

aircraft's transponder to be activated. The fact that it was so activated at the time which I have stated produces the obvious answer that the DC10 had then been identified on the ground radar screen.

314. The above interpretation of the aircraft's transponder response was challenged by the United States Navy witnesses. It was contended that when the crew of the DC10 were asked to activate the aircraft's transponder this had reference not to identification of the aircraft on the radar screen, but to the radio link between the aircraft and the TACAN. In other words, it was being suggested that the request from Mac Centre referred to the DC10 establishing contact with the TACAN, it being recalled that a DC10 is not equipped to obtain a bearing from the TACAN but is equipped to communicate with the DME function of the TACAN.

315. This explanation cannot possibly be accepted. With ground radar, that radar equipment is the interrogator and the aircraft returns a radio pulse from its transponder thus confirming that radar contact has in fact been made with the aircraft. But in the case of the TACAN, the system works the other way round. The DC10 radio link with the TACAN, if successfully established, carries out the interrogation of the DME system of the TACAN and in this case it is the TACAN equipment which acts as the transponder replying to the airborne interrogation. The instruction therefore from Mac Centre to the aircraft to activate its transponder could have had nothing to do with the TACAN at all. The purpose of the aircraft being asked to activate its transponder was solely for the purposes of surveillance by the Ice Tower radar equipment.

316. It should be noted that I have been compelled to express conclusions as to what might have been seen on the Ice Tower radar because there was no direct evidence on the point from the United States Navy witnesses. Neither the radar operator nor the Ice Tower radio operator was available to give evidence.

317. From all this I draw the following conclusions:

- (1) The probabilities are that the DC10 was in fact on the radar screen for something like half a minute as it emerged from behind Ross Island at about 16 000 feet travelling west on its first orbit, and it may have been on the screen for as long as one minute.
- (2) Seeing that the DC10 began turning to the west on this orbit at 37 miles out (as revealed by the black box) then a pick-up at the 38 miles referred to in the United States Navy telex message would thus be corroborated.
- (3) If the DC10 was observed on the screen, then the radar operator would immediately have noticed that it was on a bearing about 40° to the east of where he had supposed the aircraft to be.
- (4) If the aircraft was seen and the unexpected bearing observed, then the radar operator may have been deterred from any inquiry by reason of the fact that the crew intended to fly out on 180° grid (meaning thereby true north) and proceed visually to McMurdo. That is, the radar operator may have believed that the air crew were aware of their true position and were intending to fly away to the north.
- (5) In any event the last transmission from the aircraft had announced that it was in the process of descending to 2000 feet and was flying VMC. This again would justify, at least in practical terms, a lack of any further communication from the ground to the aircraft.

- (6) In summary therefore, I have formed the view that the aircraft did appear on the radar screen, that it was observed by the radar operator, but that for the reasons just expressed he is not to be blamed, at least within my own terms of reference, from taking any step towards advising the aircraft (on HF through Mac Centre) as to its estimated location. In terms of the official United States Department of Defence publication covering use of the McMurdo navigation aids, there is a public notification that civilian aircraft must use these aids at their own risk. It will be understood that I am not here concerned with any question of liability of the United States Navy at common law, I am only concerned with the question asked in my terms of reference, and I do not believe that the radar operator at McMurdo, if he saw the aircraft appear on his screen, was guilty of any omission in respect of a function which he had a duty to perform or which good aviation practice required him to perform.

THE FACTUAL CIRCUMSTANCES OF THE DESCENT AS DEDUCED FROM THE AVAILABLE EVIDENCE

318. I have now reached the stage when I must indicate my view as to the nature of the descent, and what happened during the course of descent towards the ultimate flight level of 1500 feet. What I have to say is based upon the CVR transcript of communications between the two pilots, the data relating to the descent provided by interrogation of the black box, and the inferences legitimately to be derived from the known circumstances.

Pre-descent Briefing

319. In accordance with standard practice, Captain Collins would have conducted a pre-descent briefing involving not only First Officer Cassin but also Flight Engineers Brooks and Moloney. He would at that briefing have announced his intentions in regard to the descent, and stated exactly how it would be carried out. He would expect to listen to and discuss any queries from the other three members of the flight crew as to his proposed descent procedure.

