
Airspace incident between ATR 72-212 ZK-MCC and Boeing 737-219 ZK-NAT, Queenstown control zone, 26 July 1999

Micro-summary: This Boeing 767 was flying a circling approach when an arriving ATR 72 entered the zone, infringing separation requirements.

Event Date: 1999-07-26 at 1250 NZST

Investigative Body: Transport Accident Investigation Commission (TAIC), New Zealand

Investigative Body's Web Site: <http://www.taic.org.nz/>

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Report 99-005

ATR 72-212 ZK-MCC and Boeing 737-219 ZK-NAT

airspace incident

Queenstown control zone

26 July 1999

Abstract

On Monday 26 July 1999 at about 1250 hours, an Air New Zealand Boeing 737 was flying a circling instrument approach in the Queenstown Control Zone when a Mount Cook ATR 72 entered the zone without a clearance, infringing the separation requirements for the 2 aircraft.

The ATR 72 had descended early and was joining Queenstown under visual flight rules via Kawarau Gorge at low-level in poor weather. Before entering the gorge, the ATR 72 had been advised by air traffic control of a possible requirement to hold at a reporting point on the edge of the control zone. Committed to continue flying through the gorge in deteriorating weather, the ATR 72 was unable to hold at the reporting point when later instructed to. The crew of the ATR 72 had continued through the gorge in the belief that they did not need to obtain an entry clearance into the control zone.

Having entered the control zone the ATR 72 compromised the circling approach of the Boeing 737 that was operating in accordance with normal instrument flight rules procedures. The controller was initially unsure of the location and intended flight path of the Boeing 737, and when both aircraft were established in the zone he was left with little option than to position the ATR 72 in front of the Boeing 737. The captain of the Boeing 737 was then committed to continuing towards the aerodrome in reducing visibility because the ATR 72 had obstructed its primary escape route to the south of the aerodrome.

Safety issues identified were:

- the ATR 72 entering a control zone without an entry clearance
- safety procedures for flying through Kawarau Gorge
- a general poor industry understanding of the requirements for flight under special visual flight rules
- position reporting by aircraft after becoming visual on the instrument approach
- flight under visual flight rules by medium and large air transport aircraft
- poor industry understanding of the management of general aviation areas within the Queenstown Control Zone.

Recommendations were made to the operators of both aircraft, the director of Civil Aviation and the chief executive of Airways Corporation to address the safety issues.

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List of Abbreviations

agl	above ground level
amsl	above mean sea level
ATC	air traffic control
ATR 72	ATR 72-212
ATS	air traffic service
B737	Boeing 737
CAA	Civil Aviation Authority
CARs	Civil Aviation Rules
CTA	control area
CTR	control zone
GAA	general aviation area
GST	Goods and Services Tax
HF	high frequency
hPa	hectoPascal
IFR	instrument flight rules
km	kilometres
kts	knots
m	metres
MDA	minimum descent altitude
MHz	megaHertz
nm	nautical miles
NZAIP	New Zealand Aeronautical Information Publication
NZST	New Zealand Standard Time (UTC + 12 hours)
SPECI	special weather report
TAF	aerodrome forecast
TMA	terminal control area
UTC	Co-ordinated Universal Time
VFR	visual flight rules
VHF	very high frequency
VOR/DME	very high frequency omni-directional radio range/distance measuring equipment

Aviation Incident Report 99-005

Data Summary

Aircraft types, flight numbers and registrations:	ATR 72-212, NZM 5001, ZK-MCC, and Boeing 737-219, NZ 639, ZK-NAT
Date and time:	26 July 1999, 1250 hours ¹
Location:	Queenstown control zone
Types of flight:	scheduled passenger transport
Persons on board:	crew: NZM 1: 4 NZ 639: 6 passengers: NZM 1: 40 NZ 639: 65
Injuries:	nil
Nature of damage:	nil
Investigator-in-Charge:	I R M ^c Clelland

¹ All times in this report are in NZST (UTC + 12).

1. Factual Information

1.1 History of the flights

- 1.1.1 On Monday 26 July 1999 at about 1030 hours, ZK-NAT, an Air New Zealand Boeing 737-219 (B737) operating as NZ 639, departed Auckland on a scheduled service to Queenstown. The flight to Queenstown was being flown under instrument flight rules (IFR) procedures and was planned to take nearly 2 hours. On board the aircraft were the captain, first officer, 4 flight attendants and 65 passengers. The captain was the designated flying pilot because company procedures prohibited the first officer from flying into or out of Queenstown.
- 1.1.2 Before departing from Auckland the captain received several updates on the weather en-route and at Queenstown. The captain also telephoned the air traffic service (ATS) staff at Queenstown on at least 2 occasions prior to departure to gain a more accurate picture of the Queenstown weather. The cloud base was reported as 5000 to 6000 feet with passing snow-showers about every 15 to 20 minutes, with good visibility between the showers. Owing to the fluctuating nature of the weather, the captain elected to carry sufficient fuel for 30 minutes' holding and 2 approaches at Queenstown, plus diversion and one approach at Invercargill and final diversion to Christchurch, should that be necessary.
- 1.1.3 While NZ 639 was en-route to Queenstown, the Air New Zealand Airline Operations Centre at Christchurch contacted the aircraft captain and advised him of a recently issued Queenstown SPECI² weather report. The centre recommended the flight divert to Christchurch. The captain, being aware that weather conditions were fluctuating, elected to continue to Queenstown.
- 1.1.4 At 1156 hours, with about 100 nautical miles (nm) to fly to Queenstown, the first officer of New Zealand 639 contacted Queenstown Information (Information) on 128.0 megaHertz (MHz) and requested the latest weather conditions. These were passed as: "runway 23, wind 190° 10 knots [kts], visibility generally 15 km with intermittent light snow-showers. Heavier showers appear to be approaching from southeast ... 3 oktas³ of stratus stratoform at around 2200 feet ... main base is a stratocu layer approximately 5000 feet ... temperature is 2° with the QNH⁴ 1002. Forecast 2000 foot wind 200° at 30 kts". Information also informed NZ 639 that 2 previous inbound jet aircraft had become visual at about 3 nm on the very high frequency omni-directional radio range/distance measuring equipment (VOR/DME) Bravo instrument approach.
- 1.1.5 By 1208 hours NZ 639 had commenced descent to Queenstown and was cleared by Queenstown Tower (Tower), through Information, to join the 15 nm VOR/DME arc for the Bravo approach circling for runway 23. A slight deterioration in weather was reported by Information. Once established on the arc the first officer changed to the Tower frequency of 118.1 MHz. The aerodrome controller manning the Tower position confirmed there had been no further change in the weather since the last report and advised that the visibility towards Bungy Bridge visual reporting point (see Figure 1) was 8 km, but better towards Lake Hayes with 10 to 15 km. To the south of the aerodrome and over Lake Wakatipu there was a solid main cloud base between 2500 and 3000 feet above ground level (agl).

² An aerodrome special weather report.

³ A measure of cloud cover in eighths.

⁴ An altimeter subscale setting to obtain altitude above mean sea level.

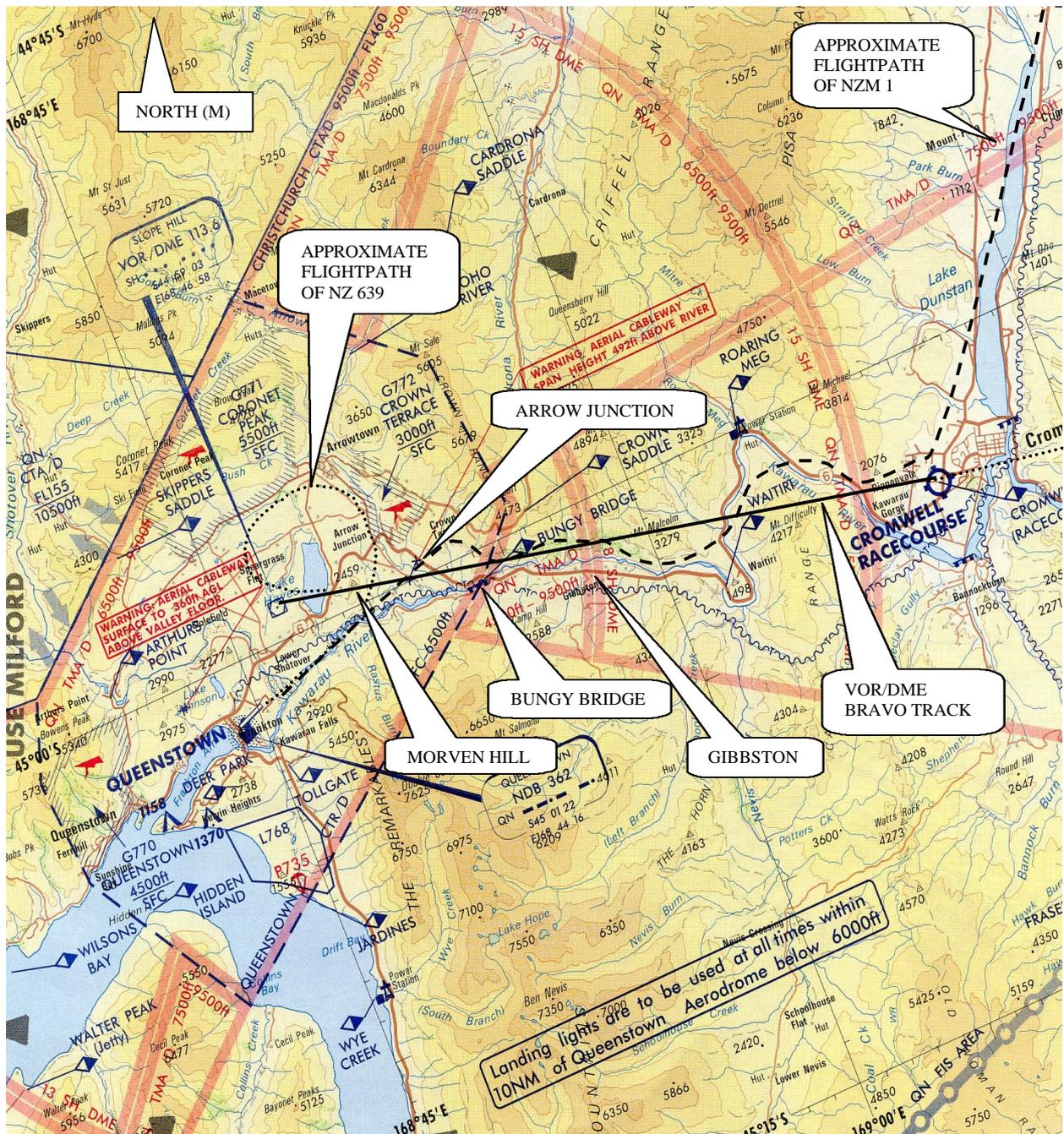


Figure 1
Queenstown Visual Terminal Chart
effective 15 July 1999 (not to scale)

(Reproduced by permission of Airways Corporation of New Zealand Limited)

