

No. 13

Aerovías Nacionales de Colombia, Douglas C-47, HK-319, accident at Mandinga Airport, Municipality of Condoto, Department of Chocó, Colombia, on 15 September 1964.
Report dated 11 December 1964, released by the Air Safety Division,
Administrative Department of Civil Aeronautics, Colombia.

1. - Investigation1.1 History of the flight

The aircraft had arrived at Condoto from Medellín at 1648 hours GMT on a non-scheduled domestic cargo flight with two crew members aboard. The unloading of 2 565 kg of cargo then took place and 9 metal drums of graphite oil, each weighing 246 kg, were loaded on to the aircraft. Their total weight was 2 214 kg. These were distributed in the freight hold of the aircraft as directed by the dispatcher and secured with agave fibre cords of the type usually used by Avianca for lashing cargo. No refuelling was necessary. After signing the weight and balance sheet, which showed a total take-off weight of 11 045 kg (1 157 kg below the maximum authorized weight), the pilot-in-command went aboard with the co-pilot and started the engines. The aircraft took off from runway 27 at 1740 hours for Medellín and reported north of Condoto on visual climb and changed over to en-route frequency. Five minutes later, the pilot-in-command requested permission to return to the aerodrome as the aircraft was badly loaded. Permission was granted and the following landing instructions were given to him. "Approach left, runway 27, wind SW/8 kt, QNH 29.92". The aircraft was seen passing over the airport, making a left turn and coming to land on runway 27. Everything appeared normal during these manoeuvres. At 1750 hours, the aircraft reported on final approach. It was seen to touch down, bounce twice and then accelerate and climb sharply. Shortly thereafter it crashed on its left wing, facing roughly the direction of landing, and came to rest within the airfield 42.80 m from the south edge of runway 27, 725 m from the threshold and 480 m from the runway end. The accident occurred at approximately 1751 hours.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	2	-	-
Non-fatal	-	-	-
None	-	-	

1.3 Damage to aircraft

The aircraft was destroyed.

1.4 Other damage

None reported.

1.5 Crew information

Both crew members held valid licences and medical certificates. The pilot-in-command was wearing spectacles at the time of the accident as required. No other information was contained in the report received.

1.6 Aircraft information

No mention is made in the report of the certificate of airworthiness. However, the aircraft had been regularly maintained in conformity with aeronautical standards.

According to the weight and balance sheet prepared by the dispatcher at Condoto, the weight of the aircraft at take-off was within limits. The centre of gravity location is discussed in 2.1.

On take-off from Condoto, the aircraft was carrying 277 gallons of fuel. The type of fuel carried was not stated in the report.

1.7 Meteorological information

At the time of the accident, weather conditions at Condoto were good and suitable for the operation of aircraft. The accident occurred in daylight.

1.8 Aids to navigation

Not pertinent to this accident.

1.9 Communications

Communications between the aircraft and ground stations were normal.

1.10 Aerodrome and ground facilities

The runway at Condoto was 1 215 m in length, and there were no obstructions at the approaches. It had a smooth surface.

1.11 Flight recorders

Not mentioned in the report.

1.12 Wreckage

The wreckage of the left wing and of eight of the oil drums was found on the edge of a ditch, parallel to runway 27. In the ditch part of the left cockpit window, part of the pilot's headset and spectacles, the dial of one altimeter and the left propeller were found. The rest of the wreckage was submerged in the adjoining pond 3 metres deep in places.

1.13 Fire

Fire broke out following the accident.

1.14 Survival aspects

Both crew members were found still strapped in their seats, which had been torn out from the cockpit floor.

1.15 Tests and research

None were mentioned in the report.

2. - Analysis and Conclusions

2.1 Analysis

No evidence of malfunction or failure of the aircraft or its engines prior to the accident was found. According to the flight plan, 9 metal drums of graphite oil, each of them being 90 cm long, 63 cm in diameter and weighing 246 kg, were loaded at Condoto.

According to the weight and balance sheet filled by the dispatcher, the cargo was distributed as follows in the aircraft:

<u>Compartment</u>	<u>Weight</u> (kg)
B and C	214
D	700
E	600
F	200
G	500

This, added to the basic operating weight, plus fuel weight, gave a total aircraft weight of 11 045 kg, i.e. 1 157 kg less than the maximum permitted take-off weight of 12 202 kg.

The dispatcher's report after the accident stated that the actual loading was: 4 drums in compartment D, i.e. 984 kg; 2 drums in E, i.e. 492 kg; 1 drum in F, i.e. 246 kg and 2 drums in G, i.e. 492 kg. Assuming that these were the facts, the centre of gravity would have been at 27% of the MAC, very near to the C-47's aft limit of 28%.

Furthermore, when asked to say from memory, prior to writing his report, how he placed the drums, the dispatcher stated that, commencing at the cargo door and proceeding upwards, he put 3 drums first, then one, then 2 and then 3, because one had failed to go through the door of the forward compartment. If this was the case, there were 3 drums in compartment G, i.e. 738 kg instead of the 590 kg for which it is designed, and not only was compartment G heavily overweight but this would have created a tail heavy moment in the aircraft.

It was also found that three-eighths of an inch fibre cords, some new, some old, were used to secure the cargo and that these heavy drums were placed on the floor (two of them in compartment E, possibly lying down on their side), without cradles or any other attachment than those cords.

It was concluded that, the lashings of the cargo being inadequate, a light turn or pitch up before landing, or bounces during the landing, might have caused a displacement of the cargo to the rear. A missed approach procedure attempted in these conditions might have caused a further displacement of the cargo to the rear and the shifting of the centre of gravity, resulting in an excessive angle of attack and a loss of airspeed which the pilots were unable to control.

2.2 Conclusions

Findings

The crew held valid licences and medical certificates.

The aircraft's certificate of airworthiness was not mentioned in the report. The aircraft had been regularly maintained.

Weather conditions did not play a part in the accident.

The aircraft had been improperly loaded by the dispatcher, who did not have an appropriate licence, but was duly exempted of having one. The cords used to lash the cargo were unsuitable and permitted displacement of the cargo.

The pilot did not make a proper check of the cargo before signing the weight and balance manifest and commencing the flight.

Displacement of the cargo towards the rear caused an excessive shift of the centre of gravity and a dangerous nose-up attitude at the start of the missed approach procedure. A loss of airspeed resulted.

Cause or

Probable cause(s)

The prime cause of the accident was error of other personnel inasmuch as the sequence of events leading up to the accident was initiated by faulty distribution of the cargo on board the aircraft.

3.- Recommendations

It was recommended:

- (1) that when drums more than 60 cm high are carried on aircraft, they shall be laid flat on a non-slip surface and secured with chocks, cradles and other special devices;
- (2) that steel cables shall be used to unite the staples in the floor of aircraft, to facilitate secure anchoring and distribution of the lashings and give them greater strength;
- (3) that sisal or hemp cords not less than half an inch thick or similar netting shall be used to fasten cargo to the floor from above;