

running up to the 300-foot ice cliff which marked the commencement of the snow-covered slopes of Mt. Erebus. The presence of the low overcast and the uniformly white surface ahead caused the snow cliff to disappear and to become merged in a featureless white expanse. The crew may have seen a distant horizon (as depicted in the bottom photograph of fig. 5, page 72) but in Mr Shannon's view, and I attach great weight to his opinion, the snow-covered terrain most probably blended with pale overcast so as to make no horizon visible at all. Captain Collins decided to fly away, and the obvious lack of any urgency surrounding that decision makes it clear that he and First Officer Cassin believed that they had many miles of flat ice on either side and in front of them. By the time the ground proximity system suddenly sounded, nothing could save the aircraft.

201. I have dealt with this "whiteout" phenomenon in considerable length for the simple reason that this disaster transcends in magnitude all past examples of aircraft disasters caused by whiteout phenomena. If the veil of cloud had parted, even for a second, and provided a fleeting glimpse of the mountainside, then the aircraft and all its occupants could at the last moment have been saved. Without the whiteout phenomenon, the mistake made by the Flight Operations Division would have been discovered, because Mt. Erebus would have appeared in the direct path of the aircraft, but as events turned out, the mistake, aided by the weather, deceived the flight crew until the end.

COMPLIANCE BY PILOTS WITH MINIMUM SAFE ALTITUDES

202. Regulation 38 of the Civil Aviation Regulations specifies minimum safe altitudes to be observed by airline operators in respect of various types of terrain. They will apply to all flights unless, for special reason, the Director of the Civil Aviation Division specifies different minimum safe altitudes. In the case of the antarctic flights, the director did specify the minimum safe altitudes of 16 000 feet and 6000 feet which have been referred to, and these were operative as from mid-1977. The first flights to which they applied took place on 18 October 1977. It will be recalled that these altitudes were suggested by the airline and not by the Civil Aviation Division which agreed with the two suggested minimum safe altitudes.

203. Captain Gemmell who commanded the first of the antarctic flights, and Captain Grundy who commanded the second, each testified that at no time did their flights go below 16 000 feet in the McMurdo area. In respect of each flight there was evidence which suggested the contrary, but I am not going to take up time by discussing that evidence now. I am primarily concerned with flights from 18 October 1977 onwards, to which minimum safe altitudes of 16 000 feet and 6000 feet at all times officially applied, in the sense that no descent below those altitudes, under specified conditions of descent, was permissible without the prior consent of the Director of Civil Aviation.

204. There were pilots who did not interpret the 6000 feet MSA as meaning what it appeared to say. They believed it was restricted to a "cloud break" procedure and that it was permissible, in appropriate conditions, to descend below 6000 feet so long as regulation 38 was complied with. On behalf of the airline and on behalf of the Civil Aviation Division, it was naturally contended that there was no room for misunderstanding with regard to the extent of the 6000 feet limitation. It

was however susceptible, as I read it, of the interpretation placed upon it by the pilots to whom I have referred. But again I do not propose to go into this matter of misinterpretation of the 6000 feet MSA because I consider that it has no real relevance to matters which I am called upon to investigate.

205. In the first place the evidence makes it clear, in my opinion, that all Antarctica flights from and including 18 October 1977 involved a let-down in the McMurdo area to altitudes considerably less than 6000 feet, and that in the main the flights down McMurdo Sound and across the Ross Ice Shelf to the south of Mt. Erebus were conducted at altitudes ranging from 1500 feet to 3000 feet. There was one flight which diverted to the South Magnetic Pole and in this case the question does not arise.

206. The next point is whether the occurrence of flights in the McMurdo region of less than 6000 feet was known to executive pilots of the Flight Operations Division and to the management sector of the airline. Captain Lawson was called to give evidence on behalf of the airline. He had been, as will be recalled, the first supervisor of the Route Clearance Unit and he had been co-pilot of the first flight. He also flew as co-pilot with Captain Hawkins on the third flight which took place on 18 October 1977, this being the first occasion upon which the 6000 feet limitation was operative. In the course of his evidence, Captain Lawson said that although Mac Centre invited Captain Hawkins to descend below 6000 feet, that invitation was declined. In cross-examination, Captain Lawson was referred to **Exhibit 83** which is an extract from a copy of the *Auckland Star* of 22 October 1977. This is an article written by a Mr Graeme Kennedy. The article describes the progress of the flight of 18 October 1977 and it contains a reference first to the aircraft flying over Scott Base and McMurdo Station "at less than 2000 m.". Later in the text the following passage appears:

"At the controls Captain Hawkins brings the DC10 down to 200 m over Scott and McMurdo Bases—well below the towering volcano Erebus belching smoke only 40 ks. away."

