Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

AVIATION INVESTIGATION REPORT

A03H0002

COLLISION WITH TERRAIN

WASAYA AIRWAYS

CESSNA 208B CARAVAN C-FKAB

SUMMER BEAVER, ONTARIO

11 SEPTEMBER 2003

Canada

The Transportation Safety Board of Canada (TSB) investigated this occurrence for the purpose of advancing transportation safety. It is not the function of the Board to assign fault or determine civil or criminal liability.

Aviation Investigation Report

Collision With Terrain

Wasaya Airways
Cessna 208B Caravan C-FKAB
Summer Beaver, Ontario
11 September 2003

Report Number A03H0002

Synopsis

On 11 September 2003, at 2057 eastern daylight time, Wasaya Flight 125, a Cessna 208B Caravan (serial number 208B0305, registration C-FKAB) departed Pickle Lake to Summer Beaver, Ontario, on a charter flight with seven passengers and one crew member. The flight proceeded on a direct routing to destination at 3500 feet above sea level under night visual flight conditions. On approaching Summer Beaver, the aircraft joined the circuit on a downwind leg for a landing on Runway 17. When the aircraft did not land, personnel at Summer Beaver contacted the Pickle Lake flight dispatch to inquire about the flight. The aircraft was declared missing following an unsuccessful radio search by the Pickle Lake flight dispatch staff. Search and rescue personnel found the wreckage in a wooded area three nautical miles northwest of Summer Beaver. The aircraft had been nearly consumed by a post-crash fire. All eight people on board had been fatally injured.

Ce rapport est également disponible en français.

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1.0 Factual Information

1.1 History of the Flight

Wasaya Airways is headquartered in Thunder Bay, Ontario,[1] and operates four different aircraft types from a number of bases in the northwestern part of the province. Wasaya's Cessna 208B Caravan aircraft are certified for Air Taxi operations under Canadian Aviation Regulation (CAR)[2] 703 and operate from bases at Red Lake (CYRL) and Pickle Lake (CYPL).

On 11 September 2003, the occurrence pilot was on reserve status. He was called in to fly the last two flights of the day because wind conditions were quite strong, and the base manager wanted a more experienced pilot for the evening flights. The pilot reported for duty at 1700 eastern daylight time,[3] completed his planning for a scheduled freight trip to Muskrat Dam and departed Pickle Lake at 1805. When he returned to Pickle Lake at 2032, the aircraft was refuelled and reconfigured for a passenger charter to Summer Beaver (CJV7).

Flight 125 departed Pickle Lake at 2057 with an estimated arrival time of 2136. There were seven passengers and one pilot on board. The pilot flew a direct visual flight rules (VFR) routing to Summer Beaver at 3500 feet above sea level (asl) under night visual meteorological conditions (VMC).

While en route to destination, the pilot exchanged radio calls with another Caravan pilot operating in the area. Ten minutes before landing at Summer Beaver, he broadcast his intentions on 126.7 MHz and activated the aircraft radio control of aerodrome lighting (ARCAL) of the airfield. Witnesses on the ground saw the aircraft's lights as it joined the downwind leg of the airport traffic circuit. The runway lights extinguished 15 minutes after activation, but the aircraft had not landed. Personnel at Summer Beaver called the Pickle Lake dispatch office to inform them that the flight had not arrived. The aircraft was declared missing at 2320 following an unsuccessful radio search by the Pickle Lake base staff. Search and rescue personnel found the wreckage at 0152; all eight people on board had been fatally injured. The aircraft was lying in a wooded area, three nautical miles (nm) northwest of Summer Beaver (52°43'773" north, 88°37'152" west, elevation 835 feet asl). The accident occurred at approximately 2130, during the hours of darkness. The accident was non-survivable.

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1 All locations are in the province of Ontario unless otherwise noted.

