2. ANALYSIS

2.1 The initiating factor in this accident was the captain's decision to make a VMC descent below the specified minimum safety height while north of McMurdo.

2.2 Although observing the Civil Aviation Regulations requiring the operator to brief the pilot in command for the particular route, Air New Zealand Limited as the operator, had not ensured that all significant information was included in the route qualification briefing and presented in an unambiguous manner or required the pilot in command to "demonstrate an adequate knowledge" of the subjects listed in Civil Aviation Regulation 77 paragraph 1(a).

2.3 The pilot in command had demonstrated to the operator in a flight simulator exercise, that he understood the salient points of the briefing relating to grid navigation. The flight simulator exercise also included a rehearsal of the arrival over Williams Field and a night VMC letdown procedure to 6000 feet AMSL following a simulated positioning by GCA north of Mt Erebus.

2.4 Although 2 of the pilots were shown a printout of the erroneous computer flight plan in advance of the actual flight they were not shown on a topographical map that the intended tack passed almost directly over the highest point in the area, Mt Erebus (12450 feet). Charts were carried in the aircraft on the day of the flight but these were very small scale (the largest scale was 1:3,000,000 with 1:1,000,000 insert of Ross Island) and not available to the crew until the final pre-flight dispatch planning on the morning of the departure. The 3 "maps" of the area between Cape Hallett and McMurdo which were used in the route qualification briefing all showed a track located clear of high ground and passing to the true west of the mountains as did one of he maps issued on the day of the flight. In fact the flight planned route passed to the east over very high ground instead of over the sea level ice shelf as portrayed on the briefing "maps". One track and distance diagram issued at the route qualification briefing showed that the track from Cape Hallett was direct to the McMurdo TACAN but this did not show the location of any topographical feature.

2.5 The flight plan was printed for each flight from a computer stored record which, until the night before the flight, had the longitude for the McMurdo destination point incorrectly entered as 164°48'E. The error in longitude had persisted for 14 months and was not corrected on the sample flight plan shown to this crew at their preliminary briefing. The error had been discovered 2 flights earlier but neither the crew of the previous flight nor that of the accident flight were advised of the error by the flight dispatcher prior to their departure. The error had placed the destination close to the longitude of the Byrd Reporting Point (165°E) and this aligned the track close to that displayed on the RNC chart and to that used by military aircraft. The fact that the computer error of over 2° of longitude to the west could exist for 14 months indicates there was no regular valid comparison between the topography and the geographical co-ordinates by briefing officers or flight deck crews. As all previous flights to McMurdo had approached the area in VMC earlier crews had not adhered to the flight plan track and hence had not detected the error. In the case of this crew no evidence was found to suggest that they had been mislead by this error in the flight plan shown to them at the briefing.

2.6 Although the CAD Airline Inspectors involved had not witnessed a complete flight crew briefing for Antarctica one had witnessed the audio visual route qualification briefing twice and had approved it, on behalf of the DCA for familiarisation purposes, without requiring it to be amended in any way.

2.7 As a result of questions put to some of the pilots of earlier Antarctic flights and from the comments on the CVR record recovered from this flight, it was obvious that misconceptions were held about the flight level which was to be used for the resetting of the aircraft's altimeters to the local atmospheric pressure (QNH), the minimum altitude to which the aircraft was permitted to descend in VMC and the actual topography below the flight planned track from Cape Hallett to McMurdo.

2.8 Flight TE 901 progressed normally from Auckland to Antarctica and the weather was clear over Northern Victoria Land affording the passengers an excellent view of this scenic area. The passengers' photographs confirm the aircraft was on its planned track and turned over the appropriate point at Cape Hallett to proceed direct towards the next planned waypoint (the TACAN at Williams Field) near McMurdo.

2.9 During the leg of the flight from Cape Hallett to Williams Field the weather conditions over McMurdo and Ross Island generally were confirmed as overcast with a ragged cloud base of 3000 feet and the actual conditions at the Ice Runway 3 miles west of the TACAN were a cloud base of 2000 feet with 40 miles visibility below it but the surface and horizon definition were poor and snow showers had been reported. Messages from New Zealand bases in the area, to the aircraft indicated that the weather was clear over the Wright and Taylor Valleys and there were breaks in the cloud 75 to 100 miles north of McMurdo.

