

05 February 2014
08:15

No. 12

British European Airways Corporation, Vickers Viscount 802, G-AOHP,
made a forced landing at Ballerup, Denmark, on 17 November 1957.
Report released by the Director of Civil Aviation, Denmark.

(Reference was made to this accident in Digest No. 9. The summary was held over at the request of the United Kingdom pending discussions on the report with the Danish Authorities. The United Kingdom subsequently informed ICAO that the Danish Authorities had agreed to the attachment to the Danish Report of a statement by the aircraft manufacturer. The substance of the attachment appears as footnotes in the following summary.)

Circumstances

On the day of the accident the aircraft had taken off from London Airport at 0130 hours GMT on a scheduled flight to Kastrup Airport, Copenhagen, carrying a crew of 2 and a cargo of mail, freight and newspapers. The flight was without incident until when holding over Radio Beacon Bella, three of the aircraft's four engines stopped. It lost height and a forced landing was made at 0403 hours GMT, 14 miles northwest of Kastrup. The aircraft was considerably damaged, but there was no fire. The crew were not injured.

Investigation and Evidence

The aircraft had taken off from London Airport with 1 480 gallons of fuel on board. Take-off weight was 28 549 kilos (maximum permitted 28 576 kilos).

Climb was made to 21 000 feet where the flight was continued in clear air without incident. At 0327 hours, clearance was given to descend to 7 000 feet, and later to 3 500 feet. A layer of stratus cloud was entered at 4 000 feet and the propeller de-icing was switched on. At this time the temperature at 3 500 feet was -2°C. The aircraft arrived at Bella Beacon at 0346 hours and was held in the holding pattern whilst another aircraft, which was experiencing radio trouble, was cleared in to land. During this time the initial pre-landing drills were started, and it is

estimated that the fuel heaters were switched on at 0348 hours. At 0351 hours Control indicated that further clearance could be expected in three minutes. The remaining initial approach drills were completed including lowering the undercarriage and switching off the flowmeters. After three minutes the captain decided that a clearance could be expected at any time and, therefore, started to make a procedure turn to the northwest in order to join the ILS.

During this time neither the windscreen de-icers nor wipers were used, and there were only light spots of ice on the windscreen. The airspeed was 135 knots, and the power settings approximately 12 000 rpm and 160 lbs torque.

At approximately 0357 hours, during the right-hand procedure turn, and soon after the captain had switched on the airframe de-icing, the port current flow warning light came on, together with the flashing central warning light. The aircraft swung to port, and having just switched on the airframe de-icing the captain associated the warning light with fire in No. 2 engine, but on checking gauges he saw that No. 1 rpm and jpt (jet pipe temperature) were falling. He, therefore, carried out the fire drill on No. 1. No other warning lights were seen. The aircraft was straightened up on to a northerly heading and the throttles of No. 2, 3 and 4 engines were set to full power, and the

wing de-icer was switched off. The aircraft was now losing height rapidly, and the captain retracted both undercarriage and flaps and decided to turn to starboard to regain the ILS. This turn tightened up considerably reaching about 45° bank with 135 knots and a high rate of descent. Severe buffeting occurred resembling the approach to the stall. It was only during this turn that it was realized that Nos. 3 and 4 engines had now failed and the rpm gauges were seen to be at zero.

The manual feathering drill was completed but no current flow warning light showed on the starboard side.

The inter-engine and cross-feed cocks were opened and the fuel heaters were switched off. The power of No. 2 engine was observed by rpm at 14 500. This power was maintained during the descent until just before touchdown when the throttle was closed. The rate of descent with one engine operating was estimated at 600 feet per minute.

At approximately 1 500 feet visual contact was established and the aircraft was directed towards the darkest patch of ground in the immediate vicinity, and an emergency landing was made with flaps and undercarriage retracted about 14 miles northwest of Kastrup.

Weather

At 0400 hours the weather situation in the eastern part of Seeland was as follows:

The area was located on the southern side of a high pressure system and there were no fronts.