2 See Glossary at Appendix B for all abbreviations and acronyms.

3 All times are eastern daylight time (Coordinated Universal Time minus four hours).

1.2 *Injuries to Persons*

	Crew	Passengers	Others	Total
Fatal	1	7	-	8
Serious	-	-	-	-
Minor/None	-	-	-	-
Total	1	7	-	8

1.3 *Personnel Information*

The pilot had been employed with Wasaya Airways since March 2001, initially as first officer on the Caravan and the Pilatus PC-12. As of May 2003, he had been flying as a captain on the Caravan. The last entry in the pilot's logbook was dated 08 August 2003. Flights that had been completed after that date were not recorded in his logbook. As of 08 August 2003, he had accumulated a total of 132 hours of night flying, 36 of which were flown on the Caravan (31 hours dual, 5 hours as captain). A study of aircraft journey logs indicated that he had flown a further six night hours between 19 August and 11 September and had completed more than five night take-offs and landings, as required for carrying passengers. The pilot last flew at night the evening before the accident. The pilot's total flying hours were calculated using his personal logbook, company hours data, and aircraft journey logs. The following is a summary of personnel information.

	Captain
Age	25
Pilot Licence	Commercial Pilot
Medical Expiry Date	January 2004
Total Flying Hours	2351
Hours on Type	946
Hours Last 90 Days	344
Hours on Type Last 90 Days	344
Hours on Duty Prior to Occurrence	5
Hours Off Duty Prior to Work Period	16

1.4 Aircraft Information

Manufacturer	Cessna
Type and Model	208B, Grand Caravan 1
Year of Manufacture	1992
Serial Number	208B0305
Certificate of Airworthiness (Flight Permit)	19 June 1992
Total Airframe Time	16 770
Engine Type	PT6A-114A
Propeller/Rotor Type (number of)	McCauley 3-blade constant speed (1)
Maximum Allowable Take-off Weight	8750 lbs.
Recommended Fuel Type(s)	Jet A, Jet A-1, Jet B
Fuel Type Used	Jet A

There is no record that the pilot performed weight and balance calculations before the flight, as required by CAR 703.37, since no form to this effect was left in Pickle Lake, as required by regulations. However, weight and balance calculations made by the investigation team, based on the information obtained about the passengers and cargo, indicated that the weight and centre of gravity were well within the aircraft limits at take-off and for the duration of the flight. The required passenger manifest was also not completed. Initially, this made it difficult to determine with certitude who was on board the aircraft at the time of the crash.

Examination of the wreckage confirmed that all of the passengers had been seated behind the cockpit bulkhead in the cabin, with no one occupying the copilot seat.

1.5 Meteorological Information

On the day of the accident, the area forecast for northwestern Ontario indicated a band of convective activity extending from Kenora to Hudson Bay. This was forecast to produce broken cloud layers between 3000 feet and 19 000 feet with numerous embedded altocumulus castellanus clouds giving a visibility of four to six statute miles (sm) in rain showers and mist. Thunderstorms were predicted in the southern half of this weather area between Kenora and Pickle Lake. Moderate mechanical turbulence below 3000 feet above ground level (agl) was forecast for the entire area. The Pickle Lake terminal area forecast called for light westerly winds, visibility greater than 6 sm with a ceiling of 3000 feet. The Pickle Lake weather at the time of departure was as follows: light westerly winds, 12 sm visibility, temperature 21°C, ceiling 3000 feet, with towering cumulus (TCU) cloud associated. At the time of the accident, the Pickle Lake weather was reported as follows: wind westerly at 7 knots, 12 sm visibility in light rain showers, and ceiling 2500 feet, with TCU cloud associated.

Summer Beaver does not have a weather reporting station; however, pilots operating in the area around the time of the accident reported strong southwesterly winds, moderate mechanical turbulence with no windshear, and visibility greater than 10 nm. There was a light rain shower observed at the aerodrome about 20 minutes after the time of the accident, but no rain at the time of the accident.

1.6 Aerodrome Information

Summer Beaver aerodrome is operated by the Government of Ontario. The single runway is a gravel strip 3500 feet long and 100 feet wide oriented 173/353° Magnetic (M), and the elevation is 832 feet asl. The aerodrome is equipped with threshold and runway end lights, medium intensity runway edge lights, and type K ARCAL lights. It is an uncontrolled aerodrome with a published aerodrome traffic frequency (ATF) of 123.2 MHz that is to be used when within 5 nm of the aerodrome and below 3800 feet asl. Summer Beaver aerodrome does not have fire fighting services.

