Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT
A99O0126

COLLISION WITH TERRAIN

MITSUBISHI MU-2B-40 SOLITAIRE N701K
PARRY SOUND / GEORGIAN BAY AIRPORT, ONTARIO 1NM W
24 MAY 1999

Canada

Aviation Investigation Report

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Summary

With one pilot and one passenger, the Mitsubishi MU-2B-40 Solitaire aircraft, serial number 410 S.A., departed on a night instrument flight rules flight from Parry Sound / Georgian Bay Airport, Ontario, destined for Toronto / Lester B. Pearson International Airport. Prior to departure, the pilot received his instrument flight rules clearance via telephone from the Sault Ste. Marie flight service station with a clearance valid time of 2118 eastern daylight time from Toronto Area Control Centre and a clearance cancel time of 2135.

When the pilot did not establish communications with Toronto Area Control Centre within the clearance valid time, the Area Control Centre supervisor commenced a communication search. At 2151, he confirmed with Parry Sound / Georgian Bay Airport personnel that the aircraft had departed 10 to 15 minutes earlier. The aircraft was assumed missing and the Rescue Coordination Centre in Trenton, Ontario, was notified. Search and rescue was dispatched and three days later the aircraft wreckage was located one nautical mile west of the airport. Both of the aircraft occupants were fatally injured. The aircraft disintegrated as it cut a 306-foot swath through the poplar forest. The accident occurred at night in instrument meteorological conditions.

Ce rapport est également disponible en français.

Other Factual Information

The pilot flew the Mitsubishi MU2 aircraft from Toronto / Lester B. Pearson International Airport (LBPIA) to Parry Sound / Georgian Bay Airport on Friday, 21 May 1999, to spend the Victoria Day holiday weekend with other family members who also have cottages in the Parry Sound area. On Monday, May 24, the pilot and his son debated throughout the day whether to fly to Toronto/LBPIA that evening or delay the departure until the next morning. The pilot was planning to fly the company Mitsubishi MU2 aircraft to a business meeting scheduled the next morning in Baltimore, Maryland, U.S.A. The son was scheduled to work at the family company office on Tuesday, May 25. At 1547,[1] the son telephoned Sault Ste. Marie flight service station (FSS), obtained a weather briefing, and advised the FSS of a tentative departure time of 1900 or 2000. The FSS specialist advised of definite IMC weather for the area due to a low pressure system located near Manitoulin Island, Ontario.

The closest weather reporting stations to Parry Sound were Muskoka (YQA), located 28 nm to the southeast, and Wiarton (YVV), located 60 nm to the west. The 2100 weather was reported as follows:

> YQA: Wind 240 degrees true at six knots, visibility six statute miles (sm), light drizzle, mist, few clouds at 700 feet, overcast cloud at 800 feet, temperature nine degrees Celsius, dewpoint eight degrees Celsius, altimeter 29.41 inches of mercury. Cloud makeup was stratus fractus two-tenths, stratocumulus six-tenths, ceiling ragged.
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> YVV:
> Wind 250 degrees true at 13 knots, visibility 15 sm, overcast cloud at 1 300 feet, temperature nine degrees Celsius, dewpoint seven degrees Celsius, altimeter 29.43 inches of mercury. Cloud makeup was stratocumulus eight-tenths.

A flying instructor based at Parry Sound / Georgian Bay Airport at the time of the occurrence reported the weather to be as follows: southwest winds at 5 to 10 knots, ceiling 500 feet overcast, visibility 3 to 4 sm, and rain. A weather forecast for Baltimore and Toronto for the next day, indicating probable visual meteorological conditions (VMC), was also provided.

Later that day, the pilot announced that he was going to fly to Toronto/LBPIA that evening, and an instrument flight rules (IFR) flight plan was filed via telephone at 2019 with a proposed departure time of 2100. The pilot and his son then drove to the Parry Sound / Georgian Bay Airport, but due to heavy holiday-weekend traffic, they did not arrive at the airport until after 2100. The pilot telephoned Sault Ste. Marie FSS and obtained the IFR clearance for departure at 2122. The pilot taxied onto runway 35, which was 4 000 feet long, and took off downwind. It was not determined whether the flaps were extended during the take-off; however, it was the pilot's practice to select 20 degrees of flap for take-off, as trained.