320. On this topic of pre-descent briefing, there was what I might describe as a noticeable silence on the part of the executive pilots who gave evidence in support of the case for the airline. They all knew, as well as I know, that a detailed pre-descent briefing would have been carried out by Captain Collins. They would also know, as I know, that the descent procedure adopted would have been in accordance with the settled agreement by the flight crew as to the future handling of the aircraft.

321. One of the major difficulties in the Inquiry has been that this pre-descent briefing occurred at a time more than 30 minutes from the collision of the aircraft with the mountain side, and accordingly there is no taped record of what took place at that briefing. If only the tape recording of that pre-descent briefing had been available then many of the disputed questions which occurred during these hearings before the Commission would not have arisen. Since we can never know what plan was settled by the crew as a result of the pre-descent briefing, it is only possible to infer

what must have been settled by Captain Collins after consultation with his crew. But when examining the known circumstances as they must have existed during the descent, and upon examining the CVR transcript of the discussions between the two pilots as they controlled the descent it is possible, without entering into the field of speculation, to deduce that the pre-descent briefing followed along these lines :-

- (1) The briefing would have taken place when the aircraft was about 200 miles out from the McMurdo waypoint and when the aircraft was flying at an altitude of more than 30 000 feet. At that time the DC10 was flying in clear air but far below, and some distance ahead, there was a solid cloud layer with a base of about 10 000 feet. In the far distance there would be seen the general location of the McMurdo area which would be totally obscured by cloud, and the cloud cover also obliterated from view Mt. Erebus and the other mountains on Ross Island. On the right, extending far away to the south, would be the clear white mountain tops of Victoria Land.
- (2) Captain Collins had received earlier during the flight from Auckland a McMurdo weather forecast, transmitted by Auckland radio. The forecast over McMurdo was for a broken cloud base at 4000 feet, with visibility at 40 miles and occasional light snow.
- (3) Captain Collins decided to let the aircraft down at a gradual rate of descent until he had penetrated the high cloud below him, and he would have demonstrated on a map his plotted track showing the nav track from Cape Hallett to the head of McMurdo Sound, and probably also a track plotted on page 185 of his atlas, which gave a close-up of the McMurdo Sound area. He would have said that the NDB had been withdrawn, and that the nav track must be exactly followed in the absence of navigational ground aids, until radar contact was made.
- (4) Captain Collins would have said that he expected to encounter clear air after penetrating the 10 000 feet cloud layers ahead, but that the aircraft would then soon encounter the lower cloud base which extended over McMurdo.
- (5) Captain Collins would announce his intention of calling for a radar letdown when the aircraft had arrived somewhere near the entrance to McMurdo Sound, as demonstrated by the track which he had drawn on the map before him. He anticipated that the radar letdown would then bring him out into clear air at about 2000 feet, at a point about midway down the Sound.
- (6) The course to be then taken by the aircraft would depend on the visibility below the McMurdo cloud base. If visibility was clear in all directions then the aircraft would proceed down the Sound, would overfly Scott Base and McMurdo Station, and after circling over the Ross Ice Shelf at an altitude of about 2000 feet would then fly past Scott Base and McMurdo Station, and fly towards Victoria Land where the crew could see the sun shining on the mountains. After flying north close to the Victoria Land coast he would then increase altitude to his cruising height and fly back to New Zealand.
- (7) If upon penetrating the cloud base over McMurdo Sound the visibility was not sufficiently clear or if there were snow showers of any intensity, then it was the intention of Captain Collins to abandon any attempt to overfly McMurdo Station and Scott Base, and the aircraft would fly away towards the sunlit mountains of Victoria Land.

- (8) A decision was reached as to the point at which the aircraft would fly out of McMurdo Sound if conditions under the 2000 feet ceiling were found to be unsuitable for viewing, and that point was settled at some figure like 30 miles distance to run, or possibly the departure point was fixed at about the vicinity of the Byrd Reporting Point, which Captain Collins would have calculated to have been 23 miles from his destination waypoint.
- (9) With this plan completed, and presumably concurred in by the crew, a decision was made to commence descent at a point some distance ahead.

