No. 11

Líneas Aéreas Nacionales S.A. (LANSA), Constellation L-749A, OB-R-771, accident on Mount Talaula, Department of Lima, Peru, on 27 April 1966. Report, dated 10 June 1966, released by the Directorate General of Civil Aeronautics, Peru

1. - Investigation

1.1 History of the flight

Flight 501 was a scheduled domestic flight from Lima to Cuzco. It was instructed to take-off from runway 15 and to climb in accordance with No. 2 standard climb procedure, described as follows in the airline's route guide: climb on a heading of 190° until 9 NM southwest of the airport, then on a heading of 120° (see Figure 11-1). The flight took off from Lima/Callao Jorge Chávez International Airport at 0740 hours local time, 10 minutes after the take-off time indicated on the flight plan. At 0757 hours it contacted Lima radio on the route frequency, 126.9 Mc/s, and reported: "Departed Lima-Callao at 1240Z*, climbing, estimating Ayacucho at 1337Z*." This was the last message from the aircraft, although Lima and Cuzco repeatedly called the aircraft around 0840 hours.

One witness from "Tres Cruces" and two witnesses from the village of San Pedro de Pilas testified that their attention was attracted between 0800 and 0805 hours by an aircraft flying unusually low over San Pedro de Pilas or Tamará**; one of the witnesses stated that he had been able to read the "LANSA" inscription on the aircraft. They had heard on several occasions aircraft flying over the area, but these were always seen at much higher altitudes. They all concurred that the aircraft was following the gap between San Pedro de Pilas and Tamará and was flying toward the mountain range below the level of the peaks. The two witnesses from San Pedro de Pilas pointed out positions on the Huamantanga peak where they observed the aircraft evading the mountain by a slight turn to the left and entering the gap towards the east. They did not see any smoke or signs of fire and one indicated that he was positive that all four engines were operating at the time.

The wreckage of the aircraft was located on 28 April on the southeast slopes of Mount Talaula at an elevation of 12 600 ft, 61 NM from Lima/Callao Airport and 29 NM north of the normal route. The co-ordinates of the site of the accident were 12°25 S - 76°09'30"W. It was calculated that the accident occurred at approximately 0805 hours.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	6	43	
Non-fatal			
None			

* GMT = local time + 5 hours

** These two villages, separated only by a narrow gap, are close to one another and approximately 5 NM southwest of the accident site.

1.3 Damage to aircraft

The aircraft was destroyed by impact and subsequent fire.

1.4 Other damage

No other damage was mentioned in the report.

1.5 Crew information

The pilot-in-command, a U.S. citizen, aged 36, held an airline transport pilot's licence issued by the U.S. Federal Aviation Agency on 9 April 1965 and validated by the DGCA Peru, with type ratings for the C-46, Douglas B-23, L-749A and DC-3 aircraft. He had flown the route Lima-Cuzco-Lima 112 times between January 1965 and his last flight on this route on 15 March 1966. He passed his last medical examination on 20 April 1966. He had flown a total of 14 684 hours including 1 461 hours on instruments and 5 522 hours by night. During the period 24 December 1964 - 26 April 1966, he had flown 1 692 hours on L-749A aircraft. He had flown 191 hours during the 90 days prior to the accident, 11 hours during the 30 days prior to the accident and 6 hours within the last 24 hours.

Originally the pilot-in-command had been rostered for this flight but subsequently the roster was changed in view of the fact he was also rostered for a late arrival the preceding evening. However, the replacement pilot, who was not aware of the roster change, was not available when the airline's driver called to pick him up, and the original rostered pilot-in-command was picked up as a replacement. Since he had probably reached his home at about midnight and was picked up at 0630 hours, he would have had a maximum rest period of 6 hours 30 minutes with a sleeping period of less than this time.

The co-pilot, aged 22, held a commercial pilot's licence issued by the DGCA on 16 January 1964. His last medical examination was on 22 November 1965. As of 22 November 1965 he had flown a total of 963 hours and as of 26 April 1965 he had flown 875 hours on L-749A aircraft. He had flown 217 hours during the 60 days prior to the accident and 136 hours during the 30 days prior to the accident.

Also aboard was a pilot, aged 42, who held an airline transport pilot's licence issued by the DGCA on 21 September 1956, with type ratings on C-47, DC-3 and C-46 aircraft. This pilot was receiving an en route familiarization prior to training on L-749 aircraft. He passed his last medical examination on 14 December 1965 and had flown a total of 7 665 hours until that date.