- 1.1.6 At 1215 hours NZ 639 turned inbound from the arc and commenced the VOR/DME Bravo approach (see Figure 2). Because of the weight of the aircraft and its requirement to meet the necessary missed approach criteria the minimum descent altitude (MDA)⁵ for the approach was increased by 600 feet to 4800 feet. At 4800 feet the captain of NZ 639 was unable to gain the necessary visual reference⁶ and commenced the missed approach procedure at about 1220 hours.
- 1.1.7 Completing the missed approach procedure, the aircraft returned to the VOR/DME beacon prior to entering the Cromwell holding pattern at 10 000 feet. After some discussion between the 2 pilots and the controller, the first officer advised that NZ 639 would remain in the holding pattern and wait for an improvement in the weather before attempting a second approach. A rostered change of aerodrome controller took place over this time with the replacement controller being briefed on the situation.
- 1.1.8 On the same morning Mount Cook Airline ATR 72-212 (ATR 72) ZK-MCC, operating as Mount Cook 5001 (NZM 1), was flying a scheduled service from Christchurch to Queenstown. On board the aircraft were the captain, first officer, 2 flight attendants and 40 passengers. The flight was the crew's second trip of the day into Queenstown, having flown there some 3 hours earlier in the same aircraft using the flight identification Mount Cook 5037 (NZM 37). The captain had flown the first 2 legs to Queenstown and return, and the first officer was the designated flying pilot for NZM 1.
- 1.1.9 The weather on the earlier flight to Queenstown had been reported as passing snow-showers with a scattered⁷ cloud base at about 1500 feet agl, patches higher and a main base of around 6000 feet agl. A second company ATR 72, ZK-MCY, had been unable to depart Queenstown the previous evening owing to the weather. In the morning the captain of ZK-MCY again delayed his departure as he wished to check with the captain of NZM 37 on the weather conditions before departing Queenstown.
- 1.1.10 At about Tarras, an improvement in the weather had permitted the captain of NZM 37 to cancel the IFR portion of the flight plan with Tower and continue under visual flight rules (VFR) to Queenstown. On cancelling the IFR flight Tower cleared NZM 37 to "track via Cromwell, Bungy Bridge for straight-in runway 23" (see Figure 1). The first officer read back this clearance. As NZM 37 passed through Kawarau Gorge the first officer reported the weather as being "a bit mucky through from Roaring Meg through to Bungy Bridge". NZM 37 then reported at "Bungy Bridge now and joining straight-in for 23, if that's OK". Tower agreed and cleared the aircraft to land.
- 1.1.11 After about 30 minutes on the ground NZM 37 had departed from Queenstown following the IFR departure procedure and returned to Christchurch without incident. The second ATR 72, ZK-MCY, followed NZM 37 to Christchurch. At Christchurch ZK-MCC, now operating as NZM 1, was refuelled and departed under IFR for the second trip to Queenstown at about 1155 hours.

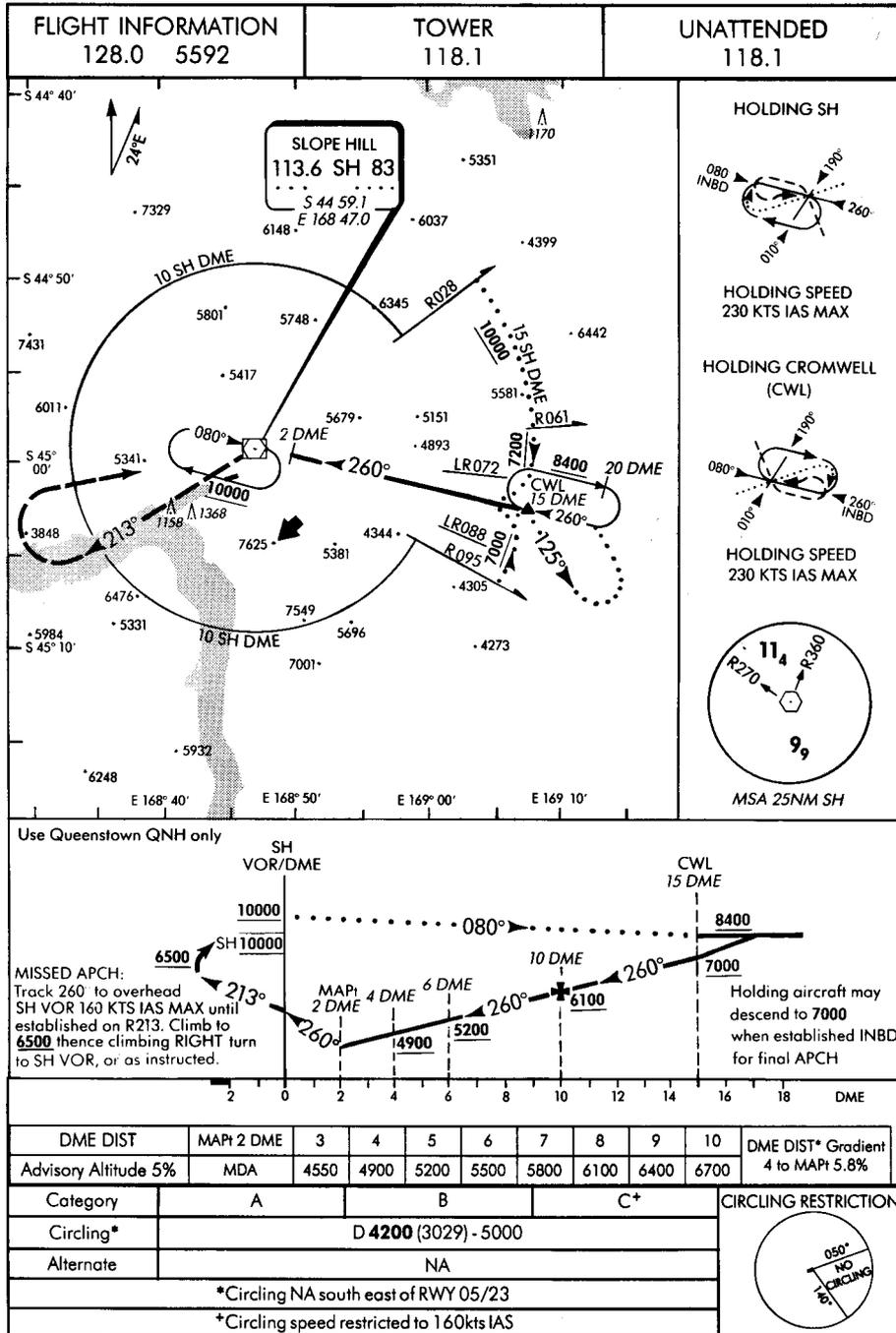
⁵ The minimum altitude an aircraft may descend to unless meeting visual reference requirements. Normally expressed as feet above mean sea level.

⁶ The pilot is able to fly the aircraft by continuous reference to terrain (land or water).

⁷ 3 to 4 oktas of cloud.

QUEENSTOWN
VOR/DME BRAVO

ELEVATION 1171



QUEENSTOWN

113.6 SH 83
... ..

VOR/DME BRAVO

15 SEP 94

Figure 2
Queenstown VOR/DME Bravo Approach Chart
Effective 15 September 1999

(Reproduced by permission of Airways Corporation of New Zealand Limited)

Note: The approach chart used by Air New Zealand crews included missed approach altitude data based on aircraft weight.

- 1.1.12 At 1227 hours, the captain of NZM 1, flying at flight level 160⁸, contacted Information when about 80 nm north of Queenstown. Although still maintaining primary communications with Christchurch Control, it was company practice to call Queenstown at this point to obtain the latest aerodrome conditions. Information reported the conditions as "... no approaches at the moment very good, just a temporary deterioration in the weather. Visibility generally 3 to 5 ks [km] in heavy snow and a scattered layer 1500 feet and a broken⁹ layer 5500 to 6000 [feet]. Temperature 1° - QNH 1002. Forecast 2000 foot wind 200° 12 kts". The captain acknowledged the report and confirmed their estimated time of arrival at the Slope Hill VOR as 1244 hours. He also advised that he would call "closer in" and asked if there had been any breaks in the cloud. Information responded, saying there had been the odd break and that NZ 639 had completed a missed approach 5 minutes previously and was holding at Cromwell. Further, the "conditions had deteriorated in the last 10 minutes or so but it has been coming and going quite a bit". The temperature was dropping and snow was starting to form on the ground towards the entrance to Kawarau Gorge. At 1230 hours the NZ 639 first officer reported to Tower that NZ 639 was entering the Cromwell holding pattern at 10 000 feet.
- 1.1.13 As NZM 1 approached Lindis Pass, Cromwell was visible to the pilots, indicating to them an improvement in the weather conditions since the morning flight. At 1232 hours the captain advised Information that they were considering joining via the gorge approach as per the morning flight. Information responded by reporting that there was a slight improvement in the visibility and cloud base at Queenstown. The captain acknowledged and replied that he would call when they had "contact with the Boeing".
- 1.1.14 Taking into consideration the cloud cover over the Queenstown area and the recent missed approach by NZ 639, the pilots of NZM 1 believed that the best chance of landing at Queenstown was to join under VFR via Kawarau Gorge. At about 1233 hours, while still in Christchurch control area (CTA) class E airspace, the captain of NZM 1 cancelled IFR flight with Christchurch Control. NZM 1 was then cleared to continue under VFR towards Lake Dunstan and Cromwell, descending through Christchurch CTA and Queenstown terminal control area (TMA) class D airspace¹⁰, into uncontrolled class G airspace below. The captain of NZM 1 acknowledged the clearance.
- 1.1.15 At 1237 hours the captain of NZM 1 reported to Information that NZM 1 was passing Tarras at 8700 feet and tracking towards Cromwell. Information acknowledged the call and advised that NZ 639 was in the Cromwell holding pattern and would be commencing a second VOR/DME Bravo approach in 3 to 4 minutes. The flight service specialist noted the visibility to the south of Queenstown had increased to 10 km and passed this information on to NZM 1. The captain of NZM 1 acknowledged and advised they would "be clear of the approach, the Bravo approach at all times". At about the same time Tower informed NZ 639 that there was an ATR 72 "tracking VFR towards the Cromwell Gorge" and would be joining Queenstown via Kawarau Gorge. Able to see some weather over the western end of Kawarau Gorge, the captain of NZ 639 expressed doubt to the first officer about the ATR 72 being able to get through to Queenstown under VFR. Nevertheless, the pilots of NZ 639 believed that the B737 with its faster speed would, by the time they completed the approach, be well ahead of the ATR 72.
- 1.1.16 At 1239 hours Tower cleared NZ 639 for the VOR/DME Bravo approach circling for runway 23 and advised there was still heavy snow activity around Slope Hill and Lake Hayes, but visibility was improving towards the Bungy Bridge area. The first officer acknowledged and reported NZ 639 was turning inbound on the approach.

⁸ 16 000 feet approximately.

⁹ 5 to 7 oktas of cloud

¹⁰ CTAs and TMAs are defined areas of controlled airspace within which an air traffic control service is provided for flights in accordance with the airspace classification.

