

No. 18

Lineas Aereas Paraguayas, Convair 240-6, Series 72,
ZP-CDP, accident at Ezeiza International Airport, Buenos Aires, Argentina,
at 1143 hours (local time), on 26 May 1967. Report No. 72 released
by the Directorate General of Civil Aviation, Argentina

1. - Investigation1.1 History of the flight

The aircraft was on a scheduled international flight and was carrying eighteen passengers. It was coming in to land and was lined up with and about to touch down on runway 10 when it suddenly underwent an abrupt change of attitude and crashed to the ground. After a series of bounces which commenced on the left wing causing it to break off together with the left power unit, the aircraft slewed round and came to rest upside down on a heading practically opposite to that of landing some 250 metres from the runway end.

The pilot stated that during approach and when he was approximately 20 metres above and some 50 metres away from the runway threshold, and had just finished calling to the co-pilot "eighteen inches, reduce to idle", that is to say, when the aircraft was practically touching down, he heard the characteristic sound of propellers reversing (on both engines). At the very same moment, according to his statement, the mechanic reported this occurrence to him, and since the aircraft was nosing down and tilting to the left at the same time, he applied right rudder and tried to correct the attitude by nosing up. The aircraft, however, did not respond in spite of application of power to supplement the control manoeuvres.

1.2 Injuries to persons

Injuries	Crew	Passengers	Others
Fatal			
Non-fatal	2	1	
None		21	

1.3 Damage to aircraft

The aircraft sustained the following damage: right and left wing and tail assembly destroyed; fuselage destroyed; nose wheel pushed into the belly of the aircraft; right and left landing gear destroyed and torn free from fuselage; left engine torn free and crankcase destroyed; crankcase of right engine destroyed; propellers with hubs torn free and blade tips broken.

1.4 Other damage

One runway light destroyed.

1.5 Crew information

The pilot-in-command, aged 32 years, held an airline transport licence which included an instrument rating. At the time of the accident he had logged 4 958 flying hours as a pilot, 780 of which were on the subject aircraft. The co-pilot, aged 27 years, held a commercial pilot's licence with a type rating for the Convair 240. He had flown 1 800 hours, 600 of which were on the subject aircraft. The flight mechanic, aged 32 years, held a maintenance mechanic's licence. The radio operator, aged 39 years, the steward, aged 22 years, and the stewardess, aged 23 years, all held proper qualifications for their duties.

1.6 Aircraft information

The certificate of airworthiness was valid until 14 July 1967. The aircraft had flown 18 502:25 hours, 672:25 of which were since the last general overhaul.

1.7 Meteorological information

The weather had no bearing on the accident.

1.8 Aids to navigation

Not relevant to the accident.

1.9 Communications

Normal up to the time of the accident.

1.10 Aerodrome and ground facilities

Not relevant to the accident.

1.11 Flight recorders

The aircraft did not carry any flight recorder.

1.12 Wreckage

The wreckage of the aircraft, consisting of the left wing and right power-unit, the right aileron, the rudder, the fin, the nose-wheel shock absorber, the left and right undercarriage, both propellers and their reduction gear, were scattered around the fuselage which, together with other parts still attached to it, was broken, dented and twisted beyond repair.

1.13 Fire

As the result of the accident a fire broke out in the detached left wing, caused by the spilled fuel which ignited by friction of the metal parts against the pavement. This fire was fanned by the wind and spread to the tail component which also caught fire. Both fires were eventually brought under control.

1.14 Survival aspects

When the aircraft came to rest after the accident, some of the passengers evacuated the aircraft through a broken window, the others leaving through the door.

1.15 Test and research

Visual inspection of the ground indicated that the initial impact occurred 21.55 metres from the threshold of runway 10, the aircraft first striking the ground with its nose wheel, then with the main left landing gear and finally with the right landing gear, and that the propellers started striking the ground a short distance before the aircraft entered the runway, all of which was evidenced by the score marks on the ground and further down on the runway itself. At a point about 9 metres down the runway the underside of the left wing scraped against the runway, destroying a runway light, and the aircraft continued to travel over some distance in this attitude, leaving continuous score marks of the left wing and the mount. A little further down the aircraft again veered to the left skidding sideways, leaving successive skid marks of the nose wheel which was found pushed into the belly of the aircraft, as well as an impact mark made by the left elevator. Throughout its travel on the ground, the aircraft was in a banked position with the right wing high and the left wing dragging along the pavement, the yaw to the left increasing until the aircraft made a 180° turn around its axis with the right wing practically in a vertical position, and finally turned over coming to rest on the roof of the cabin. The left power unit was torn free when the left wing broke off, as were the two propellers which were recovered on the runway.