207. Mr Henry, cross-examining on behalf of the passengers' consortium, told Captain Lawson that Mr Graeme Kennedy had been interviewed and had indicated that the reference to 200 metres ought to have read 400 metres—in other words, approximately 1300 feet. Mr Henry asked Captain Lawson for his comments. Captain Lawson maintained that Mr Kennedy's report was inaccurate and that "to the best of my recollection" the flight did not descend below 6000 feet. Captain Lawson admitted that Mr Kennedy was personally known to him. The point of this cross-examination was to show that there had been published in the *Auckland Star* on 22 October 1977 a press report indicating a low-level flight down McMurdo Sound with Mt. Erebus 40 kilometres away.

208. During the course of further cross-examination, Captain Lawson was asked whether he was aware of any other written reports referring to flights in the McMurdo area at below 6000 feet. Captain Lawson said that he had read a copy of **Exhibit 148A**, which is a Newsletter published by the airline and entitled *Air New Zealand News*. The article in question is dated 30 November 1978. It consists of a brief description of the flight to Antarctica of 7 November 1978. The opening two paragraphs of the article read as follows:

"The flight deck crew of TE 901 took the boss flying with them on November 7.

And as the DC10 cruised at 2000 feet past the antarctic's Mt. Erebus and over the great ice plateau Captain Doug Keesing, Flight Operations Director International, was as interested in sightseeing as the other 230-odd passengers aboard."

Captain Lawson said that he considered that this airline newsletter, which is distributed to all members of the airline's staff, would have provided ample evidence available to people in authority upon which such people could have acted. But Captain Lawson was the only pilot called by the airline who admitted any knowledge of the contents of the airline's newsletter to which I have just referred. There was no executive pilot called on behalf of the airline who admitted ever seeing this exhibit.

209. One of the executive pilots who testified for the airline was Captain R. T. Johnson. He is Flight Manager Line Operations DC10-DC8. Captain Johnson was in command of the flight of 8 November 1977. In his prepared brief of evidence, Captain Johnson stated that he descended to 3000 feet in the McMurdo area because of the perfect weather conditions existing at that time. In view of the solid front presented by all the executive pilots who testified, I was a little surprised at this distinct admission of flying below 6000 feet, it being remembered that it was Captain R. T. Johnson himself who sent out the memorandum to all pilots 2 years later, dated 8 November 1979, restating the conditions which must exist before a descent to the MSA of 6000 feet was permitted. I do not wish to be taken as suggesting that Captain Johnson felt himself obliged to admit flying at 3000 feet because of outside evidence which would confirm that fact. Nevertheless, Mr R. B. Thomson, Superintendent of the Antarctic Division of the D.S.I.R., had been on this flight. He had been on four flights in all, and believed that they had all flown at below the specified minimum safe altitudes. He admitted that Captain Gemmell's flight may have been at not less than 16 000 feet but in reference to the three flights other than Captain Gemmell's first flight, Mr Thomson had previously testified without qualification (T. 637) that they had all flown below 6000 feet, and of course one of these flights had been Captain Johnson's flight. In the event, Captain Johnson stated that he had consciously committed a breach of the MSA rules by descending to 3000 feet. In my opinion this was a contrived admission, bearing no relation to the true facts regarding minimum safe altitudes, but I shall return to that later. Captain Johnson went on to say that he was unaware of any flights, except his own, which had operated at less than the MSA of 6000 feet (T. 1370).

210. I now come back to **Exhibit 148A**, this being the airline's newsletter which referred to Captain Keesing having been a passenger on the flight of 7 November 1978 when the aircraft cruised to 2000 feet down McMurdo Sound. At that date, Captain Keesing was the Director of International Flight Operations. At the date when the hearings before the Commission commenced, Captain Keesing had retired from the airline and was employed as a consultant to one of the Pacific airlines. It appears that he was sent a press cutting which made allusion to his having been on this flight and to censorious comments said to have been made at Commission hearings that he should have condoned, in his capacity as Director of Flight Operations, this breach of the MSA of 6000 feet. When this was drawn to his attention, Captain Keesing travelled to New Zealand and saw counsel assisting the Commission and gave a brief of the evidence which he desired to give on this topic.

