No.12.

De Havilland 104 "Dove", LQ-XWW, crashed on take-off at Formosa Airport. Territory of Formosa, Argentina, on 26 February 1955. Argentine Accident Investigation Report No 465, released 30 August 1955.

Circumstances

The aircraft on a personnel transfer flight was taking off at approximately 15 50 hours from Formosa Airport with 4 passengers and 3 crew on board. It was observed to run for about 800 metres along the runway, rising only slightly a few metres before the end of the run; it then hit a runway end marker, the wire fence surrounding the aerodrome, and a telephone pole, touching the ground twice; after demolishing another wire fence, it came to rest against a small hill and caught fire. Six of the occupants were killed instantly and the seventh died some months later from burns sustained.

Investigation and Evidence

The meteorological conditions as reported by the local meteorological station, about 5 km from the aerodrome, were as follows:

> sky with 5/8 cumulus with base from 600 to 1 000 metres; wind south at 8 knots; visibility 20 km; pressure at station level 997.6 mb; temperature 32°C; dew point 20°C.

The aircraft had arrived from Córdoba with a stop at Resistencia, landing 25 minutes before the take-off on which the accident occurred.

The ground was carefully inspected and the tracks left by the aircraft on the take-off run were identified. They started 80 metres from the runway threshold, where the surface was muddy. The tracks of the main and front wheels were clearly visible both on the dry surface and in the holes; they disappeared in the central portion of the runway and reappeared on the ground near the end marker.

In the first half of the runway there were some shallow, hard-bottomed holes which were crossed by the wheels during take-off; the tracks left had a maximum depth of 10 cm over 2 metres with gradual slopes. The rest of the runway was hard-surfaced and the only marks upon it were the normal tracks left by the tire treads. The surface of the runway was covered with grass which, even though not properly mown, did not interfere with the take-off.

The total weight of the aircraft was not recorded before the flight.

The authorized weight empty of the aircraft according to its Certificate of Operating Limitations was 2 894 kg, or 289 kg over the normal authorized weight empty; this excess represented extra radio equipment and special facilities, and reduced the disposable load by the same amount. There remained a margin of 1 010 kg instead of 1 299 to reach the maximum authorized take-off weight i.e. 3 859 kg. It was deduced from the tank capacity (772 litres for fuel and 72 litres for oil) that the weight of fuel and oil on board was 621 kg, which, added to the weight empty gave a total of 3 470 kg, thus leaving only 389 kg for crew, passengers, baggage and other transportable items.

At Córdoba, the tanks were replenished with 430 litres of aviation fuel, enough for about 3 hours and 15 minutes' flying time, thus replacing the amount of fuel consumed on the flight from Quilmes.

On departure from Córdoba, the estimated weight of the aircraft was as follows:

Weight empty	2 849 kg
Fuel (772 litres)	556
Oil (72 litres)	65
Baggage and miscellaneous ..	140
Crew and passengers (6).....	480
	4 0 90 kg
Maximum licensed weight....	3 8 59 kg
Excess	2 31 kg

The flight from Córdoba to Resistencia required 2 hours and 45 minutes with a consumption of about 260 kg; at Resistencia 230 litres of fuel and 9 litres of oil, totalling 173 kg were taken on board; 80 kg were consumed on the trip to Formosa and an additional passenger was taken on for the return flight,

making a total of seven persons on board. In summary, the aircraft took off from Formosa with 4 003 kg, 87 kg less than from Córdoba, but still 144 over the maximum licensed weight of 3 859 kg.

Inspection of the propellers at the site showed that the blades were set on high pitch, except one of those of the left propeller which was facing forward, turned about 100 degrees from the high-pitch position. The other two remained in position, both firmly meshed with the driving gear, although one of them was bent backwards from contact with the ground. The blade found in the inverted position turned freely, overcoming only the normal friction of the packing of the mounting on the hub; the impact caused failure of the screws and locking pins holding the control gear segment. The right propeller blades were also bent back by impact, and one of these had broken free of the gear segment for the same reason.

The propeller controls, having been completely destroyed by fire, could not be checked, and there remains a doubt whether, in the emergency shutting of the throttles, the propeller controls were moved at the same time to the high-pitch position, or whether they slipped during the take-off run and the fact was only noticed at a late stage. The latter would explain the impression of acceleration or increase in rpm gained by witnesses to the departure.

As the right engine had been destroyed in the fire and all its working parts and attachments were melted together, detailed inspection of components was impossible.

The left engine only suffered slight fire damage to its rear attachments, the remaining ones and the engine itself being only heated or smoke-blackened. It was possible to check the distributors, which showed no sign of the internal burns common in such cases; neither did the contact breakers display any abnormal signs.

The spark plugs installed in this engine were of various makes and types, some of them with long, thick, bent electrodes, with excessive wear on the side electrode.

The technical report on the dismantled engine revealed the presence of marks of incomplete detonation on the piston crowns and one exhaust valve seat was burnt and the other pitted.

The presence of spark plugs inappropriate to this type of engine, in which the ambient temperature and that at the cylinder heads are undoubtedly high, as is also the intake pressure required for take-off, caused premature ignition, followed by the detonation revealed by the inspection, in the dismantled engine or in both, thus inevitably producing loss of power and irregular operation.

It was not possible to determine the circumstances in which the propeller blades were switched to high pitch; the very magnitude of such an error seems to rule out the theory that they were in this position at take-off; even if this irregularity had escaped the pilot's attention, it may be assumed that it would have been noticed by the flight mechanic, who usually stands between and slightly behind the seats of the pilots during take-off, or by the co-pilot, who was in the right-hand seat; it is considered possible, however, that the propeller pitch controls could have slipped to the high-pitch position during the take-off run, without this being observed in time.

Weather conditions at the scene of the accident were such that the air density was 8% below normal and the ambient temperature reduced driving power by about 3%. Had the aircraft's engines been operating normally, the meteorological factor would have reduced its forward and vertical speeds, although a run of 800 metres would have given it sufficient speed to climb at a much faster rate than its actual 0.50 m/sec, which was inadequate to clear the first obstruction, 1 metre high.

Probable Cause

The accident was due to the inability of the aircraft to reach its take-off speed after a run of 800 metres on the runway, because of:

1) Insufficient driving power for operation, resulting from:

   a) Reduction in power in one or both engines from premature ignition and detonation, originating in the use of spark plugs inappropriate to the engine type.

   b) Probable reduction in the rpm rate of the engines during the take-off run; following unnoticed slipping of the propeller controls

2) Overloading of the aircraft in relation to maximum authorized take-off weight.

3) The circumstances in which the operation was carried out indicate that the weather conditions in relation to the characteristics of the runway were a contributing cause of the accident.

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