Inspection of the parts before removal of the wreckage indicated that the propellers were actually in the "reversed" position, and still turning freely in their housing even though they have been torn free from the engines together with the reducing gear.

Notwithstanding the above, the pilot stated that at no time had he instructed the co-pilot to operate the reversing system, which, barring any defect in the system, could not be actuated except when the aircraft was resting on its three points, since the mechanism which unlocks the throttle for reverse movement is installed in the left landing gear.

Even if the shock absorber or the strut should jam for any reason the reversing system could not be operated unless the mechanical locking bar were released. The co-pilot and the flight mechanic confirmed the pilot-in-command's statement that he had not instructed the crew to operate the reversing system.

In this connexion it should be pointed out that any inadvertent placing of both propellers in the reverse pitch, with the indication of the pumps in operation as observed by the crew prior to contact with the ground, could not have occurred with the system functioning properly unless the following operations had taken place in the given sequence:

- 1) the left landing gear must be firmly compressed against the ground before the solenoid pin that locks the levers can be retracted;
- 2) the manual levers must be moved in order to release the throttle locking bar;
- 3) the throttles must be moved aft, past the idle position, overcoming a noticeable resistance, in order to set into operation the electric pumps that cause the propeller blades to rotate in the reverse position; and they must be moved still further aft in order to increase rpm and thus achieve rapid deceleration of the aircraft.

Using test equipment a first test was made to check whether the throttle levers were effectively blocked on the idle position. A first check with the aircraft in the inverted position, as it was found after the accident, revealed that the left lever was beyond the idle detent but not so the right lever, and that the pull levers releasing the locks could be operated without difficulty. A further test was carried out later with the aircraft in the normal position. The same operation was repeated, with the aircraft in its normal attitude and it was ascertained that both throttles levers held at the detents, although fairly strong pressure was applied. Under these conditions the contact switches actuating the auxiliary feathering pumps were actually set into operation, and the circuit could not be closed even when the levers were pulled hard to the extreme position. Manual release of the latches made it possible to move the throttles aft by overcoming natural resistance, and it was observed that a displacement of 5 mm, measured on the quadrant of the lever stand, closed the circuits to the pumps.

These operations were repeated several times, and each time it was found necessary to use the manual override to unlock the levers so that they could be moved beyond the idle position detent. This gave rise to the suspicion that the safety lock was not operating, and since the electromagnetic action was ruled out following tests made without the battery, it was concluded that the levers were always locked.

An inspection of the mechanical lock system revealed that the emergency unlock button was in the normal position, i.e. out. The unit was dismantled and it was found that the grooved plate connected to the levers did not travel completely up to the rest position, and therefore the pin did not come to rest into its seat to lock the system and thus prevent operation of the levers without the intervention of the electromagnetic system. It was thus possible to determine that the levers could be moved in all cases, with or without electric power, and whether or not the landing gear was on the ground.

The electric system which makes it possible to operate the levers energizes the solenoid and pulls the lock-pin out of its seat when the landing gear wheel touches the ground. It could not be determined whether this system was functioning properly, since inspection after the accident showed that the microswitch installed in the left landing gear was loose and the wires detached from the terminals. It was observed that the shock strut when fully extended did not bring the stem down far enough to ensure that the circuit remained open. On the other hand, the absence of red signal lights indicating unlocking of the throttles could not provide any information on the operation of the system. Electric checks of the micro-switch did not reveal any abnormalities, and the solenoid when energized by the battery effectively pulled the lock-pin.

The above findings indicated that the circuit of the auxiliary feathering pumps setting into motion the propeller reversing mechanism was functioning normally, each throttle lever and each power unit being actuated independently by the microswitches.

Furthermore, examination of the solenoid unit which operates the safety lock-pin and which can be operated by means of a button to retract the pin from the lock in case of an electric failure, revealed that the protective cap holding down this button and preventing rearming of the system when operated manually in case of electric failure was missing. This would make it possible to operate the lock-pin manually, without the electric safety circuit.

