

No. 3

Paraguayan National Airline, Norseman Norduyn, ZP-CAX,
crashed into a hill north of Rfo Tocomar, Salta Province,
Argentine Republic, on 23 October 1955. Accident Investigation
Report No. 538 released by Ministry of Aviation, Argentina.

(The following report was received too late for inclusion in Digest No. 7. However, it is here presented because of its medical aspects.)

Circumstances

The aircraft was on a delivery flight from Mexico City to Asunción, Paraguay, with intermediate stops at Antofagasta, Chile and Salta, Argentina. At 1245 hours local time the aircraft took off from Antofagasta for Salta. It was to be a VFR flight via Chosque, Chile and San Antonio de los Cobres, Salta Province. The aircraft was seen at 1400 hours flying in a straight line at very low altitude in the direction of San Antonio de los Cobres 40 kilometres east of Olapacato. One witness, believing that the aircraft intended to land, followed it in a jeep only to find its burned wreckage some 20 kilometres away. It had crashed into the side of a hill rising north of Río Tocomar, approximately 70 metres above the river bed. The height above sea level at this point is approximately 4 500 metres. One eye witness stated that the aircraft crashed in rectilinear horizontal flight into the northern slope of the hill and that the pilot had not taken any avoiding action. The pilot, the sole occupant, was killed, and the aircraft was destroyed by the crash and the fire which followed.

Investigation and Evidence

The crash occurred some forty kilometres to the left of the planned direct track, confirming the fact that the pilot was flying over the valleys of parallel mountain ranges which follow the railway line from west to east, to San Antonio de los Cobres, and that he was flying at low altitude, avoiding the mountain crests.

The first part of the aircraft to strike the ground was the undercarriage unit, followed by the impact of the lower portion of the engine and a violent somersault which caused the power unit to detach itself from the fuselage. The fuselage was projected seven metres from the main contact point and burst

into flames. It is presumed that when the power unit and fuselage became separated, the seat attachment broke, with the result that the pilot was thrown a distance of 15 metres from the place of impact. The wreckage was strewn over an area of approximately 50 metres.

An inspection of the wreckage showed that the engine was operating at cruise power and that the propeller blades were set in the coarse pitch position, for normal flight. This was confirmed by the deformations of the propeller blades as they struck the ground.

The fire which followed the crash of the aircraft and the remaining fuel which was spilled on the ground show that there was an adequate amount of fuel on board and that the flight could not have been hindered by a fuel shortage.

The official weather report for the area at 1400 hours was as follows:

"Overcast with low clouds; ceiling 1 100 m; visibility 23 km; wind ENE 8/10 km/h; atmospheric pressure at 1 000 m 906.4 mb; QFE 884.2 mb; temperature 12°C; R.H. 40%."

The area overflown is quite suitable for forced or precautionary landings. No major risks are involved, since the area consists of a very wide valley or glen, with a distance of 5 km between crests at its widest point and of 800 metres in narrower parts. At the site of the accident, the slope on which the aircraft crashed does not run from east to west. At this place the valley begins to narrow and runs exactly in a northwest to southeast direction. It should be borne in mind, however, that prior to the crash the pilot had flown along the valleys of the mountain range of the area. This leads to the assumption that the pilot, who did not

have an oxygen mask on board the aircraft - an essential item for flights of this kind - endeavoured to maintain low altitude. In this respect the aeronautical medical authority sent to the scene to report, issued the following opinion:

"... flights conducted at heights between 3 000 and 4 000 metres (high altitude flying) produce certain changes in the body of the pilot which are known collectively under the name of 'altitude sickness'. These changes are due to a lowering of the partial oxygen pressure which, at 4 000 metres, 97.02 mm of mercury, instead of 159.8 mm of mercury, which is the partial oxygen pressure on the ground. The altitude at which these phenomena begin to occur has been shown to be 4 000 metres, although there may be certain individual factors which will cause certain pilots to suffer from these changes at heights of less than 4 000 metres and others at greater heights. The first symptoms to appear are asthenia and loss of strength, sleepiness, violent headache, nausea, vomiting, tachycardia and precordial pain. The mental condition is characterized by a state of exaggerated well-being which causes one to lose the sense of fear and understanding of the happenings about one. This condition becomes aggravated as the pilot remains at high altitude without any oxygen. After the initial state of well-being, a feeling of drowsiness and apathy follows which then becomes deep slumber which, in turn, is followed by coma and death. In such conditions, the pilot loses control of the aircraft and does not fully realize what is happening, and his reading of instruments becomes faulty. His visual acuity and power of accommodation are also altered. A hyperacute condition may occur; this usually does not

appear at less than 8 000 metres, but may, in the case of certain individuals, present itself as low as 5 000 metres."

Setting aside the technical factors examined during the investigation and bearing in mind that the aircraft collided head-on against the hill while it was flying in an area where there were suitable stretches of land on which the pilot could have landed without any great risk - particularly in view of the experience which he is presumed to have had, judging by his licence - the Board decided in favour of the more plausible theory that the pilot suffered from the consequences of anoxia through flying an aircraft not provided with oxygen-breathing equipment essential for this kind of flight. The above conclusions are further borne out by the height of 60 to 70 metres at which the aircraft was flown, by the nature of the prevailing weather conditions at the place and time of the accident, and by the elevation of the area above sea level - approximately 4 500 metres.

Probable Cause

The accident was attributed to a loss of control over the aircraft due to a possible state of anoxia on the part of the pilot. A contributing factor was inadequate flight preparation, as no account was taken of the need for oxygen-breathing equipment for high altitude flying.

Recommendations

It appears necessary to recommend to pilots and to aircraft control and dispatching personnel that, for flights of this kind, aircraft should be provided with oxygen-breathing equipment in good working condition.

For its part, the aeronautical authority has decided to prescribe this as a mandatory requirement, and to issue specific directives aimed at prohibiting this type of flight if the requirement is not met.