- 1.1.17 At 1241 hours Information requested the position of NZM 1. The captain reported at “the Cromwell airfield at 5000 [feet]”. Information advised NZM 1 that NZ 639 had started the Bravo approach and “possible requirement to hold at Bungy Bridge depending on whether the Boeing breaks visual or not”. The captain of NZM 1 acknowledged the radio call. At about this time the pilots of NZM 1 saw NZ 639 about 3 nm ahead and inbound on the instrument approach.
- 1.1.18 Bungy Bridge was a visual reporting point on the eastern edge of the Queenstown control zone (CTR)¹¹. The location was defined as the site of an historic suspension bridge near the western end of Kawarau Gorge. The pilots of NZM 1 later reported that the possible requirement to hold at Bungy Bridge generated little discussion in the cockpit. The pilots believed that NZ 639 would either have completed the instrument approach or have commenced a missed approach and be well clear by the time NZM 1 entered the CTR. Regardless, the captain of NZM 1 considered the 3 nm spacing to be adequate and, while he could have increased the separation, he was concerned about the next squall coming through.
- 1.1.19 Passing abeam Lake Dunstan, the pilots of NZM 1 were able to see Nevis Bluff. NZM 1 then entered Kawarau Gorge in a descending right-hand turn, tracking a little to the north of Cromwell. Passing Roaring Meg reporting point the aircraft was slowed, landing lights turned on and initial approach flap extended. At 1244 hours, in response to a position and level request from Information, the captain of NZM 1 reported “Nevis Bluff at 2600 [feet]”. Information advised that visibility towards Bungy Bridge (from the tower) was at least 10 to 15 km. The captain of NZM 1 acknowledged and stated that NZ 639 “was ahead but we’ve lost him now”.
- 1.1.20 As NZM 1 approached Gibbston at 2500 feet and about 140 kts, the first officer manoeuvred the aircraft to the north side of the gorge to position for flying through the narrow section of the gorge at Bungy Bridge and to remain clear of cloud on the south side. Visibility towards Bungy Bridge was noted by the pilots to be reducing with some cloud lying across the exit of the gorge. Both pilots, however, assessed the conditions to be adequate and decided that NZM 1 could safely get through the gorge and into the Queenstown basin area.
- 1.1.21 At the time NZM 1 was entering the Gibbston area, the aerodrome controller noted a deterioration in the weather to the south of the aerodrome with visibility estimated to be reducing below VFR minima. Before requesting a position report from NZ 639, the aerodrome controller asked the flight service specialist to get an updated position on NZM 1. At 1246 hours, in response to the almost simultaneous position requests from Tower and Information to each aircraft, the NZ 639 first officer reported “5 miles” from Slope Hill and the captain of NZM 1 advised “just one km to Bungy Bridge 2400 [feet]”. Neither the aerodrome controller nor the flight service specialist mentioned the deterioration in the weather to the south of the aerodrome.
- 1.1.22 About 30 seconds after reporting their position, the captain of NZM 1 reported “Bungy Bridge and if it’s not any problem we can circle out towards Arrowtown”. The aerodrome controller overheard this transmission and instructed the flight service specialist to advise NZM 1 to hold at Bungy Bridge. The flight service specialist passed the instruction as, “Mount Cook One at this stage hold at Bungy Bridge thanks”. The captain responded saying “we’ll track across towards Arrowtown; we can’t hold at Bungy Bridge”. From Bungy Bridge the captain of NZM 1 noted some weather towards Queenstown but both the pilots were able to see Arrowtown and believed this was the best area to hold clear of the final approach path for runway 23. The captain of NZM 1 anticipated that if NZ 639 became visual it was more likely the aircraft would make a slight right turn before turning left back towards the aerodrome to join on a close right base for runway 23. Information instructed NZM 1 to change to Tower on 118.1 MHz.

¹¹ A CTR is a defined area of airspace about an aerodrome where flights are provided with an air traffic control service.

- 1.1.23 NZ 639 had become visual at about 4800 feet and 3.9 nm from Slope Hill VOR/DME. With good visibility to the right towards Arrowtown, estimated by the captain to be 20 to 30 km, but reducing to about 15 km towards Queenstown, he elected to enter a descending turn to the right and track inside of Arrowtown to position for landing. The pilots of NZ 639 did not report their intentions to Queenstown Tower at that time. The captain started configuring the aircraft for final approach as he approached Arrowtown and turned through a north-easterly heading. Continuing the right turn the captain noted that snow-showers had suddenly appeared over the Queenstown Aerodrome area and that visibility was rapidly reducing.
- 1.1.24 After NZM 1 reported on 118.1 MHz, the controller instructed the aircraft to “make straight-in approach runway 23” and advise its passing level. The captain replied that NZM 1 was 2200 feet at Arrow Junction and asked for the position of the Boeing. Unable to see NZ 639 due to the reduced visibility towards Slope Hill, the controller replied “just about on the missed approach or either visual circling for 23 very shortly”. The captain of NZM 1 then advised “OK we can stay out of his way if it’s a problem”. The controller responded by saying, “I don’t know where he’s going to circle yet”. At this time, about 1249 hours, NZ 639 reported “over the northern edge of Lake Hayes circling right-hand for 23”. (According to later information, this position was approximate and NZ 639 was about 1½nm further to the north.) Tower then instructed NZ 639 to continue the right-hand turn and track east of Morven Hill, joining via a long final approach for runway 23.
- 1.1.25 Tower confirmed NZM 1 as number one straight-in for runway 23. The captain of NZM 1 acknowledged the instruction and the first officer flew the aircraft directly towards the aerodrome, passing east of Morven Hill. In response to a request for weather conditions from NZ 639, the controller reported the visibility from the control tower to be generally 5 to 6 km, reducing to 2 km to the south and west and towards the over-shoot or go-around area for runway 23.
- 1.1.26 Turning onto a long final approach for runway 23 the pilots of NZ 639 could not see NZM 1 ahead but were able to use the various ground features to navigate their way to the aerodrome. The captain of NZ 639 was now concerned that the go-around area and his primary escape route to the south-west, should he need to use it, was obstructed by a slower aircraft that he could not see in the deteriorating weather. At about this time the captain of NZM 1 reported on a “shortish final for 23”, after which Tower cleared the aircraft to land. The controller saw NZM 1 on about a ¾nm final.
- 1.1.27 Passing Little Morven Hill, to the south-west of Morven Hill, the pilots of NZ 639 were still not able to see the runway but did have visual reference with Lake Hayes and The Remarkables. To give an updated position to NZ 639, NZM 1 reported “clearing” as the aircraft approached the taxiway turnoff. In poor visibility, estimated by the captain to be about 3 km, NZ 639 landed safely about one minute after NZM 1. At no stage when NZM 1 or NZ 639 were flying in the CTR did the pilots of either aircraft see the other aircraft.

1.2 Meteorological information

- 1.2.1 The weather situation and general forecast issued by the Meteorological Service of New Zealand on Monday 26 July 1999 at 0454 hours and valid for the period 0400 to 1800 hours, are summarised as follows:

Situation: An active trough of low pressure over the lower South Island is expected to move north-east to lie about Cook Strait by afternoon.

Area forecast: Scattered hail-showers, scattered inland snow-showers, spreading north during the morning and afternoon. Areas of broken cumulus and stratocumulus 2500 feet, tops above 10 000 feet, spreading north during the morning and afternoon. Isolated embedded cumulonimbus 2000 feet, tops 22 000 feet, chiefly about coastal areas. Visibility 30 km reducing to 4000 metres (m) in hail and snow-showers, and 6000 m in showers and rain. Occasional moderate turbulence below 12 000 feet.

- 1.2.2 The weather situation and forecast were updated at 1256 hours, shortly after the incident, and included the following:

The south-westerly flow over the South Island continues to build. The unstable airmass should continue to produce moderate to heavy showers with snow and hail throughout the forecast period.

- 1.2.3 The amended aerodrome forecast (TAF) for Queenstown, issued at 1053 hours and valid from 1000 hours until midnight, is summarised as follows:

Surface wind: 210° true, 15 kts, gusts 25 kts.
Visibility: 15 km.
Weather: Light showers and snow.
Cloud: Scattered 1500 feet, scattered 4000 feet, broken 6000 feet.
Temporary¹², between 1000 and 1200 hours: Visibility 1000 m in snow, cloud broken at 1000 feet.
Temporary, between 1200 hours and midnight: Visibility 4000 m, showers and snow, cloud broken at 4000 feet.
2000 foot wind: 220° true, 30 kts.

- 1.2.4 During the morning some 7 SPECI weather reports were issued for Queenstown. The latest SPECI, current at the time of the incident and issued at 1151 hours, reported the surface wind as 180° true at 11 kts, visibility 8000 m, light showers and snow, scattered cloud at 2200 feet, overcast at 5500 feet, temperature 2°C, dew point -2°C, QNH 1012 hectoPascals (hPa).

- 1.2.5 A second SPECI issued at 1251 hours, shortly after the incident and about the time NZ 639 landed, contained the following: Surface wind 210° true at 9 kts, wind variable between 160 and 280° true, visibility 3000 m, snow, cloud scattered at 2000 feet, overcast at 5500 feet, temperature 1°C, dew point -2°C, QNH 1012 hPa.

Note: The height of the cloud for TAFs and SPECIs was reported as above aerodrome level.

¹² Changes expected to last for a period of less than one hour, and changes take place sufficiently infrequently for the prevailing conditions to remain those reported.

1.3 Aids to navigation

- 1.3.1 The Queenstown VOR/DME instrument approaches, first published in April 1994, were both circling¹³ type approaches. The VOR/DME Bravo had an MDA of 4200 feet and visibility requirement of 5000 m or greater. However, the MDA was often raised by operators to ensure the missed approach performance criteria could be achieved by certain aircraft types, including the B737 and ATR 72.
- 1.3.2 In the initial development of the VOR/DME Bravo approach by Airways Corporation, consideration was given to having lower DME steps, down to 5000 feet at about 10 nm to fly to the missed approach point. This would have enabled pilots to get lower earlier and obtain a better appreciation of the conditions on entering the Queenstown basin. Nevertheless, several operators, including Mount Cook Airline, objected to the proposal because this would have required lowering the TMA to control and protect IFR aircraft on approach, resulting in restricted access for low-level VFR transits of the Kawarau Gorge area.
- 1.3.3 For the Queenstown VOR/DME Bravo approach, pilots were required to descend at least 3000 feet from the MDA before landing. Pilots could only descend below MDA provided: they had continuous visual reference with the ground; that visibility was equal to or greater than that prescribed for the procedure; and they were satisfied that a landing could be made using normal manoeuvres and descent rates. In addition to these requirements, Civil Aviation Rules (CARs)¹⁴ also required that some visual reference associated with the runway or approach lighting system be distinctly visible and identifiable to the pilot. These requirements were also contained in the New Zealand Aeronautical Information Publication (NZAIP) Planning Manual¹⁵, which was a pilot's normal planning and reference document.
- 1.3.4 There were no additional restrictions imposed on the flight-path selected by the pilot after descending below MDA, provided the visual reference requirements were maintained. The route taken was at the discretion of the pilot. For the VOR/DME Bravo approach, pilots were observed by air traffic control (ATC) to take a variety of routes to position for landing on runway 23. The flight-path often depended on when visual reference was obtained and the weather conditions at that time. For runway 23, many pilots would initially turn to the right before reversing left and joining on a close right base; others would continue the right turn and position on a long final approach.
- 1.3.5 For all instrument approaches, unless otherwise instructed by ATC, the pilot of an aircraft was required to report at specified positions during the approach. For VOR/DME type approaches, such as the Queenstown Bravo approach, the pilot was required to report when established on the arc, turning inbound and as soon as visual reference was gained, or alternatively when commencing a missed approach procedure. For circling type approaches, the pilot was also to advise ATC when encountering "visual reference as soon as practicable"¹⁶. After becoming visual an aircraft remained under IFR for the purpose of providing separation until the aircraft had landed. At Queenstown the visual report by the pilots was often delayed until the aircraft was well past the missed approach point and passing Lake Hayes, joining on the base turn or established on final approach.

¹³ An instrument approach where the inbound track is not aligned with the designated runway and where the aircraft is required to be manoeuvred significantly to position for landing.

¹⁴ CAR 91.413 (c) (3), effective 15 July 1999.

¹⁵ NZAIP Planning Manual, Operations section, pages 128 and 129, effective 24 April 1997.

¹⁶ NZAIP Planning Manual, Operations section, page 95, effective 5 November 1998.