The Actual Descent Procedure

322. At 12.17:13 p.m. Captain Collins said to First Officer Cassin "I think we will start down a little early here" to which First officer Cassin replied "Okay. I'll see if I can get hold of them on VHF". This remark referred to an earlier descent than had been settled at the briefing. At this stage the aircraft was about 140 miles out, and just after the aircraft had started its descent there was received an HF message from Mac Centre advising that they had a low overcast in the area of about 2000 feet and that they were having some snow, but that visibility was still about 40 miles. Immediately thereafter, First Officer Cassin obtained a clearance from Mac Centre to descend to 18 000 feet and to maintain that level. Shortly afterwards Mac Centre advised that the clear areas around McMurdo were approximately between 75 and 100 miles to the northwest of McMurdo but that an extensive low overcast still prevailed over the McMurdo area. Very shortly afterwards, Mac Centre advised that within a range of 40 miles from McMurdo they could let the aircraft down to 1500 feet on radar vectors, to which the aircraft responded by accepting that offer.

323. At this stage the aircraft was 114 miles from its destination waypoint. Captain Collins then addressed the passengers on the public address system. He said that the aircraft was going initially to 18 000 feet and that although the cloud cover at McMurdo had increased the visibility was still 40 kilometres, and that the aircraft would be adopting a radar letdown which would take it below the McMurdo cloud level and give a view of the McMurdo area. However Captain Collins added a precautionary note to the effect that there could be variations in the weather which might result in a change of course, but he said that the crew were hopeful they would be able to give the passengers "a look at McMurdo today".

324. Thereafter there ensued a number of unsuccessful attempts to contact the Ice Tower on VHF, and Mac Centre was notified on HF of these unsuccessful attempts. Mac Centre replied that the Ice Tower was attempting contact on two different frequencies and advised the crew to attempt VHF contact again when they were approximately 80 miles out. Then, with about 60 miles to run and with the aircraft still holding its altitude of 18 000 feet, the crew saw that the 10 000 feet cloud cover below them had now become disintegrated, and that there were large areas of clear sky which displayed many square miles of ice and sea, as later revealed by the passengers' photographs. The only cloud in the immediate foreground therefore consisted of some widely spaced thin patches and it was no longer necessary to hold the aircraft on nav track because the aircraft could now descend in clear visibility down to 2000 feet or 3000 feet.

325. The aircraft then notified Mac Centre on HF that they could orbit in their present position (which by that time was about 43 miles north) and could descend VMC. There was an immediate reply from Mac Centre on HF approving VMC descent, and the aircraft replied to the effect that they were now vacating 18 000 feet and would advise its later altitude. The aircraft then began the two orbits to which reference has previously been made, and the path of the two orbits was directed by the necessity to maintain VMC conditions at all times, which in terms of airline directions for these flights meant 20 kilometres of clear vision. Thus in descending from 18 000 feet to 3000 feet the track of the two orbits was arranged so as to bypass occasional thin layers of cloud, and when the aircraft levelled out at 3000 feet it was in clear air, but now approaching the edge of the solid overcast which lay ahead.

326. During the orbits there occurred further discussions with McMurdo. At 12.35:36 p.m. the aircraft obtained communication with the Ice Tower on a VHF channel. This was during the latter part of the first orbit, and the Ice Tower was advised that the aircraft was descending VMC through 13 000 feet to 10 000 feet. The Ice Tower acknowledged this and said they understood the aircraft was requesting a radar letdown through cloud (meaning thereby the cloud over McMurdo which would be lying ahead of the aircraft in due course). The aircraft confirmed this arrangement.

327. Then about 3 minutes later the aircraft notified Mac Centre that VHF contact had been lost and that they were maintaining 10 000 feet and were 34 miles to the north of McMurdo. This transmission was made at about the completion of the first orbit, when the DC10 was once more behind Mt. Erebus. The next transmission was made on HF and the aircraft reported that they still had no contact on VHF but that they were maintaining VMC and asked for a clearance to let down on a grid of 180° (meaning true north) and proceed visually to McMurdo. Mac Centre immediately authorised this proposal and then asked the aircraft to report to Mac Centre when 10 miles out from McMurdo.

328. Then came the last transmission from the aircraft, which occurred when it was completing the second orbit and was in the course of straightening up to recapture the nav track upon which Captain Collins intended to rely until he achieved radar contact. At this stage the crew could see the edge of the overcast some distance ahead, and were flying in clear air, and now expected to descend under the cloud cover and fly VMC towards the Scott Base area. They accordingly notified Mac Centre on HF that they were now at 6000 feet descending to 2000 feet and were VMC. This communication was acknowledged by Mac Centre who thereafter waited for the aircraft to appear.