It was overcast, with occasional light rain and drizzle, visibility being 8 - 10 km (5 - 6, 2 miles).

Cloud was 8/8 stratocumulus with base at 2 000 ft and tops ranging from 3 000 to 4 000 ft. Locally there were 2 - 4/8 of stratus at 400 - 600 ft. There were no clouds above the stratocumulus layer.

Wind direction and velocity were ENE to E 10 - 12 knots on the surface and at 1 500 - 2 000 ft 120°/10 knots.

Temperature:

At surface	+3°C	dewpoint value	+1°C
At 2 000 ft	0	"	" -3
4 000	-4	"	" -7
5 000	0	"	" -4
5 500	+1	"	" -2
6 000	0	"	" -7
10 000	-5	"	" -22
21 000	-23	"	" -35

No icing had been reported by other aircraft.

Actual Weather at Kastrup

	at 0355	at 0425
Surface wind direction and speed	080° - 15 kts	070° - 13 kts
Horizontal visibility	10 km (6, 2 miles)	8 km (5 miles)
Present weather and intensity thereof	int. sl. rain	int. sl. drizzle
Amount, type and height above the aerodrome elevation of cloud base	8/8, 2 000 ft	6/8, 400 ft 8/8, 2 000 ft
Altimeter setting	1 033, 5 mb	1 033, 6 mb
Surface temperature and the dewpoint temperature	+ 03/ +01°C	+03/ +01°C

Icing

The following statement was produced by the Superintendent of the Danish MET Office relating to the possibility of ice formation at the time of the accident:

"Normally the water content and drop size in clouds of this type will be rather small, and the type and intensity of ice formation will be light to moderate rime, but when soundings indicate conditional instability in the air below the inversion, the clouds will not be

homogeneous and the water content may change from place to place. The possibility can in such a case not be excluded that the water content locally may have been rather large, causing more intense ice formation. In this connection the precipitation reports issued at 0355 and 0425 hours on the day in question are rather interesting and indicate a comparatively large amount of water in the clouds.

The possibility cannot be precluded that a rather large amount of ice may have formed on the air intake during a few minutes flight, unless special precautions were taken. When the temperature, as in this case, is ranging from 0 to -4°C , the ice formed will be wet and porous."

During the investigation considerable attention was attached to the possibility that release of an accumulation of ice on the engine cowlings into the air intakes might have caused flame extinction with resultant loss of engine power.

Even though accretion of light to moderate rime only would be the most likely assumption during the prevailing weather conditions, it is possible, on the basis of the meteorological evidence, that rather large quantities of wet porous ice could have built up on the cowlings unless special precautions were taken.

The aircraft was, however, equipped with an efficient de-icing system, i.e. around the leading edges of the cowlings, and this should without any difficulty have been able to prevent ice accumulation at these points, provided that the system had been switched on before icing began and had been working properly.

According to the statements and information given by the members of the crew, it seems unlikely that the de-icing system was switched on after ice had already formed, but there is a possibility that the de-icing system might not have functioned satisfactorily. The nature and

consequences of such faulty functioning may have been as follows:

When the powerplant de-icing system was switched on as the aircraft entered the cloud layer at 0344, the cycling lights indicated that the power was on but, owing to a malfunctioning of the relay units which control the power supply to the heater pads on the cowlings, it is possible that full current was not being applied. Without full current full heat would not be available in the de-icing heater pads and, in these circumstances, ice would accumulate on the engine cowlings. If the intermittent fault in the relay unit made contact to supply the full current to the heater pads between 0351 and 0356 hours, the accumulated ice would become dislodged in sections and be sucked into the combustion chambers where it could cause partial flame out in three of the engines. This in turn would cause the auto feathering of the three propellers.

The pilots were not aware of previous cases of engine failure caused by shedding of an accumulation of ice on the engine cowlings, nor were they aware of instructions concerning the operation of the powerplant and propeller de-icing systems which appeared in the aircraft Flight Manual but were not included in the BEA Operations Manual.