1.7 Flight Recorders

The aircraft was not equipped with any on-board recording devices nor were they required by regulations. The determination of the occurrence events was hampered by the lack of on-board recording equipment.

1.8 Wreckage and Impact Information

1.8.1 General

Examination of the wreckage revealed that the aircraft struck heavily wooded terrain in a near vertical attitude with the wings level. The site was located 3.1 nm from Summer Beaver on a 295° M bearing from the threshold of Runway 17. The aircraft knocked down several trees that had occupied the ground where the aircraft came to rest, and there were signs of tree impact to the leading edges of both wings. The aircraft came to rest facing 200° M, with the remains of the wings nearly perpendicular to the fuselage. Fire consumed some trees and most of the aircraft, with the exception of portions of the fuselage, wings, engine, and propeller. The remains of the landing gear, seats, door latches, and cargo pod were identified. No evidence of pre-impact structural failure was identified.

Photo 1. Overhead view of accident site

All major components of the aircraft were located at the accident site. No discrepancies were found with the portions of the aircraft that could be examined. Only small fragments of the windshield were found within and immediately outside of the site perimeter.

1.8.2 Engine and Propeller

The engine was located under the forward fuselage structure, upright and aligned approximately with the aircraft longitudinal axis. The engine displayed severe impact and fire damage, including the complete consumption of the reduction and accessory gearbox housings. Extreme fire damage precluded assessing the pre-impact continuity of any of the engine-to-airframe connections, or power controls and related gauges. There were no indications of operational dysfunction of any of the engine components examined. The engine displayed contact signatures on the internal components, characteristic of an engine developing significant power at the time of impact. The engine did not display any pre-impact anomalies or distress that would have precluded normal operation.

The aircraft was equipped with a McCauley three-bladed, constant-speed, full-feathering, reversible, governor-regulated propeller. The propeller spinner, propeller hub, and blades were found embedded approximately 1.5 feet below the surface of the forest floor with portions visible at the surface. The propeller was relatively intact, with the propeller spinner crushed aft against the propeller hub. The displacement of the propeller back plate and the distortion of the mounting bolts approximately 30 to 40 degrees indicated propeller rotation at impact. During examination, there were no indications of operational dysfunction of any of the propeller components that would have precluded normal operation. The propeller displayed contact signatures on the internal components characteristic of a propeller producing forward thrust at a low blade angle. The governor displayed severe impact and fire damage, and an assessment of its serviceability prior to impact could not be completed. The governor counterweights and oil pump were intact.

1.8.3 Flight Controls

The Caravan aircraft is equipped with flight controls consisting of ailerons; inter-connected spoilers, elevators, and rudder control surfaces; and trim tabs. The control surfaces are manually operated through mechanical linkage using a control wheel for the ailerons, spoilers, and elevator, and using rudder/brake pedals for the rudder. Manually operated aileron, elevator, and rudder trim systems are provided and controlled from the cockpit by trim wheels mounted on the control pedestal. The aircraft is also equipped with an electric elevator trim system. The wing flaps are large-span, single-slot type, incorporating trailing-edge angle and leading-edge vortex generators to reduce stall speed and provide enhanced lateral stability. The flaps are driven by an electric motor and are extended or retracted by positioning the wing flap selector lever on the control pedestal to the desired flap deflection position.

Flight control cable continuity for all flight controls was determined to be normal with the exception of cuts or overload failures as a result of the impact and aircraft breakup. The positions of the ailerons, elevators, spoilers, and rudder at impact could not be determined. The position of the aileron trim tab actuator was consistent with a one-degree up, trim tab deflection. The elevator trim tab actuators were found at approximately six degrees trim tab up.

The autopilot system components were destroyed by the fire; the status of the system at impact could not be determined.

The flaps, flaps tracks, and flap pushrods were partially consumed by the post-crash fire. The measurement of the extension of the flap actuator jackscrew was interpreted to be equivalent to a 20° flaps down position. There were no pre-impact failures identified with the flap bellcranks, and the impact damage to the bellcranks was symmetric about the wings. The flap actuator support structure, the flap motors, and the transmission were destroyed by the fire.

The Transport Canada Service Difficulty Record database was queried regarding the flap system. The search produced 81 service difficulty reports (SDRs) submitted between 1989 and 2003.

