

that it has been found normal for the system to be operating "well within the specified tolerance when operating under those conditions". This was also the experience of the pilots who gave evidence before the Commission. It will be remembered that Captain Spence reported, following the initial flight to Antarctica, that there had been a discrepancy on the return flight of only 3 nautical miles after a flight of over 3000 nautical miles "without a radio update into the AINS".

90. The Director of Civil Aviation felt himself entitled to postulate a theory that after a flight of over 10 hours' duration, pilots would have to allow for tolerance of plus or minus 20 nautical miles of cross-track error, and plus or minus 20 nautical miles of directional track error. This calculation proceeded upon the basis that there was only one inertial sensor platform in operation. When it was pointed out to the Director by Mr Baragwanath in cross-examination that the DC10 contained a triple system, the Director was thereupon constrained to agree that the maximum possible cross-track error, after a total flight of 10 hours, could only be 12 miles and that upon arriving at McMurdo from Auckland, involving a flight of 5 hours, the maximum positional error with the navigation system flying in the "I" mode could only be 6 miles.

91. I only mention this incident as demonstrating the earnest desire of the Director to rebut the suggestion that a DC10 pilot is entitled to rely upon the AINS producing a result, even in the "I" mode, which almost exactly coincides with the geographical position of the aircraft upon arrival at its destination. As I have said, it was distinctly proved that this has been the experience of Air New Zealand pilots flying on long sectors, and I have referred already to the evidence of Mr Amies in relation to the Los Angeles/Tahiti route where the "R-I" mode is not available for many hours.

92. During my visit to the United Kingdom with Mr Baragwanath I arranged to obtain, through the co-operation of Mr Shaddick of the United Kingdom Air Accidents Branch, a quantity of printed information as to extensive tests which have been made for some years involving the evaluation of inertial navigation systems. I need not go at this stage into the complex data which was recorded in respect of the North Atlantic Region and the difference between aircraft with triplicated inertial systems and those with dual systems, nor with the difference in accuracy which was ascertained depending whether a flight was east-bound or west-bound. As a matter of interest, radial error rates averaged 2.1 nautical miles per hour on east-bound flights as compared with 1.15 nautical miles per hour on west-bound flights, even though west-bound flights were about one hour longer in duration.

93. The result of these assessments and of others which I obtained were summarised on my behalf in a memorandum prepared by the United Kingdom National Air Traffic Services. They calculated that the maximum possible radial error on the fatal antarctic flight of 28 November 1979, taking into account navigation in the "I" mode, could not exceed 4 nautical miles. Here is the final paragraph of the text of this memorandum, which is dated 6 November 1980:

"If INS navigation played any part at all in the causes of the accident I should have expected its un-updated radial error to have been of the order suggested above (i.e. in the range of 0 to 6 or 7 nautical miles for a single INS, in the range of 0 to 5 nautical miles for a dual installation where the outputs are averaged, or in the range of 0 to 4 nautical miles for a triple installation where the outputs are averaged)."

94. In addition to summaries of the accuracy of the INS method of navigation on trans-Atlantic routes, I was also supplied with printed details of a special test run by the European Organisation for the Safety of Air Navigation which took place in March 1980. The navigational results of this special flight were distributed on 27 June 1980. The flight was made with a DC10 aircraft which left Paris on 3 March 1980 and flew to Abidjan, which is on the Ivory Coast of West Africa. The outbound flight included a landing part of the way to Abidjan. The inbound flight took place on 4 March 1980 and was made direct from Abidjan to Paris over a route involving 3000 miles. For the major part of each journey the AINS was in the "I" mode through lack of VOR/DME radio aids, and this was one of the reasons for the selection of this particular north-south route as a test of the AINS system.

95. On arrival at Abidjan the average of the differences of the three inertial sensor systems after 9 hours 25 minutes comprised 4.2 minutes of longitude and 3 minutes of latitude. On the inward flight, which was direct from Abidjan to Paris, the differences between the three platforms averaged 1.5 minutes of longitude and 2.3 minutes of latitude which, in that part of Europe and the Continent, represent approximately 1 mile and 2 miles respectively. This may usefully be compared with the flight of TE 901 from Auckland to McMurdo, involving the same distance of 3000 miles, when the NCU cross-track error was 1.2 miles and when the distance error was 3.1 miles.