The flight engineer, aged 31, held a flight mechanic's licence issued by the DGCA on 28 April 1965 with rating on L-749 aircraft. He passed his last medical examination on 4 March 1966. He had flown a total of 1 995 hours, including 228 hours during the 90 days prior to the accident, 126 hours during the 30 days prior to the accident and 6 hours during the last 24 hours.

Also aboard were two stewardesses.

1.6 Aircraft information

The certificate of airworthiness and certificate of maintenance of the aircraft were valid until 25 February 1967.

The aircraft had flown a total of 48 799 hours, including 2 415 hours since the last overhaul and 130 hours since the last periodic check on 11 April 1966. Upon completion of a flight on the day prior to the accident, several minor deficiencies were reported by the pilot and were subsequently corrected. However, maintenance records revealed that some aircraft accessories were operated beyond their operating time limitations, indicating deficiencies in the maintenance control. It was also found during the investigation that residues and sediments had accumulated in the domes of some propellers because of deficiencies in maintenance.

The gross weight of the aircraft at take-off was 90 572 lb, which was less than the maximum of 94 100 lb authorized for this flight. At the time of the accident it was calculated as being approximately 89 174 lb.

The type of fuel used was not stated in the report.

1.7 Meteorological information

The 0800 hours weather observations for Lima, Pisco and Cuzco stations were:

Lima: wind, calm; visibility 16 km, partly overcast, 2/8 St 360 m; temperature 18°; dewpoint 16

Pisco: wind 150°/8; visibility 16 km; clear; temperature 19°; dewpoint 15

Cuzco: wind calm; visibility 30 km; clear, temperature 9°; dewpoint 3

Witnesses and residents located in the area of the accident confirmed that the weather conditions were exceptionally good, with clear skies and no fog, both at the upper altitudes and in the areas near the mountains and the passes. Likewise, the crew of another aircraft which travelled the Cuzco route on the same day stated that weather conditions were very good along the entire route.

1.8 Aids to navigation

The aircraft was equipped with a radio compass, ILS, VOR and radar.

The following aids to navigation were available and operating normally on the day of the accident:

Lima	Pisco
NDB - LP - 300 kc/s	NDB - SCO - 355 kc/s
NDB - R - 400 kc/s	Andahuaylas
NDB - IN - 375 kc/s	NDB - AND - 230 kc/s
NDB - PV - 230 kc/s	Cuzco
NDB - NT - 248 kc/s	NDB - ZCO - 1638 kc/s
NDB - LIM - 335 kc/s	
ILS - INT - 109.7 Mc/s	

1.9 Communications

Communications with Lima control tower on 121.9 Mc/s, 118.3 Mc/s and 118.1 Mc/s were normal. At 0757 hours the aircraft changed to route frequency 126.9 Mc/s, and contacted Lima Radio. This was the last radio contact with the aircraft and was 8 minutes before the estimated time of the accident.

1.10 Aerodrome and ground facilities

Not relevant to this accident.

1.11 Flight recorders

Not mentioned in the report.

1.12 Wreckage

The aircraft struck the ground on the southeast side of Mount Talaula, a rocky peak with a slope of 35°, at an altitude of 12 600 ft. There was a single impact and the wreckage pattern was circular. All main components of the aircraft were recovered in the wreckage area and it was concluded that the aircraft was intact at the time of impact. The wreckage pattern and the impact marks indicated that the aircraft struck the ground with the underside of its fuselage, wings level, flaps and undercarriage retracted, on a heading of 340°. In view of the slope of the terrain and the impact pattern it was concluded that the aircraft was in a steep nose up attitude and near the stalling speed at impact.

Examination of the engines revealed that all four engines were operating at the time of impact and that the propellers were at low pitch, 2 400 rpm, which corresponds to maximum except take-off power (METO).

The right-hand fin and rudder were recovered nearly intact from the wreckage; inspection of the rudder revealed that its tab was deflected 15° to the left which suggested that at the time of impact the rudder was fully deflected to the right. No evidence of a pre-impact fire was found.

1.13 Fire

The wing fuel tanks were ruptured by the impact and a ground fire ensued.

1.14 Survival aspects

This was a non-survivable accident. Most of the bodies were found along the line of impact in that part of the wreckage corresponding to the passenger cabin.

1.15 Tests and research

A fly pass was made in another aircraft at the height and position indicated by some ground witnesses. It confirmed that the aircraft was flying at an altitude of 12 000 ft in the vicinity of Mount Huamantanga a few minutes before the accident.