2.10 There was no explanation of the horizon and surface definition terms in the operators' route qualification briefing or pre-flight dispatch planning, and only a passing reference to whiteout conditions.

2.11 The direct flight from Cape Hallett to Williams Field was interrupted some 40 miles true north of McMurdo to take advantage of a hole, in the cloud cover, which extended vertically to sea level and to descend the aircraft in this gap prior to its planned arrival at McMurdo. The captain bad been advised that the visibility below the cloud which was over Ross Island, was 40 miles. This descent was made despite the safety requirements to maintain a minimum sector altitude of 16000 feet until overhead McMurdo TACAN and to descend below that height only in a specified sector and in weather conditions of 20 km visibility and no snow showers, and after contacting the radar controller.

2.12 Despite the Company's previous requirement for radar monitoring of the descent, the air traffic control centre staff at McMurdo had not been given an opportunity to study the altitude and area limitations imposed by Air New Zealand Limited for any of their aircrafts' descents in the area. The McMurdo Air Traffic Control officers were however, in possession of a chart which depicted the safe altitudes at various ranges and bearings from their radar installation for descents in the area.

2.13 When flight TE 901 requested a clearance for a descent from 10000 to 2000 feet on a heading of 180° Grid (i.e. towards the north) and to proceed to McMurdo VMC there was no reason for the Air Traffic Centre staff to question this as it was from a reported position to the true north of Ross Island and therefore the descent would take the aircraft back out over the sea level ice and the flight had confirmed it would maintain VMC inbound to McMurdo.

2.14 Had the crew followed their stated intention to descend on a heading of 180° grid they would have increased their safety margin from the high ground, but without further advice to "McMurdo Centre" the pilot in command reversed the aircraft's descent track and from 5800 feet the descent to 2000 feet was completed on a heading of 357° grid back toward the cloud covered high ground. This inbound track had a minimum safe altitude of 16000 feet. After reaching 2000 feet the aircraft captain announced he would descend a further 500 feet to obtain a better view below the continuous cloud layer and the first officer supported this by say "Yeah O.K. – probably see further in anyway".

2.15 The main altimeters were not reset from the standard setting until the aircraft was about 3500 feet on this inbound track for the last time although the flight level for this adjustment was 180. The substantial change in pressure (0.62 inches of mercury), meant the aircraft was actually 570 feet lower than indicated prior to the altimeters being reset. (The crew referred to altitudes of 13000 ft and above as flight levels). There was no evidence to suggest that the standby altimeter had not been set to the local QNH prior to descent as was the normal practice but neither could this be confirmed.

2.16 The captain had been qualified as a flight navigator and could be expected to keep a realistic mental plot of his position with regard to the juxtaposition of Mt Erebus, their next turning point, the inbound track and the distance to go. Although both he and the co-pilot would be more likely to be monitoring the area navigation computer display unit, the latitude and longitude indicators of the AINS were displaying the co-ordinates of an aircraft position slightly (3.1 nm) to the southwest of the actual position. This position although incorrect was within the accuracy limitations of the AINS and indicated that the aircraft was closer to Mt Erebus than was actually the case. The AINS would also indicate that the aircraft was on its flight planned track with the distance remaining equal to that which would place the aircraft close to the Lewis Bay coastline of Ross Island and heading towards Mt Erebus. Despite this and the aircraft's speed of 260 knots IAS (257 knots ground speed) the captain headed the aircraft toward the cloud covered island and no expression of doubt was made by the first officer. The captain descended the aircraft a further 500 feet from the original 2000 feet but at 1500 feet and at a distance to run of 26 miles he finally became concerned and stated "We're 26 miles north, we'll have to climb out of this".

2.17 The weather conditions as described had a high potential for a "whiteout" the phenomenon which is always likely when overcast conditions exist above a continuous snow covered slope (see 1.17.46 et seq). Various reports from aircraft which were flying in the area shortly afterwards indicated that the surface and horizon definition were poor. Whiteout conditions can exist within the normal VMC minima and even in the conditions defined by Air New Zealand as the minima for VMC descents to 6000 feet.