96. I only refer to the Paris-Abidjan-Paris test flights as they were on a north-south axis over a 3000 mile route and confirmed, in the final result, the evidence of airline pilots in their evidence before me as to the minimal degree of radial error which their experience has led them to expect when operating flights over long sectors.

97. Captain Collins had a total flying time of 11 151 hours, including 2872 hours on DC10 aircraft. First Officer Cassin had a total flying time of 7934 hours, including 1361 hours on DC10 aircraft. Their navigation experience with the AINS, considered both separately and jointly, would have led them to check any cross-track error at Buckle Island, an exact target in the centre of the Balleny Islands waypoint, and then at the Cape Hallett waypoint, and that same experience would have led them to rely upon the aircraft developing not more than a 2 nautical mile cross-track deviation upon arrival at McMurdo. Such a deviation would be immaterial having regard to the approximate 40 mile width of McMurdo Sound. As already indicated, the actual cross-track deviation on impact was only 1.2 nautical miles. Each of the pilots was therefore, in my opinion, entirely justified in placing this degree of reliance upon the nav track as they approached the McMurdo area.

COCKPIT VOICE RECORDER SYSTEM

98. The aircraft was equipped with a recording system whereby whatever was said on the flight deck was recorded by a sensitive microphone situated in the roof of the flight deck. Its location is at a point between and fractionally behind the seats of the pilot and co-pilot. Since the flight engineer will be sitting at the instrument panel located in the centre of the flight deck just behind the two pilots, the microphone will pick up fairly clearly whatever is said by any one of the three men. In

addition there is wired into the tape system all the microphone inter-communication between the pilots and the flight engineer. Further, the tape system records radio transmissions emanating from and received by the aircraft.

99. In theory, the system ought to operate satisfactorily. With only the two pilots and the flight engineer on the flight deck, and with the door behind them closed, the system is probably adequate although not fully satisfactory. In the present case, however, there were present on the flight deck not only a second flight engineer but also Mr Mulgrew, the commentator for the flight. Therefore the total official complement of the flight deck was five and not three. Further than that, there were regular visits to the flight deck by passengers, this being authorised by the airline as part of the sightseeing flight, although pilots had been cautioned to exercise some restraint in this respect when the aircraft was flying at a low level. In addition to the complications just mentioned, the CVR microphone will pick up conversations, or parts of conversations, from persons in the galley, which is situated immediately behind the flight deck, so long as the flight deck door is open. The tape recording thus provided by the CVR system continually erases anything said further back than a period of 30 minutes, so that in the present case the total extent of the tape recording available covered the last 30 minutes of the flight.

100. A transcript of the contents of the CVR tapes was published by the chief inspector as Annex C to his statutory report. He co-ordinated with the content of the CVR tapes the recordings made on tape recorders located at Mac Centre. When I first read the published transcript of the CVR system I was under the impression that although sundry irrelevant pieces of conversation had been excluded, the resulting transcript comprised a record of exactly what had been said by different voices, some identified, some not identified, during the progress of the last 30 minutes of the flight. The contents of the transcription also received wide press publicity after the report had been released, and members of the public also thought that they were reading an accurate transcript of what had been said. However, when I discovered that the CVR tapes had been taken to Washington for the purpose of transcription with the aid of special sound-filtering devices employed by the National Transportation Safety Board, and when I discovered that it had taken no less than 5 days for a transcript to be prepared of a 30-minute tape, I assumed, correctly as it happened, that the quality of the tape recording must have been very bad indeed.

