

No. 55

British European Airways Corporation, Comet 4B, G-ARJM, accident at Esenboga Airport, Ankara, Turkey, 21 December 1961. Report of the Accident Investigation Team established by order of the Ministry of Communications, Turkey. This report was also released by the Ministry of Aviation (United Kingdom) as C. A. P. 188.

Circumstances

The aircraft was on a scheduled flight from London to Rome, Athens, Istanbul, Ankara, Nicosia and Tel Aviv. From Istanbul the flight was operated by British European Airways on behalf of Cyprus Airways. The operating crew, employed by BEA, consisted of a captain and two first officers. Also aboard were four cabin staff employed by Cyprus Airways and 27 passengers.

The trip to Ankara was normal. The time between landing and starting engines at Ankara was 46 minutes during which light snow was falling. (At take-off the aircraft had a light covering of snow on the upper surface of its wings, however, this deposit had no bearing on the accident).

The radio-telephony tape recording showed that the aircraft taxied out along the short taxiway, then back-tracked up the runway to its take-off position on runway 21 at the intersection with the longer taxiway. The runway length available from this position was 9 027 ft. Take-off weight was 53 465 kg, i.e. 18 185 kg below maximum permissible weight or 1 085 kg below the regulated take-off weight. The take-off run as to distance and time was quite normal, as also were rotation and unstick. The first abnormality occurred a second or two after unstick when the aircraft rapidly assumed an excessively steep climbing angle. One witness put the angle achieved as about twice the normal, another as 45° to 50°. There was also evidence from witnesses of a wing drop and of variations in the engine noise during this climb. The aircraft stalled with the left wing down at a height of about 450 ft then sank to the

ground in a relatively flat attitude. The accident site was 1 600 m and on a bearing of 214°T from Esenboga Tower. The accident occurred at 2143 hours GMT.

G-ARJM was almost completely destroyed by impact and fire. All 7 crew and 20 passengers were killed. Six passengers were seriously injured.

Investigation and EvidenceThe Crew

The operating crew held valid licences. The captain had flown a total of 13 240 hours including 785 hours on Comet aircraft.

The Aircraft

It had valid certificates of airworthiness, registration and maintenance and had been maintained in accordance with the approved maintenance schedule. The aircraft's weight and centre of gravity were within the permissible limits.

There was no record of any defect or repair during the recent operation of the aircraft which could be considered to have any bearing on the accident.

Weather

At 2150 hours GMT (i.e. 7 minutes after the accident) the weather conditions were -

surface wind: calm; visibility: 2 km;
weather: snow; cloud 6/8 stratus at 600 ft; 6/8 stratus at 600 ft; 6/8 Ns at 2 500 ft; 8/8 As at 7 000 ft;
temperature 0°C.

Navigational Aids

All the ground navigational aids and radio-telephony channels were checked after the accident and were found to be functioning satisfactorily. The ILS was not operational and had been notified as such by Notam.

The Accident Site

The ground at the scene of the accident sloped up at an angle of 2 or 3°, and the aircraft struck on a heading of 180°M without yaw with the left wing down and the fuselage parallel to the ground. The nature of the damage, the marks on the ground and the disposition of the wreckage all indicated that the aircraft had a low forward speed coupled with a high rate of descent at the moment of impact.

Technical Examination

External examination of all flying control surfaces revealed no evidence of any damage or abnormality. No evidence was found of any control or electrical failure or emergency (such as pilot's seat slippage or fouling of the control column) nor was there any evidence of fire or structural failure prior to the impact with the ground.

Flaps were in the take-off position (i.e. 20°) dive brakes were in, and the landing gear "down" and locked. No evidence of any malfunction of the engines was found, however two of the three booster pumps in each of the No. 4 fuel tanks should have been switched on for take-off, but all were found switched off.* This failure to follow the fuel management drill may have brought about fuel starvation of the two outer engines when the climb became steeper than normal, but it did not contribute to the accident as a stall was by then inevitable and any subsequent recovery impossible because of lack of height.

The captain's director horizon was examined by the Royal Aircraft Establish-

ment, Farnborough (England). It was found that the pitch pointer "spider" was being obstructed by the upper left dial mask screw, which had unscrewed sufficiently for its head to be in the plane of movement of the "spider". To attain this position, the screw had to be three and a half turns from the fully tightened condition. Examination of the screw head, the washer and the surface around the screw hole in the dial mask flange showed that the screw had not been tightened down fully during the assembly of the instrument. Local disturbance of the paint of the flange suggested that the assembly was tightened to within about half a turn from the fully tightened state.

Checks have shown that complete obstruction to "spider" upward movement would have first occurred when the screw was one full turn from the condition as found. At this time the "spider" had to be below the screw position and since the "spider", and hence the pitch pointer, gives a direct indication of aircraft pitch attitude, then the aircraft had to be below 7-1/2° of pitch (the aircraft angle equivalent to the obstructed position of the pitch pointer).

The instrument had been installed in the aircraft during construction of the latter and there had been no reports of any malfunctioning of it since 12 October 1961 when the left vertical gyro was changed.

The inspection records showed that this instrument had been inspected at all the requisite stages of manufacture. In the inspection procedure laid down by the manufacturers there is a specific item "check that MAIN MASK fixing screws are secure".

Analysis

The position of the impact point in relation to the unstick point, the fact that the aircraft did not begin to assume an abnormally nose-up attitude until a second or two after unstick, and the fact that the landing gear was not selected up, together gave a strong indication that something

* Note:- The switching on of two booster pumps in each No. 4 tank has to be done immediately before take-off. The drill cards were not adequate to ensure that this was done.

unusual occurred immediately after unstick. From unstick the aircraft assumed an increasingly steep angle which reached about 45° , that is about twice the normal, before it stalled. The exact sequence of events and the actions of the crew during the brief flight cannot be established. The only fault in the aircraft and its equipment that could account for the abnormally steep climb was the obstruction of the pitch pointer in the captain's director horizon. It is believed probable that the captain looked at this instrument for attitude information immediately after unstick and seeing the pitch pointer only about half way to the normal nose-up position on the pitch scale, applied more up elevator. Although this would have at once steepened his climb, there would have been no indication of it from the pitch pointer. It has been calculated that the time interval between unstick and the stall was approximately 8 to 10 seconds.

The evidence suggests that the outer engines may have begun to fail due to fuel starvation after the angle became excessive. But as the fuel starvation would have

occurred very close to the stall and when recovery was impossible in the height available, it is not considered a contributory cause of the accident.

In the event that the co-pilot was at the controls for the take-off the accident could then have been brought about by the captain either telling the co-pilot to increase the climb or himself pulling back the control column, basing his action upon a glance at his own director horizon.

Safety harnesses of the crew

Only the lap straps of the crew's safety harness were fastened at impact. It is probable that the three pilots would have survived had they used the shoulder straps of their harnesses.

Probable Cause

The probable cause of the accident was the obstruction of the pitch pointer in the captain's director horizon which led him to make an excessively steep climb immediately following unstick.
