

No. 11

Viação Aérea São Paulo S.A., Viscount 701, PP-SRR, accident on Pico da Caledonia, 15 km southwest of Nova Friburgo, Rio de Janeiro State, Brazil, on 4 September 1964. Report released by the Department of Aviation of Brazil (SIPAER) on 15 December 1964.

1. - Investigation1.1 History of the flight

The aircraft was flying a scheduled domestic flight from Recife to Rio de Janeiro with intermediate stops at Salvador and Vitoria. At 1553 hours GMT, the aircraft took off from Salvador for Rio de Janeiro, with clearance to fly at 4 200 m on Airway Green 1 and to make an intermediate stop at Vitoria. Over Caravelas the pilot requested permission to change altitude to 1 800 m without indicating his reason for doing so. Rio Area Control Centre modified the flight plan but as Radio Station Caravelas did not obtain contact with the aircraft, the latter maintained its altitude as far as Vitoria. At 1845 hours GMT the aircraft took off from Vitoria, climbing on instruments, and then informed Guarapari that it had reached the altitude of 1 800 m. At 1910 hours GMT, it reported over Campos above the clouds. At 1922 hours GMT, it reported over Macaé and estimated arrival at Rio Bonito at 1934 hours GMT. At 1933 hours GMT, the aircraft reported its position as Rio Bonito, 1 800 m in instrument meteorological conditions and was instructed by Rio ACC to maintain altitude, head for "Quebec" and pass to approach control. The real position at that time was reconstructed as being over the city of Nova Friburgo at a distance of 43 km from Rio Bonito (see Figure 11-1). Some 30 seconds later (at 1934 hours GMT) the aircraft, flying in IMC, crashed on the west slope of Pico da Caledonia at a point located 22°19'S - 42°33'W and at an elevation of approximately 1 950 m.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	5	34	
Non-fatal			
None			

1.3 Damage to aircraft

The aircraft was destroyed.

1.4 Other damage

There was no other damage.

### 1.5 Crew information

The pilot-in-command was a first-class reserve officer of the Brazilian Air Force and had considerable experience on the route. His instrument rating, certificate of medical fitness and equipment rating were all up to date. He had flown a total of 6 787 hours as pilot-in-command, including 284 hours night flying and 588 hours instrument flying. His total experience as pilot-in-command on Viscount 701 aircraft amounted to 428 hours.

The co-pilot had flown a total of 5 945 hours, including 1 494 hours instrument flying. His total experience as pilot-in-command amounted to 2 972 hours, including 433 hours on Viscount 701 aircraft. His instrument rating, certificate of medical fitness and co-pilot's rating for the aircraft were up to date. Most of his flying experience was on DC-3s, and therefore his experience on the particular route was relatively small since it was only flown by Viscount 701s.

Both pilots had considerable flying experience and were considered by their colleagues as attentive and disciplined pilots. Their recent flying activities and hours of work were perfectly normal, and fatigue was excluded as a possible factor in the accident.

### 1.6 Aircraft information

The aircraft had flown a total of 17 165 hours, including 1 494 hours since the last overhaul. No information on the aircraft's certificate of airworthiness was given in the report, but it appeared that the aircraft and its equipment had been properly maintained.

On arrival in Brazil, where radio direction-finding equipment is the basic navigational aid, the aircraft posed various problems for the pilots. The tropical climate and generally low strength of radio beacons affected adversely the efficiency of the equipment. The company's servicing, after various precautionary measures, resulted in the ADF equipment attaining satisfactory efficiency for the approach operation. Nevertheless, as far as navigation was concerned, the bearings remained deficient at a distance from the radio beacon. Another factor was the behaviour of the aircraft when traversing cold fronts at high altitudes. On a number of occasions, radar failure placed the pilots in a difficult situation. In order to overcome that deficiency, the pilots preferred to cruise at the lowest altitudes possible whenever there was a front to traverse although this tended to diminish the endurance.

These factors explained certain aspects of the accident, such as the change of altitude and the fact that the aircraft was not on the Macaé radio beacon.

The aircraft's weight and centre of gravity were within limits at take-off and there was no change by the time the impact occurred.

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

### 1.7 Meteorological information

There was a cold front between Caravelas and Vitoria and a cloud cover of 8/8 in the area from Santa Cruz to Caravelas.

### 1.8 Aids to navigation

All NDBs between Vitoria "VT" and Quebec "Q" and also the Marica VOR "VTA" were operating normally. The radar at Rio was not in operation; however, even if it had been operating it could not have prevented the accident.

### 1.9 Communications

No communications difficulties were reported.

### 1.10 Aerodrome and ground facilities

Not pertinent to the accident.

### 1.11 Flight recorders

Not mentioned in the report.

### 1.12 Wreckage

The point of impact was on the west slope of Pico da Caledonia at an elevation of 1 950 m, i.e. 300 m below the summit. The aircraft collided at that point, flying horizontally at a magnetic heading of 257° and at an angle of 67° to the surface of the mountain.