101. When I listened to the tape recording myself, which I did on two occasions in New Zealand, it became clear that the only two voices which could be heard without difficulty were those of Captain Collins and First Officer Cassin. From time to time there could be heard the voices of the flight engineer, who happened at the time to be seated at the panel behind the two pilots, this being either Mr Brooks or Mr Moloney, and on occasions the clarity of such parts of the tape reproduction was reasonable, although it was often not clear to whom the engineer was speaking. It was also the case that some comments made by Mr Mulgrew were reasonably clear, and of course whatever he said to the passengers on the public address system was quite clear because that system was also wired into the CVR system. By and large, however, I found that the volume of conversations and cross-talk on the flight deck behind the two pilots made it difficult in the extreme to ascertain what exactly was being

said. Conversations between different people tended to run together. A sentence uttered by someone would be interrupted mid-way through by a sentence spoken by someone else who was evidently closer to the microphone. Someone would give an answer to an indecipherable question. All in all, I was perturbed at the bad quality of the tape reproduction with the exception, as I say, of what was said by Captain Collins and First Officer Cassin. I should here emphasise, however, that the chief inspector had previously warned me that the task of transcribing these garbled observations at the rear of the flight deck had been difficult in the extreme.

102. When the CVR tapes were transcribed in Washington there were present Mr Milton Wylie, an Inspector of Air Accidents employed by the Air Accidents Branch, and also present were pilots from Air New Zealand who were there for the purpose of identifying, if they could, the voice which was speaking at any given time. The tapes were played through the sophisticated filtering devices used by the National Transportation Safety Board and the evidence relating to the transcription of the tapes in Washington disclose that many sections of the tapes had to be played and re-played before agreement could be reached on what had been said, or more often what had probably been said. The gist of the whole exercise really was that many sections of the transcript dealing with conversation and remarks made by people other than the two pilots were the result of combined opinion on the part of the persons who were listening. One person would have his own opinion as to what had been said in respect of a specified word or phrase. Another person would have an opinion to some extent at variance, and so on. In the end a great many sections of the transcript merely represented an agreed joint opinion, which might not be an opinion in all cases unanimous, as to what had been said on a particular occasion. Mr Baragwanath and I verified all this when we took the tapes ourselves to Washington and arranged for certain sections (which at the hearing of the Commission had been in dispute) to be played back by Mr Paul Turner, the expert who had played the tape through filtering devices when the Washington transcription was first settled.

103. The visit of Mr Baragwanath and myself to Washington was occasioned by the following submission on the part of counsel for the Air Line Pilots' Association. They drew attention to two particular extracts which appeared to refer to the weather, or to some expressed concern on the part of the flight engineers. These extracts were:

"Bit thick here eh Bert" and

"You're really a long while on . . . instruments at this time are you"

It was contended that each of these extracts had been regarded by Washington as being unintelligible or, alternatively, not sufficiently intelligible to be of any assistance, and that this had been agreed by everyone present at Washington, and accordingly these extracts had not been included in the transcript which had been agreed and settled by all parties in Washington. Mr Baragwanath and I discovered that this in fact was true. It then transpired that when the Washington transcript arrived in New Zealand the chief inspector had thereupon gone to Farnborough in the United Kingdom where there are similar filtering devices as in Washington, and that in consequence of his endeavours at Farnborough the two extracts just quoted had been considered intelligible by the Farnborough filtering expert, Mr Davis, and had thereafter been printed as part of the chief inspector's final transcript. This visit to the United

Kingdom was strongly attacked by counsel for ALPA. They contended that it was contrary to established practice for any transcription to be entered upon without representatives of ALPA being present and it is, of course, correct that the very existence of the CVR system has always been a very sore point with the International Air Line Pilots' Association.

104. When Mr Baragwanath and I listened to extracts from the tape played back at Washington by Mr Turner, we were satisfied that the original decision had been correct and that these two extracts did not represent what had been said. With reference to the phrase "a bit thick here eh Bert", neither Mr Baragwanath nor myself, nor Mr Turner, was able to pick up the word "here". There was no hesitation or pause or auditory gap between the words "thick" and "eh" into which any other word seemed capable of being interposed. There was also doubt, shared by Mr Turner, as to whether the word "thick" had in fact been used. It may well have been another word. Then there was the undisputed fact that although this observation was supposed to have been answered by flight engineer Moloney his name in fact was not "Bert", and indeed it was undisputed that there was no one on the flight deck with the name "Bert". In short, Mr Turner believed the entire sentence or phrase to be quite unintelligible, and Mr Baragwanath and I fully agreed.

