Aviation Safety Investigation Report 199403842

Mitsubishi Aircraft Int MU-2B-30

21 December 1994

Readers are advised that the Australian Transport Safety Bureau investigates for the sole purpose of enhancing transport safety. Consequently, Bureau reports are confined to matters of safety significance and may be misleading if used for any other purposes.

Investigations commenced on or before 30 June 2003, including the publication of reports as a result of those investigations, are authorised by the Executive Director of the Bureau in accordance with Part 2A of the Air Navigation Act 1920.

Investigations commenced after 1 July 2003, including the publication of reports as a result of those investigations, are authorised by the Executive Director of the Bureau in accordance with the Transport Safety Investigation Act 2003 (TSI Act). Reports released under the TSI Act are not admissible as evidence in any civil or criminal proceedings.

NOTE: All air safety occurrences reported to the ATSB are categorised and recorded. For a detailed explanation on Category definitions please refer to the ATSB website at www.atsb.gov.au.

Occurrence Number:	199403842	**Occurrence Type:**	Accident
Location:	2km E Melbourne		
State:	VIC	**Inv Category:**	3
Date:	Wednesday 21 December 1994		
Time:	0324 hours	**Time Zone**	ESuT
Highest Injury Level:	Fatal		

Injuries:

	Fatal	Serious	Minor	None	Total
Crew	1	0	0	0	1
Ground	0	0	0	0	0
Passenger	0	0	0	0	0
Total	**1**	**0**	**0**	**0**	**1**

Aircraft Manufacturer:	Mitsubishi Aircraft Int		
Aircraft Model:	MU-2B-30		
Aircraft Registration:	VH-IAM	**Serial Number:**	
Type of Operation:	Charter Cargo		
Damage to Aircraft:	Destroyed		
Departure Point:	Sydney NSW		
Departure Time:	0135 ESuT		
Destination:	Melbourne Vic		

Crew Details:

Role	**Class of Licence**	**Hours on Type**	**Hours Total**
Pilot-In-Command	ATPL 1st Class	150.0	5000

Approved for Release: Friday, February 14, 1997

Sequence of events

The pilot received an endorsement on the MU2 after completing 3.4 hours on the aircraft type with the operator's check-and-training pilot. The operator's policy was that before being cleared to operate as pilot in command on company MU2 aircraft, pilots were required to accumulate 150 hours in command under supervision (ICUS) on the aircraft type. Company records indicated the pilot had completed this flying.

On the evening of 19 December 1994 the company check-and-training pilot gave the pilot a 45-minute check flight. Following this flight the pilot went on a final route check flight with a senior company training captain, from Bankstown to Melbourne and back to Sydney. These three flights were all conducted in VH-IAM. No instrument landing system (ILS) approaches were undertaken on these flights. After the return to Sydney the pilot was assessed as suitable to act as pilot in command on company MU2 aircraft.

Early on the morning of 20 December 1994 the pilot flew VH-IAM from Sydney to Melbourne International airport on his first company flight as pilot in command. On the approach into Melbourne there were three octas of cloud at 600 ft, three octas at 1,000 ft and an ILS approach was required. After landing at 0410 ESuT he rested at a nearby motel. Following this rest period, the pilot spent the afternoon with a fellow pilot. The only problem he mentioned with VH-IAM was that it did not have a serviceable distance measuring equipment (DME) unit.

Early in the evening of 20 December 1994 a flight plan was submitted for an instrument flight rules (IFR) flight to Sydney, departing Melbourne at 1930, and from Sydney to Melbourne, departing Sydney at 2230. The aircraft did not depart Melbourne until 2215. The ILS for runway 34 left at Sydney was out of service. Due to cloud at 800 feet a runway 34 left VOR/DME approach was flown.

The runway 34 left VOR/DME approach involves a progressive descent to specific altitudes at specific DME distances, but VH-IAM did not have a serviceable DME. The controller offered to keep the pilot advised of the aircraft's distance by radar to facilitate the approach. This offer was accepted. During the approach, the aircraft was noted on radar to descend to 1,000 ft when it should still have been at 1,900 ft. The pilot was advised and the aircraft was noted to climb back to 1,500 ft, still below the required 1,900 ft. The aircraft landed without any further problems.

