely that the disaster was due to:

a) the weather conditions, including ice accretion and lightning;

b) any type of collision;

c) ground-air firing;

d) failure of a powerplant, including blade failure;

e) failure of main structural parts in flight.

There are no indications that the sudden descent was due to passengers, crew condition or loading. A failure in one of the systems (control, hydraulic, electric, oxygen, fuel, cabin pressure, emergency equipment) cannot be excluded, but due to the fact that only about 10% of the systems were available for inspection, it is impossible to base any conclusion upon the evidence.

A number of hypotheses as to the cause of the accident were developed. Some possibilities considered were: overheating of the electric system with heavy smoke development, explosion of one of the high pressure bottles, failure of a cockpit window, failure of the automatic pilot. However, no hypothesis could be formulated in which all occurrences and evidence could be made reasonably acceptable. Therefore, in November 1955, after a 15-months' period of intensive investigation, the conclusion had to be drawn that the cause of the accident could not be established.

Probable Cause

The Investigator of Accidents was unable to determine the probable cause of the accident.

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