105. As to the second disputed sentence referring to "instruments", it seemed clear enough that that word in fact was used. But whereas there was the expression "this time", I kept hearing it as "that time". It also seemed to me that the words after the word "instrument" might have been from a different speaker and dealing with a different subject. Mr Turner said that in his opinion the word "instruments" marked the end of a sentence and that the following words, whether spoken by the original speaker or not, appeared to relate to a different topic. In the result therefore, although the sentence as appearing in the chief inspector's report may possibly have been correctly transcribed, it was impossible to be sure. In view of the doubts as to whether one was hearing a single sentence or two parts of different sentences, possibly uttered by different voices, it was Mr Turner's opinion that the sentence should be classified as either not intelligible or not sufficiently intelligible as to be given any reliable translation.

106. At Farnborough the same extracts were played over and over again through a different variety of filters by Mr Davis, and we listened to them in the ordinary way and through ear-phones. Once again, we could not discern the word "here" as following the word "thick", and it appeared that Mr Davis had been unaware that there was no person called "Bert" on the flight deck. As to the second sentence involving the word "instruments", I came to the same conclusion as at Washington. Those listening to the tapes at Farnborough were Mr Davis, Mr Tench (Chief Inspector of Air Accidents for the United Kingdom), and Mr Shaddick together with Mr Baragwanath and myself. Mr Davis did not venture any opinion as to the interpretation of the two extracts. He merely played the part of expert technician (which he clearly is) in reproducing the two extracts in different forms from his variety of filters. The consensus of opinion among the four of us (I am excluding Mr Davis) was that the extracts were either unintelligible or not sufficiently intelligible to be given any reliable meaning.

107. I shall now turn to consider the other parts of the transcript of the CVR tapes which appear to have been relied upon by the chief inspector

as indicating either uncertainty or mounting alarm on the part of crew members other than the two pilots. The following symbols are used in the transcript to identify the person speaking, if his identity is known:

CAM-1	is Captain Collins
CAM-2	is First Officer Cassin
CAM-3	is Flight Engineer Brooks
CAM-4	is Flight Engineer Moloney
CAM-5	is Mr Mulgrew
?	indicates that the voice is not identified.

108. The first of such additional passages occurs at page 80 of the chief inspector's report. The transcript reads as follows:

"CAM-1 Tell him we can make a visual descent descending
(Interjection)
CAM-? My God
CAM-1 on a grid of one eight zero
CAM-2 Yes
CAM-1 and make a visual approach to McMurdo
CAM-2 OK"

I must say that I am at a loss to understand how the interjection "My God", presumably thought to have been uttered by a flight engineer, can be interpreted as an expression of alarm as to the decision of Captain Collins to advise McMurdo that he was able to make a visual descent. A flight engineer alarmed at such a decision would certainly not content himself by uttering a brief invocation to the Deity and thereafter remain silent. It would be his duty as one of the flight engineers, and particularly if he were the flight engineer on duty at the panel, to express a reasoned opposition to an announced intention on the part of the captain. The same interjection appears in another version of the Washington transcription of the tapes, and is to be found in a full transcription supplied to the airline by Captain Wyatt. This transcript is contained in **Exhibit 269** and comprises document J 19 of that file. The interjection is referred to at page 15, and Captain Wyatt interpolates, after the phrase "My God", that it is followed by an "irrelevant conversation". In my opinion the insertion of that interjection in the transcript is entirely unwarranted insofar as it purports to be a comment upon the stated intentions of the captain.

109. The next part of the transcript purporting to exhibit some measure of doubt on the part of the crew is to be found at page 83 of the chief inspector's report. The relevant passage reads as follows:

"? Where are we?
(Thought to be Brooks)
? About up to here now?
[sound of rustling paper]"

It is to be noted that these two questions are asked by persons not identified except that the second question was evidently thought to have been asked by one of the flight engineers. It is not known to whom the flight engineer was speaking but it seems clear that a map was being referred to. In addition, I can see no warrant for adding a question mark to the second phrase "About up to here now". I should have thought that the flight engineer, if indeed he was the person who spoke, was merely answering the question by pointing to a map.