The force of the impact caused the aircraft to disintegrate, scattering wreckage over an oval-shaped area, the horizontal axis of which formed an angle of 68° with the flight path of the aircraft. The shortest radius of that area measured 15 m, its longest radius (in the direction of the flight path) 200 m, and the median radius measured 75 m.

### 1.13 Fire

There was no fire.

### 1.14 Survival aspects

None given in the report.

### 1.15 Tests and research

None mentioned in the report.

## 2. - Analysis and Conclusions

### 2.1 Analysis

Due to the degree of destruction of the aircraft, little information could be gained from the examination of the wreckage. Only three instrument dials were found, and nothing was learned from their examination. It was estimated that the speed at the time of impact was about 495 km/h. No indication of in-flight failure or malfunction in the aircraft or its equipment was found.

All factors pertaining to the flight from Recife to Rio de Janeiro were reconstructed. The route segment Recife-Salvador was flown at 3 600 m and was uneventful. The route segment Salvador-Vitoria was flown at 4 200 m, despite the fact that over Caravelas the aircraft had requested permission to change altitude to 1 800 m. As the approval for the new altitude took 36 minutes to reach Caravelas, it had not been possible to reach the aircraft by VHF and it continued to fly at 4 200 m according to the position report over Praia. In Vitoria no deficiencies were reported by the pilots. The arrival at and the departure from Vitoria were made in IMC. The climb to en-route altitude was carried out

according to climb procedure No. 2. The amount of cloud in the area as far as Rio left no doubt that the pilots had to fly in IMC. It was established that the aircraft's ADF equipment had not given rise to complaints since 19 August. A defect in the pressurization system was excluded in view of the fact that the aircraft was still flying at 4 200 m after it had requested permission to change altitude and that nothing was reported to the maintenance at Vitoria.

It was concluded that the request to change altitude over Caravelas was not made for technical reasons but was made in connexion with the presence of the cold front and the associated turbulence.

In view of the aircraft's characteristics, the Commission was unable to understand why the flight was continued towards Rio de Janeiro at 1 800 m. The altitude of 4 200 m was vacant, and there was no difficulty in obtaining permission for that altitude.

It was considered that the ADF functioned normally but that a good bearing from Macaé might not have been obtained.

When the aircraft passed over Campos it was on top of a cloud bank. However, the layer of cloud was of a type which must have made it possible for the pilots to see the river Paraíba and the city.

Bearing in mind the type of navigation instruments used by the Viscount 701, it would be difficult to assume that a malfunction of the instruments might have resulted in an erroneous heading.

A mean wind speed of 10 kt prevailed in the entire area and, consequently, this factor could not have caused the deviation which took place on the route segment Campos-Macaé.

Evidence suggested that the automatic pilot did not play any part in the accident.

According to the operating rules of the company, the pilot-in-command should have been flying the aircraft at the time of the accident.

The Pico da Caledonia and the adjacent mountains have erroneous spot elevation indications on the air navigation charts. The altimeters were found at a setting of 1 013 mb and indicated approximately 1 800 m. The aircraft had not yet started the descent.

The NDB of Rio Bonito frequently has no identification.

It is likely that the pilots sighted Nova Friburgo and gave their position as being over Rio Bonito. This could have happened in view of the fact that they had no indication from the radio direction-finder and that the estimated time over Rio Bonito was only one minute after the actual time at which they reported. In the expectation of being over Rio Bonito, it is possible that despite the topography the pilots mistook Nova Friburgo for Rio Bonito through the clouds.

## 2.2 Conclusions

### Findings

Both pilots had considerable flying experience both in VMC and IMC.

The aircraft, its engines and equipment had been properly maintained.

No indication of malfunction or failure of the aircraft or its equipment was found.

From the reconstruction of the flight, it was concluded that the aircraft had deviated 35 km to the right of its normal route and as a result of this struck the mountain in a nearly horizontal attitude.

Nothing was found which indicated the reason for this deviation; however, it was believed that the pilots mistook Nova Friburgo for Rio Bonito through the clouds.

Cause or  
Probable cause(s)

Collision with an obstacle located 35 km to the right of the intended track, for reasons unknown.

3. - Recommendations

The Directorate of Civil Aviation should study the possibility of requiring that radar be carried as essential equipment by all commercial aircraft with speeds of over 400 km/hr to facilitate flying through fronts and as an aid to navigation.

The Directorate of Civil Aviation and those in charge of airline operations should increase the use of VOR and ILS among air crews, not only in re-checks but also in normal operation.

The Directorate of Aviation Routes should study the possibility of augmenting the power of the Macaé and Rio Bonito non-directional radio beacons as well as the Route Service of the 3rd Area Zone to improve the assistance as far as transmission of the identification of the Rio Bonito NDB is concerned, and of equipping all towers, approach control offices, radar and area control centres with recording equipment.