The operation of the lock and the throttle latches was checked on another service aircraft of the same type on 14 June 1967. It was observed that the levers could move freely with or without any current in the circuit, and it was deduced that the solenoid did not prevent retracting the lock-pin. During the test on this other aircraft both red warning lights went on when the levers were moved, the throttles unlocked and the propeller blades reversed as soon as the throttles were moved back. The button to retract the safety lock did not function and its protective retainer cap, which prevents re-arming of the system, was missing as in the case of the aircraft that had crashed. Both aircraft belonged to the same company.

As regards the warning lights and the electromagnetic lock, the crew stated that these components had operated in the same manner from the time they had received the aircraft, that is to say the levers moved freely without the warning red lights coming on.

During the investigation, the crew stated that on several occasions they had used the manual "override" button which actuates the safety lock and that they had never seen the red warning lights indicating that the throttles were unlocked. The conclusion was reached, however, that in view of the conditions in which the aircraft was being operated at the time of the accident, this was impossible, since the lock-pin was permanently retracted, and, if as they stated, they occasionally had to use the override, it meant that on those occasions the system was functioning normally, in other words the lock was operating properly. In view of these circumstances and since it was suspected that certain authorized modifications had been made on the occasion of overhauls or during service, the manufacturer of the aircraft was requested to provide information in this respect. The corresponding Service Bulletins were duly received, including Service Bulletin 240-460-A of 27 December 1954, concerning the inclusion of the pin which locks the levers and prevents their operation before the wheels of the aircraft are on the landing gear, and which can be released manually in case of failure of the microswitch installed on the landing gear. These modifications had been included on the date of transfer of the aircraft to the airline.

As already stated, the levers could not be locked in the neutral position, since the lock-pin could not be moved to the position where it would fit into its seat, owing to shortening of the push rod of the plate actuating the lock-pin.

The adjustable terminals of this push rod had been intentionally shortened so as to render inoperative the switch on the landing gear strut which actuates the safety lock mechanism when the wheels were compressed against the ground. This had been done presumably to obviate possible electric failures or to make it possible to move the levers into the reverse position before the aircraft touched down.

2. - Analysis and conclusions

2.1 Analysis

The conclusion set forth above is based on the fact that the electro-mechanical reverse safety device installed on the landing gear is so designed that when the left landing gear strut is compressed it closes an electric circuit and frees the throttle lock. Therefore, the aircraft must touch down and roll for some distance in order to lose some lift through decrease in speed. The full weight of the aircraft is then on the landing gear and it is possible to move the levers manually and place the throttles into the proper position to reverse the propellers and then to give more throttle to gain more reverse thrust. All this requires some time and some ground roll distance after touchdown, which may or may not have some effect on the estimated distance for braking the aircraft or discontinuing the landing.

The fact that the reverse lock safety system was inoperative was considered a deficiency in maintenance, even in the assumption that it had been intentionally so adjusted by the crew or during overhauls in the aviation workshops.

The confirmed abnormality explains why in this particular case the levers could be moved back and the propeller reversing system operated.

2.2 Conclusions

In accordance with the above findings and conclusions, it was considered that the statements by the crew members should be disregarded because, as brought out by the evidence, the accident was due to premature operation of the reversing system, when the aircraft was on final approach at a height of 20 metres, thereby causing it to go into a stall. This, together with the fact that the reverse safety mechanism was not operating as it should have been, led to operation of the reversing system before the landing gear had made contact with the runway -- an essential requirement for operation of the propeller reversing system, barring any irregularities in the operation of the equipment.

It is furthermore considered that the pilot-in-command acted incorrectly and imprudently in prematurely operating the propeller reversing system during the final approach instead of following the required procedure of applying reverse propellers during the landing run, when the weight of the aircraft is firmly on the landing gear.

Consequently, the accident -- which was classified as serious -- was attributed to sudden loss of lift of the aircraft when it was about to land, which caused it to drop to the ground, slew round and turn over as a result of premature application of the propeller reversing system.

3. - Recommendations

The facts having been clearly brought out by the exhaustive investigation it was not considered necessary to make recommendations.

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Scheduled international Landing Stall Pilot - misuse, propeller controls
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