2. - Analysis and Conclusions

2.1 Analysis

The airline's operation procedure for the route Lima - Cuzco specified that the aircraft should climb on a heading of 190° until reaching a point 9 NM south of the station, then turn 70° to the left climbing along the coast up to the Quebrada de Canete and then turn on to a direct heading to Ayacucho and from there to Cuzco. This procedure was made in order to allow the aircraft to reach a safe altitude before crossing the Andes mountains and placing the engine superchargers in the "HIGH" position (see Figure 11-1).

Three witnesses observed the aircraft flying unusually low over the narrow gap between the villages of San Pedro de Pilas* (elevation 2 633 m or 8 638 ft) and Tamará (elevation 2 833 m or 9 294 ft) and heading towards Mount Huamantanga. It was deduced from their statements that the aircraft was then flying on a heading of approximately 100° and was operating normally. This appeared to be confirmed by the fact that the aircraft continued its flight in the direction of the peak whereas, should the pilot have been faced with any type of difficulties in the vicinity of San Pedro de Pilas, he would certainly have turned towards the Rio Omas gap, starting between San Pedro de Pilas and Tamará and debouching on the coast near the town of Asia.

By joining Cuzco to San Pedro de Pilas by a straight line a true track of 107°, i.e. a magnetic track of 100° (variation 7°E) was obtained. This corresponded to the general heading of the aircraft and therefore it was believed that the pilot elected to fly a direct route to Cuzco. By continuing this straight line in the direction of Lima, it was found that it intersected the prescribed 190° climbout procedure track in the vicinity of Las Palmas and it was assumed that the pilot turned on to a direct course to Cuzco abeam this town which is 7 NM from Lima, i.e. 2 NM short of the prescribed turning point. The late departure and the fact that the meteorological conditions were exceptionally good along the route may have induced the pilot to take such a decision. However, in view of the fact that the aircraft was heavily loaded, although within permissible limits, its climbing performance was not sufficient to allow it to reach the safety height required over the mountain range along the direct route.

It was deduced from the witnesses' statements that the aircraft had only reached an altitude of 12 000 ft in the vicinity of Mount Huamantanga (elevation 3 948 m or 12 952 ft). It was seen turning slightly to the left in order to avoid the mountain and follow the gap generally oriented on a heading of 80° magnetic and rather narrow at this point. Farther on this gap broadens in an area surrounded by Mount Chunga 3 813 m (12 510 ft), Talaula mountains with its northern peak rising to 4 356 m (14 291 ft) and its eastern peaks rising to 4 437 m (14 557 ft) and 4 544 m (14 908 ft) and Mounts Huanañave and Cutalla 3 815 m (12 516 ft). It was calculated that at this stage the aircraft would have reached an altitude of approximately 13 000 ft.

Since the wreckage of the aircraft was found at a heading of 340° and since no evidence of malfunction or failure of the aircraft or its components prior to impact was found, it was believed that the pilot attempted to turn back on a reciprocal heading through the gap when he realized that he would not be able to clear the 14 000 ft summits ahead of him. While doing so and after having completed a 100° turn to the left, he probably

* The accident site was located 5 NM northeast of that village.

found himself near the side of Mount Talaula with insufficient space to clear it and the aircraft crashed at an altitude of 12 600 ft and exploded. Evidence of a very steep nose up attitude and near stalling speed seemed to indicate that the pilot either made a desperate attempt to clear the mountain range or tried to minimize the effect of the crash.

2.2 Conclusions

(a) Findings

The crew were properly certificated and the pilot-in-command had considerable experience on the aircraft and on the route. He was not rostered for the flight but was selected at the last minute because the pilot who had been assigned for the flight had not been properly warned and was not available. As the pilot-in-command had completed duty late the preceding evening his rest period would have been a maximum of 6 hours 30 minutes.

The certificate of airworthiness of the aircraft was valid and the periodic checks had been undertaken at the appropriate times. However, some aircraft accessories were in service beyond their operating time limitations. The gross weight of the aircraft was within limits at take-off.

The meteorological conditions along the route were exceptionally good with clear skies and no fog.

Communications between the aircraft and the control tower and Lima Radio were normal. The last message from the aircraft was received by Lima Radio on the route frequency at 0757 hours. At no time did the aircraft report departing from its flight plan or experiencing any difficulties.

