

No. 19

Aerovías Nacionales de Colombia, S. A., Lockheed Super Constellation, HK-177,  
Accident at Montego Bay Airport, Jamaica, West Indies, on 21 January 1960.  
Report dated 27 February 1960 of the Public Inquiry carried out in  
accordance with the Air Navigation (Investigation of Accidents)  
Regulations, 1953 (Jamaica).

Circumstances

The aircraft took off at 1035 hours\* on 20 January from Idlewild Airport, New York, on scheduled flight 671 to Bogotá, Colombia, via Montego Bay and Kingston, Jamaica and Barranquilla, Colombia. Thirty minutes beyond Wilmington, North Carolina, engine No. 3 malfunctioned and as a precautionary measure this engine was stopped and the propeller was feathered. The aircraft was diverted to Miami, Florida where it arrived at 1657 hours. Following the fitting of a replacement propeller governor, a further defect in No. 2 engine was discovered during pre-flight checks. This was rectified at 2330 hours. For the next segment of the flight to Montego Bay, the captain ordered the co-pilot to undertake the take-off, en route flying, descent and landing. The co-pilot was to occupy the right-hand seat in accordance with Company practice. The aircraft was airborne at 0012 hours (21 January) and the flight to Montego Bay appears to have been uneventful. Shortly before arrival overhead, a standard instrument approach clearance was obtained from air traffic control, and a normal instrument approach procedure appears to have been carried out. On completion of the procedure turn at 2 000 ft, the airfield was sighted and the approach continued visually. The co-pilot continued to control the aircraft with the captain monitoring events and operating the radio equipment. The aircraft made an initial contact with the runway, bounced into the air and re-landed on the runway. When the fuselage finally came to rest 1 900 ft from the threshold of the runway, 200 ft to the left of the centreline on a heading

130° to the runway, it was completely inverted and fires were burning almost all the way around it. Of the 7 crew and 39 passengers (including an infant) aboard, nine survived - three crew members from the cockpit and four passengers and two crew from the rear passenger compartment. The accident occurred at approximately 0224 hours.

The Aircraft

It held a Certificate of Airworthiness valid until August 1960. There was no evidence that the aircraft was not properly maintained, laden or trimmed or that its documents were not in order or that any technical defect was present in the aircraft which could have contributed to the accident.

Its estimated weight on reaching Montego Bay Airport was 110 000 lb, i. e. well within the maximum permissible landing weight of 113 000 lb.

Structural design strength data

In evidence, the following data, pertaining to the design of the aircraft, was given:

The aircraft structure was designed to withstand a rate of sink during landing of 10 ft/s.

The static rating of the tires used on the aircraft was 34 500 lb each, and the maximum deflection load without damage was in the order of 115 000 lb each, making a total load capacity of each pair of wheels of 230 000 lb, which could be transmitted to each oleo leg.

\* All times in this summary are GMT minus 5 hours.

It would be necessary to apply 192 000 lb to each undercarriage unit axle in order to cause a sufficient deflection to bring the wheel hubs in contact with the brake assemblies.

The force necessary to bottom an undercarriage oleo strut, which was correctly charged, was 187 000 lb.

The rate of sink necessary to bottom an oleo strut as above, at an aircraft landing weight of 110 000 lb would be between 12 to 14 ft/s, that is 2 to 4 ft/s above the design maximum.

The tire marks on the runway threshold, presuming a landing weight of 110 000 lb with a forward speed of 115 kt, represented an aircraft sinking speed in excess of 10 ft/s.

#### The Crew

The captain was in command of the aircraft, but at the time of the accident the co-pilot was in control. The captain held a Colombian Airline Transport Pilot's Licence valid to 22 January 1960 (i. e. the day after the accident). He also held an Instrument Rating for Lockheed 1049 aircraft and a valid Radio Telephony Operator's Licence. He had been a pilot for fifteen years and had flown a total of 12 206 hours. Of this total about 9 208 hours had been as captain and about 2 998 as co-pilot. Of the hours as captain, 3 450 hours had been in command of Super Constellation aircraft. His last proficiency test was carried out on a 1049 aircraft on 7 September 1958 and his last instrument rating renewal on 15 and 16 July 1959 was on a 749 type aircraft.