1.4 Communications

- 1.4.1 Three Queenstown very high frequency (VHF) channels were in use on the day of the incident: Queenstown Information -128.0 MHz, Queenstown Tower -118.1 MHz and Queenstown Ground on 121.9 MHz. Normal practice was for the information and ground frequencies to be operated by the same person. The Queenstown TMA and CTR were both controlled by the aerodrome controller on 118.1 MHz.
- 1.4.2 An ATS tape recording of radio communications on 128.0 and 118.1 MHz was available of the earlier flight into Queenstown by the crew of NZM 37 and for the period from 1156 hours, when NZ 639 first called Information, to the time both aircraft had landed. Additional recordings were available covering communications between NZM 1 and Christchurch Control, and between the Christchurch Control and Queenstown Aerodrome controllers.
- 1.4.3 Regular scheduled IFR air transport aircraft joining for Queenstown Aerodrome would normally contact Information before entering the Queenstown TMA. The purpose of the call was to get an update on the local conditions to be able to brief passengers, determine the best way to approach Queenstown or commence an early diversion to the alternate aerodrome if required. The installation of a 128.0 MHz radio transmitter/receiver on The Remarkables range provided good VHF coverage around Queenstown and the adjacent areas. This was the primary means by which low-level VFR aircraft would maintain communications, including during transit of Kawarau Gorge. However, aircraft flying through Kawarau Gorge to Cardrona Valley were not required to talk to ATC and their presence would often remain unknown to Queenstown ATS.
- 1.4.4 The location of the 118.1 MHz radio transmitter/receivers, one on the control tower and a second on Slope Hill, provided limited coverage through Kawarau Gorge. Low-level aircraft were unable to contact Tower until west of about Waitiri visual reporting point. At the time of the incident, approval was being obtained to re-locate one of the 118.1 MHz transmitters to Coronet Peak, thereby giving Tower extended coverage within both the CTR and the Kawarau Gorge area.
- 1.4.5 The aerodrome controller and flight service specialist sat next to each other and were able to talk without hindrance. Common practice was for the aerodrome controller to pass instructions to the flight service specialist for onwards transmission to aircraft operating on 128.0 or 121.9 MHz. On 26 July 1999, the aerodrome controller and flight service specialist were aware of the coincidental arrivals of NZ 639 and NZM 1. Together they discussed the situation, the aerodrome controller instructing the flight service specialist to advise NZM 1 of the possible requirement to hold at Bungy Bridge. The subsequent requirement to hold at Bungy Bridge was likewise instructed by the aerodrome controller and relayed to NZM 1 by the flight service specialist. The flight service specialist did not include in his transmissions to NZM 1 the identity under which the holding warning and instructions were issued.
- 1.4.6 Neither the crew of NZ 639 nor NZM 1 heard any transmissions from the other aircraft until NZM 1 had changed to 118.1 MHz after passing Bungy Bridge. Queenstown Tower was not equipped with a re-transmit facility, allowing transmissions on 128.0 MHz to be heard simultaneously on 118.1 MHz.

1.5 Aerodrome and airspace information

- 1.5.1 In 1993 a safety review of operations in the Queenstown area was carried out by the Civil Aviation Authority (CAA) and a report published in June of that year. The review foreshadowed the establishment of the Queenstown CTR and TMA and the two VOR/DME approaches. The safety review noted that some operators, mainly local, opposed the introduction of ATC services in Queenstown. The pilots of locally based fixed and rotary wing aircraft had developed over the years informal procedures for separating aircraft. These procedures relied on the skill and

judgement of the pilots who regularly used Queenstown Aerodrome, but were considered by CAA to be “potentially hazardous”. Several operators, including Mount Cook Airline, believed that the introduction of ATC would not improve safety but would result in delays for local VFR flights, with the need to protect the larger IFR jet aircraft that were planned to fly regular services to Queenstown Aerodrome.

- 1.5.2 To address concerns over possible delays, VFR entry and exit routes and procedures were established. Where practicable these new routes and procedures followed those traditionally flown by VFR traffic. Further, 3 local general aviation areas (GAAs) were also established in an effort to identify and contain activities such as parapenting and hang-gliding. The GAAs, G770, G771 and G772 (see Figure 1), were each located within the Queenstown CTR and designated as active during daylight hours, for the purpose of facilitating VFR operations. Queenstown GAA users did not require the approval of, or communication with, ATC before operating in the areas, but any radio communications were to be on the Queenstown Tower frequency of 118.1 MHz. Because of the GAAs’ distance from Queenstown Tower and some intervening terrain, controllers could not always confirm when the areas were being used. G772 was located on the Crown Terrace in a direct line between Bungy Bridge and Arrowtown, extending from the surface to 3000 feet above mean sea level (amsl) or up to about 1700 feet agl.
- 1.5.3 On the day of the incident the captain of NZM 1 believed that owing to the poor weather conditions there would be no activity in G772. He was therefore content to fly through the area towards Arrowtown.
- 1.5.4 Contained within the recommendations of the safety review was the need for consultation in the development of “procedures for flights transiting the Cromwell and Kawarau Gorges”. The flight or route guides for Air New Zealand, Ansett New Zealand and Mount Cook Airline all contained information for VFR flights into Queenstown. The guides for the latter 2 airlines also detailed procedures for the transiting of Kawarau Gorge by their respective company aircraft. Queenstown ATS staff had access to some company procedures, specifically the instrument approach and missed approach procedures for jet-engine aircraft, but not those procedures relevant to Kawarau Gorge. Some general procedures for VFR arrivals at and departures from Queenstown were contained in the NZAIP Visual Flight Guide, but no specific air traffic procedures for the management of aircraft transiting the gorge from and into the Queenstown CTR had been developed.
- 1.5.5 In 1994 a new control tower was built, giving the aerodrome and ground controllers an improved view of the airfield and environs. However, views of the entrance to Kawarau Gorge continued to be obstructed by a bluff extending westward from The Remarkables range. Slope Hill, where the VOR/DME beacons were located, could be seen from the control tower. Aerodrome controllers could see aircraft completing the VOR/DME approaches only when there was good visibility combined with high or no cloud.
- 1.5.6 The Queenstown CTR was classified as class D airspace and an entry clearance was required before an aircraft could enter the CTR. In determining the initial classification of the CTR, class D was considered the preferred classification as this permitted greater flexibility when co-ordinating coincidental arrivals and departures for IFR and VFR aircraft. The alternative, class C, would have required increased levels of control such as issuing separation instructions rather than just providing traffic information. The NZAIP Instrument Flight Guide required ATS to be in attendance for Category B and C IFR approaches and departures at Queenstown¹⁷.
- 1.5.7 When operating within a class D CTR below 10 000 feet amsl the meteorological minima for VFR operations required the aircraft to remain at least 500 feet vertically and 2 km horizontally from cloud and the visibility to be not less than 5 km. The 500 feet vertical separation from

¹⁷ NZAIP Instrument Flight Guide, Queenstown Arrival/Departure page, effective 15 July 1999.

cloud, previously 1000 feet, was changed in July 1999. When the weather conditions reduced below any of these minima an aircraft could continue flying subject to gaining an ATC clearance to operate as special VFR. Outside of a CTR the 1000 feet vertical separation from cloud continued to be effective for operations in controlled airspace.

- 1.5.8 Special VFR was permitted only in CTRs. CARs¹⁸ stated that VFR minima at aerodromes¹⁹ within a control zone required a cloud ceiling²⁰ of not below 1500 ft and a visibility of not below 5 km. The NZAIP Planning Manual, Operations section²¹ expanded on the above table by defining the minima as being applicable to aircraft taking off, landing or flying “in the vicinity of an aerodrome”²² in a control zone. No minimum distances from cloud were stipulated for operating under special VFR. A pilot or aerodrome controller could initiate the intention to operate in accordance with the provisions of special VFR.
- 1.5.9 In class D airspace ATC was required to provide separation between all IFR aircraft. Separation was not provided between IFR and VFR flights when mutual traffic information had been passed. After issuing a clearance for an aircraft to operate as special VFR, ATC was then required to provide separation between IFR and special VFR aircraft, and between special VFR and other special VFR aircraft when the visibility reduced to below 5 km. This provided added levels of safety in poor weather conditions.
- 1.5.10 Regardless of separation requirements, an ATC service was provided for the purpose of preventing collisions and maintaining an orderly flow of traffic²³. In the interests of safety the aerodrome controller was able to suspend all VFR operations within a control zone.²⁴
- 1.5.11 Meteorological minima for operations in uncontrolled class G airspace varied, depending on aircraft altitude amsl or height above the local terrain. When above 3000 feet amsl or 1000 feet agl, whichever was the higher, VFR operations required a minimum of 5 km visibility and a 1000 feet vertical and 2 km horizontal separation from cloud. Below these datums, whichever was the higher, the aircraft must have been operated clear of cloud, in sight of the surface and have visibility equal to or greater than 5 km. Regardless of airspace designation, when operating under VFR and flying above 10 000 feet amsl the visibility requirement increased to 8 km.

1.6 Personnel information

1.6.1	<i>Captain NZM 1</i>	Male, aged 52 years
	Licence:	Air Transport Pilot Licence (Aeroplane)
	Aircraft ratings:	ATR 72, Fokker F27, HS 748
	Medical Certificate:	Class 1, valid until 18 April 2000
	Last Instrument Rating check:	22 July 1999
	Last Regulation 76 check:	22 July 1999
	Last route check:	16 February 1999
	Flying experience:	Total all types: >14 400 hours Total on type: >2000 hours
	Duty time:	6.2 hours
	Rest before duty:	More than 12 hours

¹⁸ CARs, Part 91, Subpart D, Table 5, page 46, effective 15 July 1999.

¹⁹ Any defined area of land or water intended or designed to be used either wholly or partially for the landing, departure, surface movement or servicing of aircraft.

²⁰ Height above the ground or water of the base of the lowest layer of cloud covering more than half the sky.

²¹ NZAIP Planning Manual, Operations section, page 91, effective 15 July 1999.

²² An area around an aerodrome where aircraft carry out manoeuvres associated with entering, leaving, or operating within the circuit.

²³ NZAIP Planning Manual, Rules of the Air and Air Traffic Services section, page 39, effective 15 July 1999.

²⁴ CAR 172.159, Suspension of VFR operations, page 58, effective 1 January 1998.

- 1.6.2 The captain of NZM 1 had been employed by Mount Cook Airline since 1973. He had acquired extensive experience operating light and medium transport aircraft in the Southern Alps region, including Queenstown. The captain also held an executive appointment within the airline.
- 1.6.3 *First officer NZM 1* Male, aged 44 years
 Licence: Air Transport Pilot Licence (Aeroplane)
 Aircraft ratings: ATR 72, HS 748, DHC-6, SA 226
 Medical Certificate: Class 1, valid until 16 September 1999
 Last Instrument Rating check: 7 June 1999
 Last Regulation 76 check: 7 June 1999
 Last route check: 12 February 1999
 Flying experience: Total all types: >10 400
 Total on type: >2300
 Duty time: 6.2 hours
 Rest before duty: More than 12 hours
- 1.6.4 The first officer of NZM 1 had been employed by Mount Cook Airline since August 1988. Before joining the company the first officer had worked for about 2 years in the Southern Alps region, flying with 2 other operators.
- 1.6.5 The incident flight was the third flight of the day for the crew of NZM 1, having commenced duty at about 0640 hours that morning. The pilots did not consider fatigue a factor in the incident.
- 1.6.6 *Captain NZ 639* Male, aged 44 years
 Licence: Air Transport Pilot Licence (Aeroplane)
 Aircraft ratings: Boeing 737, Boeing 767, Fokker F27
 Medical Certificate: Class 1, valid until 28 March 2000
 Last Instrument Rating check: 31 May 1999
 Last Regulation 76 check: 31 May 1999
 Last route check: 30 May 1999
 Flying experience: Total all types: >8500 hours
 Total on type: >1200 hours
 Duty time: 6.5 hours
 Rest before duty: More than 12 hours
- 1.6.7 The captain of NZ 639 had been employed by Air New Zealand since 1984 and had been flying the Boeing 737 within New Zealand since 1996. He had been approved to fly the Boeing 737 into Queenstown since about September 1997.
- 1.6.8 *First officer NZ 639* Male, aged 35 years
 Licence: Air Transport Pilot Licence (Aeroplane)
 Aircraft ratings: Boeing 737, F27
 Medical Certificate: Class 1, valid until 10 April 2000
 Last Instrument Rating check: 2 February 1999
 Last Regulation 76 check: 12 December 1998
 Last route check: 4 March 1999
 Flying experience: Total all types: >5828
 Total on type: >2800
 Duty time: 5 hours
 Rest before duty: 15 hours
- 1.6.9 The first officer of NZ 639 had been employed by Air New Zealand since 1995 flying Boeing 737 aircraft. He had been approved to operate as crew into Queenstown since 3 March 1999. The first officer joined the captain of NZ 639 at the flight's point of origin.