The airline's operation procedures for the Lima - Cuzco route specify that the aircraft should climb on a heading of 190° until reaching a point 9 NM south of the airport, where a turn to the left is made to continue climbing along the coast to the Quebrada de Canete, then a direct course to Ayacucho and thereafter to Cuzco can be taken.

The aircraft was seen over the village of San Pedro de Pilas on a heading of approximately 100° and then turning left to avoid Mount Huamantanga, which was higher than its flight altitude, following a gap oriented on a 80° magnetic heading.

The wreckage of the aircraft was found on a heading of 340°, 5 NM northeast of San Pedro de Pilas and 29 NM to the north of the normal route. The aircraft struck the 35° slope of Mount Talaula in a very steep nose high attitude equal or superior to the slope of the terrain and at low speed.

No evidence of pre-impact malfunction or failure of the aircraft was found; at impact the engines were operating at high rpm.

It was concluded that the pilot elected to fly a direct route from Las Palmas, 7 NM south of Lima/Callao, to Cuzco and found himself trapped in a gap with insufficient climb performance to clear the summits ahead of him and insufficient manoeuvring space to turn back on a reciprocal course.

(b) Cause or
Probable cause(s)

The Commission considered that the probable cause of the accident was pilot error in that he -

(a) incorrectly selected the route to be flown in violation of the provisions established by the Airline for operation of flight 501;

(b) incorrectly calculated the climb performance of the aircraft in relation to its total weight at take-off. This aircraft type, with a gross take-off weight of 90 572 lb cannot within the 25 minutes of flight after take-off attain the altitude required to fly over the peaks of the Cordillera which are encountered over the distance that can be covered in the above-indicated time along the route followed by the aircraft. Under such conditions the operation can be performed only by flying the aircraft at lower levels between the mountains, in violation of the most elementary principles of flight safety;

(c) erroneously estimated the elevation of the nearby peaks he had to clear along the route.

The Commission considered that the critical moment of decision came in the area of the towns of Tamará and Pilas which are separated by a gap running into the Cordillera and joining in the same area another wide gap into which flows the Rio Omas and which leads to the coastal town of Asia.

At this point the pilot could still have flown out to the coast but this would have entailed continuing on his course, then turning to avoid Mount Huamantanga (12 600 ft), since he was flying below the elevation of the mountain so as to enter the gap and follow it up to the Cordillera even though it would have been flying below the elevation of the surrounding peaks. The Tamará and Pilas gap, the entrance to which is in the area of the above-mentioned villages, at a rather low elevation, is about 5 NM wide along its entire length up to the Cordillera, rises very steeply until it reaches elevations of more than 14 000 ft, which could not be cleared by the subject aircraft, considering its weight, the climb characteristics of the aircraft, the time to fly the 5 NM length of the gap and the altitude of the aircraft when it entered the gap.

(d) In view of the flight experience of the pilot-in-command, who had completed 112 flights on the 501-502 route, one can only surmise that he overestimated the technical possibilities of the aircraft and his own personal ability, and that his judgment was affected by insufficient rest and his particular state of mind as a result of his assignment to perform this flight for which he was not rostered. He may have been further influenced in the selection of the direct route by the perfect weather conditions obtaining at the time.

(e) Finally, although there was no evidence of any mechanical failure the Commission could not definitely rule out the possibility of some "undetermined" factor during the two minutes of flight from San Pedro de Pilas to the point of impact inside the gap. If such was the case, this would have only aggravated the situation, since it was considered that after having entered the Tamará-Pilas gap, the aircraft could not have cleared the peaks along the route nor come back. In view of this circumstance, it was considered that an "undetermined factor" did not necessarily cause the accident.

3. - Recommendations

(a) It was recommended that all airlines operating in the national territory ensure that their pilots follow the routes established in their approved route guides and exercise strict control to that effect.

(b) It was recommended that LANSA ensure that during the 130-hour and 260-hour periodic checks an appropriate inspection be made of the propellers in order to eliminate the accumulation of residues and sediments in the domes, and that it establish a better control of maintenance of accessories.

(c) It was recommended that LANSA establish a standard procedure for the rostering of crews to duty assignments which will ensure that assignments are notified to crews sufficiently in advance and acknowledged in writing by the crew members concerned.