110. The next passage from the transcript relevant in this context is at page 86. It reads as follows:

"CAM-3 Where's Erebus in relation to us at the moment
CAM-? Left about (twenty) or (twenty) five miles.
CAM-? Left do you reckon
CAM-? Well I don't know --- I think
CAM-? I've been looking for it
-2 Yep Yep
CAM-? I think it'll be erh
CAM-3 I'm just thinking of any high ground in the area that's all
CAM-5 I think it'll be left yes
CAM-4 Yes I reckon about here
CAM-5 Yes --- no no I don't really know
CAM-5 That's the edge."

First of all, it will be observed that the second sentence referring to Mt Erebus being about 20 or 25 miles to the left would be correct, on the assumption that the crew believed they were flying down McMurdo Sound. Then there are following comments made by persons, believed to be flight engineers but not identified, which appear to now evidence doubt as to the validity of the statement that Mt. Erebus is situated to the left, about 20 to 25 miles away. As will be seen, this fragmentary discussion cannot really be reconciled with the positive answer to which I have referred. Then there follows a discussion which commences "I am just thinking of any high ground in the area that's all". This comment is identified as being made by Flight Engineer Brooks. It is obviously an explanation offered to the person who indicated the location of Mt. Erebus. Then there are the following remarks by Mulgrew and Moloney. Were they directed to the same subject matter? They may have referred to another feature, not deciphered, which was also located out to the left towards an area covered in cloud. Then the final comment "That's the edge" can only be interpreted as a reference by the commentator to the edge of Ross Island as a reference point to whatever landmark had been under discussion, which may not have been Mt. Erebus.

When this excerpt from the CVR transcript was published by the newspapers after the release of the chief inspector's report, it was naturally interpreted by the public as indicating lack of knowledge by the air crew as to the aircraft's position. As will be apparent by now, that interpretation was totally misconceived.

111. The next passage in the transcript which requires attention is at page 87 and reads as follows:

"-? What's wrong?
-? Make up your mind soon or ---
CAM-1 We might have to pop down to fifteen hundred here I think
CAM-2 Yes OK
CAM-2 Probably see further in anyway."

The first two phrases are uttered by persons who are not identified and, upon my own experience of listening to those same phrases, I was quite unable on either occasion to relate them to any suggested remarks being made to Captain Collins. The portion of this part of the transcript refers to

the decision of Captain Collins to move down to an altitude of 1500 feet. First Officer Cassin then expresses the view that they can probably see further in, which obviously means further up the Sound. I also note that in another version of the transcript, Captain Collins does not say that "we might have to pop down" but says that they might have to "drop down". The chief inspector seems to have criticised this decision to descend to 1500 feet because it seemed to him to indicate that there was no proper visibility at 2000 feet or that the visibility ahead was worsening. As already stated, I consider that there is no evidence at all that the visibility ahead was worsening. On the contrary, as previously indicated, the two pilots and the other three official occupants of the flight deck would only have seen a long, flat, white expanse of snow running away into the distance. I interpret the decision to descend to 1500 feet as being an attempt to discern in the far distance some sign of features like Mt. Discovery which would be nearly straight ahead, and McMurdo Station which would be forward and to the left.

112. The next part of the transcript relevant in the present context is at page 89 and reads as follows:

"CAM-1 Actually those conditions don't look very good at all—do they?
CAM-5 No they don't."

The first comment I would make about these two remarks, and they were certainly quite clearly made, is that no one knows what "conditions" Captain Collins was referring to. As with all attempts to interpret a transcript of this kind, the unknown factor is to identify the particular direction or view which is being referred to by the speaker. A reference to "those conditions" obviously means that Captain Collins was referring to weather conditions located a long way off. So the question is, in what direction was he pointing? I should have thought that the only reasonable inference is that he was pointing forward and to the right where he believed that he saw cloud over the area of the Taylor and Wright Valleys, it being recalled that he had been advised previously by Mac Centre that those areas were free of cloud.