The aircraft departed Sydney for Melbourne International airport at 0130 on 21 December 1994. En-route cruise was conducted at flight level 140. Melbourne Automatic Terminal Information Service (ATIS) indicated a cloud base of 200 feet for the aircraft's arrival and runway 27 with ILS approaches, was in use. Air Traffic Control advised the pilot of VH-UZB, another company MU2 that was also en-route from Sydney to Melbourne, and the pilot of VH-IAM while approaching the Melbourne area, that the cloud base was at the ILS minimum and that the previous two aircraft landed off their approaches.

VH-UZB was slightly ahead of VH-IAM and made a 27 ILS approach and landed. In response to an inquiry from the Tower controller the pilot of VH-UZB then advised that the visibility below the cloud base was 'not too bad'. This information was relayed by the Tower controller to the pilot of VH-IAM, who was also making a 27 ILS approach about five minutes after VH-UZB. The pilot acknowledged receipt of the information and was given a landing clearance at 0322. At 0324 the Approach controller contacted the Tower controller, who had been communicating with the aircraft on a different frequency, and advised that the aircraft had faded from his radar screen.

Transmissions to VH-IAM remained unanswered and search-and-rescue procedures commenced. Nothing could be seen of the aircraft from the tower. A ground search was commenced but was hampered by the darkness and reduced visibility. The terrain to the east of runway 27 threshold, in Gellibrand Hill Park, was rough, undulating and timbered. At 0407 the wreckage was found by a police officer. Due to the darkness and poor visibility the policeman could not accurately establish his position. It took approximately another 15-20 minutes before a fire vehicle could reach the scene of the burning aircraft. The fire was then extinguished.

Wreckage examination

The aircraft had struck the ground on a descent path of about three degrees while banked about five degrees to the left. The ground impact position was about 150-200 metres to the right of the centreline for the 27 ILS approach. The track of the aircraft at the time of the accident was about 245 degrees. Examination of the badly fire-damaged wreckage did not produce evidence of any significant defects. At the time of ground contact the landing gear was extended and the flaps were in the 20-degree position.

The tuning units for the VHF radios and navigation receivers were badly fire damaged. However, it was established that the cockpit selector for the number one VHF navigation receiver was tuned to 109.3 MHz, the frequency for the runway 27 ILS and the number two VHF navigation receiver to 114.1 MHz, the frequency for Melbourne VOR. One glidepath receiver was fitted and although some impact damage was sustained in the accident, no evidence of any pre-existing defect was identified. Examination of the altimeters established that the pilot's was correctly adjusted to a QNH setting of 1008 hectopascals and the co-pilot's was set to 1013 hectopascals.

Weather data

The amended terminal area forecast for Melbourne, issued at 1929, included a prediction of 7 octas of stratus cloud, base 500 ft. The 0100 aerodrome weather report for Melbourne included an observation of 2 octas of stratus at 500 ft and 3 octas of stratus at 1,000 ft. The ATIS current at the time of arrival of VH-IAM, was runway 27, damp, wind light and variable, QNH 1008, temperature 17, 7 octas cloud, base 200 ft, drizzle, expect ILS approach. Flight conditions for the ILS approach were smooth. The Bureau of Meteorology estimated that the low stratus cloud layer extended up to an altitude of 4,500 ft.

ILS approach procedure

The published chart for this procedure showed that the approach commenced at an altitude of 3,000 ft at the Epping locator beacon which was 8.5 NM east of the runway threshold. The specified track was 263 degrees magnetic and the glideslope angle was 3 degrees. The outer marker beacon was at 3.8 NM from the runway threshold and the middle marker was 0.6 NM from the runway threshold. The pilot was required to keep the aircraft within two dots of the on glidepath and on track ILS indications to remain within specified tolerances. If the aircaft was on the glidepath at the outer marker the altitude would have been 1,645 ft.

As the aircraft gets closer to the runway the ILS localiser and glide path beams become progressively narrower, requiring increased flying accuracy to remain within limits. The minimum altitude for the approach was 610 ft and this altitude should have been reached at about the position of the middle marker. Provided that the high intensity runway and approach lights were on, the required flight visibility to continue the approach was 800 metres. If this minimum visibility did not exist, a missed approach was required. The missed approach procedure was to maintain a track of 263 degrees magnetic and climb to 4,000 ft.