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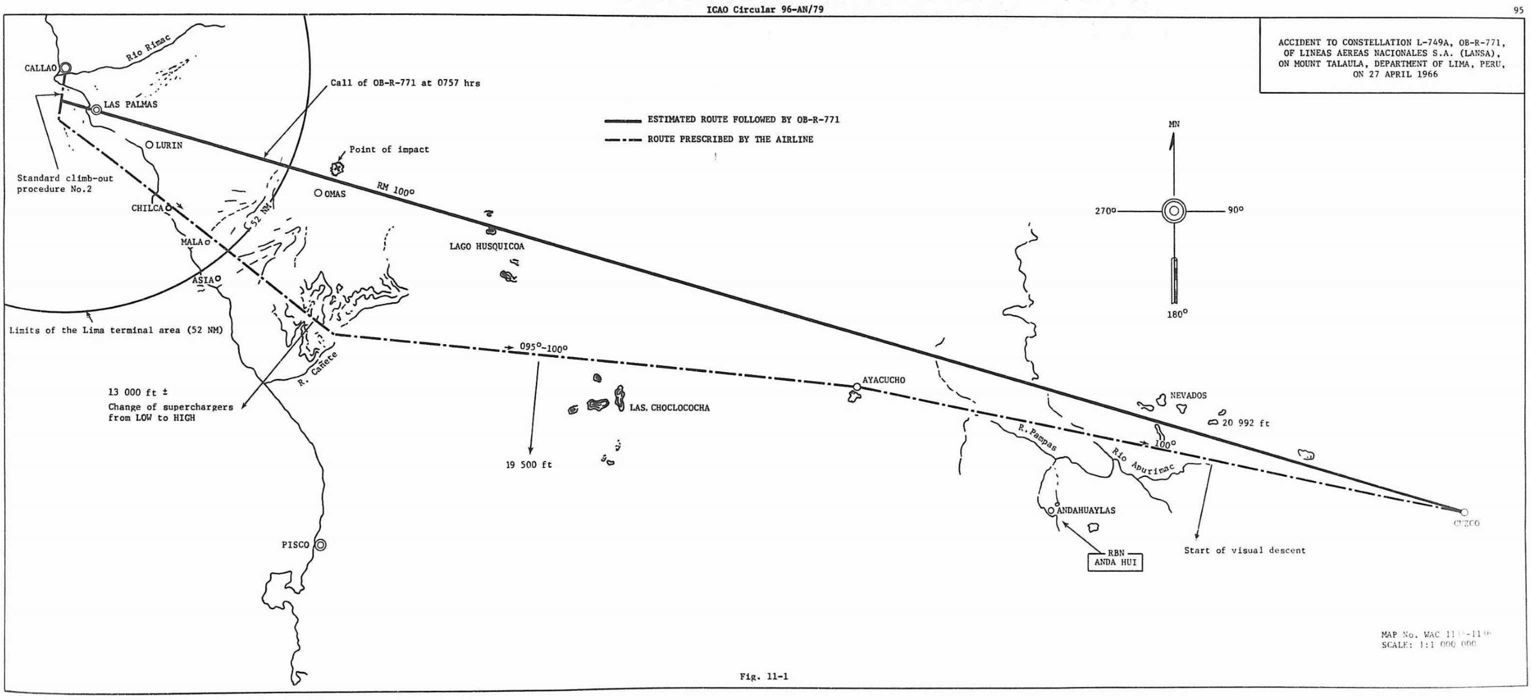
ACCIDENT TO CONSTELLATION L-749A, OB-R-771,
OF LINEAS AEREAS NACIONALES S.A. (LANSA),
ON MOUNT TALAULA, DEPARTMENT OF LIMA, PERU,
ON 27 APRIL 1966
ESTIMATED ROUTE FOLLOWED BY OB-R-771
ROUTE PRESCRIBED BY THE AIRLINE
MN
270°
90°
180°
Rio Rimac
CALLAO
LAS PALMAS
Call of OB-R-771 at 0757 hrs
LURIN
Point of impact
Standard climb-out
procedure No.2
OMAS
RM 100°
CHILCA
52 NM
MALA
LAGO HUSQUICOA
ASIA
Limits of the Lima terminal area (52 NM)
095°-100°
R. Cañete
13 000 ft ±
Change of superchargers
from LOW to HIGH
AYACUCHO
LAS. CHOCLOCOCHA
19 500 ft
NEVADOS
20 992 ft
R. Pampas
100°
Rio Apurimac
ANDAHUAYLAS
RBN
ANDA HUI
Start of visual descent
CUZCO
SCALE: 1:1 000 000

Fig. 11-1