- 1.6.10 *Aerodrome controller.* A male aged 29 years, the aerodrome controller had been employed by Airways Corporation since 1989 and been based in Queenstown since the introduction of ATC there in 1993. The controller's last annual performance assessment was successfully completed on 17 February 1999. The controller had commenced his duties about 30 minutes before the incident.
- 1.6.11 *Flight service specialist.* A male aged 27 years, the flight service specialist had been employed by Airways Corporation since 1990 and based in Queenstown since 1995. His last annual performance assessment was on 21 June 1998. Assessment requirements are documented in Airways' procedures and a one-month extension on this assessment was permitted before it needed to be completed. He subsequently underwent that assessment on the Queenstown position on 2 August 1999.

1.7 Organisational and management information

- 1.7.1 Mount Cook Airline began operating the ATR 72 on scheduled flights into Queenstown Aerodrome in about September 1995. Before the ATR 72 the company had operated the Douglas DC 3, Hawker Siddeley (later British Aerospace) 748 and Fokker F27 aircraft.
- 1.7.2 In about 1989 Air New Zealand Limited acquired full ownership of Mount Cook Airline, which became part of the Air New Zealand Domestic Airline Group. Air New Zealand appointed an airline manager for the company and provided commercial direction, including the aircraft type to be operated and routes to be flown. The company, however, was free to manage all other areas of the operation, including the development and maintenance of company flying procedures.
- 1.7.3 In 1997 a company restructure within Mount Cook Airline resulted in the sale of the small aircraft operation, leaving only the ATR 72 fleet intact. Before 1997 it was common practice for pilots to progress through the company's smaller aircraft types before flying the larger twin turbo-propeller aircraft. Many of the company's pilots as a consequence had extensive experience in flying VFR operations into the aerodromes in the Southern Alps region, many of which were in uncontrolled airspace without any ATC support. After 1997 new pilots were normally recruited from other air transport organisations.
- 1.7.4 Before the establishment of the instrument approaches at Queenstown, Mount Cook Airline aircraft were able to enter the Queenstown basin only under VFR. To achieve this the pilots would, if conditions permitted, cancel flight under IFR and descend under VFR directly to the Queenstown Aerodrome. Should the weather prevent a direct VFR descent, the pilots would conduct an instrument approach at Alexandra and then continue low-level under VFR through the Cromwell and Kawarau Gorges to Queenstown. On other occasions, the pilots would locate "a break or gap in the cloud", cancel IFR flight and descend under VFR through the break to join Queenstown via Kawarau Gorge or other entry point.
- 1.7.5 Before entering the confined spaces of the gorges, the pilots would ascertain the known traffic by contacting the then Queenstown Flight Service. This often required the use of high frequency (HF) radio communications until the aircraft were within VHF²⁵ coverage as they neared the Queenstown basin. The aircraft would hold clear of the gorge until any traffic had exited, then proceed through.
- 1.7.6 Procedures developed for ATR 72 operations were incorporated in the company's flight guide. These included the low-level VFR transit of Kawarau Gorge "in conditions of low cloud and/or poor visibility" and other applicable information for operations into Queenstown. Before entering the gorge both pilots were to assess the conditions and mutually agree to proceed. Queenstown

²⁵ Range normally restricted to line of sight.

Information was to be contacted, normally on VHF radio, and advised of intentions and questioned on the location of any known traffic that might conflict. The aircraft was to be flown in the “low visibility configuration” with undercarriage up, landing lights on and at least 15° of flap extended.

- 1.7.7 Before entering the gorge, or before passing a turning point within the gorge, the next turning point was to be visible and clear of any cloud that would prevent a reversal turn. The geographic reference points where low-level reversal turns could be achieved were identified as the Roaring Meg visual reporting point, the loop in the river east of Nevis Bluff and the Gibbston area. Company pilots were reminded to maintain a constant lookout owing to the possibility of other unknown traffic being in the area. Pilots were each issued with a copy of the flight guide.
- 1.7.8 No minimum aircraft altitudes amsl or heights agl, cloud heights or visibility requirements were stated in the procedures as being essential for the transit of the gorge. Company pilots were to comply with the normal VFR minima for class G uncontrolled airspace; namely, clear of cloud, in sight of the ground and 5 km visibility. Pilots were able to fly as low as 500 feet agl to conform to the VFR criteria.
- 1.7.9 The Mount Cook Airline flight guide and flight operations manuals contained those elements of CARs, the NZAIP Planning Manual and the Instrument Flight Guide that were applicable to company operations. One variation in the limits prescribed was the VFR minima for operations in the vicinity of an aerodrome in a control zone. In the company flight operations manual the minimum visibility requirement was raised to 8 km, from the 5 km stipulated in the CARs. Nevertheless, company policy reflected CARs, allowing operations below VFR minima with the requirement to obtain an ATC clearance.
- 1.7.10 During aircraft conversion training, pilots were given instruction on the procedures for flying through Kawarau Gorge. Either pilot was permitted to fly the aircraft through the gorge. The first officers were encouraged to make their own assessment of the conditions and to voice their opinions.
- 1.7.11 In 1993 Mount Cook Airline opposed the establishment of ATC at Queenstown, maintaining that uncontrolled VFR offered greater efficiency for local area operations. Senior company captains spoken to during the investigation considered that a flight information service was all that was necessary. They felt this facility would have been able to provide general traffic information and, on behalf of ATC, issue clearances to IFR aircraft. The company considered the establishment of a control zone would restrict VFR operations unnecessarily but did agree that a control zone was perhaps required for international arrivals and departures only.
- 1.7.12 Company pilots were encouraged to plan their descents to allow for a VFR approach when suitable conditions existed. The company flight guide stated that “Whenever possible, and in the opinion of the pilot, that the conditions permit the flight to continue safely VFR, IFR cancellation should be made from outside the approach zone...”. Owing to traffic densities IFR was not to be cancelled at Christchurch, Wellington and Auckland Aerodromes, but visual approaches²⁶ could be requested at these aerodromes.
- 1.7.13 By cancelling IFR flight while en-route and descending into uncontrolled airspace, an aircraft captain would have greater flexibility to manoeuvre the aircraft as desired and also avoid any delays that could occur while conforming to procedural IFR requirements. There were also some cost savings to be made by joining an aerodrome under VFR. For an aircraft of the same weight category as the ATR 72, a charge of \$330.39, including Goods and Services Tax (GST), would have been levied had the IFR flight, including instrument approach, been completed. By

²⁶ The aircraft remained under IFR but could manoeuvre by visual reference to facilitate landing.

cancelling the IFR flight plan and joining under VFR, the operator would have been charged \$263.62, including GST - a saving of \$66.77.

1.8 Additional information

1.8.1 During the investigation into the incident, the Commission conducted a survey of the aviation industry in New Zealand, with the objectives of determining the correlation between documented requirements and current aviation practices, and identifying the levels of understanding of certain activities. The survey focused on 3 areas of interest, namely VFR operating requirements, special VFR operations and instrument approaches. A summary of survey questions and responses is at Appendix A.

1.8.2 The Commission contacted 50 organisations or people, including pilot training establishments, national and regional scheduled and charter operators, ATC instructors, standards personnel, investigators and aerodrome tower managers, and military training and operational units. Where possible the senior representative from each organisation was spoken to and in one organisation a sample survey of line pilots was taken to provide balance with company management views. The following organisational groups were contacted:

- all aerodrome control towers in New Zealand
- all national scheduled operators listed in the 1999 New Zealand Wings Directory
- an additional 3 scheduled operators that were not listed in the directory
- 19 (about 75%) of the charter operators listed in the directory that operated multi-engined IFR capable aeroplanes.

1.8.3 In addition to the industry survey, the Commission reviewed the CAA incident database, focusing on airspace incidents, in particular those concerning the Queenstown area and Mount Cook Airline. Data dating back to 1993 was reviewed but emphasis was placed on incidents since 1997.

1.8.4 In March and April of 1997 the CAA was advised of 2 incidents where Mount Cook Airline aircraft had not flown in accordance with the ATC clearance or filed flight plan. The aircraft had departed from Pukaki and Mount Cook aerodromes and were cleared by ATC to fly to Queenstown via Mount Mary and Slope Hill VOR/DME navigation aids. Instead the aircraft were flown directly towards Slope Hill and Queenstown, entering controlled airspace earlier and in a different location than expected.

1.8.5 In December 1997 and March 1998 a further 2 incidents were reported where Mount Cook Airline aircraft had descended without first obtaining an ATC clearance. In the December incident, the IFR flight had been cancelled while still in controlled airspace and a VFR descent commenced to avoid cloud.

2. Analysis

2.1 This incident would not have occurred had the crew of NZM 1 not proceeded past Gibbston, the last available low-level holding area for an ATR 72, until a clearance to enter the CTR was obtained. However, the company operated on the understanding that having obtained an IFR clearance, which was often cancelled while en-route, the aircraft was entitled to re-enter controlled airspace without obtaining a further clearance.

2.2 The incident stemmed from 6 proximate causes:

- NZM 1 not obtaining an entry clearance from Queenstown Tower before being committed to entering the CTR²⁷
- the crew of NZM 1 assuming that they had automatic clearance to enter the CTR unless specifically told by Queenstown Tower that they did not
- the aerodrome controller's loss of situational awareness concerning the progress of the 2 aircraft involved in the incident
- the aerodrome controller's late request for NZM 1 to hold clear of the CTR
- the crew of NZM 1 assuming, on the basis of incomplete information, that NZ 639 would be clear having either completed the instrument approach or, as they thought more probable, commenced a missed approach
- the foreseeable rapid approach of a snow-shower resulting in a significant reduction in visibility in the vicinity of Queenstown Aerodrome.

2.3 There were other latent factors that probably precipitated the incident; these were:

- Mount Cook Airline policy encouraging pilots to cancel IFR flight and join an aerodrome under VFR whenever possible
- the lack of standardised procedures for the co-ordination of aircraft transiting Kawarau Gorge
- the lack of specified weather and aircraft minima for VFR flight through Kawarau Gorge by Mount Cook Airline aircraft
- a lack of understanding by the pilots of NZM 1 of the objectives and requirements of operations under special VFR.

2.4 While not contributing to the causes of the incident, the lack of a visual report by the crew of NZ 639 after achieving visual reference, and the captain of NZM 1 wanting to track towards Arrowtown, under the circumstances hindered the aerodrome controller's ability to co-ordinate the 2 aircraft inside the Queenstown CTR.

Cancellation of IFR

2.5 The decision by the crew of NZM 1 to cancel IFR flight and continue to Queenstown under VFR was based on a number of factors. Firstly, having completed one return trip to Queenstown earlier that day, the crew were aware of the fluctuating nature of the weather, including a moderately high cloud base and passing snow-showers. Secondly, the crew had doubt about being able to successfully complete an instrument approach. This was reinforced by the preceding B737 not becoming visual. Thirdly, by remaining under IFR and attempting the instrument approach, NZM 1 would have encountered a delay of about 5 minutes waiting for NZ

²⁷ CARs 91.225 (a) (2) (iii) and 91.245 (a) (1), effective 15 July 1999.

639 to commence its approach and become visual, or complete the missed approach and vacate the area. Finally, the captain of NZM 1 was very familiar with the area and local weather patterns and preferred to join under VFR.

