Australian Government
Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT
Aviation Occurrence Report – 200503265
Final

Collision with Terrain
Mount Hotham, Victoria
8 July 2005
VH-OAO
Piper Aircraft Corporation PA31-350 Navajo Chieftain

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Postal address: PO Box 967, Civic Square ACT 2608
Office location: 15 Mort Street, Canberra City, Australian Capital Territory
Telephone: 1800 621 372; from overseas + 61 2 6274 6590
Accident and serious incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6274 6474; from overseas + 61 2 6274 6474
E-mail: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

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Australian Transport Safety Bureau
PO Box 967, Civic Square ACT 2608 Australia
www.atsb.gov.au

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Background maps for Figure 1 and Figure 4 provided by Google Earth.

Abstract

On 8 July 2005, the pilot was conducting a charter flight, with two passengers on board, in a Piper PA31-350 Navajo Chieftain. The flight was initially planned to proceed from Essendon Airport to Mount Hotham, Victoria. However, because of adverse weather, the pilot revised his destination to Wangaratta. While en route, he diverted the aircraft to his originally intended destination, Mount Hotham. The pilot subsequently reported to air traffic control that he was overhead Mount Hotham. He changed the flight category from visual flight rules to instrument flight rules and advised his intention to conduct an instrument approach to runway 29. At about 1725, the pilot told the Mount Hotham Airport Manager by radio that he was on final approach for runway 29 and asked him to switch on the runway lights. After doing so, the manager attempted to tell the pilot that the lights had been switched on, but received no response. Subsequent attempts by air traffic control and the crews of other aircraft to contact the pilot were also unsuccessful. Because of hazardous weather conditions over the following two days, the search for the aircraft was primarily conducted on foot and horseback. The aircraft was located on a tree covered ridge, partially covered by snow. It had flown into trees in a level attitude, slightly banked to the right. Initial impact with the ridge was at about 200 ft below the elevation of the Mount Hotham aerodrome. The Chieftain had broken into several large sections and an intense fire had consumed most of the cabin. The occupants were fatally injured. The investigation determined that the aircraft systems had been operating normally. The weather conditions were ideal for a 'flat light' phenomenon that was likely to have denied the pilot adequate visual reference. The pilot may have experienced disorientation and loss of situational awareness. The aircraft was not equipped for flight in icing conditions, nor had the pilot complied with the requirements for flight under the instrument flight rules or in accord with the visual flight rules.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal Bureau within the Australian Government Department of Transport and Regional Services. ATSB investigations are independent of regulatory, operator or other external bodies.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations. Accordingly, the ATSB also conducts investigations and studies of the transport system to identify underlying factors and trends that have the potential to adversely affect safety.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and, where applicable, relevant international agreements. The object of a safety investigation is to determine the circumstances to prevent other similar events. The results of these determinations form the basis for safety action, including recommendations where necessary. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations.

It is not the object of an investigation to determine blame or liability. However, it should be recognised that an investigation report must include factual material of sufficient weight to support the analysis and findings. That material will at times contain information reflecting on the performance of individuals and organisations, and how their actions may have contributed to the outcomes of the matter under investigation. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. While the Bureau issues recommendations to regulatory authorities, industry, or other agencies in order to address safety issues, its preference is for organisations to make safety enhancements during the course of an investigation. The Bureau is pleased to report positive safety action in its final reports rather than make formal recommendations. Recommendations may be issued in conjunction with ATSB reports or independently. A safety issue may lead to a number of similar recommendations, each issued to a different agency.

The ATSB does not have the resources to carry out a full cost-benefit analysis of each safety recommendation. The cost of a recommendation must be balanced against its benefits to safety, and transport safety involves the whole community. Such analysis is a matter for the body to which the recommendation is addressed (for example, the relevant regulatory authority in aviation, marine or rail in consultation with the industry).

EXECUTIVE SUMMARY

On 8 July 2005, the pilot of a Piper PA31-350 Navajo Chieftain, registered VH-OAO, submitted a visual flight rules (VFR) flight plan for a charter flight from Essendon Airport to Mount Hotham, Victoria. On board the aircraft were the pilot and two passengers. At the time, the weather conditions in the area of Mount Hotham were extreme.

While taxiing at Essendon, the pilot requested and was granted an amended airways clearance to Wangaratta, due to the adverse weather conditions at Mount Hotham. The aircraft departed Essendon at 1629 Eastern Standard Time.

At 1647 the pilot changed his destination to Mount Hotham. At 1648, the pilot contacted Flightwatch and requested that the operator telephone the Mount Hotham Airport and advise an anticipated arrival time of approximately 1719. The airport manager, who was also an accredited meteorological observer, told the Flightwatch operator that in the existing weather conditions the aircraft would be unable to land.

At 1714, the pilot reported to air traffic control that the aircraft was overhead Mount Hotham and requested a change of flight category from VFR to instrument flight rules (IFR) in order to conduct a Runway 29 Area Navigation, Global Navigation Satellite System (RWY 29 RNAV GNSS) approach via the initial approach fix HOTEA.

At 1725 the pilot broadcast on the Mount Hotham Mandatory Broadcast Zone frequency that the aircraft was on final approach for RWY 29 and requested that the runway lights be switched on. No further transmissions were received from the aircraft.

The wreckage of the aircraft was located by helicopter at 1030 on 11 July. The aircraft had flown into trees in a level attitude, slightly banked to the right. Initial impact with the ridge was at about 200 ft below the elevation of the Mount Hotham aerodrome. The aircraft had broken into several large sections and an intense fire had consumed most of the cabin. The occupants were fatally injured.

There was no evidence that physiological factors affected the performance of the pilot. There were no indications prior to, or during the flight, of any problems with the aircraft systems that may have contributed to the accident.

The weather at Mount Hotham aerodrome at the time of the accident did not meet the minimum requirements for the conduct of flight under VFR. The conditions in the vicinity of the aerodrome were also significantly worse than the IFR approach minima. During the day, two other aircraft had attempted RWY 29 RNAV GNSS approaches in accordance with the published procedure. However, in both cases the crews were unable to establish visual reference at the approach minima, and they diverted to alternate aerodromes.

The two accredited meteorological observers at Mount Hotham aerodrome reported that at the time of the accident there were snow showers and an unbroken cloud base at between 100 and 200 ft. The Mount Hotham automatic weather station recorded that between 1629 and 1729, visibility was 300 m, with a temperature of zero degrees Celsius. The area and aerodrome forecasts for Mount Hotham predicted icing conditions in the area. The aircraft was not equipped to fly into forecast or actual icing conditions.

The weather conditions at the time of the accident included a cloudy sky and sleet and snow showers in an area in which the ground was covered with snow. Such conditions are conducive to visual illusions associated with a ‘flat light’ phenomenon. Flat light can impair a pilot’s ability to perceive depth, distance, altitude or topographical features. It can completely obscure the features of the terrain, creating an inability for the pilot to distinguish closure rates. In these conditions a pilot may become spatially disoriented, unable to maintain visual reference with the ground, and unaware of actual altitude. Such conditions can result in controlled flight into terrain.

Radar data and other information indicated that although the pilot had advised his intention to conduct the RWY 29 RNAV GNSS instrument approach, he did not follow the published procedure. The pilot did not overfly any of the initial approach fixes, but conducted a truncated procedure that did not follow any of the prescribed tracks. The aircraft appeared to be tracking adjacent to the Great Alpine Road on the last segment of the flight and diverging further left of the published RNAV GNSS inbound track.

Staff at Mount Hotham and pilots interviewed by the Australian Transport Safety Bureau (ATSB), reported that they had observed the pilot land at Mount Hotham in weather conditions unsuitable for aircraft arrivals. An arrival method, of which he had frequently spoken, was to fly down a valley to the south-east of Mount Hotham aerodrome, locate the Great Alpine Road and follow it back to the aerodrome.

The pilot was known, by his Chief Pilot and others, to adopt non-standard approach procedures to establish his aircraft clear of cloud when adverse weather conditions existed at Mount Hotham. This accident highlights the unsafe nature of such practices.

The investigation was unable to determine why the pilot persisted with his attempt to land at Mount Hotham in such adverse weather conditions. However, it is possible that overconfidence and commercial or family pressures influenced the pilot’s decision making.

Civil Aviation Safety Authority (CASA) Field Office staff had held concerns about aspects of the operator’s performance for some time. As a result, CASA staff continued to monitor the operator. However, formal surveillance of the operator in the two years prior to the accident had not identified any significant operational issues that would have warranted CASA taking action against the operator. In that situation, the safety of the flight was reliant on the safety culture of the operator, and ultimately depended on the operational decision-making of the pilot in command.

As a result of this investigation, the ATSB has recommended that CASA publish educational material, to promote greater awareness of the flat light phenomenon for pilots operating in susceptible areas. The ATSB has also recommended that CASA review its surveillance methods, which may include cooperation with Airservices Australia, for the detection of patterns of unsafe practices and non-compliance with regulatory requirements.