The co-pilot held a Colombian Commercial Pilot's Licence valid to 26 August 1960 and endorsed with an Instrument Rating in respect of Lockheed 1049 aircraft. He had been a pilot for six years during which time he flew approximately 5 158 hours - all of which were as co-pilot. Of this total about 2 348 hours were spent on 1049 aircraft and 753 hours of this time

were logged since 1 January 1959. His last proficiency check on 1049 aircraft was in September 1959 and his last instrument rating renewal was in June 1959, on 749 type aircraft.

The flight engineer held a Colombian Flight Engineer's Licence valid to 17 November 1960 endorsed for Lockheed 1049 E/G aircraft. He had been a flight engineer for eight years during which time he had flown 5 202 hours, 2 778 hours of which were on 1049 aircraft.

These three crew members were among those who survived the accident.

#### Fatigue

The crew went on duty at 0900 hours on 20 January and remained on duty for 17 hours and 24 minutes, i. e. within the permitted maximum of 20 hours. However, the report states: "To provide against fatigue by prescribing that the crew shall not remain on duty for more than 20 hours or be engaged in flying for more than 12 hours would seem to lose sight of factors that in themselves may bring on fatigue. The nervous strain brought on by handling an aircraft with one engine not functioning properly may itself be equivalent to more than 20 hours of ordinary duty. Also, the variety of duties should be taken into account."

"The crew of HK-177 flew some six hours or more over the United States of America. Over such territory the work load is heavy. To that load was added the strain of a malfunctioning engine, the anxious wait for repairs to be done in Miami and the renewed anxiety when the second engine started to give trouble as well as the wait to have it repaired. The accumulation of such circumstances might very well have affected the pilot sufficiently to cause an error of judgement."

#### The Weather

The Montego Bay weather report at the time of the accident was overcast

estimated 2 000 ft, visibility 4 NM, wind 030/18 kt, intermittent rain.

#### Reconstruction of the Approach

HK-177 maintained an undesirably high flight path at distances within one nautical mile of the runway threshold. In order to make a height reduction sufficient to effect a landing, power had to be reduced, and this was done so as to produce a rate of descent that must have exceeded 1 200 ft/min. Such a rate of descent (20 ft/s) was greatly in excess of what is considered to be normal practice, and if maintained to the point of contact with the runway must result in major structural damage to the aircraft. The pilot's efforts in the final stages of the approach arrested the rate of descent by some measure, but the procedure adopted was insufficiently effective to prevent a severe impact with the runway.

#### Left wing fracture

The left wing of the aircraft had broken away outboard of the Station 80 wing joint, and through No. 2 fuel tank. On examination, failure appeared to have originated with a relative upward movement of the rear spar, as a result of which it had broken across Station 87 at the bottom boom, and Station 70 at the top boom. Remains of the bottom wing skin had a failure pattern consistent with a nose down-wing torsion, and the detachment of the wing had been completed by the failure of the front spar in a tip upwards direction. All the sections of this failure appeared to be caused by over-stressing, and no evidence could be found to suggest previous damage to the wing, or fatigue failure.

#### The Fire

It started as the second contact with the runway was made. The fracture of the left wing through No. 2 fuel tank released the fuel which ignited. The fire was sus-

tained by 2 600 gal of aviation fuel on board at the time.

A member of the Airport Fire Service was on the lookout for the arrival of HK-177. He was, therefore, able to alert the whole Service at the onset of the fire. The Montego Bay Fire Brigade was also summoned. Both Services turned out promptly, however, the fire was so intense and severe that they were not able to reach the fuselage for perhaps twenty minutes from the start of the fire.

#### The Airport Fire Service

The Airport Fire Service is subject to the control of the St. James Parish Council. The senior officer at the Airport Fire Station is under the direct supervision of the Superintendent of the Montego Bay Fire Brigade.