2.18 After the captain's decision to climb the aircraft out of the area he and the co-pilot were discussing the most suitable climbout path when the ground proximity warning system sounded instructing the crew to "Pull up". The crew responded to the alarm without undue hesitation, the flight engineer calling off the heights of 500 and 400 feet indicated on the radio altimeter and the captain calling for "Go-round power". The warning 6½ seconds before the impact was, however, too late for the crew's action to make any significant effect on the aircraft's level flight path. Their reaction time was established as very similar to or better than that of experienced crews placed in a similar situation in the training environment of the flight simulator. It is likely however that as a result of a whiteout the go-round attempt was procedural in response to the warning rather than a desperate attempt to avoid a readily apparent obstacle.

2.19 The ground proximity warning system's alarm was delayed because the terrain closure started from above a coastal cliff 300 feet high instead of a steadily increasing slope which would have triggered the warning approximately 3 seconds earlier. The system has an approximate 6 second delay after it first senses a dangerous closure rate with the terrain below the aircraft. This is to minimise spurious alerts triggered by short steep slopes below the aircraft during normal safe flight paths. Another factor was the aircraft's speed. The aircraft was closing with the slope at 257 knots. Although it could have been cruising at a lower speed with the flaps and slats, deployed, the extension of flats/slats in the Antarctic area was expressly prohibited by the operator owing to the difficulties which could occur in returning the considerable distance to the nearest landing point should a malfunction prevent retraction of the flats/slats. (260 knots was close to the minimum safe manoeuvring speed of 252 knots which was the $1.5V_s$ speed for the aircraft's all up weight in the clean configuration).

2.20 The pilot-in-command did not comply with the company's requirements to limit the descent to 16000 feet until overhead "McMurdo Field". He was not violating any local restriction by descending to 1500 feet in VMC or when he did not advise the ATCC when he altered his descent path from 180°G to 357°G. One explanation for his decision to continue on track toward McMurdo at this low altitude, was that it was the result of a misconception shared by himself, the first officer and the flight's official commentator that the approach path was over a sea level ice shelf to the west of Mt Erebus. There were discussions on the flight deck indicating that some of the speakers believed they were to the west of Mt Erebus but the 2 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. The pilots may also have believed that the would be able to see any obstruction within 40 miles as soon as they were below the 2000 foot cloud base but evidently this was not so. Observed conditions probably led to the particular snow slope and the cloud base appearing to the pilot as an area of limited visibility and this whiteout situation may well have been the deciding factor which made him announce his intention to climb out of the area.

2.21 The co-pilot advised the captain that there was no high ground to the right and the aircraft was clear to make a 180° turn whereas the terrain sloped up to 3500 feet to the right within 5 miles. Or within 2 miles of the position indicated by the AINS.

2.22 Once the aircraft was overdue the search and rescue operation was mounted with the appropriate dispatch but the weather prevented an immediate search of the terrain below the aircraft's track in the vicinity of the local high ground. After the wreckage was located further delays resulted due to adverse weather conditions despite determined efforts by helicopter crews to hover close to the ground adjacent to the site. An attempt was made to gain access to the site by surface travel but the high ice cliffs on the shore line and the numerous crevasses in the area made this impracticable.

2.23 There was no appropriate survival equipment on the aircraft and the weather conditions that prevailed after the accident coupled with the light summer clothing worn by almost all occupants would have minimised the chances of survival had any victim not been fatally injured by the impact even had they been able to make the optimum use of the undamaged items of the standard survival equipment fitted to the aircraft. The aircraft might well have touched down on the ice and remained sufficiently intact for some occupants to have survived had the angle of its flight path prior to the impact approached that of the ice slope more closely. In the event it was clear that no one survived the impact in this case.

2.24 A comprehensive study of the navigation equipment in conjunction with the crew's comments on the last 30 minutes of the flight as recorded by the CVR gave no indication that the area navigation system had displayed any erroneous information either by malfunctioning or incorrect input by the crew. (The actual error in the navigation presentation was 3.1 nm which was well within the allowable tolerance of 1.99 miles per hour since the last position update).

2.25 The CVR record revealed that the pilots' demeanour was composed and confident during the aircraft's approach to the accident area which was covered by a low overcast. 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. When the captain descended the aircraft outside of the approved area and below the minimum safe altitude the first officer did not criticise this decision. Although he was diverted to some extent in his endeavours to establish VHF communications as instructed by "Mac Centre" and endorsed by the captain, these VHF transmissions should not have overcome his natural caution in relation to cloud covered high ground. Had he been clearly aware that a 12450 foot mountain peak existed just 20 miles from destination on the planned track the simple selecting and monitoring of the AINS presentation showing distance to run and any divergence from the planned track could have overridden any preoccupation with operating the VHF radio.

