CANADIAN FORCES
FLIGHT SAFETY INVESTIGATION REPORT

FINAL REPORT

FILE NUMBER: 1010-C-GVWT
DATE OF REPORT: 11 Oct 2001

AIRCRAFT TYPE: C-172M
DATE/TIME: 26 July 2000 1250 Z
LOCATION: Bromont Quebec
CATEGORY: B Category Air Accident

SYNOPSIS

On 26 July 2000, a solo Cadet undergoing private pilot training with the Air Cadet Flying Scholarship Program was practising touch-and-go landings at the Bromont airport. On his third landing, he lost directional control of the aircraft and exited the runway. The aircraft came to rest in a ditch approximately 200 ft off to the left (south) of the runway. The pilot sustained only minor injuries but the aircraft's structure was substantially damaged. The Regional Cadet Air Operations Officer for the Eastern Region contacted the National Cadet Air Operations Officer in Ottawa who in turn contacted DFS. Since the civilian registered aircraft was under contract with DND to provide training to the Air Cadets, a DFS investigation was initiated under Article 18 (3)(4) of the Canadian Transportation Accident Investigation and Safety Board Act.

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1. FACTUAL INFORMATION

1.1 History of the Flight

On the morning of 26 July 2000, a solo Air Cadet undergoing private pilot training departed St-Jean PQ for Bromont PQ in a Cessna 172M. The purpose of the flight was to practise touch and go landings away from the student's base at St-Jean as that airport was also host to the Air Cadet Regional Gliding School and the circuit was very busy. The Cadet also required more solo cross country time to meet the 5 hours requirement for his private pilot licence.

The civilian instructional staff authorized the flight after reviewing the student's flight planning. Following an uneventful flight to Bromont, the student entered a right hand circuit for runway 23.

The student pilot set up for a touch and go with a slight crosswind from the left (45 degrees at 5 to 10 Kts). On touchdown, the student selected flaps up and applied full power. The aircraft began to move left, then right of the centre-line. The student elected to continue the take off roll, went around the circuit and attempted another touch and go. Again, after touchdown, the aircraft moved left and right of the centre-line. The student continued the take off roll and decided to carry out one more circuit to a touch and go, with the provision that if the aircraft exhibited the same tendency to cross the centre-line he would stop and phone his home base in St-Jean to report the aircraft's directional problems to the flying school staff.

The student reported that the set up for his third touch and go to runway 23 was normal. Approach and touchdown were also normal, with the aircraft landing approximately 1000' from the threshold and on centre-line. The student then raised the flaps and applied full power. At this point, the aircraft turned to the left, heading towards the runway edge at about a 30º angle. The aircraft left the runway, crossed over a 4 foot-deep ditch, continued along a relatively flat unprepared surface, then entered a second 4 foot-deep ditch, where it came to rest. The two ditches run parallel to the runway and are 100 and 200 ft from the runway edge respectively. The total distance travelled outside of the runway hard surface was approximately 500 ft. The student suffered minor injuries and the aircraft sustained "B" category damage.

1.2 Injuries to Personnel

	Crew
Fatalities	0
Injuries	1

The pilot's injuries were limited to a bruised forearm. Shortly after the accident, he was transported back to St-Jean by his instructor and the Cadet supervising

officer (chaperon) who had flown to Bromont in another aircraft from the same flying school.

1.3 Damage to Aircraft

The aircraft received "B" Category damage. The propeller was dented and bent at the tips. The engine was pushed out of alignment and was sent to overhaul. The left wing tip struck the ground and was heavily damaged. The nose gear was bent out of alignment. There was extensive rippling of the aircraft's skin in numerous locations, mostly centred around the mid fuselage and the base of the empennage, and some structural bulkheads were deformed. The fibreglass fairing around the base of the rudder was cracked, and seals around the rear windows were loosened.