CASA has advised the ATSB that it is taking safety action including enhancing its operator risk assessment processes to enable it to more clearly identify and quantify operators presenting risks to aviation safety.

1 FACTUAL INFORMATION

1.1 History of the Flight

On 8 July 2005, the pilot of a Piper PA31-350 Navajo Chieftain, registered VH-OAO, submitted a flight plan to air traffic control for a charter flight from Essendon Airport to Mount Hotham, Victoria. The flight plan indicated that the flight would be conducted in accordance with the visual flight rules (VFR) and that two passengers would be on board.

While taxiing at Essendon, the pilot notified Essendon air traffic control that due to adverse weather conditions at Mount Hotham, he now required an amended airways clearance to Wangaratta. He added that it was because Mount Hotham was '...all socked in'. That was acknowledged by the Essendon surface movement controller who then issued an airways clearance to Wangaratta via Strathbogie at an altitude of 9,500 ft. The aircraft departed Essendon at 1629 Eastern Standard Time[1]. The Essendon aerodrome controller advised Melbourne air traffic control of the departure. The aerodrome controller added that the aircraft had planned VFR, but that there was cloud along the intended route.

Figure 1: Diversion from the Essendon – Wangaratta track to Mount Hotham

At 1647 the pilot changed his destination to Mount Hotham (Figure 1)[2]. That was acknowledged by air traffic control, who advised that the aircraft was outside

1 The 24-hour clock is used in this report to describe the local time of day, Eastern Standard Time (EST), as particular events occurred. Eastern Standard Time was Coordinated Universal Time (UTC) + 10 hours.

2 Background maps for Figure 1 and Figure 4 provided by Google Earth.

controlled airspace and that radar services had been terminated. Outside controlled airspace, air traffic control does not provide an aircraft separation service, but, dependent upon the flight category, may provide aircraft traffic information, search and rescue alerting services, and requested weather and aeronautical information.

At 1648, the pilot contacted Flightwatch[3] and requested that the operator telephone the Mount Hotham Airport and advise an anticipated arrival time of approximately 1719. The airport manager, who was also an accredited meteorological observer, told the Flightwatch operator that in the existing weather conditions the aircraft would be unable to land. He also indicated that prior to the aircraft departing Essendon he had twice spoken to the pilot about rapidly deteriorating weather conditions at Mount Hotham. The Flightwatch operator conveyed to the pilot the message that he would be unable to land at Mount Hotham. The pilot responded to the Flightwatch operator that '...our customer is keen to have a look at it'. During a conversation between the pilot and his chief pilot prior to departing Essendon, consideration was given to deferring the flight until the weather at Mount Hotham had improved. The pilot reportedly advised that his passenger was adamant that if possible, he wanted to fly to Mount Hotham that afternoon.

The area and aerodrome forecasts for Mount Hotham were available to the pilot, but the investigation was unable to determine whether he had obtained copies of them. Each forecast predicted icing conditions in the Mount Hotham area. During the two discussions prior to departing Essendon, the pilot was advised by the airport manager of low cloud, poor visibility and snow showers in the vicinity of the Mount Hotham aerodrome. Those discussions were in accordance with the operator's requirement, contained in a special operating procedure, to obtain the latest actual weather information prior to operating into Mount Hotham. At 1714, the pilot reported to air traffic control that the aircraft was overhead Mount Hotham and requested a change of flight category from VFR to instrument flight rules (IFR) in order to conduct a Runway 29 Area Navigation, Global Navigation Satellite System (RWY 29 RNAV GNSS) approach via the initial approach fix HOTEA (Figure 2). The change of flight category to IFR required the controller to provide traffic information and search and rescue services. At the time that the pilot advised air traffic control that he was going to conduct an instrument approach he was already 700 feet below the initial approach altitude.

The controller advised the pilot that the aircraft was identified on radar and that there was no other IFR aircraft in the area. The Australian Advanced Air Traffic System (TAAATS) recorded radar data showed that the aircraft approached Mount Hotham from the west and passed to the south of the aerodrome. Mount Hotham aerodrome did not have tower or approach control services.

The controller selected the RNAV GNSS approach fixes on the air situation display[4] (ASD). Prior to amending the aircraft's track in TAAATS, the controller displayed the fixes and then changed the aircraft's flight plan in the radar system. The controller re-routed the aircraft's track symbol direct to HOTEA. Then, intending to also display HOTEI, the controller inadvertently enabled the Mount

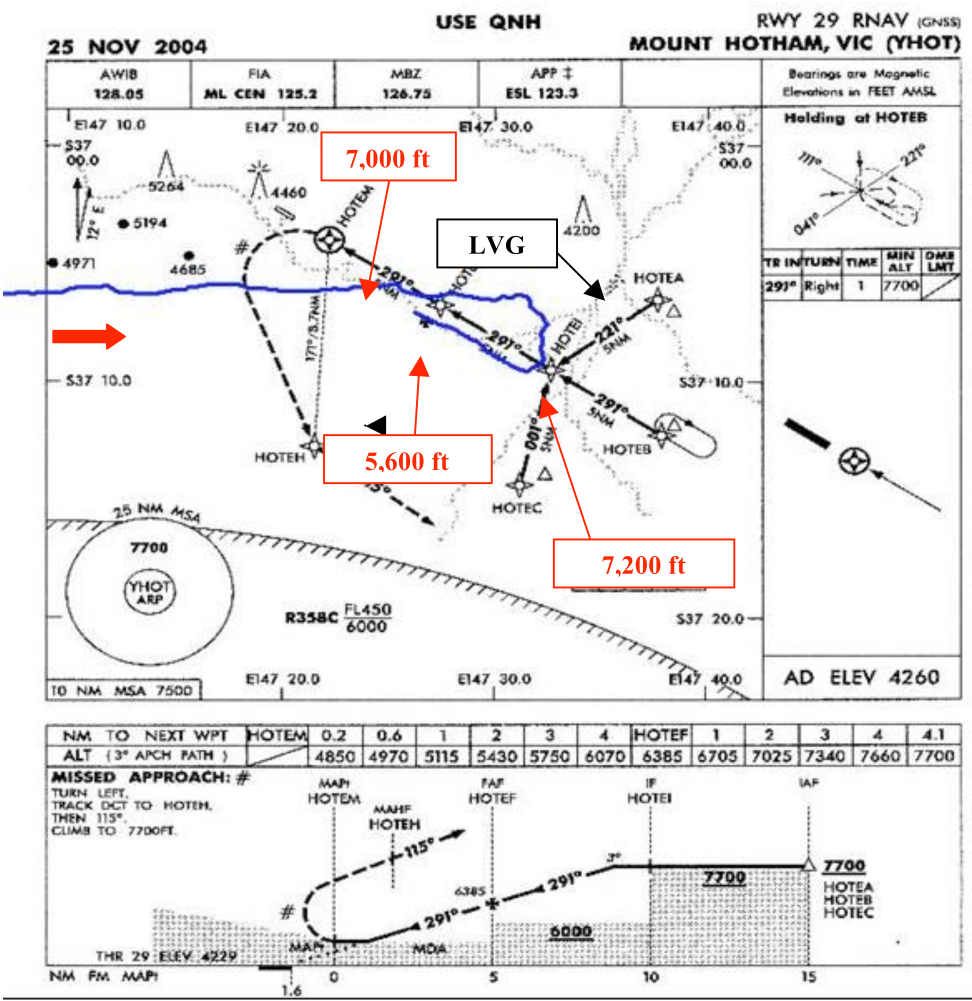
3 Flightwatch provided on-request radio services, initial in-flight emergency response and search and rescue time management services to pilots.

4 The air situation display is the screen used by air traffic control to display radar data.

Livingstone (LVG) VOR[5] navigation aid symbol to appear on the ASD, instead of the HOTEI symbol. Mount Livingstone VOR is located approximately 1.8 km north of HOTEI (Figure 2). The aircraft flight category was amended to IFR.

At 1725 the pilot broadcast on the Mount Hotham Mandatory Broadcast Zone (MBZ) frequency that the aircraft was on final approach for RWY 29 and requested that the runway lights be switched on. At 1727 the airport manager attempted to advise the pilot that the runway lights were now on. There was no response and no further transmissions were heard from the aircraft.

Figure 2: Runway 29 RNAV GNSS instrument approach chart showing the radar derived VH-OAO track and altitudes



Due to hazardous weather conditions over the following two days, the search for the aircraft was primarily conducted on foot and on horseback. A helicopter crew located the Chieftain at 1030 on 11 July. The wreckage was found on a tree covered ridge, partially covered by snow, approximately 5 km south-east of the aerodrome (Figure 3). Although the aircraft was fitted with an emergency locator transmitter (ELT), AusSAR[6] did not receive a signal. The ELT had been severely damaged by

5 VHF omnidirectional radio range navigation beacon.

6 AusSAR is the national search and rescue organisation.

heat from the post-impact fire and the cable connecting the antenna to the unit was broken during the impact. Consequently, had the ELT operated, it would not have radiated a viable signal.