329. The aircraft then descended to 2000 feet and flew under the overcast on nav track. The areas of pack ice which extended for many miles around were now starting to give way to solid snow-covered ice, and the view ahead consisted of a wide vista of flat white terrain apparently stretching many miles away under the overcast. Despite the apparent clear visibility for many miles forward, no landmarks could be seen, except in due course the distant shorelines to the left and right which were interpreted as being the shorelines of McMurdo Sound, they being located in conformity with the plotted nav track to which the pilots were referring.

330. Captain Collins then descended to the altitude of 1500 feet which had been recommended by Mac Centre, but still no forward landmark could be seen, and at this juncture Captain Collins said: "We are 26 miles

north. We will have to climb out of this". I pause to say that this reference to being 26 miles north very clearly related, in my opinion, to a decision reached at the pre-descent briefing when Captain Collins had indicated that he would climb away out of the Sound unless he had clear visibility by the time he was 30 miles out or reached the approximate position of the Byrd Reporting Point which he had calculated to be 23 miles north of his destination waypoint.

331. Then there followed the casual discussion between Captain Collins and First Officer Cassin as to whether they would climb away to right or left, and there was clearly no sense of urgency so far as either officer was concerned and they would, without doubt, have been referring to the map which contained the plotted track running down McMurdo Sound. The discussion had still not been concluded when the ground proximity warning system sounded and Captain Collins, attempted, without success, to fly the aircraft away from some presumed rising terrain which in fact was not visible at all, despite the clear air, to any member of the flight crew or to Mr Mulgrew.

332. The decision to fly away was not directed by lack of visibility. I think this conclusion is reinforced by a study of some of the final discussions which took place between Captain Collins and First Officer Cassin. At 12.48:30 p.m. Captain Collins is preoccupied with trying to obtain contact with the TACAN. He verifies from First Officer Cassin that contact with the TACAN has not been made. Then, having ascertained that the aircraft had been unable to interrogate the TACAN, Captain Collins at 12.48:55 p.m. addresses the following remark to First Officer Cassin:

"Have we got them on the Tower?"

and the First Officer replies:

"No ... I'll try again."

Then one of the flight engineers says that there has only been contact on HF. Captain Collins then says to First Officer Cassin:

"Try again."

to which First Officer Cassin replies:

"O.K."

At 12.49:25 p.m. Captain Collins inquires:

"Have you got anything from him?"

and First Officer Cassin replies:

"No."

Then Captain Collins says:

"We are 26 miles north. We'll have to climb out of this."

It will be observed that the first priority of Captain Collins was to endeavour to raise the TACAN, and it will also be recalled that the only information available from the TACAN was the distance to run. In other words, successful contact with the TACAN would have resulted in a print-out on the DC-10 panel giving the distance to run to the TACAN. But when communication with the TACAN was found to be non-existent, Captain Collins then directed that an attempt be made to contact the Ice Tower on VHF. It will be observed that he did not suggest any contact with Mac Centre on HF, even though there had been no difficulties at all with communication on that frequency. Why was it that he was intent on trying to get communication with the Ice Tower? In my opinion, it was for the same reason that he earlier tried to get communication with the TACAN. What he wanted from the Ice Tower was a report from the radar operator as to the range of the aircraft as depicted on the Ice Tower radar screen.

In other words, Captain Collins had seen that according to his own instruments he had only 30 miles to run, and despite the abnormally clear air of Antarctica he still could not see in the distance such obvious features as the long peninsula running out to the west from Ross Island. Therefore, he had come to suspect the accuracy of the DME of his aircraft, and what he wanted was confirmation from the TACAN or from the Ice Tower of the true distance to run, because he knew that the distance to the TACAN would only vary from the distance to the Dailey Island waypoint by about 2 miles. All this leads to the necessary conclusion that both Captain Collins and First Officer Cassin believed that their vision extended for at least 40 miles ahead. But they could not reconcile the absence of any landmarks with the fact that their own DME function told them that there was 30 miles to run. So the question of visibility was not involved. The visibility was clear enough. But I cannot think it coincidental that Captain Collins decided to climb away immediately after he had failed to obtain from McMurdo their information as to how far he was from the Ice Tower.