113. The next relevant item from the transcript is a single phrase uttered by Flight Engineer Brooks and appearing at page 90 of the chief inspector's report. It simply reads "I don't like this". Once again, the question is whether Mr Brooks was referring to the weather conditions immediately surrounding the aircraft, or whether he was directing attention to areas of cloud located somewhere in the distance. The fact that he uses the word "this" leads, in my opinion, to the inference that Mr Brooks was referring to the present situation of the aircraft. What did he mean by that observation? According to the Captain Wyatt transcription it was also followed by an irrelevant conversation. But I will assume for present purposes that the remark did refer to the aircraft's location. Proceeding once more upon the assumption that the flight crew were looking ahead at a long vista of white ground, then the probabilities are that Flight Engineer Brooks was concerned with the fact that despite the clear visibility in front, there were no features of terrain discernible in the far distance. Only 6 seconds after Flight Engineer Brooks made the remark just quoted, Captain Collins says "We're twenty-six miles north. We'll have to climb out of this". It therefore appears that Captain Collins and Flight Engineer Brooks unaminously decided that it was time to fly away, and reached that decision simultaneously.

114. These different passages from the transcript which I have quoted are those which were relied upon by the chief inspector to support his allegation that the crew was "uncertain" of its position and that there was some degree of "mounting alarm" on the part of the crew. The answer to all this is that nowhere in the remarks passed at any stage by Captain Collins or by First Officer Cassin is there the slightest suggestion of uncertainty as to the aircraft's position, or any concern as to the circumstances in which the aircraft was flying. What has been relied upon as generating the suggested "uncertainty" are the various remarks banded back and forth by people behind the two pilots, who certainly included passengers, venturing opinions as to the location of Mt. Erebus, and remarks of a similar kind. The only real expression of concern made by anyone is the remark of Flight Engineer Brooks "I don't like this" (assuming that it was not part of an irrelevant conversation) and, as I say, it was made only 6 seconds before Captain Collins made his decision to fly away.

It will further be observed that after making that decision Captain Collins and First Officer Cassin then began a discussion as to whether the aircraft should turn away to the left or the right. This discussion, both from the transcript and from listening to the actual voices on the tape, was very obviously a conversation containing not the slightest degree of urgency and indicating no concern whatever. It might almost be described as a casual discussion as to the direction which Captain Collins should take when he increased altitude and began to climb away from McMurdo Sound. That discussion was still continuing when the ground proximity warning device suddenly sounded 6 seconds before the plane struck the mountain. As soon as the device sounded Flight Engineer Brooks adopted the standard procedure of announcing the altitude, and then Captain Collins gave the following order "Go round power please". There is discernible, from listening to the tapes, a rising inflexion in the voice of Captain Collins as he gave this order and, indeed, that would be understandable in view of the unexpected sounding of the alarm system. But I would emphasise that the order ended with the word "please", and there was certainly no apparent indication of alarm or dismay by Captain Collins when he gave that order.

115. I have taken this trouble to examine these different sections of the transcript of the CVR because of the following four statements made by the chief inspector in his report:

- (a) "There were discussions on the flight deck indicating that some of the speakers believed they were to the west of Mt. Erebus; but the two Flight Engineers on the flight deck had voiced frequent queries about the procedure and expressed their mounting alarm as the approach continued on at low level toward the area of low cloud." (paragraph 2.20)
- (b) "The apprehension expressed by the flight engineers indicated that these members of the crew were endeavouring to monitor the flight responsibly but their suggestions of caution, as with the captain's decision to climb out of the area, were overtaken by the speed of the sequence of events." (paragraph 2.25)
- (c) "The flight engineers endeavoured to monitor the progress of the flight and expressed their dissatisfaction with the descent toward a cloud covered area." (paragraph 3.24)
- (d) "... the crew was not certain of their position. . ." (paragraph 3.37)

116. In my opinion none of these views expressed by the chief inspector in his report is substantiated, either by the transcript of the CVR, or by the process of listening to the playing of the tapes. The only possibility of apprehension on the part of a Flight Engineer is that referred to a little earlier when Flight Engineer Brooks said "I don't like this", always assuming that he was in fact referring to the aircraft's location, and the Captain simultaneously came to the same decision and decided to fly away.