The aircraft had cut a swath through trees on the slope of a steep ridge and came to rest near the top of the ridge. Tree damage indicated that the aircraft was maintaining an approximately level attitude, slightly banked to the right, and aligned on a magnetic bearing of 280 degrees.

Figure 3: Main wreckage obscured by snow

Several people in the vicinity of the aerodrome, and at nearby Cobungra, heard the aircraft and advised that the engines sounded normal. The witnesses also commented that the weather conditions included rain, sleet and low cloud. The two accredited meteorological observers at Mount Hotham aerodrome reported that at the time of the accident there were snow showers and an unbroken cloud base at between 100 and 200 ft. The Mount Hotham automatic weather station recorded that between 1629 and 1729, visibility was 300 m, with a temperature of zero degrees Celsius (Appendix A).

During the day, a Bombardier Dash 8 (Dash 8) and a Cessna Citation aircraft had attempted RWY 29 RNAV GNSS approaches. Each aircraft’s crew had commenced the approach by overflying the initial approach fix HOTEA. The Dash 8 crew conducted a second instrument approach, and joined the procedure from a position abeam HOTEB. As the crews were unable to establish visual reference at the approach minima, they diverted to alternate aerodromes. Radar data showed that the instrument approaches were conducted in accordance with the published procedure (Appendix B).

No anomalies with the global navigation satellite system were detected during the period that any of the aircraft were in the vicinity of Mount Hotham. Radar data and other information also showed that although the pilot had advised his intention to conduct the RWY 29 RNAV GNSS instrument approach, he did not follow the published procedure. The RWY 29 instrument approach procedure should have been commenced by flying over one of three initial approach fixes, HOTEA, HOTEB or HOTEC. The pilot did not overfly any of the initial approach fixes, but conducted a truncated procedure that did not follow any of the prescribed tracks. Radar data recorded the aircraft turning towards the aerodrome when passing abeam the intermediate fix HOTEI, at 7,200 ft (Figure 2).

The published initial approach altitude was 7,700 ft. When passing Mount Hotham the aircraft was at 7,000 ft. It was recorded at 7,200 ft while turning near position

HOTEI. When passing left abeam the final approach fix HOTEF, the Chieftain's altitude was 5,600 ft. The published minimum altitude at the final approach fix was 6,385 ft. Radar data also showed that the aircraft appeared to be tracking adjacent to the Great Alpine Road on the last segment of the flight (Figure 4) and diverging further left of the published RNAV GNSS inbound track. It passed 1.3 km to the left of the final approach path fix at HOTEF.

Figure 4: Aircraft flight path into lower terrain and relative to the Great Alpine Road

The controller did not see that the Chieftain had turned onto a southerly heading when about 5 NM west of HOTEA, but observed the aircraft when it turned toward Mount Hotham. TAAATS incorporated safety functions to automatically alert air traffic controllers to situations such as deviations by aircraft from their assigned altitude or flight path when within radar system coverage. Outside controlled airspace, altitude deviation alerts were not available and tracking alerts would only activate if an aircraft deviated more than 7.5 NM from a nominated track. The aircraft was not subject to any alerts during the flight, as it did not deviate more than 7.5 NM from the tracking requirements of the RNAV GNSS approach.

The default range of the radar display was 390 NM and the controller later reported that he normally operated the display on 290 NM when managing the combined Dookie, Ovens and Hume sectors. The combined sectors encompassed the area from 40 NM north-east of Melbourne to 30 NM south-west of Canberra, plus Shepparton and Wagga Wagga to the west and Mount Livingstone and Corryong to the east (Appendix C). Limitations in the TAAATS replay system precluded confirmation of the range displayed at the time of the occurrence. Due to the high terrain in the area, radar data was not available once the aircraft descended below approximately 5,500 ft. The altitude at which air traffic control may receive radar information from an aircraft on approach to Mount Hotham is not constant, but is affected by the vagaries of radio signal propagation in a mountainous environment.

Earlier in the day, the pilot had flown family members to Mount Hotham. He then returned to Essendon to pick up the two passengers for the charter flight and return to Mount Hotham to rejoin his family. During the arrival at Mount Hotham earlier in the day, the pilot had broadcast on the MBZ frequency that he would conduct a RWY 29 RNAV GNSS approach. The aircraft was subsequently observed banking to the right from a position near the Great Alpine Road and tracking parallel to the final approach path to runway 29. The pilot later told aerodrome ground staff that although there was low cloud in the area, he had gained visual contact with the ground and had changed his mind about conducting the instrument approach procedure in case he lost sight of the ground.

Prior to departing Mount Hotham to return to Essendon, the pilot was observed wiping snow from the Chieftain's wings. The aircraft subsequently departed in conditions of light snowfall, a cloud base of 500 ft, and visibility of 1,000 m.

1.2 Injuries to persons

The pilot and two passengers sustained fatal injuries.

1.3 Damage to aircraft

The aircraft was destroyed by impact forces and the post-impact fire.

1.4 Other damage

The aircraft cut a swath through trees on a steep ridge.

1.5 The Pilot

Type of licence	Commercial
Medical certificate	Class 1
Flying experience (total hours)	4,770.0
Hours on the type	1,268.7
Hours flown in the last 24 hours	3.2
Hours flown in the last 90 days	126.3
Instrument Rating	Multi engine command

The pilot had recently renewed his instrument rating, which included demonstrating his ability to conduct RNAV GNSS approaches. His flying was assessed by an Approved Testing Officer as competent, although weak in some procedural areas. Staff at Mount Hotham and pilots interviewed by the ATSB, reported that they had observed the Chieftain pilot land at Mount Hotham in weather conditions unsuitable for aircraft arrivals. An arrival method, of which he had frequently spoken, was to fly down a valley to the south-east of Mount Hotham aerodrome, locate the Great Alpine Road and follow it back to the aerodrome.

The organisation had incorporated into its operations manual a standard operating procedure for flights into, and from Mount Hotham. It required that:

> operations into Mount Hotham be conducted primarily on a VFR basis, with the capability to upgrade to IFR if required. IFR procedures will normally only be used for Melbourne arrivals and departures, since flights will not normally depart for Hotham unless reported conditions permit visual approach.
>
> Factors to be particularly aware of when operating at Mt Hotham are; icing (flight into known icing conditions is not permitted), high terrain, mountain turbulence, and the effects of altitude on aircraft performance.
>
> Pilots should fly PAPIs for all approaches. …RWY 29 is standard 3.3%[7].

The standard operating procedure also provided guidance to pilots who, after having become visual from the RWY 29 GNSS RNAV approach, subsequently lost visual reference with the ground. An operator specific, missed approach procedure was required.

The Chief Pilot informed the ATSB that the pilot had 'flown into Mount Hotham 204 times in the past 6 years, and had conducted 51 flights into Mount Hotham in 2005'. The Chief Pilot further advised the expectation that the pilot:

> was able to remain in visual contact with the ground and that he elected to remain visual and that he in fact tracked around the high feature in a clockwise direction, and attempted to follow the roadway to YHOT.

The weather at Mount Hotham aerodrome at the time of the accident (Appendix A) did not meet the minimum requirements for the conduct of flight under VFR. The conditions in the vicinity of the aerodrome were also significantly worse than the IFR approach minima. The published IFR approach minima applicable to the RWY 29 RNAV GNSS approach were; a minimum descent altitude of 4,970 ft and visibility of not less than 4.2 km.

Two weeks prior to the accident, the pilot was counselled by a senior air traffic controller at Essendon Airport. The discussion was primarily about the impact that the pilot's impatient style and relatively high performance aircraft were having on those providing the control service, as well as other pilots operating in the Essendon control zone.

During the discussion with the senior air traffic controller, the pilot had spoken enthusiastically of a proposed development at Mount Hotham and the potential benefit for his business. He spoke of being asked by the developer if weather was an operational problem at Mount Hotham. The pilot reportedly assured the developer that in ten years of operating into Mount Hotham, weather had never prevented him from making a landing. His passengers on the accident flight included the developer.

The air traffic controller observed that previous counselling had not produced any notable change in the pilot's level of consideration of other airspace users. During the early part of the accident flight, in coordination discussions between two air

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7 (PAPI) Precision approach path indicator. An array of lights used to guide pilots on the correct approach angle when landing.

traffic controllers involving the Chieftain, another controller commented in relation to the pilot that 'He's a bit of a cowboy, keep an eye on him'.

The Essendon Tower manager was aware that CASA was scrutinising the pilot's performance as (a) the pilot had mentioned this fact; and (b) that Flying Operations Inspectors from CASA had rung Essendon Tower to request anecdotal information about the pilot's performance and had in the fortnight prior to the accident sought information about flying times between Essendon and Mount Hotham.