211. It will be remembered that at the beginning of 1977 it had been Captain Keesing who had set out the conditions for antarctic flights in correspondence with the Civil Aviation Division, and he had proposed that minimum safe altitudes would be in accordance with regulation 38 of the Civil Aviation Regulations. Then Captain Gemmell who, as chief pilot, had been his subordinate, had himself negotiated the minimum safe altitudes of 16 000 feet and 6000 feet which are presently under discussion. When Captain Keesing gave evidence before me, he said that he believed that he had concluded the minimum safe altitude arrangements with Civil Aviation Division along the lines of the terms set out in his letter of 2 February 1977. He had never received a formal reply to this letter, but he had been aware that antarctic flights had started 13 days later and he had assumed that the detailed operating conditions in his letter had been accepted by the Civil Aviation Division. He had been quite unaware that Captain Gemmell had been conducting independent negotiations and had settled an MSA, first of 16 000 feet and then later 16 000 and 6000 feet. Captain Keesing told me that he was not aware, until this evidence before the Commission had been brought to his attention, that there had ever been minimum safe altitudes of 16 000 feet and 6000 feet.

212. After Captain Keesing had travelled as a passenger on the flight of 7 November 1978 he had been asked by one of the editorial staff of the airline's newsletter to give his impressions of the flight, and he had done so. He had specifically referred to a flight of 2000 feet. He had been shown the draft of the article and had approved it. Captain Keesing took great exception at the suggestion which had been made to the Commission—during his absence overseas—that he had been a party to a breach of the MSA rules.

213. I pause to observe that this incident demonstrates one of the constant features of this Inquiry, namely the lack of adequate communication within the Flight Operations Division of the airline. This was certainly an extraordinary situation. Captain Keesing had never been told that his own specified operational conditions, believed by him to have been accepted by the Civil Aviation Division, had been altered by one of his subordinates. Captain Keesing was cross-examined at some length by Mr L. W. Brown, Q.C., on behalf of the airline, but he was at no time challenged on this aspect of his evidence.

214. The next feature of the evidence concerning MSA was equally surprising. The DC8 and DC10 aircraft owned by the airline had been manufactured by the McDonnell-Douglas Corporation of the United States of America. The president of the corporation in 1977 had been Mr John Brizendine. Towards the end of 1977 he had visited Auckland and at the invitation of the chief executive, Mr M. R. Davis, he had travelled on the antarctic flight of 17 November 1977. Upon his return to the United States he wrote to the chief executive and enclosed the script of an article which he had written describing the spectacular nature of the flight and the excellent service provided by the airline in relation to that flight. In that article, which incidentally described the flight path as being down longitude 165° east (that is, down the centre of McMurdo Sound), the following passage appears:

"As we neared the Ross Ice Shelf, Captain Vette began a gradual descent which would bring us to approximately 3000 feet above the ice. Ahead could be seen 13 200 foot Mt. Erebus, a live volcano emitting clouds of white smoke.

At 2.20 p.m. New Zealand time, we were abeam of Ross Island, dominated by Mt. Erebus, flying over the Ross Ice Shelf at relatively low altitude. Surface features could be seen distinctly."

215. Seeing that this eulogistic article clearly referred to an approach down the centre of McMurdo Sound at an altitude of 3000 feet, the question naturally arose as to why the chief executive had been unaware, as from the end of 1977, that the suggested MSA of 6000 feet was not being complied with. Upon being asked about this in cross-examination, the chief executive replied to the effect that he received considerable quantities of mail and that it was his practice not to read many of the attachments annexed to his correspondence. I asked him whether this philosophy applied to the president of the McDonnell-Douglas Corporation, one of the largest manufacturers of aircraft in the world. The chief executive replied in the sense that even correspondence of this major importance was not immune from the chief executive's practice of not reading all attachments to his correspondence. Needless to say, I find myself unable to accept this explanation. I can only make the assumption that the chief executive's memory is at fault.

216. But the matter of Mr Brizendine's article does not rest there. Towards the end of the hearings before the Commission it was discovered by counsel assisting the Commission that Mr Brizendine's article had been widely distributed throughout New Zealand as part of a publication entitled *Travelling Times*. This publication was produced as **Exhibit 84**. Inquiries were duly made, and it was found that the airline itself had arranged for the distribution of the circular *Travelling Times*—which included Mr Brizendine's article—and that distribution had been effected by an organisation called Circular Distribution (New Zealand) Limited on 9 September 1978. It was further discovered that no less than one million copies of this circular had been prepared. The object of the airline had been to ensure, so far as possible, that a copy of the publication reached every home in New Zealand. Counsel assisting the Commission acquired from the distributors a complete breakdown of distribution, with itemised figures for every part of New Zealand. A total of 978 620 copies had been distributed throughout the country. The total cost to the airline was \$16,008.30.