1.8.4 Flight Instruments

The remains of the flight instruments were found, but all were burned or damaged to such an extent that no meaningful information could be recovered.

Between 05 March 2001 and the date of the accident, nine replacements of the flight command indicator (FCI) were recorded in the technical records of the occurrence aircraft. The reasons for these replacements varied from the instrument displaying erroneous pitch and bank information while in level flight to the unit not erecting properly or toppling.

1.8.5 Maintenance Records

A review of the maintenance records for the two-year period prior to the accident indicated that the aircraft had been maintained in accordance with the maintenance program approved by Transport Canada. It was noted that the maintenance requirements of the emergency locator transmitter (ELT) and battery were overdue. However, as the ELT is not part of the certification criteria for this aircraft, the certificate of airworthiness was valid and in force. In the months leading up to the accident, numerous unserviceabilities were recorded with the FCI, flap system, and autopilot system; however, the impact forces and post-crash fire precluded determining the serviceability of this instrument and these systems at impact.

In the two-year maintenance history reviewed, numerous recurring defects pertaining to the KI 256 FCI and the autopilot were recorded. The operator indicated that they had experienced operational and reliability problems with the KI 256 FCI across their fleet of Caravans. On 08 May 2003, this entry was made in the journey log of the accident aircraft: “The Capt’s attitude

indicator needles shake after unit is spooled up. Unit becoming unstable after 5 min in flight." The FCI, King KI 256 attitude indicator, S/N: X23297 was replaced with KI 256, S/N: X21778. Between 08 May and 05 July, two more FCIs were replaced. On 05 July, KI 256, S/N: X23297 was re-installed in the occurrence aircraft and was the unit in place the night of the accident. The pre-impact serviceability of the occurrence FCI could not be determined as the unit was found nearly completely melted.

1.9 Medical Information

There was no indication that medical issues played a role in the occurrence. The pilot's aviation medical file contained no information relating to pre-existing medical conditions that would have led to incapacitation.

1.10 Fire

An intense post-crash fire consumed most of the aircraft. The accident site was accessible only by helicopter. Aerodrome fire fighting services would have been unable to reach the site had they been available.

1.11 Survival Aspects

Pickle Lake flight dispatch staff commenced a radio search for the aircraft after being informed by personnel in Summer Beaver that the flight had not arrived. The aircraft was officially declared missing at 2320, and a search and rescue Hercules aircraft from Winnipeg, Manitoba was tasked to respond. At 0101, the Hercules was in the search area and reported picking up a weak ELT signal. The crash site was located at 0152; a fire was still burning at the site. Rescue personnel parachuted into the location and, after searching the area, determined that the passengers and the pilot had perished in the wreckage.

The ELT had separated from the aircraft during the impact sequence and was found leaning against a tree. Rescue personnel indicated that the activation light on the ELT was illuminated when they found it, but the antennae cable had detached from the ELT. This would explain why the ELT signal was not picked up by high flying aircraft nor by the search and rescue satellites.

This was not a survivable accident. Impact forces were in excess of the design limits of the restraint system, and the liveable space of the cabin was compromised.

1.12 Aircraft Operating Procedures and Handling Characteristics

The Wasaya Airways *Standard Operating Procedures* for the Cessna 208B describe the standard VFR circuit, as follows: The aircraft is established on the downwind leg at 130 knots with the 10° flap position selected. After turning to base leg, the speed is reduced to 120 knots, 20° of flap is selected, and the propeller is set for maximum rpm. The aircraft is positioned on final at 500 feet agl at landing reference speed (V_{REF}) plus 15 knots. Full flap is selected on short final with the intent to land.

The accident aircraft was last seen on a right downwind leg for Runway 17. The wreckage was found in the general area of where the turn to base leg would be expected. When the aircraft is at the maximum certified weight of 8750 pounds, with the most rearward centre of gravity (C of G), and configured with 10° of flap, the aircraft will stall at 58 knots indicated airspeed (KIAS) while straight-and-level and at 62 KIAS with 30° of bank. At the same weight and C of G position with 20° of flap, the aircraft will stall at 53 KIAS while straight-and-level and at 57 KIAS with 30° of bank. The Cessna 208B pilot operating handbook indicates that altitude loss during a stall recovery may be as much as 300 feet from a wings-level stall and even greater from a turning stall.