The pilot had been the subject of several incident reports that had been submitted by air traffic control to the ATSB and CASA. In the three year period from 2001 until 2004, he was reported for failing to maintain lowest safe altitude at night, violations of controlled airspace and a failure to comply with air traffic control instructions.

The pilot was aware that he was under CASA scrutiny, but told a Flying Operations Inspector that he could not understand CASA's concerns as he had never had an accident. Other issues identified and noted on CASA documentation were the pilot's inadequate knowledge of operational and regulatory requirements.

1.6 Aircraft information

1.6.1 Aircraft data

Manufacturer	Piper Aircraft Corporation
Model	PA31-350 Navajo Chieftain
Serial number	31-8252021
Registration	VH-OAO
Year of manufacture	1982
Maintenance release (No.)	RAC 24253
Total airframe hours	9,137.5

1.6.2 Aircraft maintenance, serviceability and equipment

The Chieftain had been maintained in accordance with regulatory provisions and there were no current defect reports. The aircraft was equipped for flight under the Instrument Flight Rules (IFR). It was fitted with a King KLN89B Global Positioning System (GPS), which was approved for RNAV GNSS instrument approaches. While the aircraft was equipped to fly in instrument flight conditions, it was not equipped to fly into forecast or actual icing conditions.

1.7 Meteorological information

1.7.1 Weather forecasts

In accordance with the requirements for flight under IFR, the pilot was required to obtain either a flight forecast for the route being flown, or an area forecast and destination weather forecast. The Bureau of Meteorology provided area and aerodrome forecasts at specific times each day, and these were available to the pilot on request (Appendix D). The investigation was unable to determine whether the pilot had obtained the required meteorological forecasts prior to departing Essendon. There was no record of his having accessed AVFAX[8] information. However, he received information on the actual destination weather conditions from an approved meteorological observer at Mount Hotham.

The area 30 forecast, which incorporated Mount Hotham, showed that a low pressure trough was expected to pass through the area during the late afternoon. The low pressure trough was associated with a flow of unusually cold air. A moist south-easterly air flow near the surface exposed Mount Hotham to cloudy conditions when the flow lifted along the mountain. It also led the Bureau of Meteorology to issue a significant meteorological information bulletin, which forecast severe icing between 5,000 and 14,000 ft within the area. The Mount Hotham aerodrome forecast for the period up to 2400 indicated a light south-south-easterly wind, with broken cloud between 1,000 and 9,000 ft. The forecast also indicated temporary periods of snow, broken cloud at 400 ft and a visibility of 1,000 m. Last light was forecast for 1735. At the time of the accident, a meteorological observer at the aerodrome noted that the combination of approaching last light and local meteorological conditions had resulted in rapidly fading light conditions.

1.7.2 Observed weather conditions

Meteorological data recorded at the Mount Hotham aerodrome automatic weather station showed that during the period 1659 to 1759 there was a light south-easterly wind with a visibility of 300 m. That was consistent with data recorded by the meteorological observer. He had recorded the cloud base as unbroken between 100 and 200 ft with heavy snowfall. Unusually heavy snowfall had covered the opening to the rain gauge associated with the aerodrome automatic weather station. This precluded any accurate record of precipitation.

Several witnesses in the vicinity of Mount Hotham reported that at the time of the accident there had been fog, mist, low cloud, drizzle, light rain and sleet.

1.8 Aids to navigation

There were no ground based navigation aids at Mount Hotham aerodrome. There was an approved RWY 29 RNAV GNSS instrument approach procedure for the aerodrome. The Mount Livingstone VOR was located approximately 20 km from the aerodrome.

1.9 Communications

During the flight, all communications between ATC, Flightwatch and the pilot were recorded by ground based automatic voice recording equipment. The quality of the

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8 Airservices Australia provided a pre-flight pilot briefing service, which included relevant weather and aeronautical information. The service could be accessed via telephone, fax or the Internet.

aircraft's recorded transmissions was good. The telephone conversation between the Flightwatch operator and the Mount Hotham Airport Manager was also recorded. In keeping with normal practice in similar situations, communications on the Mandatory Broadcast Zone frequency in the vicinity of Mount Hotham were not recorded.

1.10 Aerodrome information

Mount Hotham aerodrome was privately owned and operated. It had a single sealed runway, which was aligned 110º/290º (RWY 11/RWY 29) magnetic direction. The aerodrome reference point elevation was 4,260 ft above mean sea level (AMSL).

1.11 Flight recorders

The aircraft was not fitted with a flight data recorder or a cockpit voice recorder, nor was there a legislated requirement to do so.

1.12 Impact and wreckage information

The impact site was on the side of a steep ridge approximately 5 km south-east of the aerodrome and to the left of the extended centreline of RWY 29. The slope was heavily timbered with an average tree height of 8 to 10 m. There was extensive snow cover in the area as a result of moderate to heavy falls. The aircraft broke into several large sections during the impact sequence. The pieces came to rest in an area 100 m long by 20 m wide and spread up the ridge from 4,060 to 4,130 ft AMSL. The main wreckage was located at GPS position 37º5´12.74´´S 147º22´33.11´´E.

Damage to the engines and propellers was consistent with both engines delivering power at the time of impact. The landing gear was extended, but its pre-impact position could not be confirmed. The wing flaps were fully retracted. An intense post-impact fire destroyed most of the fuselage, including the instrument panel and avionics.

1.13 Medical information

There was no evidence that physiological factors affected the performance of the pilot.

1.14 Fire

An intense fire, fed by fuel from the ruptured right wing fuel tanks, consumed most of the fuselage.

1.15 Survival aspects

The severity of the impact was such that the accident was not survivable.

1.16 Tests and research

The following paragraphs briefly describe results of research conducted by the Flight Safety Foundation, the International Civil Aviation Organization, the US Federal Aviation Administration, and the US National Transportation Safety Board. The ATSB's research report B2004/0010 found that 30 per cent of general aviation fatal accidents in the decade to 2001 were caused by controlled flight into terrain (CFIT). Recent ATSB reports into CFIT accidents include the Raytheon Beech 200C near Mt Gambier, Victoria on 10 December 2001 (BO/200105769) and the Ilyushin IL-76 TD near Baucau, Timor Leste on 31 January 2003 (BO/200300263). The Mt Gambier report highlighted the importance of good CFIT/approach-and-landing accident reduction (ALAR) awareness, and included the Flight Safety Foundation CFIT Checklist and ALAR risk reduction tool kit in that report.

1.16.1 Controlled flight into terrain and approach and landing accidents

Research into accidents has been conducted by an international industry taskforce, under the auspices of the International Civil Aviation Organization and the Flight Safety Foundation. The research found that accidents occurring in the approach and landing phase and CFIT accidents, together accounted for 80 per cent of fatalities in commercial transport-aircraft accidents globally from 1979 to 1991. CFIT occurs when an airworthy aircraft, under the control of the flight crew, is flown unintentionally into terrain, obstacles or water. This type of accident can occur during most phases of flight, but is more common during the approach and landing phase.[9]

1.16.2 Flying in flat light conditions

'Flat light', also known as sector or partial white-out, is an optical illusion caused by the diffused lighting that occurs under a cloudy sky, particularly when the ground is snow covered. While not as severe as white-out, when the aircraft may be engulfed in a uniformly white glow, the condition causes pilots to lose their depth-of-field and contrast vision. Flat light conditions inhibit visual cues, impairing a pilot's ability to perceive depth, distance, altitude or topographical features. Flat light can completely obscure the features of the terrain, creating an inability for the pilot to distinguish closure rates. Reflected light can give a pilot the illusion of ascending or descending when actually in level flight. In these conditions a pilot may become spatially disoriented, unable to maintain visual reference with the ground, and unaware of actual altitude.[10]

1.17 Organisational information

The aircraft was operated by a family-owned charter organisation based in regional Victoria. The Air Operator Certificate (AOC) issued by the Civil Aviation Safety Authority authorised the operation of single and multi-engine aircraft. The pilot's

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9 For further information see Flight Safety Foundation http://www.flightsafety.org/alar_list.html

10 FAA *Aeronautical Information Manual*, Chapter 7, s7-5-13, http://www.faa.gov/ATpubs/AIM National Transportation Safety Board, http://www.ntsb.gov/Recs/letters/2002/A02_33_35.pdf

spouse was the organisation's Chief Pilot and the pilot was both the AOC holder and Operations Manager.

1.18 Additional information

1.18.1 CASA surveillance of the operator

The role of CASA in aviation safety is multifaceted – it is responsible for the safety regulation of the aviation industry as well as having the function of encouraging the industry to accept its obligation to maintain high safety standards. To meet its obligations, CASA relies on a number of surveillance mechanisms to enable an adequate level of awareness of industry practice and operational safety management. Those surveillance mechanisms include; audits of operators' systems, document reviews, and safety trend indicator assessments[11].

CASA has a number of administrative enforcement-related tools available in the event that an operator or pilot has demonstrated a disregard for operational safety. However, the effective application of those mechanisms can be limited by the difficulties in gathering information of sufficient accuracy and reliability.