217. This revelation was greeted with some measure of surprised protest by counsel for Air New Zealand, and it is apparent that in this matter, as in some other matters which arose during the Inquiry, they had not been informed by the airline of the existence of the distribution of this circular. I asked Mr Davis how it could possibly be suggested that the airline's management was unaware of flights below 6000 feet in view of the fact that his company had seen fit to print one million copies of a printed text which established that fact. He could suggest no reasonable explanation.

218. There were other items printed from various publications which made allusion to the flight levels of antarctic flights. One of them was **Exhibit 85** which consisted of a page from an Auckland suburban newspaper containing an article by a Mr Graham McGregor referring to a flight of 7 November 1978 and describing the spectacular views obtained at 2000 feet over Scott Base. The same article was printed in another Auckland suburban newspaper, of which an extract was produced as **Exhibit 86**.

219. I only advert to this widespread publicity of the actual flight levels being conducted in Antarctica because of the steadfast denial by the airline management, by the Flight Operations Division of the airline, and

by the Civil Aviation Division, that any such information ever became known to them. As it happens, flights as low as 1500 feet are perfectly safe in clear weather and were far in excess of the minimum safe altitudes described by the regulations. They were considered safe and acceptable by the United States Navy and there is no doubt at all that no question of breach of any safety rules arose in respect of flights at this level. But the alleged contravention of the official MSA levels of 16 000 feet and 6000 feet formed the bulwark of the defence by the airline and by Civil Aviation Division to the wide-ranging attacks made upon them in respect of their organisational defects. At every point when an error on the part of their respective officials was alleged, and often identified, the answer was inevitably given that the disaster would not have occurred had the aircraft been flying at 16 000 feet. This, of course, is correct. The disaster would also not have occurred had Captain Collins been notified prior to leaving Auckland that the computer track of his aircraft, previously plotted down the safe area of McMurdo Sound, had been altered, without his knowledge, to a collision course with Mt. Erebus. Had Captain Collins even suspected that such an alteration had been made, it can safely be assumed that the aircraft would not have left Auckland until the altered track had been plotted on a topographical map.

220. As to the position of Civil Aviation Division with regard to knowledge of flights under the officially approved MSA levels of 16 000 feet and 6000 feet, the position taken by the division is that they had no knowledge that any such flights occurred. In this regard I must take into account what I have previously said about newspaper reports referring to flights under 6000 feet, and the distribution among 8000 employees of the airline of the Air New Zealand newsletter, **Exhibit 148A**. In addition, there was the nation-wide distribution in September 1978 of the circular *Travelling Times* which contained Mr Brizendine's article. Despite denials on the part of Civil Aviation Division, it seems scarcely credible that someone among their senior staff would not have become aware of what evidently had become a matter of public knowledge.

221. There is also relevant in this respect a matter to which I have referred previously, that is; the conversation on 22 November 1979 between Captain Omundsen, the controller of airline operations for the Civil Aviation Division, and Captain Grundy. I have indicated Captain Grundy's version of this discussion. He said that Captain Omundsen was only concerned with separation between civil aircraft and helicopters and that the report from the United States Antarctic Support Force referred only to altitudes over glaciers. Captain Omundsen, in the course of his evidence, maintained that he had in mind in this verbal discussion a breach of the 6000 feet MSA but the diary note which he made on 23 November 1979 (**Exhibit 1/25**) does not bear out this assertion. The only reference in the diary note to this topic is in paragraph 3 which reads as follows:

"Report from United States Authority in the Antarctic that large civil aircraft have been observed operating at lower than normal altitudes over glaciers and in fact the height mentioned was 1000 feet above glacier level."

Nothing is said there about any breach of minimum safe altitudes of 16 000 feet and 6000 feet.

222. Had the Civil Aviation Division not been aware of flights operating at less than 6000 feet, I would certainly have expected that Captain Omundsen would have raised this specific question with Captain Grundy

on 22 November 1979, that he would have emphasised the point in his diary note, and that there would have been an immediate letter to the airline requesting an explanation. Upon the whole, I prefer Captain Grundy's version of this conversation.