At the airport were a foam tender, a nurse truck and a rescue tender. This equipment, apart from the capacity of the nurse tender, is in accordance with the Colonial Office requirements for an airport such as Montego Bay. The capacity of the mobile water supply was 1 350 gal, whereas the requirement demands one of 1 800 gal. This deficiency did not, however, hinder the work of the fire fighters. There was the main supply of water at the fire station (a few hundred yards from the scene of the fire) as well as an abundant source of open water at hand in which the aircraft was partially immersed.

Evidence established that the fire station was reasonably well organized much on United Kingdom lines and that the station records, standards of training and apparent efficiency were satisfactory. However, no matter how efficient the fire service and irrespective of the scale of the equipment employed, it was clear that the nature of the blaze precluded the degree of control necessary to effect rescue within the three minutes during which life was estimated to exist on board.

In the Singapore disaster of G-ALAM\* it seems to have been recognized that the fire hazard to a crashed aircraft varies from a fire that can be extinguished with a hand extinguisher to one that would be uncontrollable despite any equipment. The fire on HK-177 was adjudged to fall within the latter category.

#### Probable Cause

The cause of the accident was the adoption of a final approach path resulting in a heavy landing during which a major structural failure occurred in the port wing in the immediate vicinity of Station 80 joint caused by the transmission of stresses through the undercarriage in excess of those which would be encountered if the rate of sink of the aircraft at the time of impact had been controlled within the designed maximum of 10 ft per second.

The primary responsibility for the safety of an aircraft and its complement is vested in the captain. However, there is evidence of mitigating circumstances in that the errors of judgement that precipitated the disaster reflect some deficiency of knowledge which should have been instilled in the training and flight proficiency checking of the pilots of HK-177. A measure of responsibility for the accident must, therefore, devolve on the supervisory and advisory authorities for the overall conduct of the operation.

#### Recommendations

It was recommended:

1. that emergency exits be provided in public transport aircraft on a scale which relates to the seat density of each compartment, rather than to the overall seat capacity of the aircraft;
2. that consideration be given to the placarding of the instructions appertaining to the method of operating emergency exits, in such a manner that they can be read with the aircraft in the normal or inverted positions;
3. that all compartment doors in aircraft interiors be constructed in such a manner that ample clearance is provided between them and their respective door jambs to minimize the possibility of jamming due to distortion of the door frames;
4. that a fracture joint be provided down the length of each internal compartment door suitably placarded which can be split by pressure from either side, by a person in distress;
5. that a latching hook be provided on internal compartment doors so that they may be secured ajar at the time of landing and take-off;
6. that in the case of traversing main cabin entrance doors quick release pins be provided which when removed liberate the door from such retaining mechanisms as may be utilized;
7. that regulations be imposed by the operator, having the effect of restricting the hours of duty and of flight carried out by flying personnel; and that these restrictions shall be related separately to each operation, having regard to the varying associated workload. Captains of aircraft shall be afforded guidance in the extent to which their discretion may be exercised in the application of these regulations.

\* Summary No. 11 in ICAO Aircraft Accident Digest No. 6 - BOAC, Lockheed Constellation, accident at Kallang Airport, Singapore on 13 March 1954.

8. that consideration be given to the introduction of legislation which would require that provisions be made to bring about the automatic discharge of all permanently installed fire extinguishing systems in an aircraft, through the medium of some form of impact or or inertia switch, so that all areas of known fire hazard could be evenly engulfed in fire prevention simultaneously;
  9. that an emergency axe be provided in each compartment normally containing a crew station;
  10. that the administrative control of an Airport Fire Service shall be vested exclusively in the Airport Manager, and not in the Parish Council, in view of the specialist nature of the fire fighting apparatus utilized, and the specific training necessitated by the particular duties inherent in aircraft fire fighting;
  11. that aircraft operators be required to afford facilities to members of an Airport Fire Service, so that they may become familiar with the provisions for emergency, specific to the aircraft types utilized by them;
  12. that every Airport exercising Air Traffic Control by radio-telephony record by means of an approved electronic device, all voice communications carried on all ATC radio frequencies. Such recordings shall be preserved for a minimum period of two months.
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