Cessna Aircraft company certification data[4] describes the 208B as having good stall characteristics. The data from flight testing indicated that power-on stalls required typical aileron and rudder inputs, and that the 208B had to be forced into a spin with aggressive rudder input. With less than a 200-pound imbalance between the fuel tanks, wing drop in the stall should not occur. Cessna Caravan pilots generally describe the 208B as very docile in a stall.

1.13 Waterfowl Migration

Numerous Canada geese were observed migrating south during the time surrounding the occurrence, and during the field phase of the investigation large flocks of geese were observed and heard overflying the area well into the hours of darkness. The accident area encompasses one of the major geese migration routes; however, there was no indication of a birdstrike on any part of the wreckage.

1.14 Company Operations

Wasaya Airways *Air Operating Certificate* (AOC) grants authority for the company to carry passengers aboard the Cessna Caravan on instrument flight rules (IFR) and night VFR flights. The AOC also grants authority to carry passengers on IFR flights without a second-in-command. Because rules for IFR flight are more stringent than those for VFR flight, this implies

[4] Cessna Aircraft Company flight test report #DM-208B-0, dated 9 December 1982.

that the same authority would be granted to carry passengers in night VFR conditions without a second-in-command. The pilot held a valid instrument rating required for night VFR flight with passengers.

Wasaya operates a Type-C dispatch system and, as such, the pilot-in-command (PIC) retains overall responsibility for flight watch. It employs and uses flight followers to assist the PIC. Specifically, they maintain arrival and departure information, flight schedules, and meteorological and notice to airmen (NOTAM) information. As required by CAR 724.15, the company's *Operations Manual* describes the training provided to the flight followers and the responsibilities of the PIC and the flight followers with respect to flight watch.

Wasaya uses a flight dispatch clearance form in lieu of a flight plan or flight itinerary. This form contains flight information regarding routing, distance, time, and fuel. Flight progress is updated by Wasaya agents in the various aerodromes or through radio rebroadcast with other aircraft. The company also uses forms for recording the aircraft weight and balance, and for the passenger manifest.

The PIC is required to complete these three forms for every flight or series of flights before departure, and a copy of each form is to be left with the departure base, or faxed to the base when operating from a satellite location. The pilot of the accident aircraft did not leave copies of any of these forms at the Pickle Lake base before departing for Summer Beaver.

Flight following procedures during some stages of operations can be impractical. Changes to flight plans can only be passed by radio relay with other company aircraft when operating from remote locations or after normal working hours, as aerodrome offices may be closed, and crews do not have access to passenger agents or telephones.

1.15 Spatial Disorientation

Spatial disorientation occurs when a pilot loses the ability to orient himself with respect to the horizon by using instruments or other visual references. A number of illusions affecting the visual or vestibular systems can result in spatial disorientation including:

- Somatogravic Illusion (pitch up, pitch down illusion): This illusion occurs when the otoliths, structures in the inner ears, interpret a horizontal acceleration or deceleration as if the head were being tilted backward or forward. If uncorrected, this illusion will cause the pilot to pitch the nose of the aircraft in the opposite direction to compensate.

- The Leans: This illusion occurs when a roll is introduced slowly or maintained for a period of time. The semi-circular canals, structures in the inner ears, experience the banked attitude as being straight up an down. Once returned to straight flight, the pilot senses a turn in the opposite direction and may attempt to correct by banking in the opposite direction.

- Coriolis Illusion: This illusion occurs when two or three of the semi-circular canals in the inner ear are subjected to accelerations in different directions (e.g. such as might occur when turning the head and bending down while the aircraft is turning). This illusion causes a strong sensation of falling or tumbling with the danger that the pilot will attempt a take-control action opposite to the false sensation.

- Drift Illusions: This visual illusion occurs when operating low to the ground in strong wind conditions where the effect of wind on ground speed and drift gives the pilot a strong sensation of flying faster or slower than desired and of turning in an uncoordinated manner. The danger of this illusion lies in the pilot taking action to counter the visual illusion, possibly placing the aircraft in a slow-speed range in uncoordinated flight.