For at least three years prior to the accident, staff at CASA's Moorabbin Field Office had recorded concerns regarding the operator. Those concerns were a result of safety incidents and CASA safety trend indicator assessments. The last CASA on-site audit of the organisation was completed in late 2003 and the last on-site operational records inspection was in May 2004. Neither the audit nor the inspection identified any significant operational issues.

Safety trend indicator assessments of the operator were completed in September 2003, February 2004, September 2004, and February 2005. During that time, the overall performance of the organisation was judged to have deteriorated. In particular, the overall performance of the organisation relative to other organisations carrying out similar work was judged to have deteriorated from 'About average', to 'Somewhat worse', to 'Much worse'. It should be noted, however, that this rating still assumed that the organisation was operating at or above the minimum standard required by regulation.

Some elements of the safety trend indicator assessments used by CASA to determine the safety risk potential of the operator were open to subjective interpretation. In addition, some assessments contained errors that were not recognised by CASA until after the accident. Nevertheless, a trend of concern was evident throughout consecutive reports, and the operator was considered to be at risk of falling below the minimum standards in a number of key safety related areas. CASA advised that in the two years prior to the accident, surveillance of the operator and pilot did not indicate any significant safety issues.

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11 The CASA safety trend indicator system was used nationally to analyse the overall state of the aviation industry. It was intended to determine trends over time and target surveillance resources at a field office planning level. It quantified the external stressors, internal management issues and compliance history of an operator, and indicated any higher likelihood of problems occurring in an organisation.

CASA Field Office management had responded to concerns expressed by Flying Operations Inspectors by continued monitoring of the company and their operations and actively seeking additional information about the operator. The type and frequency of monitoring was dependent upon resource availability. An audit of the operator had not been conducted since late 2003. CASA Field Office management, who were responsible for the oversight of the operator, had forwarded to CASA's then Head of Risk and Internal Audit their concerns about the operator, and the reasons behind the concerns. The operator was identified by CASA as one of several in the Vic/Tas[12] Region whose activities may pose a potential safety risk.

12 The CASA Field Office at Moorabbin was responsible for regulatory oversight of general aviation operations throughout Victoria and Tasmania. This was referred to as the Vic/Tas Region.

2 ANALYSIS

2.1 Introduction

This analysis will address the following aspects relevant to the circumstances of the occurrence:

- weather conditions
- operational decision making processes
- provision of air traffic services
- aviation safety regulation.

2.2 Weather conditions

The pilot changed his planned destination from Mount Hotham to Wangaratta in response to the extreme local weather conditions at Mount Hotham. However, when en route he diverted to Mount Hotham and commenced an approach despite further strong advice that low cloud and snow showers precluded a landing. It could not be determined whether the pilot was in receipt of the current significant meteorological information bulletin (SIGMET). Had the pilot received the SIGMET, it would have alerted him to the forecast severe icing conditions.

Given the pilot's considerable experience flying into Mount Hotham in marginal weather conditions, he could have had no realistic expectation that the published instrument approach procedure would enable a landing in the extreme conditions forecast and advised by the airport manager and meteorological observer at Mount Hotham.

2.2.1 Flat light phenomena and the approach path

The meteorological conditions existing at the time the pilot commenced the approach were consistent with those necessary for the flat light phenomenon (Section 1.16.2). The existing low-visibility environment would have been exacerbated by rapidly fading daylight.

Consequently, it is likely that the pilot's depth-of-field and contrast vision were impaired. The aircraft was moving towards heavily snow covered and steeply rising terrain, in conditions of continuing snowfall. The pilot would have had difficulty distinguishing distances and closure rates. Any existing visual cues may have created visual illusions as to whether the aircraft was climbing, descending or flying level. The pilot's request that the runway lights be switched on is consistent with the low visibility conditions due to weather and light that prevailed at the time of the accident.

2.2.2 Airframe icing

On the earlier flight from Mount Hotham to Essendon the pilot departed in actual icing conditions. Given that the aircraft was not fitted with anti-icing or de-icing equipment, the pilot placed the safety of the flight at risk.

The pilot subsequently returned to Mount Hotham, fully aware that the conditions had further deteriorated. The automatic weather station recordings, and the observations of the approved meteorological observers, together with other witness reports of snowfall, drizzle, light rain and sleet in the Mount Hotham area make it probable that ice accreted on the aircraft. However, it is not possible to determine the amount, or the effect that any icing may have had.

2.3 Operational decision making processes

Given the pilot's statements to the effect that weather had never prevented him from landing at Mount Hotham, his decision to proceed to Wangaratta indicated his recognition that the weather conditions were extreme. Information provided to him during the flight confirmed the earlier reports. Despite that, the pilot diverted to Mount Hotham and commenced an approach to land.

In doing so, the pilot demonstrated a high degree of confidence in his ability to establish visual flight while manoeuvring near mountainous terrain in conditions that included fog, sleet, snow and light rain. He may have become overconfident as a result of his previously successful landings and having 'never had an accident'. He may also have felt some pressure to attempt the approach as a consequence of his claims regarding his operations at Mount Hotham. Successful completion of the flight could have been seen to confirm to the resort developers his credentials for reliable aircraft services to the resort.

On the earlier flight, the pilot had flown members of his family to Mount Hotham, with the intention of joining them following his return from Essendon. It is possible that commercial considerations and a desire to rejoin his family influenced the pilot's decision to not land at Wangaratta.

The pilot indicated his intention to conduct a Runway 29 Area Navigation, Global Navigation Satellite System (RWY 29 RNAV GNSS) approach via the initial approach fix at HOTEA. Given the aircraft's track into Mount Hotham from the west, the nearest entry point to the procedure would have been via the initial approach fix at position HOTEC (Figure 2). Although it was the nearest point at which to establish the aircraft on the instrument approach procedure, it is likely that the pilot chose to track toward HOTEA in order to become visual by descending away from higher terrain. The radar plot of the occurrence flight showed that the pilot had tracked around a knoll and turned towards an approximate final leg of the approach to the runway over lower terrain.

It is evident that the pilot did not follow the prescribed entry, tracking, or altitude requirements of the instrument approach procedure. Earlier that day a witness had observed the aircraft flying a final approach track corresponding to that flown on the occurrence flight, which suggests that he had conducted a similar approach on the earlier flight. That accorded with comments made by the pilot, as well as observations of his approaches in adverse weather. It is likely that the pilot adopted practices to gain visual contact with the ground and follow the Great Alpine Road (Figure 4). He was relying on local knowledge and experience to establish visual reference with the ground. The Chief Pilot was aware that in adverse weather conditions, the pilot did not always track via the published procedure at Mount Hotham.

The pilot's alternative approach procedure for adverse weather arrivals into Mount Hotham depended upon his ability to accurately judge the extent and severity of weather conditions. In utilising his alternative approach procedure, the pilot negated the inbuilt safety margins of the published instrument approach. Without adequate safety margins, the pilot was entirely dependent upon his situational awareness and recognition of his own limitations.

2.4 Provision of air traffic services

The aircraft was outside controlled airspace at the time of the accident; therefore the air traffic controller's primary responsibility was to provide aircraft traffic information and search and rescue services. The controller was not required to monitor the Chieftain's flight path during the instrument approach. Unless otherwise alerted, a controller would not normally monitor the approach of an aircraft into an aerodrome outside controlled airspace. As the aircraft did not deviate by more than 7.5 NM from the published instrument approach no alerts were triggered.

As the aircraft approached Mount Hotham Aerodrome, there was no specific information available to the sector controller that would have indicated that the flight was proceeding other than normally. The controller would have been aware of the variable heights at which an aircraft may be lost to radar view in the Mount Hotham area. Considering the area for which he was responsible, it was reasonable that the radar scale should be set at either the default range or at the 290 NM range. At either scale, the shape of the aircraft's track was similar, but slightly offset, to that of the instrument approach procedure. The extent of that displacement on the display was unlikely to have been sufficient to alert the controller. Consequently, unless otherwise alerted, the controller would not have recognised that the aircraft was not tracking in accordance with the prescribed instrument approach procedure. In addition, the departure of an aircraft from an instrument approach procedure may simply mean that the pilot has gained visual reference with the ground.

The circumstances of the accident were not influenced by the incorrect entry of the Mount Livingstone navigation aid into the controller's air situation display.

2.5 Aviation safety regulation

CASA works to fulfil it's role in relation to aviation safety both directly, through surveillance of operators and enforcement of the regulations, and indirectly, by encouraging operators to develop and maintain best practice in relation to aviation safety. Hence, aviation safety is a shared responsibility between the regulator and operators.

CASA Field Office staff had held concerns about aspects of the operator's performance for some time, and these concerns were reflected in successive safety trend indicator assessments. As a result, CASA staff continued to monitor, and were actively seeking information in relation to the operator. Nevertheless, formal surveillance of the operator in the two years prior to the accident had not identified any significant operational issues that would have warranted CASA taking action against the operator. In that situation, the safety of the flight was reliant on the safety culture of the operator, and ultimately depended on the operational decision-making of the pilot in command.