1.4 Collateral Damage

The aircraft travelled through a rough grass area and did not cause any damage to the terrain. Some fuel may have escaped the reservoirs as the aircraft was removed by company personnel. The CFB Montreal Environment Officer was notified of the spill. As the aircraft is owned and operated by a private company and is covered by an insurance policy, a claim against the crown is unlikely.

1.5 Personnel Information

The student was undergoing powered flight training with the Air Cadets. Training took place at the St-Jean airport with a private flying school. The student was approximately halfway through the training syllabus at the time of the accident, having accumulated a grand total of 24.1 hours dual instruction and 5.9 hours solo. His training reports had no major deficiencies, but on the day prior to the accident his instructor noted that the student needed to "pull more on the controls during and after landing"; meaning that the student had a tendency to release the control column early in the landing resulting in a excessive amount of weight being applied to the nose gear.

Rank	Cadet
Age	17
Total Flying Time (Power)	24.1 Dual 5.9 Solo

1.6 Aircraft Information

All controls were found to operate properly. All maintenance and inspections were up to date. The weight and balance was within limits.

1.7 Meteorological Information

There are no METARS or Forecasts issued for the Bromont airport. Weather briefings for this site are obtained by calling the Bromont Unicom operator. Area forecasts and actual conditions for surrounding airports as well as the Unicom report are listed below:

Unicom weather report for Bromont: Wind 180 @ 5-10 Kts, CAVOK

Weather report for St-Hubert, 30 miles to the north-west:

> TAF CYHU 261300Z 261402 16010KT P6SM FEW060 TEMPO 1722 BKN060 RMK NXT FCST BY 20Z
>
> CYHU 261200Z 16005KT 15SM FEW070 FEW100 21/16 A3030 RMK ACC1AC1 SLP260 51010 SKY00
>
> CYHU 261300Z 16008KT 15SM FEW10 22/16 A3030 RMK AC1 ACC ASOCTD SLP262 SKY00

Weather report for Sherbrooke, 45 miles to the east:

> TAF CYSC 261215Z 261224 09005KT P6SM SKC FM 1400Z 12005KT P6SM SCT040 RMK NXT FCST BY 18Z
>
> CYSC 261200Z 00000KT 15SM FEW250 16/13 A3036 RMK CI1 SLP281 52010 SKY00
>
> CYSC 261300Z 00000KT 15SM SKC 20/14 A3036 RMK SLP282 SKY00

1.8 Aid to Navigation

Not applicable

1.9 Communications

The aircraft is equipped with 2 VHF radios, both of which were serviceable at the time of the accident. Once the aircraft came to a complete stop in the second ditch, the student used the aircraft's radio to contact another solo student that was in the circuit at Bromont and inform him that he was unhurt but required assistance. This second student informed the Bromont Unicom Operator of the situation and then landed, pulled off into the grass on the east side of the runway and ran to the accident site to render assistance to his friend.

1.10 Aerodrome Information

The Bromont Aerodrome is uncontrolled. There is a bilingual Unicom frequency of 122.15 operating between 1200 and 0200 Z. Outside these hours the frequency reverts to "Traffic", where pilots broadcast their intentions on a common frequency. The Unicom operator was on duty at the time of the accident.

The runway at Bromont is 5000' by 100' paved asphalt. Runway 23 is equipped with a P2 PAPI for eye-to-wheel heights of up to 25', as well as LOC(BC)/DME. The circuit for Runway 23 is to the right (west) as there is an obstruction (hill) on the east side of the airport that precludes a standard left-hand circuit.

1.11 Flight Recorders

The aircraft is neither equipped nor required to be equipped with any type of flight recording device. These devices could have been of assistance in this accident investigation but it is recognized that they are cost prohibitive and difficult to install in General Aviation aircraft.

1.12 Wreckage and Impact Information

The aircraft remained intact during the accident.