Such illusions have been well documented during training for private and commercial pilot licences as well as in training for instrument ratings.[5]

1.16 Transport Canada Audit

Between 17 and 20 September 2003, Transport Canada Aviation Enforcement conducted an audit of Wasaya Airways operations and maintenance divisions. The only finding of note was that the company had not been documenting the requirement to complete five take-offs and landings at night before carrying passengers. The company confirmed that the pilots had carried out the landings and take-offs, but no system had been used to record them. The company has since implemented a method of tracking night take-offs and landings.

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[5] See for example: *Human Factors for Aviation - Basic Handbook*, TP12863; *Instrument Procedures Manual*, TP2076; and *Flight Training Manual*.

2.0 Analysis

2.1 General

The attitude of the aircraft at impact indicates that it was out of control at the time of impact. Therefore, the analysis concentrates on those areas that could have led to the loss of control: the pilot's ability to perform, aircraft airworthiness, and environmental issues.

2.2 Pilot Ability to Perform

2.2.1 Medical Incapacitation and Fatigue

No pre-existing condition was found in the pilot's aviation medical examinations to suggest the possibility of pre-impact incapacitation. The pilot had 16 hours off duty prior to the work period, reporting for work at 1700, with the accident occurring at approximately 2130. This schedule does not raise concerns about chronic or acute fatigue. No information was gathered that indicates that pilot incapacitation or fatigue played a role in this occurrence.

2.2.2 Spatial Disorientation

At some point during or shortly after the turn to base leg, the aircraft left controlled flight. The orientation of the aircraft at impact would be consistent with a fully developed aerodynamic stall, with a wing and nose drop. Therefore, the potential for spatial disorientation to have played a role in the aircraft departing controlled flight must be considered. The pilot of the accident aircraft, holding a commercial licence and valid instrument rating, would have been aware of the possibility of such illusions and had been trained to focus attention on the instruments when such illusions were probable or suspected. At the time of the occurrence, some outside visual references were available to help orient the pilot. Although the overcast would have obscured any stars, ground lights from Summer Beaver and the airport itself would have been visible. These ground references would have been off the right side of the aircraft during the downwind leg and off the nose and front right quarter once established on the base leg. Having flown en route at night to Summer Beaver over uninhabited and unlit terrain, and under an overcast sky, the pilot would have been making the transition from flying with reference to the flight instruments to flying with reference to external landmarks at the time control of the aircraft was lost.

With the availability of both instruments and external references to help the pilot maintain orientation for the approach and landing, it is difficult to envision how a visual or vestibular illusion, in isolation, could have led to loss of control of the aircraft. The pilot's disorientation would have had to have been significant enough to result in a fully developed stall or spiral dive. Assuming no load or gust factor, and given the target airspeed of 120 KIAS on the base leg, the aircraft would have had to lose more than 60 knots airspeed to reach the point of the stall. Further, the stall characteristics of the Cessna 208B have been described as being fairly docile

with adequate warning of an impending stall. Prior to reaching the point of stall, the pilot would have been confronted with a significantly increased nose-up attitude, decreased cockpit noise, decreasing airspeed, a stall warning horn and, finally, buffeting prior to departing controlled flight. Having flown the trip from Pickle Lake with few ground references, the pilot would likely have been sufficiently attentive to his instruments to detect some or all of these symptoms of an approaching stall.

The availability of ground references, the pilot's instrument flying experience, and the flying characteristics of the Cessna 208B all serve to reduce the probability of spatial disorientation by itself as leading to a loss of control of the aircraft. However, the possibility of disorientation in conjunction with some other event cannot be ruled out. Events such as an in-flight emergency, a failure of the attitude indicator, or an inadvertent entry into a rain shower are all possibilities that might have contributed to pilot spatial disorientation and could not be ruled out in this investigation.

2.2.3 Birdstrike Hazard

It is plausible that a birdstrike during the turn to base leg, or shortly thereafter, could have incapacitated the pilot to the extent that subsequent control inputs, or the lack thereof, resulted in loss of control. No bird remains were found at the accident site; however, the intense post-crash fire could have destroyed all evidence of a birdstrike.

2.3 Aircraft Airworthiness

2.3.1 Engine and Propeller

The investigation revealed that the engine was developing significant power at impact. Therefore, a lack of engine/propellor power is not considered a contributing factor.

