

minimum safe altitude provisions of 16 000 feet and 6000 feet, I find myself unable to accept that there were not some responsible officers of the division who were aware of the actual flight levels at which these flights were being conducted in McMurdo Sound. The flight levels were a matter of common knowledge. I have already gone through all the evidence on the point. These MSA conditions of 16 000 feet and 6000 feet were quite unrealistic and, as I have said before, I consider that the airline was perfectly entitled, in terms of practical considerations, to authorise pilots to descend to whatever flight level was thought appropriate by McMurdo Air Traffic Control, providing that flight at such levels was in VMC. It is impossible to infer that McMurdo Air Traffic Control would ever suggest to any pilot that he let down to altitudes like 1500 feet or 2000 feet unless visibility at that altitude was perfectly clear for many miles. Nor would any pilot of the airline consider descending to any such level unless he was satisfied, by information from McMurdo Air Traffic Control and by his own observation, that he would be flying at such levels in VMC.

#### *Conclusion*

The division may be entitled to assert as against the airline that the official MSA figures should not have been varied by the airline without the division's consent. But in the context of the present inquiry, I am satisfied that there were responsible officials of the division who were well aware of the actual flight levels being maintained by pilots in McMurdo Sound. What the division should have done was to consult with the United States authorities in Antarctica, and with the airline, and then set new flight levels on realistic terms. The minimum safe altitudes thus adopted for VMC conditions should not, on any basis, have been different from those set for general aircraft operations by regulation 38 of the Civil Aviation Regulations. Within the context of this inquiry, the failure by the airline to enforce the official minimum safe altitude conditions has no relevance and the division, in my opinion, is not at fault in the manner suggested.

382. I have now concluded my appraisal of what in my view were the substantial allegations against the division, and I have expressed my conclusions. There are two respects in which, in my opinion, the Civil Aviation Division contributed to this disaster by an omission in respect of a function which it had a duty to perform, and the omission in each case also related to a duty of which the execution was necessary in order to ensure the safe operation of flights such as TE 901. These two omissions are those to which I have referred in subparagraphs (a) and (c) above.

383. When I consider all the evidence relating to Civil Aviation Division participation in these antarctic flights, it seems to me that the division was always too ready to approve whatever proposal was put to it by the airline. It seems as if the division adopted as its controlling policy the opinion that the operational proposals of Air New Zealand would always be satisfactory and did not require close scrutiny. I believe that the adoption of such a policy on the part of the division was unwise.

384. I have no doubt that in the great majority of cases any operational proposal placed before the division by Air New Zealand would be totally sound, having regard to the very experienced and skilled operational personnel who are employed by the airline. But, as this Inquiry has shown, there were substantial defects in the administration and communication procedures of the Flight Operations Division, and one of the reasons for the continuation of this loose system of administrative

control within the Flight Operations Division might well have been the failure of the airline inspectors to examine in detail the proposals made to it in respect of this very unusual and unscheduled series of flights. It is even possible that the sheer size of the airline has come to overshadow and dominate the personnel of the division.

#### **THE CAUSE OF THE DISASTER**

385. The occurrence of any accident is normally due to the existence of a variety of factors. Sometimes the factors are co-existent, sometimes they occur in sequence. In that sense the existence of any one factor can be described as a "cause" of the accident, because were it not for the existence of that factor at a particular time or in a particular locality, the accident could not have occurred. It is therefore not quite right to refer to each and every contributing factor as a "cause", even though its existence was a necessary pre-condition of the occurrence of the accident. In the field of negligence litigation, this problem of identifying and assessing causative factors leading up to the event constantly presents a problem, and leading textbooks which refer to the legal elements of causation tend to classify co-existent causes into two categories. The first category involves those causes which only bear that name because without their existence the accident could not have occurred. The second category consists of what lawyers describe as "effective" or "contributing" causes, meaning thereby those factors which are to be taken into account when assessing legal responsibility for the event which occurred.

386. In the case of this Royal Commission, I am required to report as to whether the disaster was "caused or contributed to" by any person as the result of an act or omission in respect of any function in relation to the flight which that person had a duty to perform, or which good aviation practice required that person to perform. Therefore, although I am not concerned in any way with legal responsibility for the disaster, I am required to identify any culpable act or omission which in my view was either a cause or a contributing cause of the disaster.

387. For the purposes of determining whether there was a culpable or blameworthy act or omission, I must take into account the existence of the following factors or circumstances which preceded the occurrence of the disaster:

- (1) Captain Collins had complete reliance upon the accuracy of the navigation system of his aircraft. He had a total flying time of 2872 hours in DC10 aircraft and the AINS had demonstrated to him its extreme accuracy on countless occasions.
- (2) There was not supplied to Captain Collins, either in the RCU briefing or on the morning of the flight, any topographical map upon which had been drawn the track along which the computer system would navigate the aircraft.
- (3) Captain Collins plotted the nav track himself on the night before the flight on a map or maps and upon an atlas.
- (4) The direction of the last leg of the flight path to be programmed into the aircraft's computer was changed about 6 hours before the flight departed.
- (5) Neither Captain Collins nor any member of his crew was told of the alteration which had been made to the computer track.