223. My opinions on this aspect of the Inquiry are:

- (a) The management of the airline and its Flight Operations Division were aware from November 1977 onwards that airline pilots on antarctic flights were flying at levels ranging from 1500 feet to 3000 feet, and that some flights travelled down McMurdo Sound in the direction of true south at such altitudes.
- (b) Civil Aviation Division was aware, probably over the whole period of the antarctic flights, but certainly from September 1978 onwards, that the airline's pilots were flying at levels well under 6000 feet in the McMurdo area.
- (c) Neither the Flight Operations Division of the airline nor Civil Aviation Division considered that there was any breach of safety requirements involved in pilots adopting flight levels in accordance with regulation 38 in view of the fact that such sightseeing flights were being conducted in VMC conditions. Both the airline and the Civil Aviation Division were correct in holding that opinion.
- (d) As previously stated, the airline should have put its house in order in terms of regulation 38 of the Civil Aviation Regulations by applying for minimum safe altitudes which would reflect the known practice of pilots operating the antarctic flights. The authorised flight path should have been amended so as to coincide with the military route down McMurdo Sound and a minimum safe altitude over McMurdo Sound and the Ross Ice Shelf to the true south should have been set at 1500 feet subject to VMC conditions, with visibility not less than 20 kilometres.
- (e) Such a revised minimum safe altitude would have been approved by the Civil Aviation Division and would also have been accepted by the United States Naval Support Force authorities at McMurdo.

THE CREATION OF THE FALSE McMURDO WAYPOINT AND HOW IT CAME TO BE CHANGED WITHOUT THE KNOWLEDGE OF CAPTAIN COLLINS

224. By way of preliminary, something should be said about the nature of the flight plan delivered to the crew of an aircraft just prior to departure. In an aircraft such as the DC10, with its navigation controlled by the AINS, the primary content of the flight plan is the list of waypoints running down the left hand edge of the page. In the case of scheduled routes flown by Air New Zealand the waypoints are denominated by names, and the airline's ground computer system connects those names with fixed geographical positions. The system of inserting details of the flight plan into the aircraft's own computer involves a tape cassette with which, in the present case, we are not concerned. This is because the Antarctica flights were non-scheduled and the method adopted for inserting the waypoints into the aircraft's computer system was to insert manually the co-ordinates of latitude and longitude for each waypoint. A flight plan, as well as containing these pre-determined and fixed waypoints, will also contain the distance in miles between each waypoint

and the heading along which the aircraft will fly from one waypoint to another. All these details will be constant from one flight plan to another unless for some reason it is thought necessary to change the position of some particular waypoint. Then the flight plan will also contain other material which is not constant and which must be inserted for the specific purposes of the flight in question. This will involve the different flight levels to be maintained over different sectors of the journey, and these will be determined by up-to-date weather forecasting, indicating the direction and velocity of winds at various altitudes. There are other details which also require insertion for the purposes of the particular flight, and of these perhaps the most important is the calculation of the fuel required by the aircraft on its journey. Opposite each waypoint will be printed in metric tonnes the amount of fuel then remaining at the point when that waypoint is reached. To summarise, a flight plan delivered to the crew of an antarctic flight at the pre-despatch briefing an hour or two before departure will comprise the fixed waypoints and track and distance details held in the airline's ground computer in respect of that particular route, to which has been added, for purposes of the flight, the last minute calculations to which I have just referred. During the course of the flight the aircrew will have their printed flight plan before them, and they will keep checking at all times the comparison between fuel consumed over one sector, as appearing from their instruments, with the estimated fuel components appearing on the flight plan, and they will also be checking the other operational details appearing on the flight plan.

225. In 1977 the flight plans delivered to aircrew of Air New Zealand were manually produced, that is to say, there would be a print-out document containing the fixed waypoints and track and distance details applicable to the journey, but the other details applicable to the day of the flight would be inserted by hand. In 1978 however, the decision was made that all the airline's flight plans for its different flight routes would be computerised. The ground computer unit of the airline would therefore hold a flight plan for every route, containing the fixed waypoints and track and distance details to which I have referred, but shortly before the pre-despatch briefing the flight levels and fuel calculations and other necessary data would be inserted into the ground computer for inclusion in the standard computer flight plan for that particular route. Then the Flight Despatch Section would be handed a print-out from the ground computer which would comprise the full flight plan for the journey, with all details printed thereon.

226. The alteration of the original McMurdo waypoint was said by members of the airline's Navigation Section to have originated with the decision in 1978 to computerise all flight plans, and the following narrative sets out the explanation which I was given in this respect by the Navigation Section witnesses.

227. For the first two Antarctica flights of 1977 the destination waypoint represented the latitude and longitude co-ordinates of the landing strip at McMurdo which is known as Williams Field. Those co-ordinates were 77 degrees 53 minutes south and 166 degrees 48 minutes east. However, as previously described, a decision was made in mid-1977 that there was to be an additional MSA of 6000 feet under specified conditions. This 6000 feet cloud break procedure meant that during instrument meteorological conditions (IMC) the McMurdo non-directional beacon (NDB) had to be used in order to give the aircraft a positive confirmation of its position prior to descent. Accordingly, as from the first of the late 1977 flights,