2.3.2 Flight Controls

In view of the service bulletins and airworthiness directives associated with the flap system of this aircraft through its history, the investigators conducted a thorough analysis of all the associated flap control systems. All the bellcranks, pulleys, and associated cables that were examined were either normal or were shown to have failed in overload during the crash sequence. The flap tracks and associated rollers showed indicating marks at the 20° position, but these marks could have been caused by repeated movement of the flaps to that position through normal flight operation. Exact flap position immediately prior to impact could not be determined as both sections were driven up past the 0° position during the crash.

2.3.3 Structural Failure

All the major components of the aircraft were found at the site. The wings were in one piece, and both elevator horns and parts of the elevator were attached to the structure. Ailerons, flaps, and trims were all attached and identified. The cockpit and passenger doors were confirmed as having been closed, and both handles were recovered in the latched position. Therefore, structural failure of a primary control or surface has been eliminated.

2.3.4 Flight Instruments

Numerous recurring defects pertaining to the KI 256 FCI on the operator's Cessna 208B Caravan have been documented. Such failures can be very insidious, causing the pilot to become easily disoriented when he realizes that things are not as he perceives them. Such an in-flight emergency would be aggravated in conditions of little or no external visual references. The FCI was fire damaged to the extent that its serviceability could not be determined. However, it is possible that a failure of the FCI, coupled with spatial disorientation or the illusion possibilities described above, could have led to the loss of control.

2.4 Weather

Considering the pilot's experience, the ceiling and visibility were adequate for the flight to be conducted under VMC in a safe manner. Rain showers had been forecast and reported throughout the area, but there were no showers observed at the Summer Beaver aerodrome at the time of the aircraft's arrival.

The Summer Beaver airport does not have a recorded weather capability, but strong, gusty winds were reported by pilots flying in the area. However, the turbulence was reported only as moderate with no windshear. Although it does not appear that wind was a factor in this accident, the possibility of a localised severe condition cannot be ruled out.

3.0 Conclusions

3.1 Findings as to Causes and Contributing Factors

1. The aircraft departed controlled flight and struck terrain for undetermined reasons.

3.2 Findings as to Risk

1. The company's flight-following procedures for flights operating in remote areas were impractical and were not consistently applied; this could compromise timely search and rescue operations following an accident.

3.3 Other Findings

1. The aircraft did not carry flight recorders. Lack of information about the cause of this accident affects TSB's ability to identify related safety deficiencies and to issue safety communications intended to prevent accidents that could occur under similar circumstances.

4.0 Safety Action

4.1 Action Taken

4.1.1 Flight Instruments

The operator has provided maintenance personnel with additional training for handling gyro instruments.

4.1.2 Emergency Locator Transmitter Maintenance Requirements

The operator has revised its tracking of emergency locator transmitter maintenance requirements.

4.1.3 Flight Following Capability

Prior to the accident, the company had started to equip their aircraft with an automatic tracking system. This system updates aircraft position every three minutes and allows operations dispatchers to track the location of an aircraft throughout the duration of its flight. Since the accident, this modification has been completed on all but two of the company's aircraft.

4.1.4 Crew Requirements on Passenger Flights

Although not required by regulation, the company has instituted a policy of crewing all passenger flights with two pilots.

This report concludes the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 08 December 2004.

Appendix A – List of Supporting Reports

The following Transportation Safety Board Engineering Laboratory reports were completed:

LP 098/03 – Airspeed Indicator
LP 126/03 – Fractured Rod Ends

Appendix B – Glossary

agl	above ground level
asl	above sea level
AOC	air operating certificate
ARCAL	aircraft radio control of aerodrome lighting
ATF	aerodrome traffic frequency
CAR	Canadian Aviation Regulation
C of G	centre of gravity
ELT	emergency locator transmitter
FCI	flight command indicator
IFR	instrument flight rules
KIAS	knots indicated airspeed
M	Magnetic
nm	nautical mile
NOTAM	notice to airmen
PIC	pilot-in-command
rpm	revolutions per minute
SDR	service difficulty report
sm	statute mile
TCU	towering cumulus
VFR	visual flight rules
VMC	visual meteorological conditions