* The examination of the electrical circuits insofar as the de-icing equipment is concerned revealed that it is possible that a failure therein might occur with resultant irregular functioning of the relay units which control the power supply to the heater pads on the engine cowlings and propellers. Although thorough examination was made of the system in G-AOHP, it was not possible to establish whether such a failure mentioned above did occur in this case.

* It should be mentioned in this connection that modification action has since been instituted in order to eliminate the possibility of such a failure.

* The aircraft manufacturer agrees with these two paragraphs but contends that the possibility of a circuit failure is speculative. Nevertheless, the possibility of such a circuit failure in the future has been reduced by modification. The modification is not, however, considered mandatory either by the manufacturer or the Air Registration Board.

Air Traffic Control

On the morning in question an assistant, acting as a controller, was on duty in the tower.

The air traffic controller understood the word "fire" as "failure" when this was reported by the aircraft, but his reaction of summoning the fire and rescue services was correct.

The air traffic controller did not comply with the request for radio silence even though it was fully understandable, and, as a consequence thereof did not receive that part of the message which said that the aircraft was losing height on full power. If this message had been received, it is highly probable that the search would have been confined to the area around the holding position over Bella.

It is finally observed that the recording of the R/T messages revealed that the ATC official's voice was extremely husky, which must no doubt be put down to improper operation of the microphone by him.

Search and Rescue

The way in which the search was set in motion by the ATC Officer was in accordance with prescribed procedure, but the accident may give occasion for consideration of a revision of the SAR organization system, especially as regards the coverage of the area surrounding Copenhagen.

In the present case it took 2 hours and 15 minutes to locate the wrecked aircraft. The time lapse would have been greater but for the fact that the crew members themselves were able to get to a place from which notification of the forced landing could be made.

One of the most serious shortcomings in the system seems to be that teletype-writer messages are too long in reaching points where the search really is likely to yield a result.

In the present case Police Headquarters were notified at 0410 hours, but only at 0515 hours was the message telephoned from the Glostrup to the Ballerup Police Station (no teletypewriter is installed at the Ballerup Police Station), and only then was Kastrup notified that the aircraft had been observed flying over at 0400 hours.

At 0430 hours the Air Base at Vaerløse notified the police at Ballerup of the supposed crash. The police sent out patrol cars to investigate but did not contact the ATC at Kastrup until 0620 hours when the crash was confirmed by one of the patrol cars.

Evacuation

It appeared from the pilot's statement that it was very difficult for the crew to force open the door between the cockpit and the cabin after the forced landing.

Although according to the information given in the Operations Manual, Emergencies Section, it should be fairly easy to split this door along the vertical centreline, it was found necessary in the accident investigation to use an axe to gain access to the flight deck. The cause was found to be that the door, instead of splitting as mentioned, had got stuck in such a way that only the upper left corner of the doorway up to the diagonal of the aperture was free.

Another point brought out during the investigation was that the aircraft was not provided with emergency lighting in the cockpit.

Crew

The captain had flown a total of 9 034 hours, 426 of which were as pilot-in-command on Viscount 802 aircraft.

Apart from the fact that the captain erroneously took the lighting of the warning lights previous to the detection of the failure of No. 1 engine to be an indication of fire in that engine and ordered fire drill to be carried out, the crew appear to have taken

correct action in the situations which arose during the different phases of the flight.

Probable Cause

The cause of the engine failures, which brought about the accident, lay in the accumulation of ice on the engine

cowlings which, because of malfunctioning of the de-icing system, * was allowed to build up before being dislodged. Passage of the lumps of ice through the engines caused partial flame out, which produced sufficient loss of power to initiate the auto-feathering and thus to stop the engines.

* The aircraft manufacturer does not concur with the conclusions arrived at in the report which refer specifically to malfunctioning of the de-icing system.

Scheduled Landing Emergency conditions engines failed-landing
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FIGURE 4



VISCOUNT G-AOHP WHICH MADE
A FORCED LANDING AT
BALLERUP, DENMARK
ON 17 NOVEMBER 1957