- (6) Checks made in flight at the Balleny Islands and at Cape Hallett demonstrated to the crew that the AINS was operating with its customary extreme accuracy, and that any cross-track drift upon arrival at the destination waypoint would not be greater than about 1 mile, or 2 miles at the most.
- (7) McMurdo Air Traffic Control believed that the destination waypoint of the aircraft was 27 miles west of McMurdo Station, and that the aircraft would approach at a low altitude down McMurdo Sound.
- (8) Mac Centre invited the aircraft to descend to 1500 feet in McMurdo Sound for the reason that visibility at that altitude was 40 miles or more.
- (9) Captain Collins accepted this invitation and made the decision to descend to that altitude.
- (10) The nature of the cloud base in Lewis Bay and the unrelieved whiteness of the snow-covered terrain beneath the overcast combined to produce the whiteout visual illusion.

388. If any one of these 10 factors had not existed, then there would have been no disaster. It therefore required the coincidental existence of no less than 10 separate factual circumstances to make the disaster possible at all. The collision of the aircraft with the mountain slopes was a million to one chance.

389. The 10 factors which I have isolated are all contributing causes to the disaster, and I was invited by counsel for the airline, in the course of their final submissions, merely to identify the contributing causes and to let the matter rest there. That submission was based upon the very proper philosophy that the prime purpose of aircraft accident investigations is to secure avoidance of similar incidents in the future, and not to identify and apportion culpability or blame for what occurred.

390. I entirely agree that a mere recital of the ascertained contributing causes, which in the present case in my opinion amount to ten in number, is fully adequate in respect of the accident avoidance feature of accident investigations. But my terms of reference preclude me from adopting that course. I am required, in terms of paragraph (g), to answer the question whether this disaster was caused or contributed to by blameworthy acts or omissions by any person or persons.

391. I must now look at the contributing causes which I have identified, and see whether any one or more of them is the result of a culpable act or omission. In my opinion the only contributing causes which I have listed which were created by blameworthy acts or omissions are those which I have identified as Nos. (2) and (5). They each result from culpable acts and omissions on the part of the airline, and in the case of No. (2), on the part of the Civil Aviation Division also.

392. As a result of forming that opinion as to contributing causes I am able to reach a decision as to whether or not there was a single cause of the disaster. In my opinion there was. The dominant cause of the disaster was the act of the airline in changing the computer track of the aircraft without telling the aircrew. That blend of act and omission acquires its status as the "dominant" cause because it was the one factor which continued to operate from the time before the aircraft left New Zealand until the time when it struck the slopes of Mt. Erebus. It is clear that this dominant factor would still not have resulted in disaster had it not been for the coincidental occurrence of the whiteout phenomenon. But the conditions of visual illusion existing in Lewis Bay would have had no effect on flight

TE 901 had the nav track of the aircraft not been changed, for it was only the alteration to the nav track which brought the aircraft into Lewis Bay instead of McMurdo Sound.

393. In my opinion therefore, the single dominant and effective cause of the disaster was the mistake made by those airline officials who programmed the aircraft to fly directly at Mt. Erebus and omitted to tell the aircrew. That mistake is directly attributable, not so much to the persons who made it, but to the incompetent administrative airline procedures which made the mistake possible.

394. In my opinion, neither Captain Collins nor First Officer Cassin nor the flight engineers made any error which contributed to the disaster, and were not responsible for its occurrence.

## EPILOGUE

395. The circumstances of the final stage of the approach of Flight TE 901 towards Ross Island will never be fully known, and without the advantage of the CVR and the digital flight data recorder (the "black box"), would never have been known at all. The airline witnesses who appeared before me were intent, as I have indicated before, upon establishing pilot error as the effective cause of the accident. This is a conventional stance adopted by airline operators, and sometimes aircraft manufacturers, when an inquiry like the present is convened. In most cases the object is to persuade the tribunal that despite some technical malfunction of the aircraft which originated the chain of events, the pilot had the chance, even at the last minute, of avoiding the accident. The types of pilot error suggested in such cases normally include flying on a course or at an altitude which in the circumstances was unsafe, or was not authorised by the airline operator, or was forbidden by aviation regulations, and in suitable cases it may be alleged that the pilot was too slow in his response to an emergency. When the air crew has been killed in a flying accident, allegations of "pilot error" require careful consideration, for they will mainly depend upon inferential conclusions rather than direct evidence. It is a mistake to draw conclusions or to make deductive inferences without assessing all the known facts, and in the present case I think this error was made by the chief inspector when he deduced that Captain Collins was "uncertain" of his position, and I think the same error coloured a good deal of the evidence adduced on behalf of Air New Zealand.

396. The principal factors relied upon by these witnesses were altitude, speed, heading, terrain, and weather. But a conclusion based upon those five factors alone involved the omission of an additional and perhaps paramount factor, and that was the skill and experience of the two pilots. This was not the case of a top-dressing aircraft or deer-hunting helicopter in which a degree of risk is undertaken by the pilot as part of his operational duties. Nor is it the case of an amateur pilot flying a light aircraft in a manner suggesting or establishing his folly or his ignorance of sound aviation practice. The pilot and co-pilot of the DC10 were commercial pilots of long experience. Neither Captain Collins nor First Officer Cassin would consciously take the slightest risk in the course of