The ILS chart also provides a table of DME distances against altitudes. This allows pilots to make progressive checks of altitude, independent of the ILS cockpit needle indications, to monitor the progress of the ILS. However, DME is not mandatory for the approach which can be satisfactorily completed by reference to the needle indications and by making altitude checks at the locator beacon, the outer marker and middle marker beacons. The elevation of the runway 27 threshold was 407 ft.

Radar data

A readout of the air traffic control radar data tape for the approach indicated that tracking, altitude, and speed anomalies had occurred during the approach.

Tracking

At 3 NM from the runway threshold the aircraft was about 440 metres left of the runway centreline. A heading alteration to the right of about 30-40 degrees was made and the aircraft passed through the centreline and went about 250-300 metres to the right. At the time of ground impact the aircraft heading had again been altered and the aircraft was closing on the centreline from the right.

Altitude

The aircraft had passed slightly north of the Epping locator beacon, which marks the start of the ILS final approach, at an altitude of about 2,800-2,900 ft. This altitude was maintained until 2 NM past Epping, when the aircraft was about 200 ft above the glidepath. The descent was then started and continued with the aircraft descending through the glideslope at about 5 NM from touchdown. The descent continued with displacement below the glidepath increasing. Between approximately 2 NM and 1.5 NM from touchdown the descent temporarily stopped at about the minimum altitude for the approach. (This minimum altitude was 610 ft but the radar data only reads out in increments of 100 ft.) At this stage the aircraft was about 400-450 ft below the glidepath. Descent then recommenced, probably at an increased rate. The last altitude recorded was at approximately 400 ft in the vicinity of the accident site.

Speed

Radar data records calculations of ground speed. From 10 NM in to 6 NM the speed was about 145-150 knots. It then increased and at 5 NM peaked at about 170 knots. The speed then decreased to about 120 knots at 2.5 NM. It briefly increased to about 138 knots at 2 NM then decreased to 120 knots at the accident area. During the ILS approach the wind at 3,500 ft was estimated to be a south-easterly at 20 knots. This varied moderately to be a southerly at 7 knots at 1,000 ft. This indicated that the winds were mainly from abeam and that most of the ground speed fluctuations were probably associated with pilot handling.

Pilot/aircraft handling information

The pilot's logbook was not located after the accident. Most of his experience was on twin piston-engine aircraft such as the Cessna 310 and the Piper PA 31. He also had some time on Nomad aircraft. His last instrument rating renewal was carried out on a Cessna 310 aircraft. The renewal for conduct of an ILS or VOR approach was not covered on that flight but was completed separately in a synthetic trainer.

Advice on the aircraft handling characteristics was obtained from a pilot who was very experienced on the type. He indicated the MU2 was a faster, more difficult type to fly in comparison to general aviation twin piston-engine aircraft on which the accident pilot had gained most of his experience. After inspecting the radar readout data he said that VH-IAM was never stabilised on the ILS approach.

The MU2 is an aerodynamically clean and pressurised aircraft. This means that unlike piston engine types the pilot had flown, there would not have been the audible changes in wind noise associated with airspeed changes which provide clues to the changing situation. The experienced pilot consulted during the investigation indicated that with changes in airspeed and/or engine power it is very easy for the MU2 to quickly develop a rate of descent. This can only be detected by close monitoring of the cockpit instruments.

Medical/Fatigue

There was no medical evidence of any condition that might have contributed to the accident.

Specialist advice provided to the investigation indicated that persons involved in night shift work experience circadian disruption. This is because of the disruption of normal sleep and the quality of sleep gained. The main factor known to regulate the sleep/wake cycle is core body temperature. The best quality of sleep is gained when the core body temperature is at its lowest point, which usually happens between 0200 and 0600. As body temperature increases during the day, sleep quality and duration decreases.

Research shows that even where people are exposed to long periods of night shift the human circadian rythm does not adjust. However, if the individual forms a routine of night shift that is consistent they can partially compensate. Techniques to assist include the use of heavy drapes and air conditioning and buffering of outside noise.