3 CONCLUSIONS

3.1 Findings

- There were no indications prior to, or during the flight, of problems with any aircraft systems that may have contributed to the circumstances of the occurrence.
- The pilot continued flight into forecast and known icing conditions in an aircraft not approved for flight in icing conditions.
- The global navigation satellite constellation was operating normally.
- The pilot did not comply with the requirements of the published instrument approach procedure.
- The pilot was known, by his Chief Pilot and others, to adopt non-standard approach procedures to establish his aircraft clear of cloud when adverse weather conditions existed at Mount Hotham.
- The pilot may have been experiencing self-imposed and external pressures to attempt a landing at Mount Hotham.
- Terrain features would have been difficult to identify due to a heavy layer of snow, poor visibility, low cloud, continuing heavy snowfall, drizzle, sleet and approaching end of daylight.
- The pilot's attitude, operational and compliance practices had been of concern to some Airservices' staff.
- The operator's operational and compliance history was recorded by CASA as being of concern, and as a result CASA staff continued to monitor the operator. However, formal surveillance of the operator in the preceding two years had not identified any significant operational issues.

3.2 Significant factors

- The weather conditions at the time of the occurrence were extreme.
- The extreme weather conditions were conducive to visual illusions associated with a flat light phenomenon.
- The pilot did not comply with the requirements of flight under either the instrument flight rules (IFR) or the visual flight rules (VFR).
- The pilot did not comply with the requirements of the published instrument approach procedure and flew the aircraft at an altitude that did not ensure terrain clearance.
- The aircraft accident was consistent with controlled flight into terrain.

4 SAFETY ACTION

4.1 Recommendations

Recommendation 20060010

The Australian Transport Safety Bureau recommends that the Civil Aviation Safety Authority publish educational material, to promote greater awareness of the flat light phenomenon for pilots operating in susceptible areas.

Recommendation 20060013

The Australian Transport Safety Bureau recommends that the Civil Aviation Safety Authority review its surveillance methods, which may include cooperation with Airservices Australia, for the detection of patterns of unsafe practices and non-compliance with regulatory requirements.

Previous recommendation

On 9 March 2006, following a review of a number of CFIT accidents and recommendations by ICAO and other accident investigation agencies, the ATSB issued the following recommendation to CASA:

Recommendation 20060008

The Australian Transport Safety Bureau recommends that the Civil Aviation Safety Authority review the requirements for Terrain Awareness Warning Systems for Australian registered turbine-powered aircraft below 5,700 kgs, against international standards such as ICAO Annex 6 and regulations such as FAR 91.223, with the aim of reducing the potential for CFIT accidents.

The Civil Aviation Safety Authority should also consider the requirements for Terrain Awareness Warning Systems for Australian registered turbine-powered helicopters against the background of the US NTSB recommendation for the fitment to turbine-powered helicopters certificated to carry six or more passenger seats.

4.2 Civil Aviation Safety Authority

The Civil Aviation Authority (CASA) has encouraged use of the Flight Safety Foundation CFIT awareness material and has included CFIT awareness modules in its safety promotional activities. During 2002, the module was included in eight Flight Safety Forums and four road shows. CASA also published articles on the Mount Gambier and Baucau CFIT accidents referred to above in the Flight Safety Australia May-June 2004 and July-August 2004 editions respectively.

CASA has further advised that:

> CASA is in the process of enhancing its operator risk assessment processes to enable it to more clearly identify and quantify operators presenting risks to aviation safety. These processes are intended to take into account an extensive range of risk factors, such as:
>
> - financial viability;
> - intelligence from industry;
> - operational environment;
> - Risk Assessment Tool (RAT) inputs;
> - Safety Trend Indicator (STI) inputs; and
> - enforcement action.
>
> CASA is introducing version 2 of its STI tool for operator risk assessment, which will reduce the subjectivity in the indicators in the tool in use at the time of the accident. Work is also in progress on RAT, using data sourced from Electronic Safety Information Reports (ESIRs), Aviation Safety Incident Reports (ASIRs) and Safety Defect Reports (SDRs), to complement the STI tool.
>
> In addition, CASA has reviewed surveillance priorities to focus on fare-paying passenger operations, and is establishing specialist teams to carry out risk-based surveillance on smaller passenger operations.

4.3 Australian Transport Safety Bureau

The reports of previous investigations conducted by the ATSB may be of interest to the reader, as they provide information regarding issues identified in this report:

On 17 June 2003, the ATSB released its report into the investigation of a controlled fight into terrain (CFIT) accident involving a Raytheon Beech 200C aircraft near Mount Gambier on 10 December 2001 (BO/200105769). The ATSB report highlighted the importance of good CFIT/approach-and-landing accident reduction (ALAR) awareness, and included the Flight Safety Foundation CFIT Checklist and ALAR risk reduction tool kit in that report.

On 24 June 2004, the ATSB released its report into a CFIT accident involving an Ilyushin IL-76 TD near Baucau, Timor Leste, on 31 January 2003 (BO/200300263) and once again drew attention to the importance of CFIT/ALAR awareness and the Flight Safety Foundation ALAR tool kit.

Further attention was drawn to the importance of CFIT/ALAR awareness and the Flight Safety Foundation ALAR tool kit on 26 August 2004, when the ATSB released report BO/200302172 relating to an accident involving a Raytheon Beech 200C aircraft near Coffs Harbour on 15 May 2003.

4.4 Flight Safety Foundation

The Flight Safety Foundation Accident Prevention bulletin Volume 61, Number 8, titled *Improvised GPS Approach Procedure and Low Visibility Set Stage for CFIT*, was issued in August 2004 and summarised ATSB report BO/200300263 on the

CFIT accident at Baucau in January 2003. The bulletin reinforced the importance of good CFIT/ALAR awareness and the importance of the Flight Safety Foundation CFIT Checklist and ALAR risk reduction tool kit.