- 2.6 The practice of joining an aerodrome under VFR was reinforced by Mount Cook Airline company policy, which encouraged this procedure at all aerodromes operated into, except Auckland, Wellington and Christchurch. This practice was regarded by pilots in the company as the most efficient method of joining an aerodrome. While there were cost savings, the captain and the first officer agreed that the decision to cancel IFR flight and continue under VFR to Queenstown on 26 July was for practical reasons and to avoid any possible delays to the schedule.
- 2.7 Mount Cook Airline pilots were proud of their ability to continue flying into and out of Queenstown when other operators, particularly those with larger IFR aircraft, were forced to divert to other aerodromes or remain on the ground at Queenstown. The common practice of joining Queenstown under VFR probably originated from the need to utilise low-level entry routes on occasions of poor weather or low cloud. Company pilots then steadily gained experience in flying through Kawarau Gorge on larger multi-engine aircraft.
- 2.8 Despite the changes in the weather during the morning, the pilots of NZM 1 were made aware on their initial contact with Information that the conditions in the CTR at that time were below VFR minima, with the visibility reported to be between 3 and 5 km in heavy snow. Wanting to join under VFR, the crew kept their options open by confirming that there had been the “odd break” and that they would call closer in. A reported improvement in the conditions was sufficient for the captain of NZM 1 to cancel IFR flight and proceed under VFR.
- 2.9 On 26 July the weather between Tarras and the first half of Kawarau Gorge posed no problems for a VFR descent. When IFR flight was cancelled, ATC cleared NZM 1 to descend through the Queenstown TMA into uncontrolled airspace, routing via Lake Dunstan and Cromwell for Queenstown. Many of the company’s senior pilots believed that having been cleared to continue under VFR they could operate without restriction and deviate from track at will. However, while an aircraft remained in controlled airspace ATC was able to issue instructions that could have restricted a captain’s ability to maintain the required VFR minima. Should this occur, a captain was required to immediately advise ATC and obtain an amended clearance. An aircraft captain, therefore, had the responsibility to ensure the break in the weather through which the aircraft would fly was sufficiently large to cater for all contingencies.
- 2.10 After cancelling IFR flight, the captain of NZM 1 was required to maintain the VFR minima appropriate for different combinations of airspace and aircraft altitude. The 2 km horizontal and 1000 foot vertical separation from cloud was applicable until the aircraft had descended into uncontrolled airspace, below 3000 feet amsl or 1000 feet agl, whichever was the higher. The captain was then required to remain clear of cloud, in sight of the surface and have a visibility equal to or greater than 5 km. Entering the Queenstown CTR, and unless cleared to operate under special VFR, the 2 km horizontal separation from cloud returned but vertical separation was now only 500 feet. Regardless of airspace classification the visibility minimum below 10 000 feet was 5 km.
- 2.11 The VFR minima were based on internationally accepted criteria, which were designed to permit a pilot to see and avoid any obstacle that may endanger the aircraft. The faster an aircraft the less time the pilot had to react. Weighing about 19 000 kg with 40 passengers and flying at 240 kts, the normal cruise descent speed for the ATR 72, NZM 1 would have required a significant area of clear airspace to ensure the safety of the aircraft. Despite communications with Information, neither station would have been able to ensure that there was no other VFR traffic in the area that may have conflicted with NZM 1.

- 2.12 Although an improvement in the weather had been reported to NZM 1 as the aircraft descended towards Cromwell, the captain would have been aware from previous weather reports, his experience of operating in the region for many years and his personal observations on the day of the incident, that conditions were likely to deteriorate with the next passing snow-shower. The judgement of the crew of NZM 1 in deciding not to positively increase the spacing behind NZ 639, as NZM 1 descended into the gorge, was influenced by their concern about being caught in the next shower to pass through the CTR, possibly precluding them from making a successful first approach.
- 2.13 The practice of cancelling an IFR flight and joining an aerodrome under VFR was often more efficient than remaining under IFR. Further, VFR was potentially as safe as remaining under IFR. However, a pilot was responsible for complying with the rules applicable to the type of operation to be conducted and to know the procedures when cancelling an IFR flight. During the investigation some of the company pilots spoken to did not fully understand the VFR weather minima and separation requirements, nor the rules applicable to cancelling an IFR flight and entering controlled airspace. The incidents referred to in paragraph 1.8 further indicated a lack of understanding of or indifference to the documented rules and procedures by Mount Cook Airline pilots.
- 2.14 By cancelling IFR flight, NZM 1 lost the protection afforded by ATC providing separation from other IFR and VFR aircraft in class C airspace, and separation and information on IFR and VFR aircraft in class D airspace. In descending to low level under VFR the captain increased the risk of being caught out by poor weather. While the various VFR minima and a philosophy of see and avoid were satisfactory for slower aircraft, for faster and less manoeuvrable aircraft the safety margins were reduced. The philosophy, therefore, of one set of VFR minima for all aircraft is fundamentally flawed, that is, the larger the capacity or capability of the aircraft, the lower the level of safety. Operators of larger and more capable passenger aircraft need to consider this when carrying out a risk assessment of their operations, and apply their own increased VFR minima, rather than simply applying those minima set out in the CARs.

Kawarau Gorge

- 2.15 The lack of standardised procedures for aircraft flying through Kawarau Gorge had resulted in informal routines being developed to suit the various operators. Mount Cook Airline aircraft joining under VFR through the gorge would normally remain on the Information frequency of 128.0 MHz and confirm that there was no known conflicting traffic in the area. This ensured continuous VHF coverage through the gorge but meant that NZM 1 was still on the Information frequency and not the Tower frequency when it entered the CTR. Had both aircraft been on the same radio frequency, the situational awareness of both crews and the aerodrome controller would have been significantly higher.
- 2.16 The need for the aerodrome controller to relay instructions through the flight service specialist to NZM 1 added incremental delays to the process. With some limited low-level VHF coverage on 118.1 MHz available in Kawarau Gorge, the captain of NZM 1 could have changed frequency earlier or used the second VHF radio to attempt to contact Tower before reaching Bungy Bridge. Likewise, ATC could have requested that NZM 1 change frequency earlier rather than continue to relay instructions through Information.
- 2.17 The planned relocation of a 118.1 MHz transceiver to Coronet Peak should assist in providing improved radio coverage in the CTR and Kawarau Gorge. However, it will only improve communications if procedures are put in place to ensure effective communication between all users and Tower. The installing of a re-transmit facility for 118.1 and 128.0 MHz would probably be of no additional benefit and could clutter both frequencies needlessly.

- 2.18 In giving the warning of a possible requirement to hold at Bungy Bridge and the subsequent instruction to hold at the bridge, Queenstown Information gave no indication as to the identity initiating the transmissions. Had the flight service specialist stated that the initial warning was relayed on behalf of Queenstown Tower, the captain of NZM 1 may have taken more notice.
- 2.19 In descending to enter Kawarau Gorge, the captain of NZM 1 met the company's requirement of being able to see the next turning point where a low-level escape manoeuvre could be safely completed. Because no additional minimum aircraft altitudes or weather minima were stipulated by the company as being essential for the transit of the gorge, the captain of NZM 1 was permitted to operate a larger passenger aircraft to the same criteria as a smaller VFR aircraft. Although the speed of an ATR 72 would be reduced on occasions of poor visibility, the aircraft would still not have been as manoeuvrable as a light single-engine aircraft.
- 2.20 Once past Waitiri the pilots of NZM 1 knew that Gibbston was the last point before entering the CTR at which the aircraft could either hold or turn back towards Cromwell. Knowing this, and having been warned about 4 minutes earlier of the possible requirement to hold at Bungy Bridge, the captain should not have proceeded past the point which he could safely hold until he had a clearance to enter the CTR and he was satisfied the weather and traffic would permit him safe passage.

Entry clearance

- 2.21 The requirement to obtain an entry clearance before entering a CTR, and specifically the Queenstown CTR, was annotated in several publications. The accepted practice was for pilots to change to the Tower frequency when reaching Bungy Bridge and then be given joining instructions to the aerodrome. If onwards instructions could not be passed the aircraft was expected to hold at Bungy Bridge and not proceed further into the CTR. The term "hold at Bungy Bridge" implied that the aircraft was to hold in close proximity to the bridge.
- 2.22 Requests for clearance into the Queenstown CTR were rarely declined. None of the Mount Cook Airline pilots spoken to during the investigation could recall having been previously instructed to hold at Bungy Bridge. The CAA database indicated that there had been 4 incidents where aircraft had proceeded into the CTR without obtaining an entry clearance. Most of these incidents were in 1996 and concerned light aircraft.
- 2.23 Mount Cook Airline management believed that having filed and been cleared to fly to Queenstown under IFR, then cancelling IFR flight and continuing under VFR, as in the case of NZM 1, that aircraft were then permitted to re-enter controlled airspace approaching Queenstown without obtaining an entry clearance. The management also believed that this policy applied to all the company's destinations and in their view was standard aviation practice.
- 2.24 In the industry survey a scenario was provided similar to the incident flight. Although experience of cancelling IFR flight and continuing under VFR varied widely, all respondents were unanimous that an entry clearance was required before an aircraft could re-enter controlled airspace. This was regardless of the aircraft previously being cleared to a destination under IFR.
- 2.25 Plain language entry clearances for entry into the Queenstown and many other CTRs around New Zealand were not normally issued. Aircraft were commonly cleared into the Queenstown CTR by the passing of joining instructions, as explained in the NZAIP Planning Manual²⁸. Joining instructions inferred an entry clearance and, besides reducing radio chatter, were clearly understood by most pilots. For example NZM 37 was cleared to enter the CTR by being instructed to join "via Cromwell, Bungy Bridge for straight-in for runway 23". However, NZM 1 was not given joining instructions to the aerodrome; in fact it was warned early that it

²⁸ NZAIP Planning Manual, Operations section, page 63, effective 20 May 1999.

may be required to hold clear of the CTR. Most survey participants believed that joining or routing instructions constituted an entry clearance. Possibly as much as 30% of respondents, however, were unaware of this.

- 2.26 NZM 1 was unable to hold in the narrowing confines of Bungy Bridge due to the combination of low cloud base and aircraft performance. The physical constraints of the gorge meant that NZM 1 would have needed to be flown at a significantly greater height before it could safely hold overhead Bungy Bridge. By comparison a smaller light aircraft would have been able to hold at a height less than that required by an ATR 72, the best example being a helicopter for which different VFR minima were applicable. The performance capabilities of the ATR 72 again emphasised the need for aircraft performance to be matched by different VFR operating minima.

Air traffic services

- 2.27 As NZM 1 progressed through Kawarau Gorge the aerodrome controller had noted a deterioration in the weather to the south of the Queenstown Aerodrome and was becoming increasingly concerned about the effect this may have on the 2 inbound aircraft. The aerodrome controller, therefore, asked the flight service specialist for an updated position report on NZM 1, while he checked on the location of NZ 639. The objective of this request was probably to update the aerodrome controller's appreciation of the progress of the 2 aircraft compared to the approaching snow-shower, and not to compare the 2 aircraft with each other.
- 2.28 NZM 1, although initially faster than NZ 639 as it descended, would have been maintaining about the same distance behind the B737 as it manoeuvred to enter the gorge near the Waitiri visual reporting point. After Waitiri NZM 1 started to steadily gain on NZ 639. This was probably contrary to what the aerodrome controller and the crew of NZM 1 assumed would occur. The crew of NZM 1 lost sight of NZ 639 shortly after NZ 639 entered a bank of cloud extending from The Remarkables across to the Crown Range to the north and were, therefore, unable to update their appreciation of the spacing between the 2 aircraft.
- 2.29 As NZM 1 approached Bungy Bridge the horizontal separation between the 2 aircraft had reduced to about one nm, with NZ 639 reporting 5 nm from Slope Hill and NZM 1 at about one km to run to Bungy Bridge. The aerodrome controller may have continued to believe that NZM 1 was further behind NZ 639 than it actually was. As a result the controller was surprised when NZM 1 reported at Bungy Bridge, his only course of action being to immediately instruct the flight service specialist to have NZM 1 hold at the reporting point. The aerodrome controller was aware that an ATR 72 could not hold in the narrow confines of the gorge at Bungy Bridge while low-level, but wanted to keep the aircraft clear of the instrument circling area and preferably clear of the CTR.
- 2.30 In issuing the initial warning about a possible holding requirement and giving the subsequent instruction to hold at Bungy Bridge, the aerodrome controller was attempting to keep NZM 1 clear of the CTR to give NZ 639 unrestricted room to circle off the instrument approach. Unable to see NZ 639 because of the weather conditions, the aerodrome controller remained unsure of the track NZ 639 was taking. He was therefore required to provide positive separation between the 2 aircraft because he could not give satisfactory mutual traffic information.

