

No. 36Indian Airlines Douglas DC-3 aircraft, crashed shortly after take-off at Nagpur, India, 12 December 1953. Government of India ReportCircumstances

The aircraft, an Indian Airlines DC-3, took off from Nagpur Airport at 0325 hours on December 1953 carrying 4 crew, ten passengers and mail. After a normal take-off, the aircraft was seen to turn to the left and disappear from view after losing height at a steep angle. The aircraft crashed in a field within 4,000 feet of the aerodrome and caught fire. The captain was the only survivor, escaping with serious injuries.

Investigation and Evidence

At 0325 hours, after obtaining permission from control, the aircraft started its take-off run and became airborne in the normal manner somewhere near the intersection of runways 27 and 33. The captain of another aircraft who had moved to the beginning of runway 27 for his turn for take off, watched the take-off of the aircraft and noticed that it became airborne normally but swung to the left when at a height of about 10 or 15 feet. It then climbed steeply on a straight course until it had well passed the end of the runway, and reached a height of about 100 to 150 feet. Thereafter it turned sharply to the left and lost height, disappearing in the dark. A blaze was then observed from the direction in which it had disappeared.

Fortunately, the captain of the crashed aircraft survived and was in a position to make a clear statement on the events that led to the occurrence. He stated that he commenced the take-off after satisfying himself of the performance of both the engines by ground testing them. The take-off was made with both throttles advanced to 45" of manifold pressure and with the co-pilot's hand on the throttles. The landing lights were "on". The take-off run was normal and the aircraft was airborne at 85 miles an hour. However, at a height estimated by him to be 10 to 15 feet and at a speed of nearly 100 miles an hour, the left engine "suddenly cut dead", causing the aircraft to swing to the left. The swing was checked and the aircraft was flown parallel to the runway. After about three seconds from the time of the engine failure it picked up again and the aircraft climbed steeply at 120 miles an hour without any difficulty, and gained 100 to 150 feet with both engines at 45" manifold pressure. The aircraft by this time had flown over the end of the runway. Thereafter the pilot decided to return to the aerodrome with the idea of landing on runway 33 or 27 in order to have the engine checked, and, therefore, started a gradual turn to the left. After the commencement of the turn the left engine "went off" again. The throttle of the right engine which was at 45" manifold pressure was advanced further but not to its full limit. The pilot levelled the aircraft laterally as he did not want to continue a steep turn on one engine. He noticed that the aircraft had lost a "lot of height". The pilot had intended to increase the right engine power still further, but at that time the right engine fire warning came on. He then heard a "bang", which he thought came from the right side of the aircraft. He therefore throttled back the engine. More height had been lost by that time. The pilot then lifted his hand to feather the left engine, but was "undecided", whether to feather it or not as the engine had picked up once previously. Further considerable height was again lost. Instead of feathering the propeller, the pilot switched on the port landing light, the landing lights having been switched "off" on leaving the ground. He then found himself "almost" on the tree tops in a tail-down attitude at a speed of 105-110 miles per hour. He therefore decided to land. He was under the impression that the landing gear was up, as after getting airborne he had asked for the gear to be raised and had seen the co-pilot lean over for this purpose. He had not at any time asked that the undercarriage should be lowered.

The pilot then pulled back both the throttles half way and at the same time felt a scraping sound. He does not remember the aircraft coming to a stop but recalls forcing himself out of the aircraft through a window and subsequently being helped by persons who had arrived at the scene.

There is no doubt that after getting airborne the left engine lost power, which caused the swing. This swing was, however, corrected and the fact that the aircraft was able to climb away steeply and also keep a straight course shows that the port engine revived within a few seconds of its failure.

It was evident that the captain did not follow the procedure recommended in the Operations Manual of Indian Airlines Corporation, Line 5, when the engine failure occurred, possibly because the engine had revived again. The procedure under such circumstances is to throttle back the live engine and land straight ahead. This could have been done in this case as there was a sufficient length of runway available in front to land and pull up even with the wheels down, and certainly with the wheels up.

It appears that the landing gear was not retracted soon after getting airborne as it should have been done and this omission on the part of the pilots must have resulted in a poor climb performance, in spite of the fact that both the engines were developing the required power. If it had not been retracted before the power was lost, it should definitely have been retracted at the time of the power loss or as soon as possible after that, unless, of course, it was intended to land straight ahead with the wheels down. As the captain says, he may have called for "gear up" soon after getting airborne, as is normally done, but the copilot may not have done it, possibly being confused when the swing occurred. After that, even though the engine revived, the fact that the gear was down was apparently overlooked by both the pilots.

During the initial climb with both the engines developing the required power, the "predominant desire" of the captain was to get the airfield in sight again in case the left engine failed again. It also appears that the captain felt that the aircraft, loaded as it was, would not maintain or gain height on one engine. All his subsequent actions, and particularly his omissions to attend to certain vital duties necessary under the circumstances, are attributable to this state of mind of the pilot.

With the desire to turn towards the airfield "predominant" in his mind, the captain discontinued the climb and made a turn to the left at a low and unsafe altitude. It seems that in taking a decision to turn to the left, though he felt that the left engine was "unreliable", the advantage of keeping the airfield in sight from his left hand seat outweighed the advantage of turning towards the more reliable (right) engine. An in-board engine failure in a turn would ordinarily cause considerable loss of height.

It is not certain whether, as the pilot says, the port engine failed again during the turn, but some height and speed were certainly lost in this turn, bringing the aircraft closer to the ground. Under these circumstances, i.e. when the forward speed was only about 105 miles an hour and the aircraft was "almost over the tree tops", losing height at a rapid rate, the star-board engine fire warning light came on. Faced with this situation the pilot thought it advisable to put the aircraft down straight ahead and therefore throttled the engines half way back.