The aircraft turned left after departure and, while turning through a heading of 130 degrees magnetic and in a shallow descent, it struck trees. Following the initial tree strike, the aircraft continued to turn left to a heading of 115 degrees magnetic, rolled inverted, and struck the

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[1] All times are EDT (Coordinated Universal Time [UTC] minus four hours) unless otherwise stated.

ground. Referencing the global positioning system (GPS) on board the police helicopter, the initial tree strike area was determined to be located 1 nm west of the airport. Various aircraft components were located and identified in this area, including pieces of wing structure (left fuel tip tank bulkhead) and tail assembly (left and right horizontal stabilizer and right elevator). The distance from the first tree strike to the end of the impact zone was approximately 1 000 feet. Most of the aircraft wreckage was located in the main impact zone, a 306-foot-long trail through the forest.

The aircraft wreckage was examined on site. At the time of impact, the landing gear was retracted. The flap actuators were measured, and the flaps were found to be extended between zero and five degrees. (The flaps can only be selected in one of three positions: 0, 20, or 40 degrees.) It was determined that the pilot had been seated in the left seat and the son had been seated in the right seat. The engines (AiResearch TPE331), propellers (Hartzell HC-B4TN-5GL), emergency locator transmitter (ELT), and 16 various avionics components and instruments were forwarded to the TSB Engineering Laboratory for teardown and examination. Many of the avionics components and instruments did not reveal conclusive information related to the crash. One of the airspeed indicators revealed a pointer imprint at 190 knots. The impact sustained during the crash damaged the ELT antenna, battery pack, and circuit board, and sheared off the gravity (G) switch. The ELT would not have functioned under these conditions.

The aircraft engine teardown examination revealed no pre-impact failures of any component parts or accessories in either the left or right engine that would have precluded normal engine operation. Both engines appeared to have been rotating normally and were capable of producing power prior to ground impact. Similar physical evidence in both engines in the form of scoring of rotating components with adjacent stationary structure, coupled with the widespread distribution of metal, dirt, and both burnt and unburnt wood residues, would confirm that the two engines were in the same operating condition and delivering power prior to impact. The propeller teardown examination revealed that both propellers were rotating with power. Although precise blade angles could not be established, they were in a normal operating range. Neither propeller was in the feathered position or in beta range. No propeller discrepancies that could have precluded normal operation were noted. All damage was consistent with impact damage.

The requirement to hold a flight crew permit, licence, or rating in accordance with *Canadian Aviation Regulations* (CARs) is as follows:

> 401.03(1) No person shall act as a flight crew member or exercise the privileges of a flight crew permit, licence or rating unless
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> a) subject to subsection (2) and sections 401.19 to 401.27, the person is the holder of, and can produce while so acting and while exercising such privileges, the appropriate permit, licence or rating; and
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> b) the person is the holder of, and can produce while so acting and while exercising such privileges, a valid and appropriate medical certificate.

The 68-year-old pilot started flying in 1968 and held a Canadian private pilot licence which was endorsed for all single-pilot, non-high-performance, single- and multi-engine land

airplanes. His licence was also endorsed for night flying and a Cessna 310 type aircraft. He had accumulated approximately 5 500 flying hours, including 407 hours on the MU-2, about 332 hours of which were flown as pilot in command. A review of Transport Canada (TC) records indicated that the pilot had attempted the Instrument Rating written examination on three occasions; however, it was never successfully completed. An instrument rating flight test had never been attempted. Also, there was no record of an application having been made for the endorsement of the Mitsubishi MU2 aircraft type or for the Cessna 414 aircraft type, which was previously owned and flown by the pilot.

The pilot provided the training provider with licensing documentation that indicated that he held an instrument rating when, in fact, he did not hold this rating. The pilot was in possession of a U.S. pilot certificate that was issued on the basis of, and valid only when accompanied by, his Canadian licence. This certificate also stipulated that all limitations and restrictions on the Canadian Pilot Licence applied. The pilot's son received his private pilot licence in January 1999. He had not received any training for this aircraft type.

The pilot's latest aviation medical examination was performed on 13 April 1999. TC's Civil Aviation Medicine (CAM) found the pilot "fit" and issued a Category 3 medical certificate. Records dating back to 1989 indicated that he had been diagnosed with non-insulin dependent (diet controlled) diabetes. Medications were scattered throughout the occurrence site, including Diamicron, Atenolol, Ibuprofen, Vosol HC Optic solution, Amcinonide cream, Ventolin inhaler, Otrivin moisturizer nasal spray, Kerasol ointment, Beclomethasone nasal spray, and Dristan nasal spray. It was learned that the pilot had suffered Type II diabetes (requiring insulin in addition to dietary management) and hypertension for greater than five years. Diamicron and Atenolol were respectively prescribed to control these conditions. It was also learned that the pilot suffered from asthma. The pilot did not report his asthma and hypertension medical conditions to his civil aviation medical examiner, nor did he declare that he required oral hypoglycemics to control his diabetes. TC CAM was asked to comment on how these conditions would affect the issuance of a medical certificate. The criteria used by CAM for each of these medical conditions is as follows:

Diabetes: In the early stages of diabetes, elevations in blood sugars typically are discovered during the routine urinalysis required at each medical [examination]. Minor elevations can often be controlled by diet and exercise alone, and nothing is required from the pilot other than routine monitoring. The vast majority of these people continue to exercise the privileges of their licence without restrictions. Those diabetics who cannot be adequately controlled by diet are often treated with oral medications. During the initial stabilization on medications, the pilot is grounded. Additional medical investigations need to be carried out to ensure that there are no complications of diabetes that might increase the risk of sudden or subtle incapacitation during flight. Should all these parameters be met, then most of these pilots return to unrestricted flying as long as they comply with the annual medical test and report requirements. Others return to "with accompanying pilot" status. Those pilots who require insulin to control their diabetes are much harder to deal with, since their condition tends to be more prone to fluctuations in their blood sugars. There have been occasions where pilots have been cleared for a recreational pilot permit if the pilot's diabetic awareness and control have

been exceptional. Additionally, there are a number of insulin- dependent pilots who have been granted restricted licences in the multi-crew commercial environment.

Asthma: This fairly common condition does not necessarily lead to disqualification. The medical parameters that are of most interest include: severity of symptoms, need for significant medical interventions (hospitalization), triggering factors, medications required, frequency of medication use, and results of pulmonary function tests, to name a few. The pilot 's pattern of flying can also be factored into the equation. In many cases, asthmatics can continue to fly, providing the medication usage is timed properly and the above mentioned parameters are satisfactory.

Hypertension: This very common problem arises frequently in the ageing pilot population. There are numerous medical approaches to this problem of elevated blood pressure. The concerns the CAM has centre around the potential side effects of the medications, the potential for damage to major organ systems, such as heart, brain and kidneys, and the effects that the condition might have regarding subtle or sudden incapacitation. There is an extensive list of medications in different categories that have been approved for aviation. Generally, when a new medication is prescribed for a pilot, there should be a period of grounding to ensure that the medication is providing the desired effects without causing any side effects detrimental to operating an aeroplane. The majority of pilots whose blood pressure can be controlled with the approved medications return to unrestricted flying.

Toxicological blood samples were taken from both occupants and forwarded to the Centre of Forensic Sciences for alcohol testing. The results of these tests were negative.

All pilots are vulnerable to the effects of spatial disorientation while flying in IMC conditions. The degree to which a pilot may be affected by this phenomenon depends on many factors, including the performance of the aircraft, and the pilot's experience and medical condition. The following excerpt from *Fundamentals of Aerospace Medicine* details a particular spatial disorientation/illusion that the accident pilot may have experienced:

> The otolith organs (inner ear) are responsible for a set of illusions known as somatogravic illusions. The most common example of the somatogravic illusions, the illusion of pitching up after taking off into conditions of reduced visibility, is perhaps the best illustration of this mechanism. Consider the pilot of a high-performance aircraft holding his position at the end of the runway waiting to take off. Here, the only force acting on his otolithic membranes is the force of gravity, and the positions of those membranes on their maculae signal accurately that down is toward the floor of the aircraft. Suppose the aircraft now accelerates down the runway, rotates, takes off, cleans up gear and flaps, and maintains a forward acceleration of 1g until reaching the desired climb speed. The resulting acceleration displaces the otolithic membranes toward the back of the pilot's head. In fact, the new positions of the otolithic membranes

> are nearly the same as they would be if the aircraft and pilot had pitched up 45 degrees, because the new direction of the resultant gravitoinertial force vector, if one neglects the angle of attack and climb angle, is 45 degrees aft relative to the gravitational vertical. Naturally, the pilot's percept of pitch attitude based on the information from his otolith organs is one of having pitched up 45 degrees. Given the very strong sensation of a now-high pitch attitude, one that is not challenged effectively by the focal visual orientation cues provided by the attitude indicator, the pilot is tempted to push the nose of the aircraft down to cancel the unwanted sensation of flying nose-high. Pilots succumbing to this temptation characteristically crash in a nose-low attitude a few miles beyond the end of the runway. In the absence of a distinct external visual horizon or, even worse, in the presence of a false visual horizon (e.g., a shoreline) receding under the aircraft and reinforcing the vestibular illusion, the pilot's temptation to push the nose down can be overwhelming.