- 2.31 The aerodrome controller was aware that in the prevailing weather conditions it was unlikely that he would see NZ 639 as it circled off the instrument approach to land. He would also have been unlikely to see NZM 1 until it was well within the CTR. Had the aerodrome controller instructed NZ 639 to report position and intentions as soon as possible after becoming visual and directed NZM 1 to hold clear of the CTR earlier or report on the Tower frequency well before reaching Bungy Bridge, he would have been better able to co-ordinate the arrival of the 2 aircraft.

NZM 1

- 2.32 The aerodrome controller, flight service specialist and the crews of NZM 1 and NZ 639 were all aware, or should have been aware, that both aircraft could potentially be in the Queenstown CTR at about the same time. As NZM 1 passed abeam Cromwell airfield, the crew saw NZ 639 as it tracked inbound on the VOR/DME Bravo approach. It was at this stage Information, relaying for Tower, first advised NZM 1 of a possible requirement to hold at Bungy Bridge. The captain believed the 3 nm spacing to be about right and convinced himself that NZ 639 would be well clear by the time NZM 1 reached Bungy Bridge. Unless the weather in the gorge prohibited passage, which the captain thought unlikely as it was better than on the first trip, the captain saw no reason for the aerodrome controller to prevent NZM 1 from entering the Queenstown CTR.
- 2.33 Near Gibbston and at around 2500 feet amsl, the first officer manoeuvred the aircraft to the right-hand side of the gorge to provide a better track to approach and pass through the narrow exit from the gorge. Although the weather in the gorge was above VFR minima, the first officer did descend slightly to provide suitable vertical separation from the cloud base. Visibility was also reducing as NZM 1 approached Bungy Bridge. In the area of Bungy Bridge the pilots of NZM 1 estimated the cloud base to be 1500 to 1600 feet above the floor of the gorge, however NZM 1 would have needed to be flown on occasions over the steep rising terrain to either side of the river, where the cloud base would have been 1200 to 1400 feet agl.
- 2.34 Having passed Gibbston NZM 1 was committed to entering the CTR. The pilots did not consider the lack of an entry clearance a problem as they had not been told to hold clear in their last conversation with Information. The inference they took was that because they had not specifically been refused entry they had an implied entry clearance. This assumption was reinforced by the company philosophy that an entry clearance was not required, having previously been cleared under IFR to Queenstown. The pilots continued to believe that NZ 639 would be well clear by the time they entered the CTR. Given that NZM 1 had earlier been warned about holding at Bungy Bridge and had not received joining instructions to the aerodrome, it would have been prudent for the crew to clarify the joining instructions before being committed to entering the CTR.
- 2.35 Having committed the aircraft to entering the Queenstown CTR without a clearance and then having been told by ATC to hold at Bungy Bridge, the captain of NZM 1 was left with little option than to seek a better holding position. In this case Arrowtown appeared to the captain to be the best option.

NZM 1 and NZ 639 within the Queenstown CTR

- 2.36 In meeting the requirements for visual reference, including the requirement to look towards the Queenstown Aerodrome to ensure the landing threshold or approach area was visible, the captain of NZ 639 either did not notice the snow-shower approaching the aerodrome from the south, or he did not fully appreciate the effect the shower would have on visibility as he manoeuvred the aircraft for landing. Had he done so he may have been more inclined to initiate the missed approach procedure.
- 2.37 After obtaining visual reference with 3.9 nm to fly to the VOR beacon, the captain of NZ 639 identified that the best track to fly was a right-hand descending turn to pass inside of Arrowtown

and G772, to join on a long final approach for runway 23. This decision was probably based on a combination of the need to descend about 3000 feet in a confined area, configure the aircraft for landing, his previous experience and the better weather towards Arrowtown.

- 2.38 The first officer of NZ 639 not giving a position report until prompted by Tower meant that the aerodrome controller was unsure of the position and intentions of the Boeing at a crucial time. Understandably the pilots of NZ 639 were busy flying and configuring the aircraft for landing, in a confined area with the threat of approaching bad weather. The first priority of the pilot must be to fly the aircraft. Nevertheless, about 2 minutes elapsed between NZ 639 becoming visual and advising its location after the prompting. With good pre-planning and crew co-ordination, an early brief visual report with intentions should have been possible shortly after obtaining visual reference. This information would have helped the aerodrome controller maintain his situational awareness and co-ordinate the movements of the 2 aircraft.
- 2.39 Pilots flying into Queenstown would often delay their visual report until turning towards the aerodrome and preparing to land. Despite the visual report being compulsory, according to the 24 tower managers, airline chief pilots, chief flying instructors and flight examiners spoken to during the investigation, the call was not being made on about 50% of occasions. This excluded those instrument approaches where an aircraft had requested and was cleared for a “visual approach”. By calling visual, ATC no longer needed to protect the missed approach area, was able to clear a second aircraft to commence the approach and was provided with a timely update of the aircraft’s position to enable additional instructions or information to be passed.
- 2.40 Able to see past Bungy Bridge into the Queenstown basin area, the captain noted that the weather appeared to be better out towards the Arrowtown area. The captain of NZM 1 thought, based on his experience, that if NZ 639 became visual it was more likely that NZ 639 would turn off slightly to the right before reversing left and joining on a close right base for runway 23. He did not consider that NZ 639 would make a complete turn around to the right. On reporting at Bungy Bridge the captain of NZM 1 therefore offered to track towards Arrowtown, and the area where NZ 639 was manoeuvring.
- 2.41 The repeated request or offer by the captain of NZM 1 to track towards Arrowtown hampered the aerodrome controller’s planned management of the situation and highlighted a preconception by the captain that the “see and avoid” philosophy of VFR would continue to be satisfactory in all situations.
- 2.42 To fly directly from Bungy Bridge to Arrowtown, NZM 1 would have had to pass through G772. The captain of NZM 1 believed that owing to the weather there would probably be no activity in the area.
- 2.43 Considering the weather conditions, it was unlikely that G772 or any of the other GAAs, would have been active on the day of the incident. Nevertheless, the possibility of some activity did exist. Several company pilots spoken to believed that ATC was required to inform pilots when the areas were active. This was an incorrect assumption. During this investigation the Commission was advised of incidents where other aircraft had flown through the Queenstown GAAs and came close to paragliders and the like. With the exception of an incident in January 1993 concerning a parapente and a locally based GAF Nomad aircraft, the details of these alleged incidents could not be confirmed.
- 2.44 After having established radio communications with NZM 1 and gained an update on the position of NZ 639, the aerodrome controller was left with little option than to sequence NZM 1 to land first. While it was not ideal to have a slower aircraft in front of the Boeing, directing NZM 1 towards Arrowtown could have increased the level of conflict and potential for collision. To direct NZM 1 back into Kawarau Gorge would probably have required the aircraft to be initially manoeuvred towards Queenstown before completing a turn back to Bungy Bridge. This would

have increased the time NZM 1 was in the CTR and may have again increased the conflict potential.

- 2.45 By sequencing NZM 1 in front of NZ 639, both aircraft were effectively committed to landing. If NZM 1 was forced to overshoot owing to the weather, then NZ 639 would also likely have been forced to overshoot and attempt to intercept the VOR/DME Bravo missed approach procedure from below the minimum safe altitude for the area. The captain of NZ 639 was therefore reluctant to initiate an early overshoot as he had good visual reference with the terrain but could not see NZM 1 and did not wish to be caught climbing simultaneously with NZM 1. As NZ 639 intercepted finals for runway 23, visibility reduced significantly and it was unlikely that the captain would have been able to maintain adequate visual reference to manoeuvre the aircraft back towards the VOR/DME Bravo missed approach point, while climbing to 4800 feet. Nevertheless, with about 3000 m visibility and the captain's extensive local knowledge, the chances of making a successful approach and landing were good.

Special VFR

- 2.46 Though the cloud base within the CTR was above 1500 feet agl, it should have been anticipated by the captain of NZM 1 that the aircraft may have needed to be flown closer than 500 feet vertically from any lower cloud and probably in visibility reducing below 5 km. The captain should have therefore anticipated a possible requirement for the aircraft to be operated under special VFR. The 5 km VFR visibility criterion required by regulations was exceeded by the company's 8 km requirement. Had the captain of NZM 1 given more regard to these limits he may have been more inclined not to proceed past Gibbston without first obtaining a positive entry clearance.
- 2.47 Having been instructed to join straight-in for runway 23, NZM 1 entered flight conditions that were below VFR minima. With the aerodrome controller aware of the location of the 2 aircraft and ensuring positive separation by the passing of routing instructions, there was little opportunity for and no benefit to be gained by ATC clearing NZM 1, or NZM 1 requesting a clearance, to continue under special VFR towards the aerodrome. The additional radio communications required in issuing a special VFR clearance would have added to the already high workload of the aerodrome controller and pilots of NZM 1.
- 2.48 Requests by pilots for clearances to operate under special VFR in the Queenstown CTR, and some other CTRs visited by the Commission, were infrequent. ATC-initiated special VFR clearances were also uncommon. In many cases the pilot was the best person to determine if the aircraft could be flown in accordance with the prescribed VFR minima. The pilot was therefore the best person to initiate any request to fly under special VFR. The chief tower controllers spoken to agreed that there was a general reluctance, especially by less experienced pilots, to request a special VFR clearance. Some controllers advised that on occasions of poor weather they would manage the aircraft in accordance with special VFR requirements but may not necessarily issue special VFR clearances. Most controllers, however, stated that they would issue a special VFR clearance regardless.
- 2.49 During the investigation into the incident there appeared to be a general lack of understanding or agreement by pilots, ATC staff and regulators, of the objectives and requirements for operations under VFR and special VFR. Some pilots spoken to were unsure of the VFR limits within and outside controlled airspace. The pilots, controllers and regulators spoken to were divided over the applicability of the VFR minima at controlled aerodromes. Many believed that the 1500 feet ceiling and 5 km visibility minima applied to the entire CTR, while others considered it was only in the vicinity of the aerodrome. This misunderstanding may have stemmed from the wording in

CARs and the NZAIP Planning Manual²⁹, which refers to “VFR minima at aerodromes within a control zone”, which was meant to be applicable to the entire CTR.

- 2.50 Flying in the Queenstown area offered challenges unique to that part of the country. The geographical features that helped establish the tourist industry also contributed to the challenges in managing the aviation activities in the Queenstown area. The mass exodus of aircraft from Queenstown to Milford Sound and their simultaneous return, for example, created special demands in traffic management. Uncontrolled airspace permitted a large degree of flexibility to be achieved in co-ordinating the wide range of aircraft movements. There was, however, a finite limit to which these activities could be safely carried out. With the commencement of IFR operations into Queenstown, a more formal system of traffic management needed to be initiated. The use of class D airspace still allowed for flexibility but resulted in the controllers applying a measure of control over aircraft to ensure the safe and expeditious flow of traffic. By contrast the allocation of class C airspace would have resulted in increased separation but probably restricted operations during peak periods.

3. Findings

Findings and safety recommendations are listed in order of development and not in the order of priority.