The pilot was on the second night of night operations. Flying at night is a normal situation for pilots engaged in these type of freight operations. The pilot spent the afternoon before the accident with a pilot friend who who had also flown the night before. The friend understood the pilot had slept through to 1300 after the previous night of flying and did not feel fatigued.

ANALYSIS

Because of the specialist advice that the effect of changing to night operations inevitably affects the quality of sleep achieved, it is likely that some fatigue effect existed.

No evidence was found to suggest any aircraft malfunction existed or contributed to the accident.

The cloud base being at the approach minimum altitude would have required the pilot to fly the aircraft to the minima in cloud, at night. Even so, the smooth conditions in the cloud should have made the flying task relatively easy. The knowledge that other aircraft had landed off an ILS approach may have given the pilot an expectation that he should also be able to land.

The evidence indicated that the pilot flew an erratic and unstable approach, in terms of airspeed, track, and glidepath maintenance. The safe operation of the aircraft on the approach required keeping it within specified limits for tracking and glidepath and not going below the permitted minimum. This was not done. The reason for descent below the glideslope and the minimum altitude at a late stage of the approach was not determined, but was very likely unintentional.

The MU2 is a faster and more demanding type to fly compared to general aviation piston engine twin-engined aircraft on which the pilot had gained most of his experience. Anecdotal evidence suggests that to minimise costs, many pilots undertake the flight segment of their instrument rating renewal in relatively low-performance aircraft and complete the balance in a synthetic trainer. Therefore, a pilot may be endorsed and operate a high performance aircraft in IMC, yet not have practised instrument flying in that type of aircraft.

Civil Aviation Regulations 5.81 and 5.108 require non-instrument rated private and commercial pilots to undertake Biennial Flight Reviews. The Biennial Flight Review must be conducted in an aircraft type in which the pilot flew the greatest number of hours as pilot in command during the 10 flights before the review.

The Bureau believes that a similar criterion should apply to instrument-rated pilots. It would be appropriate for flight segments of instrument rating renewals to be conducted on a complex, high-performance aircraft, representative of the types that the pilot wishes to operate.

Considering the length of the pilot's ICUS training on the MU2, the approach into Sydney and the accident approach indicated a deficiency with his instrument flying skills. The company training system had not detected this situation, but the specific reasons for this were not determined.

SIGNIFICANT FACTORS

1. The company's training system did not detect deficiencies in the pilot's instrument flying skills.

2. The cloud base was low at the time of the accident and dark night conditions prevailed.

3. The pilot persisted with an unstabilised approach.

4. The pilot descended, probably inadvertantly, below the approach minimum altitude.

5. The pilot may have been suffering from fatigue.

SAFETY ACTION

As a result of the investigation, the Bureau issued Safety Advisory Notice 960032 to the Civil Aviation Safety Authority on 02 September 1996.

"SAN 960032

"CAO 40.2.1 lays down the requirements when sythetic trainers are used for instrument rating renewals. This allows for the instrument rating renewal to be undertaken on a category B synthetic trainer except for the renewal of one aid which shall be conducted in flight. However, the CAO does not stipulate the type of aircraft that must be used. The renewal therefore can be carried out on a relatively low-performance aircraft.

"The Civil Aviation Safety Authority should note the safety deficiency identified in this report."

The following response was received from the Civil Aviation Safety Authority on 19 November 1996.

"I refer to your Safety Advisory Notice SAN 960032 concerning the accident involving Mitsubishi MU2B-30, VH-IAM during an instrument approach at Essendon, Victoria on 21 December 1994. The following comments are forwarded for your consideration.

"It can only be speculated that the accident occurred due to the pilot's lack of currency on type. The accident could equally have been caused by distraction, fatigue, or the like. It is current CASA policy that the multi-engine command instrument rating is a generic rating for multi-engine aeroplanes. Given that there are several thousand command instrument rating tests undertaken each year there does not appear to be an accident trend to suggest that the associated flight test provisions are deficient.

"The desirability, or otherwise, of reviewing Civil Aviation Order 40.2.1 will be raised as an issue under the Regulatory Framework Review program. The Personnel Licensing Technical Committee will be responsible for this issue. The suggestion to align flight test aircraft requirements with similar provisions that exist for flight reviews has merit and will be referred to this committee.

"We shall keep BASI appraised of the outcomes of this, and other committee deliberations."