117. Counsel for ALPA were highly critical of the approach of the chief inspector to this whole question of the transcript of the CVR. Their submission was that the chief inspector had formed a preliminary view that the crew was "uncertain" of its position and was expressing "mounting alarm" and so forth, and that he construed the transcript, wherever possible, so as to give effect to that point of view. One example which was given to me had reference to a remark by Mr Mulgrew transcribed at Washington as follows:

"Taylor on the right now".

This meant that Mr Mulgrew was pointing to the location of the Taylor Valley. In other words he was pointing to an area just south of that section of the Cape which he could see on the right. In the revised transcript published by the chief inspector, this remark by Mr Mulgrew is altered to a question by him, addressed to the captain, as to whether he will go to "the Taylor or Wright now". Then there is recorded a supposed answer by the captain "No I prefer here first." The captain's remark does not appear in the Washington transcript. In the view of counsel for ALPA the intention of the chief inspector in this respect was to avoid any suggestion that Mr Mulgrew had made a positive identification, because this ran counter to his controlling thesis that neither Mr Mulgrew nor the crew were quite sure as to the location of the aircraft. Mr Baragwanath, who as I have said heard the tapes in New Zealand, at Washington and at Farnborough, had this to say in the course of his final submissions:

"The point is that there is no evidence that this flight crew was in doubt as to its position".

With that comment I entirely agree.

118. I think I should make it clear, although perhaps the point is obvious, that it requires no expert skill to listen to a tape recording. The expertise in this area lies in being able to play the tapes through special filters so as to make certain words and phrases more audible, if possible, than they were before. We found, when we heard portions of the tapes played through filters, that the filter mechanism did not achieve any great improvement in what could be heard when the tape was played without the aid of these devices. What the filters did was to make certain words and phrases rather more clear than as had first appeared, but there were very few cases indeed in which an indecipherable comment was made decipherable by use of the filters.

119. This view as to the limited assistance provided by the filtering apparatus is supported by some comments made to me by avionic experts from the Bendix Corporation in Florida when Mr Baragwanath and I were on our way to Washington. I had gone to see the Bendix experts, as will later appear, in order to inquire into a controversy as to whether the pilots of the DC10 could have seen the land mass of Mt. Erebus by reference to the aircraft's radar screen. But as well as discussing this theory, the Bendix experts made two observations about the CVR transcript which they had previously read. They first of all warned me

about the garbled nature of the taped version of anything that had been said on the flight deck from behind the pilots' seats for they had observed, by studying the chief inspector's report, that there were numbers of persons on the flight deck at different times. They said that one could place little reliance upon spoken words or phrases which were only partly decipherable. I said that I expected that the filtering devices in Washington and at Farnborough might clarify to some degree what had been said in the rear section of the flight deck, but the Bendix experts did not hold out much hope in this regard. They pointed out that filtered devices were only useful in eliminating to some extent background noise. Such devices in general either confirm, by the medium of increased clarity, what the listener thought had been said, or confirm the inherent unreliability of a transcript sought to be produced from listening to particular recorded comments and remarks.

120. Mr Davison, speaking in his final address on behalf of the estate of Captain Collins, and also as junior counsel for ALPA, was very critical of the use made by the chief inspector of this defective tape recording. It was his submission that the chief inspector had formed a preliminary view, never abandoned thereafter, that the aircraft had been flying in or towards diminished visibility during the latter stages of the flight, and that the flight engineers had become anxious about the situation of the aircraft and had expressed dissatisfaction with the decisions of the two pilots. Mr Davison submitted that the chief inspector had in effect edited the Washington transcript, as a result of his visit to Farnborough, and that the editing had in certain respects been controlled by that pre-determined belief of the chief inspector to which I have referred, namely the supposed reference to the weather being "thick" and a supposed connection between the use of the words "instruments" and the prevailing weather conditions.