3. CONCLUSIONS

3.1 The crew members were certificated and qualified for the flight.

3.2 The aircraft was certificated, equipped and maintained in accordance with CAD requirements.

3.3 The aircraft was airworthy and operating normally up to the time of the accident.

3.4 The aircraft's all up weight and C of G were within limits.

3.5 The flight planned route entered in the company's base computer was varied after the crew's briefing in that the position for McMurdo on the computer printout used at the briefing was incorrect by over 2 degrees of longitude and was subsequently corrected prior to this flight.

3.6 The system of checking the detailed flight plan entries into the base computer was inadequate in that an error of 2° of longitude persisted in a flight plan for some 14 months.

3.7 Some diagrams and maps issued at the route qualification briefing could have been misleading in that they depicted a track which passed to the true west of Ross Island over a sea level ice shelf, whereas the flight planned track passed to the east over high ground reaching to 12450 feet AMSL.

3.8 The briefing conducted by Air New Zealand Limited contained omissions and inaccuracies which had not been detected by either earlier participating aircrews or the supervising Airline Inspectors.

3.9 The crew were not aware of the VHF R/T callsigns in use in the area and these are not published in the briefing notes, the NZAIP, or the US Department of Defence documents which were available to the crew. They were however specified in US Navy instruction CNSFA INST 3722.1, a copy of which was held by Operation Deep Freeze Headquarters.

3.10 The question of making a landing near McMurdo on either the ice runway or the skiways at Williams Field and the type of emergencies which might require such a diversion was not discussed at the company's briefing.

3.11 The Civil Aviation Division Airline Inspectors had formally approved the audio visual stage of the route qualification briefing for the flight and one had witnessed a typical audio visual segment of the briefing for an Antarctic flight, twice, without requiring any amendments or detecting the errors contained in the briefing. They had also confirmed that it was no longer necessary for captains to carry out a supervised flight as required in the Operations Specifications in view of these briefings and the flight simulator detail.

3.12 Civil Aviation Regulation 77 1(a) had not been complied with.

3.13 The operator departed from the stated undertaking to carry two captains on each flight and substituted an additional first officer in lieu of the second captain.

3.14 Of the flight deck crew only one engineer had flown to the Antarctic previously.

3.15 The crew were not monitoring their actual position in relation to the topography adequately even though a continuous readout of the aircraft's latitude and longitude and distance to run to the next waypoint was continuously available to them from the AINS.

3.16 The crew did not observe the transition level in use in the McMurdo air traffic control area for resetting this aircraft's altimeters and this procedure was not published in either the briefing notes or the US Department of Defence documents which were made available to the crew. The procedure used was that prescribed in US Federal Aviation Regulation 91.81 which required the QNH to be set basically at FL 180 during descent but this was modified in low pressure areas. (See Annex L).

3.17 The captain's altimeter was not set to the correct QNH until the aircraft reached 3500 feet.

3.18 The captain initiated a descent to an altitude below both the IMC (16000 feet) and VMC (6000 feet) minima for the area in a cloud free area but in contravention of the operator's briefing and outside the sector approved for the descent to 6000 feet by the DCA and the Company.

3.19 The co-pilot was devoting a significant proportion of his time in an endeavour to establish VHF contact with the McMurdo ground stations and did not monitor the decisions of the pilot in command adequately in that he did not offer any criticism of the intention to descend below MSA in contravention of company restrictions and basic good airmanship.

3.20 The descent was intentionally continued below the VMC limit specified by CAD and Air New Zealand Limited, of 6000 feet to an indicated 1500 feet.

3.21 The crew were distracted but not preoccupied by their failure to raise the Ice Tower or any local ground station on VHF, the failure of the DME to lock on to the TACAN and the lack of any identification of the aircraft on radar.

3.22 The company deleted an earlier requirement for VMC descents to be monitored by radar and substituted the alternative procedure of contacting the radar controller for co-ordination of the descent.