The airline should examine the air navigation charts, completion of which is to be left to the pilots.

The airline should avoid, as far as is possible, that its turboprop aircraft request permission to change to lower altitudes unless an emergency exists, in which case information on the emergency shall be given in the message.

The airline should instruct the air crews to report all incidents in order that the latter may be fully analysed and the necessary information be obtained from them, and to adhere to the communication traffic rule which requires a minimum of 10 minutes when in direct contact with the area control centre, or 20 minutes when contact exists through other stations, as the time preceding a request for permission to change the flight plan.

For modifications of the flight plan, contact should be established whenever possible directly on VHF or HF with the area control centres, thus avoiding delay in messages.

The Directorate of Aviation Routes and the competent authorities should coordinate their efforts to correct the spot elevations of the Pico da Caledonia and nearby mountains and to verify the relief of other mountains in Brazil.

ACCIDENT TO VISCOUNT 701, PP-SRR, OF VIAÇÃO AEREA SAO PAULO, S.A., ON PICO DA CALEDONIA, BRAZIL.  
4 SEPTEMBER 1964

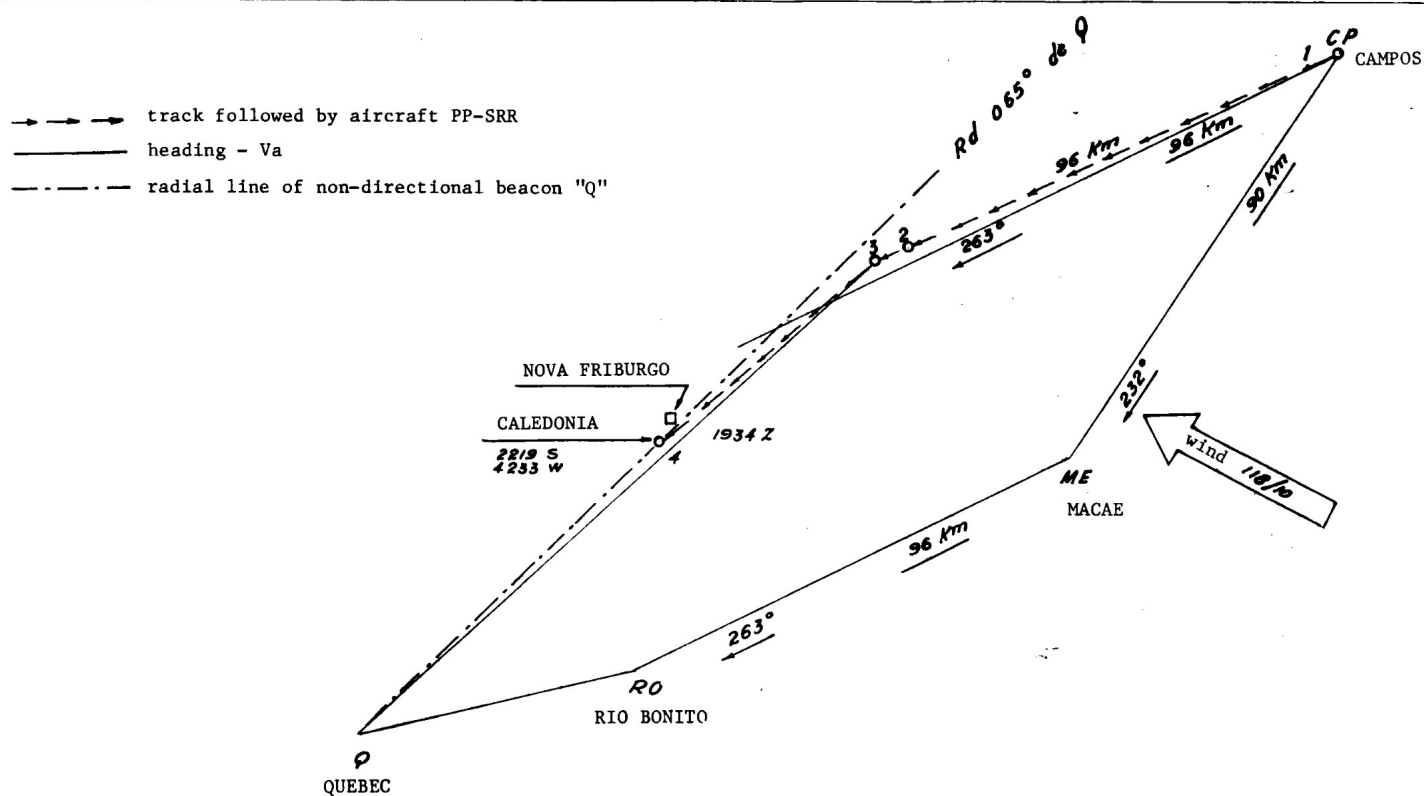


FIGURE 11-1