121. Whilst paying due regard to the various transpositions which I have mentioned, and to the submissions of Mr Davison, I cannot agree that there was any deliberate attempt by the chief inspector to edit the Washington transcript so as to conform, so far as possible, with his own opinion as to the state of mind of the flight crew. In my opinion the chief inspector's rendition of the transcript represents a bona fide attempt on his part to reproduce what was said. But I find myself obliged to agree with the rather different proposition that the chief inspector adopted as being accurate certain remarks which I have already cited from the transcript when it was by no means certain whether those exact observations were ever made, and that he was persuaded to adopt that course because of his firmly held opinion that the crew had been uncertain of its position. That is to say, the chief inspector had a natural inclination to ascribe to remarks of doubtful meaning an interpretation which favoured his own theory because, believing as he did in the validity of that theory, he also believed that members of the flight crew must from time to time have expressed apprehensions. But as I say, I am satisfied that there was no deliberate editing of the transcript so as to conform with the chief inspector's opinion. All that happened, in my view, was that as a sequel to that prevailing opinion he was naturally inclined to construe a barely audible observation, which was capable of possible reference to apprehensions about the weather, as if the comments did in fact refer to the weather. This inclination to hear what the listener expects to hear is a familiar feature of the ordinary judicial process. It is a constant feature of Court proceedings when someone with an interest in the outcome is

testifying as to what he heard a party say, or as to what he thought that party meant by a comment which he made.

122. The CVR system installed in the DC10 and also installed in other aircraft manufactured in the United States is considered very unsatisfactory indeed by the Accidents Investigation Branch of the United Kingdom Department of Trade. British aircraft use a different cockpit voice recorder system. It is essentially the same system but is wired differently. Mr Tench and Mr Shaddick arranged for Mr Davis to play over for us a CVR recording involving a major incident with a British aircraft. We were able to hear without difficulty every word which was spoken by every person on the flight deck. It was even possible, if occasion required, to isolate the speech of one person and listen to that person alone. No electronic filters or other devices are necessary for the transcription of this type of tape recording. It can be transcribed by the simple process of a stenographer listening to the 30-minute tape and typing out its contents as they are spoken. A wholly accurate transcription can thus be produced within 40 minutes or less. Five days of debate and discussion, followed by a transcript partly based on guesswork, is not required.

123. There was also demonstrated in England to the chief inspector this vastly different CVR system and this is why at paragraph 5.13 of his report he recommends that the CVR circuitry on passenger-carrying aircraft be re-arranged to adopt the system which I have just described, and which the chief inspector refers to as the United Kingdom Civil Aviation Authority's "Hot Mike" system.

124. Broadly speaking, my conclusion with regard to the CVR transcript in the case of the fatal flight is that only limited reliance can be placed upon anything which is alleged to have been said by anyone on the flight deck apart from the two pilots, and it is indeed certain that such statements as can clearly be interpreted and identified as being made by people on the flight deck behind the pilots can not be construed as throwing any light on the state of mind of the pilots at any given time.

THE ORIGIN OF AND THE PLANNING OF ANTARCTIC FLIGHTS BY AIR NEW ZEALAND

125. In 1968 the airline was exploring the possibility of operating a limited number of services between New Zealand and the Antarctic for the purposes of carrying tourists, scientists, and other interested parties to that area. There were preliminary discussions on the project with the Director of Civil Aviation and some of his officers during 1969 concerning the appropriate consents needed for such flights, and at the same time technical investigations were being carried out by the airline into various operational features of the proposed flights especially the question of fuel requirements. These matters are referred to in the notes of a meeting held at the Head Office of the Department of Transport on 10 June 1969 (Exhibit 75) and the Antarctic Division of the Department of Scientific and Industrial Research was also involved in these discussions. Later in 1969 Captain Tredrea, who was Fleet Captain of the airline at that time, discussed the situation with the United States Operation Deep Freeze organisation in Christchurch. Captain Tredrea prepared a report and sent a copy to the Department of Civil Aviation. That report (Exhibit 76) contains a detailed appraisal of all operational features.