3.23 The failure of the aircraft's systems to establish satisfactory VHF contactor to "lock on" to the McMurdo TACAN was probably due to the aircraft's low altitude in conjunction with significant high ground between the aircraft and the ground equipment.

3.24 The flight engineers endeavoured to monitor the progress of the flight and expressed their dissatisfaction with the descent toward a cloud covered area.

3.25 Although the route selected by Air New Zealand for the approach to McMurdo crossed almost directly over a 12450 ft active volcano just 20 miles from destination in preference to the normal approach path of military aircraft which was across the sea level ice shelf the Air New Zealand route was safe provided the crew observed the minimum altitudes stipulated for the flight and no extraordinary activity occurred in the volcano.

3.26 Despite the shortcomings of some aspects of the route qualification briefing, this flight and Antarctic flights in general were not unacceptably hazardous, if they had been conducted strictly in accordance with the route qualification briefing as presented.

3.27 The CAD procedure of reapproving Antarctic flights each season on the condition that they complied with the constraints of the previous season's flights led to some items being discontinued without formal notification or agreement, e.g. the carriage of 2 captains on each flight, and the requirement for a briefing by ODF Headquarters.

3.28 The on board navigation and flight guidance system operated normally during the latter stages of the flight.

3.29 The aircraft's GPWS operated in accordance with its design specifications.

3.30 CAD had not implemented effectively the section of the ICAO standard detailed in Annex 6 of the convention which requires appropriate life-sustaining equipment to be carried on flights across land areas which have been designated by the State concerned as areas in which search and rescue would be especially difficult. Although the Commander of the USN Antarctic Support Force stated that "limited SAR capability existed over land and very little over water", this may not constitute "designation of the area" as being especially difficult for search and rescue activities by the State concerned.

3.31 Although some notes on Antarctic survival were given to the Chief Purser immediately before this flight no additional life-sustaining equipment was carried or training given to the crew members to facilitate survival following an emergency landing on the ice or in the polar waters of Antarctica.

3.32 Neither the passengers nor the crew were expecting the collision and all received fatal injuries on impact with the ice.

3.33 The search and rescue organisation was mobilised and co-ordinated in a competent manner despite the difficult environment and the aircraft was located as soon as practicable, (11 hours) after the collision occurred.

3.34 The aircraft was not fitted with a self activated ELT but such equipment is not at present required.

3.35 The aircraft's CVR and DFDR operated as intended and provided an excellent record for the investigators of this accident. The CVR system however could be significantly improved as discussed in recommendation 8.

3.36 The aircraft's radar would have depicted the mountainous terrain ahead.

3.37 Probable cause: The probable cause of this accident was the decision of the captain to continue the flight at low level toward an area of poor surface and horizon definition when the crew was not certain of their position and the subsequent inability to detect the rising terrain which intercepted the aircraft's flight path.

4. OBSERVATIONS

4.1 Although the accident would have been avoided if the aircraft had not descended below safety height it was not inevitable until the aircraft reached 1500 feet AMSL on track to McMurdo and maintained a heading toward GRID north. Had the aircraft been turned toward the true north even at that late state and either climbed to safety altitude or the crew pinpointed their position and headed towards lower terrain the accident could still have been averted. This is not to say that such a manoeuvre is in any way condoned. The pilot probably assumed that he would be able to see any and all obstructions clearly with a 2000 foot cloud base and 40 miles visibility below that cloud. It is not likely that the potential whiteout hazard indicated by the reports of horizon and surface definition was appreciated by the crew.

4.2 The operator claimed that "The whole philosophy behind the Air New Zealand Antarctic flights was for crews to avoid a whiteout situation (which has particular significance in a landing context not contemplated as part of the Air New Zealand operation) by remaining strictly VMC throughout the sightseeing part of the flight". It is emphasised that the absence of snow showers and visibility in excess of 20 km would not preclude the possibility of whiteout conditions occurring and affecting the crew's judgement of terrain clearance at any altitude.

5. RECOMMENDATIONS

5.1 The question of the necessity for the carriage of polar survival equipment be resolved before any further Antarctic flights are authorised.

5.2 The route qualification briefing for Antarctic flights be reviewed to ensure it is comprehensive and current.

5.3 No further flight to the Antarctic be approved by CAD until the operator's route qualification briefing has been reviewed

5.4 The co-pilots, flight engineers and the official commentators attend the route qualification briefings in addition to the pilot-in-command.

