

No. 21

Abaroa Airlines, Douglas C-47, CP-639, accident at Paso Huayna Potosi, Bolivia, on 8 December 1964. Report undated, released by the Directorate General of Civil Aviation, Ministry of Public Works and Communications, Bolivia.

1. - Investigation1.1 History of the flight

The aircraft was on a scheduled domestic flight from Caranavi Airport to La Paz via Tipuani. It arrived at Tipuani at 0913 hours Bolivian time, carrying a crew of three, a supernumerary crew member and a passenger for La Paz. At Tipuani, eleven adult passengers and a baby boarded the aircraft. Departure from Tipuani was at 0934:36 hours and the estimated time of arrival at La Paz was 1010 hours. The last communication with Tipuani control was made at 1002 hours when it requested permission to change to the frequency of the La Paz aerodrome control zone. When the aircraft did not enter the control zone within the normal five-minute time, an emergency was declared at 1022 hours, and at 1048 hours it was learnt from the Milluni broadcasting station that the aircraft had been seen exploding in the air and falling to earth near the cemetery of that mining area. At 1121 hours the disaster was confirmed by another aircraft, CP-621, which was flying over the area. The site of the accident was 16°21'00"S, 68°10'00"W, at an elevation of 14 000 to 14 500 ft.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	4	13	
Non-fatal			
None			

1.3 Damage to aircraft

The aircraft was totally destroyed.

1.4 Other damage

There was no other damage.

1.5 Crew information

The pilot-in-command, aged 40, held an airline transport pilot's licence with a multi-engine rating. He had flown a total of 5 161 hours as pilot-in-command of C-47, YC-125, B-17 and PV-2 aircraft, in addition to 941 hours on single-engined aircraft and 1 367 hours on Beechcraft AT-7 (twin-engined aircraft) as Air Force pilot.

During the 30 days preceding the accident, he had flown 69 hours. He passed his last medical examination on 25 July 1964 and had a valid medical certificate.

The co-pilot, aged 25, held a national licence validated on an Argentine private pilot's licence. He had flown a total of 720 hours, including 625 hours as co-pilot on C-47 and C-46 aircraft. He had flown 63 hours during the preceding 30 days. He passed his last medical examination on 5 July 1964 and had a valid medical certificate.

The flight engineer had 17 years of continuous experience in aviation.

The supernumerary crew member was a general of the Air Force and manager of the airline. He was 49 years old and held an airline transport pilot's licence rated for twin-engined aircraft.

1.6 Aircraft information

The aircraft's certificate of airworthiness was valid until 4 January 1965.

The aircraft had flown a total of 17 007 hours, including 1393 hours since last overhaul. The aircraft had been properly maintained.

At the time of take-off from Tipuani, the aircraft's gross weight was 9 721 kg. The load and trim sheet for this flight was not signed by the co-pilot.

The aircraft carried 180 gallons of fuel weighing 490 kg. The type of fuel was not mentioned in the report.

1.7 Meteorological information

The weather conditions all along the route were favourable for flying in VMC.

1.8 Aids to navigation

Not pertinent to the accident.

1.9 Communications

Communications between the aircraft and ground stations were normal.

1.10 Aerodrome and ground facilities

Not pertinent to the accident.

1.11 Flight recorders

Not mentioned in the report.

1.12 Wreckage

The wreckage of the aircraft was scattered along an area 1 070 m long at a true heading of 210° (see Figure 21-1) and was distributed as follows:

Area 1: Close to the Milluni cemetery small paint flakes ($\frac{1}{2}$ " x $\frac{1}{4}$ ") were found scattered over an area of 200-m radius. They were identified as belonging to the tail unit and tail cone.

- Area 2: Approximately 50 m further on, at the top of the first rise in the ground, hundreds of small fragments of aluminium and paint flakes ($\frac{3}{4}$ " x $\frac{1}{2}$ "") were found. They were all identified as belonging to the rudder.
- Area 3: Another 50 m further on, hundreds of metal fragments ranging from bits half an inch in diameter to parts 2 to 3.5 ft long were scattered over an area of 150-m radius. They were all identified as belonging to the rear part of the fuselage and to the tail unit.
- Area 4: About 400 m further on, the horizontal and vertical tailplanes, the flight deck escape hatch and the rear cargo door were found in an area of 50-m radius.
- Area 5: An area approximately 300 m long, where no wreckage was found.
- Area 6: An area of approximately 300 sq. m in which the main wreckage of the aircraft was located, including the wings and ailerons, the engines and propellers, pieces of the fuselage and the central wing section, and the landing gear.
- Area 7: At the top of the last rise in the ground, the upper part of the fuselage and the heating duct of the passenger cabin were found. The tail skid was located further down, 5 m from the road to La Paz.

1.13 Fire

Fire broke out after impact. Since the traces left by most of the fire had not caused any significant fusing of metal parts, it was believed that the remaining fuel, estimated at 130 gallons, exploded when the aircraft hit the ground.

1.14 Survival aspects

There were no survivors.

1.15 Tests and research

Numerous fragments of aluminium plating, showing the distortion resulting from explosion, were collected in order to ascertain, as far as possible, what type of explosive could have led to the disintegration of the starboard side of the fuselage.

Tests carried out in the Bolivian Police laboratories revealed the presence of sodium nitrate and residues of other explosion-producing substances.

2. - Analysis and Conclusions

2.1 Analysis

From the distribution pattern of the wreckage, it was determined that the tail unit was torn from the aircraft at an estimated height of 1 500 ft above the ground. The stabilizers and elevators, the fin, the rudder and the rear door of the hold were all found in one piece and no evidence of in-flight damage was found on them. Examination of the main part of the wreckage, which was located 300 m farther than the tail unit wreckage,

revealed that the wings, together with their ailerons and tabs, and the flaps were intact prior to the impact of the aircraft with the ground in a nearly vertical attitude. Also the distance between the 2-ft deep craters in which the engines and their propellers were found indicated that they were still in position at the time of impact.

During the examination of the wreckage, it was found that the entire port side of the fuselage was perfectly identifiable, but that a large portion of the starboard side between station 623 and station 294, as well as part of the passengers' and freight compartment floor, had completely disintegrated.

Evidence showed that the disintegration started at a point behind the passenger cabin, in an area adjacent to the toilet, and that it was due to an explosion.

Seven days after the accident, the police found a 2-inch piece of burnt out dynamite fuse amongst the main wreckage, another piece approximately 4-inch long and not burnt in the area of great dispersion and also fragments of solidified cement.

Nothing could justify the presence of this material, which forms part of an explosive device, in the accident area.

2.2 Conclusions

Findings

The crew were adequately certificated for their duties.

The certificate of airworthiness was valid and up to date. The maintenance procedures prescribed for the aircraft had been carried out. The aircraft was properly dispatched.

The weather conditions were good.

No trace of structural or component failure of the aircraft was found that might have caused the accident.

It was proved beyond any doubt that the tail unit of the aircraft, consisting of stabilizer, elevators, fin, rudder and rear freight door had been torn off the aircraft while it was still flying normally on descent to the aerodrome of destination.

Examination of all the collected pieces revealed that this was due to sudden disintegration caused by an explosion.

The disappearance of a large portion of the starboard side of the fuselage, the breaking up of the metal parts indicated that the cause was an explosion within the aircraft.

Parts of explosives were found such as dynamite fuses and pieces of solidified cement.

Cause or Probable cause(s)

A violent explosion of criminal origin inside and at the rear of the aircraft during flight, which caused the tail unit to be torn off.