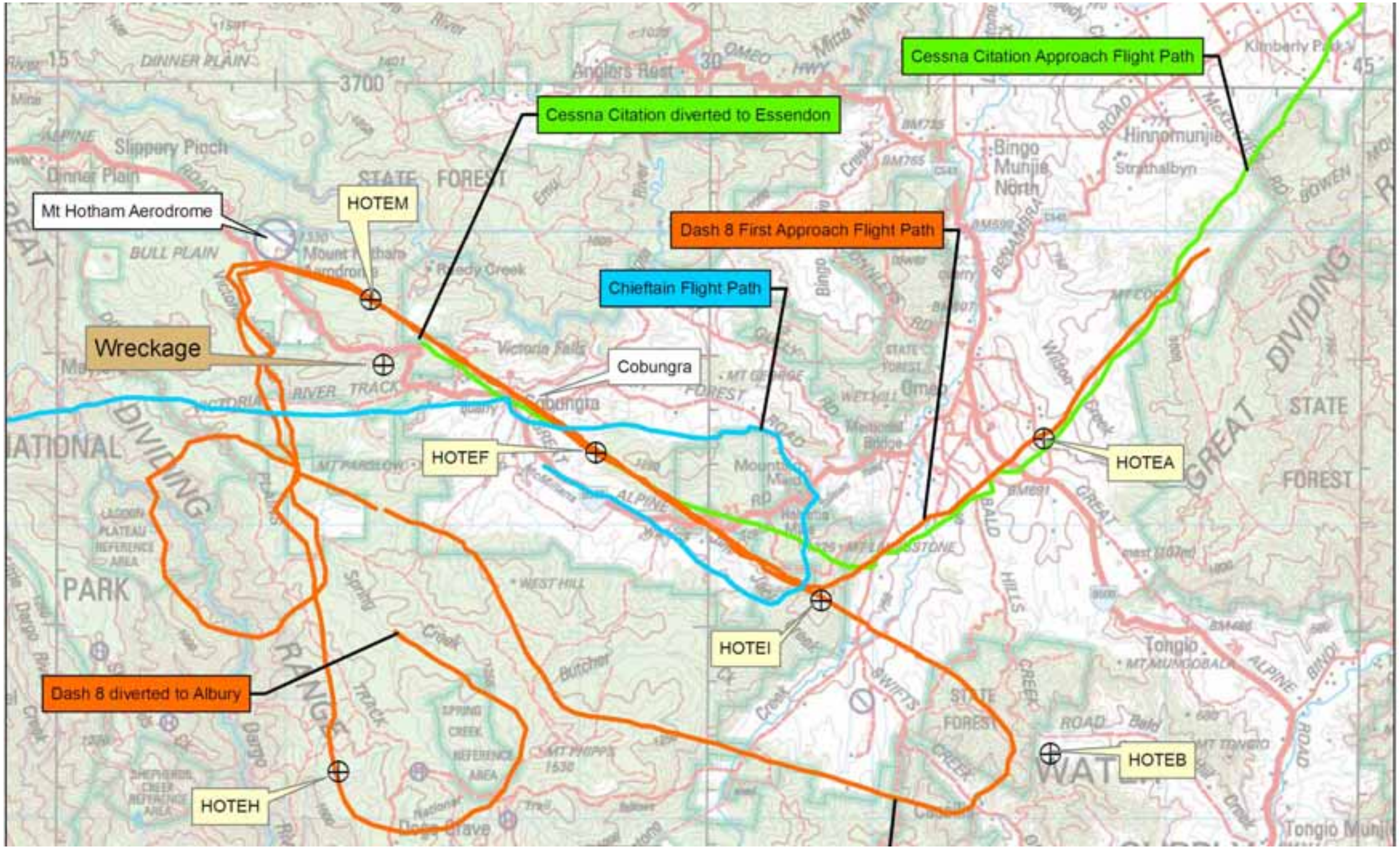
5 APPENDIXES

5.1 APPENDIX A Mount Hotham automatic weather station data

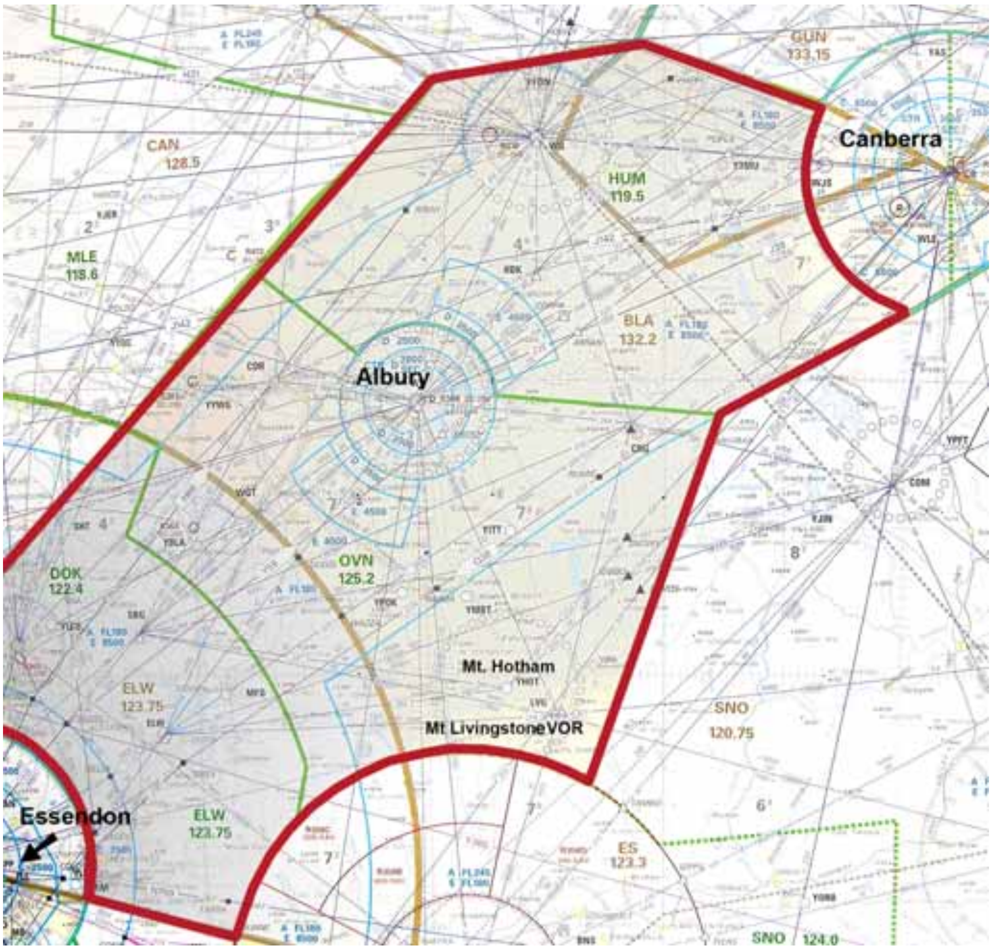
Date	Local Time		ICAO Loca-tion	UTC Time	Wind: Dir in º True from North, Speed in Knots; G for gusts, Knots	Tem-pera-ture, º C	Dew Point, º C	QNH, hPa		Rainfall, since last ob-serva-tion	Rainfall, since 9 am, mm	Visiome-ter reading, metre
8/07/2005	11:34	METARAWS	YHOT	0130Z	11002G03KT	0.5	M00.3	Q1020.2	RMK	RF00.0	1	VIS:7000
8/07/2005	12:04	METARAWS	YHOT	0200Z	09001G02KT	0.8	0.1	Q1019.9	RMK	RF00.0	1.2	VIS:9000
8/07/2005	12:34	METARAWS	YHOT	0230Z	04002G03KT	0.8	0.1	Q1018.9	RMK	RF00.0	1.2	VIS:1100
8/07/2005	13:04	METARAWS	YHOT	0300Z	03002G03KT	0.4	M00.2	Q1018.9	RMK	RF00.2	1.8	VIS:5000
8/07/2005	13:31	METARAWS	YHOT	0330Z	04003G04KT	0.4	M00.1	Q1018.1	RMK	RF00.0	2	VIS:5000
8/07/2005	14:01	METARAWS	YHOT	0400Z	36003G05KT	0.5	0.1	Q1017.8	RMK	RF00.0	2	VIS:6000
8/07/2005	14:29	METARAWS	YHOT	0430Z	06002G03KT	0.5	0.1	Q1017.6	RMK	RF00.2	2.4	VIS:3500
8/07/2005	14:59	METARAWS	YHOT	0500Z	11004G05KT	0.5	0.1	Q1017.4	RMK	RF00.2	2.6	VIS:4700
8/07/2005	15:29	METARAWS	YHOT	0530Z	12003G04KT	0.6	0.2	Q1017.3	RMK	RF00.0	2.6	VIS:4900
8/07/2005	15:59	METARAWS	YHOT	0600Z	11002G03KT	0.5	0.1	Q1017.2	RMK	RF00.2	2.8	VIS:2000
8/07/2005	16:29	METARAWS	YHOT	0630Z	13004G04KT	0.1	M00.3	Q1016.9	RMK	RF00.0	3	VIS:0300
8/07/2005	16:59	METARAWS	YHOT	0700Z	13003G05KT	0	M00.4	Q1016.9	RMK	RF00.0	3	VIS:0300
8/07/2005	17:29	METARAWS	YHOT	0730Z	16003G03KT	0	M00.3	Q1017.1	RMK	RF00.0	3.4	VIS:0300
8/07/2005	17:59	METARAWS	YHOT	0800Z	12004G05KT	0	M00.3	Q1016.7	RMK	RF00.0	3.6	VIS:0700
8/07/2005	18:29	METARAWS	YHOT	0830Z	14004G05KT	M00.1	M00.4	Q1016.3	RMK	RF00.2	4.2	VIS:0600
8/07/2005	18:59	METARAWS	YHOT	0900Z	15005G07KT	M00.1	M00.4	Q1016.4	RMK	RF00.0	4.4	VIS:0300

Date	Local Time		ICAO Location	UTC Time	Wind: Dir in º True from North, Speed in Knots; G for gusts, Knots	Temperature, º C	Dew Point, º C	QNH, hPa		Rainfall, since last observation	Rainfall, since 9 am, mm	Visiometer reading, metre
8/07/2005	19:29	METARAWS	YHOT	0930Z	14004G06KT	0	M00.3	Q1016.7	RMK	RF00.0	4.6	VIS:0400
8/07/2005	19:59	METARAWS	YHOT	1000Z	12006G08KT	M00.1	M00.4	Q1016.0	RMK	RF00.4	5.4	VIS:0500
8/07/2005	20:29	METARAWS	YHOT	1030Z	13005G08KT	M00.2	M00.5	Q1015.6	RMK	RF00.4	6.2	VIS:0600
8/07/2005	20:59	METARAWS	YHOT	1100Z	13007G11KT	M00.3	M00.6	Q1015.3	RMK	RF00.4	7.2	VIS:1600
8/07/2005	21:29	METARAWS	YHOT	1130Z	13007G09KT	M00.3	M00.6	Q1014.8	RMK	RF00.0	7.2	VIS:0350
8/07/2005	21:59	METARAWS	YHOT	1200Z	13008G10KT	M00.4	M00.7	Q1014.4	RMK	RF00.2	7.8	VIS:0500
8/07/2005	22:29	METARAWS	YHOT	1230Z	13007G11KT	M00.4	M00.7	Q1014.4	RMK	RF00.2	8.6	VIS:1500

5.2 APPENDIX B The Dash 8, Cessna Citation and Chieftain flight tracks at Mount Hotham



5.3 APPENDIX C Air traffic control sector areas



The sector areas for which the air traffic controller was responsible at the time of the occurrence.