With the speed already low, the aircraft must have dropped in a nose-down attitude as soon as the engines were throttled back, a phenomenon which is normally to be expected under such circumstances.

It appears that the captain was perplexed by the temporary failure of the left engine during take-off. The reaction of the pilot to these circumstances may be attributed to:-

- (1) a fear that this aircraft could not maintain height or climb on one engine with the load it carried; and
- (2) lack of sufficient intensive checks for emergency procedures during the past twelve months, which, if carried out, might have given the pilot confidence apart from practice, enabling him to deal coolly with an emergency of this nature.

The symptoms of loss of power as described by the pilot are consistent more with a defect in the fuel system than any other failure of mechanical parts of the engine. The port engine which had been thrown clear of the fire was, however, stripped and examined thoroughly. There was

no evidence of any mechanical defect or internal fire in it.

The possibility of this engine having cut out completely due to ignition trouble is very remote. This could only happen if both the independent ignition systems had failed. Considering the fact that the pilot had ground tested both the engines, (this ground test includes the testing of the engine on each magneto), the failure of both the ignition systems soon after is extremely unlikely. Whatever components of the ignition system were recovered from the wreckage were, however, examined, but no defect was detected.

As some defect in the carburetion and its related fuel system was the most likely explanation for the intermittent loss of power, a detailed examination of the complete system from the fuel tanks to the combustion chambers was attempted. Most of the fuel lines had been destroyed by fire, but there was evidence that the left main tank was selected to the left engine and the right main tank to the right engine. The fuel valve itself of the left engine could not be recovered but the right valve was found to be fully open and connected to the right main tank. The cross feed valve was found to be off. The left fuel pump and its drive were mechanically sound. Both the injectors were bench tested and found to be satisfactory, in spite of some damage caused by the impact. The fuel strainers in the fuel system and in the injectors were found clear. A few ounces of fuel were recovered from the left injector.

As already observed, both the suspected left engine and the right engine were rotating at the same speed, and as the pilot says, with the throttles about half-way at the time the propellers first cut the ground. This would indicate that any trouble that caused loss of power of the port engine had cleared itself at the time of impact. An examination therefore of the engines and their related accessories cannot be expected to give any indication of a defect, unless there was evidence of physical restriction which would obstruct the amount of flow causing intermittent failure. No such evidence was, however, found. But this does not rule out the possibility of the symptoms of power failure described by the pilot. An air or vapour lock in the system may cause a temporary engine cut. In such cases, the use of the wobble pump helps to maintain the fuel supply. There is, however, no evidence that the wobble pump was used, nor is there any evidence to show whether the fuel pressure dropped at the time of the engine cut.

Although the pilot noticed the starboard engine fire warning light come on, there is in fact no evidence of fire having broken out in that engine till the aircraft hit the bund. There have been numerous occasions in the past when a false fire warning was given by the type of the warning system installed on this aircraft. The warning light would come on as a result of short circuit in the system or a defect in the switch. Although a modification has been recently carried out in the fire warning system of Dakotas by Indian Airlines Corporation, Line 5, with a view to reduce the chances of false alarm, such a chance cannot be said to have been altogether eliminated, as shown on the present case.

The aircraft was loaded at Nagpur to 25,797 lbs., 403 lbs. less than the authorized maximum all up weight of 26,200 lbs. A doubt has been expressed as to whether a Dakota aircraft with one engine inoperative is able to climb or even maintain height with this all up weight. The evidence on the point is conflicting. The chief Inspector of Flying, Civil Aviation Department, said that it could, but the Chief Pilot (Training), Indian Airlines Corporation, Line 5 doubted it and has deposed to two tests on Dakotas carried out after this accident. It was also found from the tests that the performance of the two aircraft varied to some extent. The Senior Scientific Officer, Civil Aviation Department, recommended that "tests should be carried out on a fleet of Dakota aircraft for determining their exact performance". It will then be possible to determine up to what weight the present Dakotas can be safely loaded for single engine operation.*

The aerodrome crash tender could not reach the scene of the accident as unfortunately its clutch plate burnt out on the way while crossing a "nullah". The fire engine which came later from the city however, succeeded in reaching the spot quickly in spite of the difficult terrain,

* Secretariat Note: An Indian Airlines DC-3 aircraft crashed on 25 February 1954 during continued tests to determine the cause of the above crash. The crew of three were killed. The co-pilot was a brother of the Indian Government's inspector of accidents who was directing the tests.

and commenced fire fighting action. When its supply of water and foam was exhausted, it was replenished from the aerodrome crash tender. But the magnitude and intensity of the fire as a result of the bursting of fuel tanks was such that it took considerable time before it could be controlled.

Probable Cause

Loss of critical height during a steep left hand turn, with the under carriage down, executed by the pilot at an unsafe altitude in an attempt to return to the aerodrome, after experiencing a temporary loss of power of the left engine soon after getting airborne. A false right engine fire warning precipitated the attempt at a forced landing.

Recommendations

(i) Checks for proficiency in instrument flying and emergency procedures should be made a mandatory requirement for the renewal of the licences of pilots engaged on scheduled air transport services.

(ii) Some infallible mechanism should be devised whereby false fire warning may be completely eliminated. Till then the attention of the pilots should again be drawn to the fact that the fire warning light is sometimes a false alarm, and does not necessarily indicate that a fire has actually broken out.