5.5 Briefing officers be familiar with the details of all routes for which they have the responsibility of providing operational briefing for flight crews and dispatch officers attend the initial briefing for each season's flights.

5.6 All entries into any operator's computer which stores flight plan information be independently checked immediately after they have been entered into the computer.

5.7 The operator discuss what emergency situations could involve an attempt to land at McMurdo's Williams Field and how the approach for such a landing should be made together with a full and up to date brief on the airfield locations, approach aids, Antarctic phenomena, and cabin crews' instructions to passengers.

5.8 Consideration be given to a requirement for all long range air transport aircraft flying over areas where search and rescue is unduly difficult be fitted with an inertia switch operated ELT fitted in the empennage.

5.9 Consideration be given to designing an inertia activated location transmitter or other indicator to be fitted in both the CVR and FDR units of all aircraft fitted with this equipment to assist in the prompt location and recovery of such recorders by the accident investigation team and thus enhance their contribution to the determination of the cause of the accident.

5.10 No descent below MSA be authorised in the Ross Island area unless the aircraft is under continuous radar surveillance.

5.11 For the purposes of flights to the Ross Dependency civilian operators accept the USN and FAA ATC procedures utilised by military aircraft as mandatory and approach McMurdo via the Byrd reporting point.

5.12 The Recommendation in Paragraph 6.3.3. of Part I of Annex 6 of the ICAO Convention on Civil Aviation "International Commercial Air Transport" be adopted by New Zealand as a standard practice. This Recommendation states "After 1 January 1975 all turbine engine aeroplanes of a maximum weight of over 5700 kg (12566 lb) up to and including 27000 kg (59525 lb) that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 should be equipped with a cockpit voice recorder the objective of which is the recording of the aural environment on the flight deck during flight time".

5.13 The CVR circuitry be rearranged to adopt the UK Civil Aviation Authority's "Hot Mike" system. This will enhance the value of the CVR without in any way altering present flight deck procedures and involves no significant expense.

5.14 The latest recommendation of the ICAO Accident Investigation Group to extend the length of the CVR tape to record more than the last 30 minutes of the CVR's operation be implemented as soon as practicable.

5.15 Strenuous efforts continue to ensure that each member of the flight crew is involved in all phases of a flight to utilise their full potential to contribute to the safe conduct of the flight particularly in actively endorsing or criticising the captain's management of the flight.

5.16 No commercial passenger carrying flight be planned to fly over or close to an active volcano.

5.17 Steps be taken to ensure that the number of persons on the flight deck does not exceed the number for which seats are available except in stable cruising flight conditions.

6. REGULATORY

6.1 Pursuant to Regulation 15(1) of the Civil Aviation (Accident Investigation) Regulations 1978, the legal representatives of the pilot-in-command, the co-pilot at the time of the accident, the operator and the Civil Aviation Division of the Ministry of Transport, were invited to avail themselves of the opportunities afforded them thereunder.

6.2 All parties presented written submissions and within the constraints of Regulation 15(3) these submissions were considered by the Chief Inspector of Air Accidents and the report was expanded and amended to incorporate relevant factual detail which was presented and to amplify areas which were considered ambiguous.

6.3 These submissions are not to be taken as an admission of liability of any kind on the part of the pilots, the operator or CAD and are without prejudice to their right to act as they think fit in any action or proceedings which may be based on the events to which the report refers. The provisions of Regulation 15(1) and 15(3) are accordingly deemed to have been fulfilled.

7. RECOGNITION

7.1 I wish to draw to the attention of all those who read this report that this investigation was only made practicable by the unselfish individual personal co-operation of all those members of the U.S. Navy, USAF, U.S. National Science Foundation, DSIR, RNZAF, N.Z. Police, the various Post Office staff, Department of Lands & Survey surveyors, N.Z. Meteorological Service meteorologists and all other N.Z. Government staff and private individuals at Scott Base, and the safety team of N.Z. mountaineers. Thanks are also due to those members of the investigating teams from the NTSB, FAA, McDonnell-Douglas Corporation, General Electric Co., U.K. Accidents Investigation Branch and Air New Zealand Limited who worked with no less effort or co-operation than the supporting personnel.

R. Chippindale
30 May 1980 Chief Inspector Air Accidents