Conclusion

333. Such is the story of the descent as I deduce it from the evidence. It is not in any sense a complicated tale. This descent to a level which would take the aircraft under a cloud base of 2000 feet would have been performed by Captain Collins on hundreds of occasions when making approaches to airport runways. In this case, as I said previously, he had no need for any radio beacon when arriving at the head of McMurdo Sound because he knew that the aircraft was flying on track and must inevitably take it into the centre of the wide expanse of the Sound.

334. As I say, I can see nothing remarkable at all in the way in which this simple descent was carried out, and there are two features about it which it is essential to keep in mind:

- (1) The CVR transcript records that at all times during the descent Captain Collins and First Officer Cassin were engaged in the sole task of monitoring the transitions from one flight level to another, and at a later stage, the aircraft's response to the changing headings and altitudes of the two orbits, and at the same time were keeping Mac Centre advised of every proposed change of altitude and course during the orbiting sequence. There are no less than 13 references made by one pilot to the other confirming that the aircraft was flying VMC.
- (2) Neither before nor after the decision was made at 26 miles out to fly away is there any remark made by either pilot referring to worsening visibility, and indeed if they had been approaching any area of impaired visibility there certainly would not have ensued the non-committal discussion between the two pilots as to whether they would climb out to the left or to the right.

335. A study of the discussions between the two pilots and whichever flight engineer was on the panel at the time, all set out in the CVR transcript, demonstrates a most careful adherence right throughout the last half hour of the flight to every detail of flight deck discipline and procedure, except for an inadvertent delay in resetting the altimeters. Every time there was a new setting for the altitude, speed, rate of descent, adopting of heading select and subsequent re-engagement of the nav track, there is verbal confirmation from the other pilot of the changed instrumental settings. There is not the slightest indication from the

recorded communications between the pilot and co-pilot that either of them took any notice of, or even heard, the running sequence of indistinct cross-talk between the various persons at the rear of the flight deck and in the galley.

336. The fact that a visual sweep was being maintained by the pilots in all directions as the aircraft completed its orbits is verified by the constant references to flying VMC and the changes in heading which were required in order to maintain VMC. This strict flight deck discipline was being maintained by the pilots at every stage, and they were preoccupied to the exclusion of all else with monitoring and negotiating the descent from 17 000 feet to 2000 feet. First Officer Cassin certainly spent some time unsuccessfully attempting to raise the Ice Tower on VHF but this was not a continuous process and, as the evidence before the Commission demonstrated, would interfere to only a minimal extent with his other flight deck duties. No pilot who gave evidence before the Commission, whether testifying on behalf of the airline or on behalf of ALPA, has questioned in any respect the dedicated vigilance of this air crew during the last stages of its flight.

337. Those who have attempted to invest this conventional and unremarkable descent procedure with a series of clouded uncertainties and ingenious complications, are those who between them have put forward this extraordinary variety of pilot errors which they contended had been made, but in respect of which, in most cases, no decisive pilot error seemed to be alleged. I have been asked, so far as I can see, to accept any one of the many theoretical varieties which were offered. So long as I could be persuaded to accept one material theory of pilot error, the aircraft radar theory for example, then that presumably would satisfy the executive personnel of the airline and those personnel of Civil Aviation Division who wished thereby to obliterate the effect of their own mistakes.

POST-ACCIDENT CONDUCT OF AIR NEW ZEALAND

338. I have already described the decision of the chief executive, when he learned of the disaster, that all documents relating to the Antarctica flights and to this flight in particular were to be impounded. The procedure adopted to achieve this purpose was that a special committee was set up comprised of certain airline officials and they were charged with the responsibility of collecting all Antarctica documents. Mr Oldfield, the airline's safety manager, was constituted secretary of the committee. He was the man who carried out the further instructions of the chief executive that any surplus documents were to be destroyed through the airline's shredder.

339. I have already referred to the reason given by the chief executive for giving this instruction. He felt that spare copies of documents might be handed by some employee to the news media, a result which the chief executive was anxious to avoid. But he insisted that, according to his instructions, only "surplus copies" of documents were to be destroyed in this manner. As will readily be apparent, there was an inherent weakness in this system. The various divisions and departments of the airline would hand over the documents to Mr Oldfield, and, as he said, he would then attach to the committee investigation file all relevant documents and would destroy all those which appeared to be copies of existing