5.4 APPENDIX D Mount Hotham weather forecasts

TAF YHOT 072058Z 2308*

VRB05KT 9999 SCT 015 BKN090

FM00 15007KT 3000 RASN BKN015 BKN090

TEMPO 0008 1000 RASN BKN008

T 02 02 02 00 Q 1022 1022 1021 1019

*Aerodrome forecast Mt Hotham issued 8 July at 0658 EST and valid from 0900 until 1800 EST. Wind variable at 5 knots; visibility 10 kilometres or greater; scattered cloud at 1500 ft, broken cloud at 9,000 ft. From 1000 EST, wind 150 degrees at 7 knots, visibility 3,000 metres, rain and snow showers, broken cloud at 1,500 ft, broken cloud at 9,000 ft. Temporarily during the period 1000 EST till 1800 EST, visibility 1,000 metres, rain and snow showers, broken cloud at 800 ft. The forecast temperatures and sea level barometric pressures for the period are provided.

A revised forecast shown below was valid for the period of the flight.

TAF YHOT 080111Z 0214*

15007KT 3000 SN BKN010 BKN090

TEMPO 0214 1000 SN BKN004

T 01 00 M01 M01 Q 1021 1019 1019 1018

*Aerodrome forecast Mt Hotham issued 8 July at 1111 EST and valid from 1200 until 2400 EST. Wind 150 degrees at 7 knots; visibility 3000 metres; snow; broken cloud at 1,000 ft; broken cloud at 9,000 ft. Temporarily during the period 1200 till 2400 EST, visibility 1,000 metres; snow; broken cloud at 400 ft. The forecast temperatures and sea level barometric pressures are provided.

Forecasts for areas 30 and 32 valid 08/07/2005 at 0300 EST until 1500 EST

AMEND AREA FORECAST 071700 TO 080500 AREAS 30/32 (issued 00:44 Local Time, 08/07/05)

AMD OVERVIEW:

LIGHT SW SURFACE FLOW TENDING SE'LY. TROUGH AT 10000FT YLAO/CAMUS 18Z AND YMIA/CHOMP 05Z. TROUGH SLOPES W WITH HEIGHT TO BE OVER FAR SW OF AREA AT 18500FT BY 05Z. SCATTERED SHOWERS MAINLY ON/S OF DIVIDE. RAIN AREAS OVER NW EXTENDING SE ALONG N BORDER TO BE N OF YLAO/YCOM BY 23Z AND NE OF YLAO/YORB BY 05Z. LOW CLOUD WITH PRECIP. ISOLATED SNOW ABOVE 5000FT MORE WIDESPREAD AFTER 23Z. ISOLATED FOG LAND TILL 24Z.

SUBDIVISION:

A: NE OF TROUGH

B: SW OF TROUGH

WIND:

	2000	5000	7000	10000	14000	18500
A:	240/15	260/15	270/20	290/20 MS06	300/30 MS12	310/40 MS19
B:	140/15	130/15	130/10	VRB/10 MS10	VRB/10 MS17	130/15 MS24

REMARK: WINDS ABV 5000 10/20 KNOTS LIGHTER IN "A" NEAR TROUGH.

AMD CLOUD:

BKN ST 0800/3000 IN PRECIP. SCT CU/SC 3000/10000, BKN COAST/SEA AND LAND S OF DIVIDE AFTER 23Z. ISOL CU TOPS 14000 IN SW. BKN ACAS ABV 10000 NE OF TROUGH AT 10000FT.

AMD WEATHER:

SHRA, FG, SNOW, RA.

AMD VISIBILITY:

0500M FG, 3000M SNOW, 5000M SHRA/RA.

FREEZING LEVEL:

6000 IN NE GRADING TO 4500 IN SW.

ICING:

MOD IN CU/SC TOPS AND ACAS.

TURBULENCE:

OCNL MOD IN CU. OCNL MOD ABV 10000 IN SE TILL 23Z.

CRITICAL LOCATION: [HEIGHTS ABOVE MSL]

KILMORE GAP: 9999 -SHRA FEW ST 2000 BKN CUSC 4000

PROB30 1723 0500 FG BKN ST 1500 [CLOUD ON GROUND]

REMARK: FOR CLARIFICATION OF METEOROLOGICAL ISSUES, CALL 03 9669 4850

Forecasts for areas 30 and 32 valid 08/07/2005 at 0900 EST until 2100 EST

AREA FORECAST 072300 TO 081100 AREAS 30/32 (issued 08:00 Local Time, 08/07/05)

OVERVIEW:

TROUGH AT 10000FT YREN/FLIKI

TROUGH AT 10000FT YREN/FLIKI 23Z AND YSWH/CHOMP 11Z. TROUGH SLOPES W WITH HEIGHT TO BE OVER FAR SW OF AREA AT 18500FT BY 05Z AND YNRC/YKII 11Z. RAIN AREAS N OF YLAO/YCOM CONTRACTING TO NE OF YMIA/YORB BY 11Z. SNOW ABOVE 5000FT. SCATTERED SHOWERS MAINLY ON/S OF DIVIDE. ISOLATED FOG LAND TILL 01Z MAINLY IN SW. SEV ICING ALONG N BORDER. LOW CLOUD

WITH PRECIP.

SUBDIVISION:

A: NE OF TROUGH

B: SW OF TROUGH

WIND:

	2000	5000	7000	10000	14000	18500
A:	140/15	140/10	VRB/10	300/15 MS07	310/25 MS12	320/40 MS20
B:	140/15	140/15	150/10	160/10 MS11	140/10 MS17	130/15 MS25

REMARK: WINDS ABV 10000 10/15 KNOTS LIGHTER IN "A" NEAR TROUGH.

CLOUD:

BKN ST 0800/3000 IN PRECIP. SCT CU/SC 3000/10000, BKN COAST/SEA AND

LAND S OF DIVIDE. BKN SC 3000/6000 IN RA. ISOL CU TOPS 14000 IN SW.

BKN ACAS ABV 10000 NE OF TROUGH AT 10000FT.

WEATHER:

SHRA, FG, SNOW, RA.

VISIBILITY:

0500M FG/SNOW, 5000M SHRA/RA.

FREEZING LEVEL:

6000 IN NE GRADING TO 4000 IN SW.

ICING:

MOD IN CU/SC TOPS AND ACAS BUT OCNL SEV BTN 7000/14000 IN N [SIGMET].

TURBULENCE:

MOD IN CU/AC.

CRITICAL LOCATION: [HEIGHTS ABOVE MSL]

KILMORE GAP: 9999 BKN CUSC 3500 BKN ACAS 14000

FM09 9999 -SHRA SCT ST 1500 BKN CUSC 3000

REMARK: FOR CLARIFICATION OF METEOROLOGICAL ISSUES, CALL 03 9669 4850

SIGMET – significant meteorological information bulletin valid from 08/07/2005 from 1500 EST until 2100 EST

WSAU21 AMRF 080501

YMMM SIGMET ML01 VALID 080500/081100 YMRF-MELBOURNE FIR.

SEV ICING FCST BTN 5000FT/14000FT WITHIN YBOR S3630E14030 YMIA YSWG

YMCO S3730E15100 S4000E15000 YKNH YBOR. INTST NC.

STS:REV SIGMET ML02 VALID 072300/080500

MEDIA RELEASE

<u>Fatal aviation accident at Mt Hotham on 8 July 2005.</u>

The ATSB has reported that extreme weather and unsafe pilot attitudes and practices led to the 'controlled flight into terrain' accident at Mt Hotham in July 2005 that claimed the lives of all three persons on board.

The weather conditions included sleet and snow showers, and were conducive to visual illusions associated with a 'flat light' phenomenon. The aircraft was not equipped for flight in icing conditions.

The Australian Transport Safety Bureau in its Final Investigation Report was unable to determine why the pilot, after acknowledging that the weather was unsuitable, persisted with his attempt to land at Mt Hotham. However, it is possible that overconfidence as a result of previously avoiding accidents despite risk-taking, and commercial or family pressures, influenced the pilot's decision making.

The Piper Navajo Chieftain aircraft was being operated on a charter flight with two passengers on board. While taxiing at Essendon, the pilot changed the flight planned destination from Mt Hotham to Wangaratta, due to the weather. However, after departure the pilot advised air traffic control that he was diverting to Mt Hotham. He was provided an assessment of the actual weather conditions at Mt Hotham by an accredited meteorological observer which advised that, in the existing conditions, the aircraft would be unable to land.

The pilot was known by the company's Chief Pilot and others to use an approach procedure in poor weather conditions at Mt Hotham that did not comply with the published instrument approach, or accord with the visual flight rules. The procedure involved descent to enable visual contact with the Great Alpine Road and then to follow the road to the aerodrome.

The ATSB hopes that pilots with local knowledge that habitually take unnecessary risks will learn from this accident and not pay the price paid by the pilot and passengers of this aircraft. The Bureau has issued two safety recommendations with this report.