- 3.1 The pilots of NZM 1 and NZ 639, and the Queenstown Aerodrome controller on duty at the time of the incident were all properly qualified for their duties.
- 3.2 The flight service specialist’s assessment had expired 5 days before the incident.
- 3.3 The B737, Flight NZ 639, was being flown in accordance with the ATC clearances issued.
- 3.4 Having cleared NZ 639 to make an IFR approach to Queenstown, ATC was responsible for providing the aircraft with a safe approach and missed approach path.
- 3.5 NZ 639 did not give ATC a timely report of becoming visual on the approach, nor its intended flight path.
- 3.6 The absence of an early visual report reduced the aerodrome controller’s situational awareness at a time when he was dealing with a developing situation.
- 3.7 The weather conditions during the period of the incident in the Queenstown CTR were at times below VFR minima.
- 3.8 The ATR 72, Flight NZM 1, cancelled IFR flight and began an approach via Kawarau Gorge into Queenstown, where marginal VFR meteorological conditions existed.
- 3.9 ATS had informed NZM 1 that NZ 639 was making an IFR approach to Queenstown and advised NZM 1 in sufficient time that it may be required to hold clear of controlled airspace.
- 3.10 NZM 1 required an entry clearance from ATC before entering the Queenstown CTR under VFR, but proceeded past its last holding or return point in the gorge, committing itself to entering the CTR without the required clearance.
- 3.11 The crew of NZM 1 believed they did not require an entry clearance into the Queenstown CTR.

²⁹ CAR 91.301 and NZAIP Planning Manual, Operations section, page 91, effective 15 July 1999.

- 3.12 The belief that an entry clearance was not required may have originated from Mount Cook Airline regularly flying into uncontrolled aerodromes and in the increasing practice of giving joining instructions in lieu of specific plain language entry clearances.
- 3.13 The assumption that an entry clearance was not required before re-entering controlled airspace was limited to some Mount Cook Airline pilots.
- 3.14 NZM 1 was unable to hold at Bungy Bridge when requested by ATC, entered the CTR without a clearance, and created a conflict with NZ 639.
- 3.15 The aerodrome controller's instruction for NZM 1 to hold at Bungy Bridge should have been issued earlier.
- 3.16 At the time of the incident, the situational awareness of the pilots of both aircraft and the aerodrome controller was low.
- 3.17 The aircraft operating on different VHF radio frequencies through different operators contributed to the low situational awareness.
- 3.18 To help regain full situational awareness the aerodrome controller had little option but to position the slower ATR 72 ahead of the B737.
- 3.19 With the ATR 72 ahead of the B737, neither aircraft had the option of performing a go-around without the possibility of further conflict with the other aircraft, thus compromising the safety of both aircraft.
- 3.20 Both aircraft landed in meteorological conditions that were below the minima for their respective operations at the time.
- 3.21 The lack of standard procedures for the management of aircraft entering or departing Queenstown CTR via Kawarau Gorge contributed to the incident.
- 3.22 The Mount Cook Airline company procedures guide for flights through Kawarau Gorge could have more adequately promoted safe air transport operations.
- 3.23 The Mount Cook Airline philosophy, which promoted efficiency by cancelling IFR flight where possible, had the potential to compromise flight safety.
- 3.24 Probably as few as 50% of pilots make the required report when becoming visual on completion of an instrument approach.
- 3.25 There existed a general lack of understanding, particularly by pilots, about special VFR and the use of GAAs.

4. Safety Action

- 4.1 Airways Corporation advised that the planned relocation of the primary transmitter/receiver for 118.1 MHz to Coronet Peak was approved in the 1999/2000 Capital Expenditure Programme. Included within the project was the installation of an automatic terminal information service, commonly referred to as an ATIS, which will transmit Queenstown aerodrome weather and relevant operational information.

- 4.2 CAA advised that a planned review of South Island airspace had commenced. Operations into and out of Queenstown, airspace boundaries and designation, instrument approaches and air traffic services will be included in the review.

5. Safety Recommendations

- 5.1 On 19 April 2000 it was recommended to the manager of Mount Cook Airline Limited that he:

- 5.1.1 Instruct company pilots of the requirement to obtain an entry clearance from the relevant controlling authority before entering controlled airspace (088/99)
- 5.1.2 Review company procedures for flights through Kawarau Gorge, including the need for specified minimum flight altitudes and visibility requirements, which permit safe manoeuvring within the geographical constraints of the gorge (087/99).

- 5.2 On 2 May 2000 the Airline Manager of Mount Cook Airline responded as follows:

5.2.1 Safety recommendation 088/99. Mount Cook Airline has adopted this recommendation, is conducting a review of its procedures, and welcomes the opportunity to introduce any improvements. It is important to work with the CAA and Airways Corporation to ensure that any changes are compatible with the mix of operations in the Queenstown region. The specific issue of entry clearances is being dealt with concurrently with Safety Recommendation 087/99. Queenstown traffic activity has increased in recent months, with significant number of additional jet movements, and Queenstown operators have requested a user's forum to discuss improvements in traffic procedures. Mount Cook Airline will work with other operators in the region to ensure the safety of operations is maintained, and enhanced where possible.

5.2.2 Safety recommendation 087/99. Mount Cook Airline's current Kawarau Gorge procedures have been developed over forty years of safe flying in the Queenstown region. We have adopted this recommendation and a review of company procedures for flights through the Kawarau Gorge has been conducted by the Manager Flight Operations, ATR Fleet Captain and Training Pilots. Some proposed minor changes to company procedures are currently being circulated to pilots for comment. It is anticipated that the consultation period will be complete by 1 June 2000 and target date for implementation of change is 20 June 2000.

- 5.3 On 19 April 2000 it was recommended to the chief executive of Air New Zealand Limited that he:

5.3.1 Instruct Air New Zealand pilots of the requirement to make a radio call as soon as possible after becoming visual on an instrument approach and, if practicable, on circling approaches to include the aircraft's position and intended track to be flown (090/99).

- 5.4 On 2 May 2000 the Manager Group Safety and Security for Air New Zealand Limited responded as follows:
- 5.4.1 Safety recommendation 090/99. Air New Zealand will emphasise to its flight crew the importance of a “visual” call during a non precision approach in Instrument Meteorological Conditions. However, it is not current practice for all pilots to make these calls in all similar situations at all airports, and we believe a more appropriate approach is for CAA, Airways Corporation and the airlines to review the total airspace procedures, in order to avoid the risk of degrading safety through unnecessary radio traffic and potentially confusing communications.
- 5.5 On 19 April 2000 it was recommended to the chief executive of the Airways Corporation that he:
- 5.5.1 Review procedures to ensure that if clearance to enter controlled airspace is not available then appropriate phraseology that correctly conveys that meaning is used, and that instructions requiring a specific action in uncontrolled airspace are not given by ATC (091/99)
- 5.5.2 Review procedures to ensure air traffic service staff undergo proficiency assessments within the prescribed time frame (092/99).
- 5.6 On 20 April 2000 the Manager System Safety for Airways Corporation responded as follows (in part):
- 5.6.1 Safety recommendations 091/99 and 092/99. Airways intends to adopt the recommendations as outlined. I would estimate that they should be completed by 31 July 2000.
- 5.7 On 19 April 2000 it was recommended to the director of Civil Aviation that he:
- 5.7.1 Submit for approval a rule change for flight under visual flight rules in uncontrolled airspace by medium and large air transport aircraft, making reference to aircraft size and manoeuvrability, to ensure adequate safety margins are retained (093/99)
- 5.7.2 Approach the local air traffic service provider and local User Group to discuss the justification and acceptability of developing standardised procedures for the co-ordination of aircraft flying through Kawarau Gorge (094/99)
- 5.7.3 Submit for approval a rule change to special visual flight rules, in particular the application of the 1500 feet cloud ceiling, to remove any ambiguities that may exist (095/99)
- 5.7.4 Educate pilots about the objectives and application of operations under special visual flight rules (096/99)
- 5.7.5 Educate pilots on the operation of the use of general aviation areas, in particular those areas within the Queenstown control zone (097/99)
- 5.7.6 Educate pilots of the requirement to make a radio call when becoming visual on an instrument approach (019/00).

5.8 On the 3 May 2000 the director of Civil Aviation responded as follows:

5.8.1 **With regard to recommendation (093/99).**

I do not accept the recommendation as worded however I will “Review the rules for flight under visual flight rules in uncontrolled airspace by medium and large air transport aircraft, making reference to aircraft size and manoeuvrability, to ensure adequate safety margins are retained” The visual flight rules will be included in the Part 91 review, which will commence in December 2000, (093/99).

5.8.2 **With regard to recommendation (094/99).**

I accept this recommendation. The CAA will discuss the justification and acceptability of developing standardised procedures for the co-ordination of aircraft flying through Kawarau Gorge at a user group meeting which is scheduled to take place in Queenstown during June 2000. (094/99).

5.8.3 **With regard to recommendation (095/99).**

I do not accept the recommendation as worded however I will “Review the rules pertaining to special visual flight rules, in particular the application of the 1500 foot cloud ceiling, to remove any ambiguities that may exist”. This will be carried out as part of the Rule Part 91 review which will commence in December 2000 (095/99).

5.8.4 **With regard to recommendation (096/99).**

This requirement should be addressed in basic pilot training. I will accept it is a subject that needs airing from time to time, and CAA has recently dealt with the topic in a Vecor article (January/February 2000 issue). (096/99)

5.8.5 **With regard to recommendation (097/99).**

I accept this recommendation and will publish a Good Aviation Practice (GAP) booklet, which is at an advanced stage of preparation (due release late 2000), which will deal with Queenstown airspace specifically. In addition to CAA Rules, education literature that addresses this topic includes a “Special Purpose Airspace” poster (released 5 July 99), and a GAP booklet on “New Zealand Airspace” (released 25 Jan 00). (097/99)

5.8.6 **With regard to recommendation (019/00)**

I accept this recommendation and will publish an article in Vector Magazine addressing Instrument Flight Rule Procedures and the requirement to make a radio call when becoming visual on an instrument approach. This will be published no later than December 2000. (019/00)

Approved for publication 12 April 2000

Hon. W P Jeffries
Chief Commissioner

Appendix A

Summary of survey questions and responses

Questions:

1. What experience do you, or your organisation, have with cancelling an IFR flight plan and continuing under VFR?
 - 1a. For non-pilots the question was modified to read - What experience do you, or your organisation, have with pilots cancelling an IFR flight plan and continuing under VFR?
2. Scenario: An aircraft has filed, been cleared and is flying an IFR flight plan from A to B. While en-route the IFR plan is cancelled and the aircraft vacates controlled airspace into uncontrolled airspace under VFR.

Approaching the CTR at B, does the pilot need to obtain an entry clearance before entering the CTR?
3. Do joining or routing instructions constitute a clearance to enter controlled airspace?
4. What experience do you, or your organisation, have with operating in special VFR weather conditions?
 - 4a. For non-pilots the question was modified to read – What experience do you, or your organisation, have of pilots operating in special VFR weather conditions?
5. Is there a good understanding of the objectives and requirements for operating under special VFR in the aviation industry in New Zealand?
6. Can you recall an occasion where the weather in a CTR has been below the VFR minima and ATC has managed an aircraft in accordance with special VFR requirements but not issued a special VFR clearance?
7. During an instrument approach do you call “visual” on completion of the approach?
 - 7a. For non-pilots the question was modified to read – Do pilots call “visual” on completion of an instrument approach?

Responses:

1. The experience levels varied significantly for pilots and non-pilots. Most of the scheduled operators spoken to stated that company rules did not normally permit the cancellation of an IFR flight plan.
2. All respondents agreed that an entry clearance was required before entering the CTR at B. About 95% of respondents gave an emphatic “yes” as their response.
3. About 75% of respondents agreed that joining instructions did constitute an entry clearance. About 5% were unsure, while the remainder believed a specific entry clearance was required.

4. Experiences varied, with most scheduled airline pilots having never flown under special VFR or only very early in their piloting career. All ATC staff spoken to had some experience with issuing special VFR clearances.
5. About 95% of respondents agreed that there was generally a poor understanding of the objectives and requirements for operating in special VFR weather conditions. Pilots with little VFR experience were considered to have the least understanding of special VFR operations.
6. About 10% of respondents reported occasions where aircraft were managed as though they were special VFR but had not been issued with a special VFR clearance.
7. The frequency of pilots reporting “visual” on completion of an instrument approach varied with no identifiable trends. As a generalisation the “visual” call would be made on about 50% of successful instrument approaches.