Analysis

CARs require pilots flying this model of aircraft to have their pilot's licence endorsed for high-performance aircraft. Similarly, a valid instrument rating is required by any pilot filing and flying under IFR. The pilot's private pilot licence was not endorsed with an instrument rating, nor did he have an aircraft high-performance type rating. TC pilot records indicate that, on several occasions, the pilot attempted, but never successfully completed, the instrument rating examination. The U.S. pilot certificate was issued on the basis of, and valid only when accompanied by, a valid Canadian licence. The pilot provided the U.S. training provider with licensing documentation that indicated that he held an instrument rating when, in fact, he did not hold this rating. Further, the pilot did not obtain a high-performance type rating on his licence for this model of aircraft.

There are inconsistencies between the facts recorded on the pilot's last civil aviation medical examination with respect to medical conditions and current prescribed medications, and those learned during the investigation. TC CAM could not declare with any certainty that the combination of medical conditions experienced by this pilot would or would not have met all the criteria to allow a valid medical certificate to be issued, since the required medical investigations were either not available or had not been done for some of the conditions of interest.

There are numerous indicators that the departure may have been rushed. The pilot and passenger arrived late at the airport due to busy highway traffic during the holiday weekend. The aircraft take-off was conducted downwind. Since the pilot was trained, and it was his practice, to conduct all take-offs using 20 degrees of trailing edge flap extended, and the flaps were found in the zero to five degrees range, the pilot most likely made a left turn shortly after take-off and raised the flaps in the turn. Finally, the occurrence site is only 1 nm west of the airport, and the aircraft had turned through more than 180 degrees prior to striking the first trees, which are also indicators that the departure may have been rushed.

After becoming airborne at night, in rain, with little outside visual reference, the pilot would have been required to rapidly shift his scan from outside the aircraft to the flight instruments in the cockpit. This transition is a critical stage of flight and demands positive, deliberate action and the pilot's full attention. While the aircraft was at low altitude, the landing gear was retracted. Moments after landing gear retraction, the pilot turned the aircraft left for the on-course track and the flaps were raised. The aircraft's rate of climb would have been degraded when the flaps were retracted while the aircraft was banked in the left turn. The tasks of moving the gear selector and raising the flaps, although not demanding, would divert some of the pilot's attention away from monitoring the flight instruments. This diversion during the transition from visual flight to instrument flight may have caused the pilot to become disoriented and to misinterpret or improperly scan the flight instruments.

The pilot may have also been subjected to somatogravic illusion. The overall result was that the pilot allowed the aircraft to commence a shallow descent until it struck trees, which compromised the integrity of the aircraft. With critical flight controls missing from the aircraft, it rolled inverted and entered the impact zone. Due to the severity of the impact sequence, many of the avionics components and instruments did not reveal conclusive information. The airspeed indicator imprint and the length of the wreckage trail through the heavily-wooded area indicate that the aircraft entered the impact zone at high speed.

The following Engineering Laboratory reports were completed:

LP 65/99—Engine Disassembly
LP 66/99—Propeller Teardown Examination
LP 67/99—ELT Examination
LP 68/99—Instrument Examination

Findings as to Causes and Contributing Factors

1. The accident flight was conducted at night in IMC, and the pilot, whose private pilot licence was not endorsed with an instrument rating, was not certified for the IFR flight.

2. The pilot may have been subjected to somatogravic illusion and allowed the aircraft to descend into terrain after a night take-off in IMC.

3. The pilot did not completely report his medical conditions to the civil aviation medical examiner.

Other Findings

1. The pilot was not certified to fly this model of aircraft as his private pilot licence was not endorsed with the appropriate high-performance aircraft rating.

2. The pilot conducted a downwind take-off.

3. While the aircraft was turning left for the on-course track, the aircraft flaps were retracting.

4. The aircraft struck trees while in a shallow descent. The integrity of the aircraft was compromised as it rolled inverted and entered the impact zone at high speed.

5. The aircraft engine teardown examination revealed no pre-impact failures of any component parts or accessories in either the left or right engine that would have precluded normal engine operation.

6. The propeller teardown examination revealed that both propellers were in a normal operating range and were rotating with power at the time of impact.

7. The ELT did not function due to the impact damage sustained by its various components.

Safety Action Taken

TC has initiated a project to cross check a sampling of IFR flight plans against instrument qualifications of the pilot filing the flight plan in order to determine if there are systemic irregularities that would warrant highlighting that area of flight operations.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 08 June 2000.