1.13 Medical

The student complained he had a sore forearm after he had been returned to St-Jean. A medical exam was carried out on his return to St-Jean by the civilian nurse on staff with the Air Cadet Camp. The next morning, the cadet was examined and interviewed by the St-Jean Base Surgeon (a qualified military flight surgeon and member of this investigation board) and he was returned to flying status. No toxicology samples were taken following the accident.

1.14 Fire, Explosives Devices, and Munitions

Not applicable, as there was no post-crash fire.

1.15 Survival Aspects

According to the GPH-205, the Bromont airport does not have CFR capability. There is, however, a volunteer fire station located just off the airport property that could have provided assistance had it been required.

After the aircraft departed the runway, the Unicom operator came out to the crash site to check on the status of the pilot. The Unicom operator then transported the student to the terminal building in her car. No Emergency services were alerted either during or after the accident.

1.15.1 Crash Survivability

The crash was survivable. The aircraft retained enough velocity to cross over the first ditch with little damage, and had lost enough velocity by the time it reached the second ditch that the impact force was considerably reduced.

1.15.2 Life Support Equipment

The four-point harness used by the pilot effectively restrained him and prevented more serious injury

1.15.3 Emergency Transmitters

The aircraft was equipped with an emergency transmitter. Deceleration forces were insufficient to activate it, and it was found to be serviceable at the time of the accident.

1.16 Test and Research Activities

Nil

1.17 Organisational and Management Information

The flying school at which the student was receiving instruction had a Transport Canada Operating Certificate to conduct pilot training. It had also been running the Flying Proficiency Program allowing CF student pilots to maintain their proficiency during long waiting periods between training courses.

1.17.1 Unit Organisation

Six flying instructors holding Transport Canada Categories 3 and 4 (roughly equivalent to CF Cat B and C) provided the flying and ground-school training, under the supervision of a Category 1 (roughly equivalent to a CF Cat A1) Chief Flying Instructor. Each instructor was responsible for 3 or 4 cadets with whom he flew almost exclusively. The cadet involved in the accident flew with the same instructor for most of his training. The Chief Flying Instructor and/or a Transport Canada Examiner administered flight tests and issued the private pilot licence.

1.17.2 Unit Training

The Cadet Flying Scholarship provides the students with 45 hours of ground instruction and an average of 48 hours of flying instruction plus applicable exams in order to obtain their private pilot's licence. A cadet can graduate with less than the 48 hours average time but must meet the Transport Canada minimum of 40 hours. Most Cadets will finish the course with 45 to 50 hours.

1.18 Investigation

When the investigation team assembled in St-Jean, the aircraft had already been removed from the ditch in Bromont. Since the accident met the criteria for a Transportation Safety Board (TSB) class five response (no field investigation, data collection for statistics only), the TSB Quebec Region office released the aircraft to the flying school. After some consultation between the National and Regional offices of the TSB, the aircraft was re-impounded to allow DFS to carry out its investigation.

2. ANALYSIS

2.1 The aircraft

The aircraft relevant systems (brakes, nose wheel steering and flight controls) were examined on site and found to be in proper working order. All maintenance requirements were up to date and records were found to be in good order.

2.2 The runway

2.2.1 Tire marks

The aircraft left visible tire imprints on the runway surface. The marks were too faint to be photographed in their entirety but were visible to the naked eye. Following these tire marks along the runway one could see that the aircraft landed on the runway centreline and tracked straight until the 1500 foot runway markings where it executed a sharp turn to the left and exited the paved surface. (see photos 2 and 3) There was no evidence on the runway indicating that the aircraft did any swerving or zigzags across the centreline. The lack of any skid marks indicated that at no time was the braking action sufficient to cause wheel lock-up. The tire marks also showed distinctly the thread pattern, indicating that the wheels were travelling along their plane of rotation (no sideways skidding). This evidence leads to the conclusion that there were no erratic lateral movements of the aircraft but rather a single event leading to the departure from the paved surface. This single event is most likely an improper reaction to the prevailing crosswind and/or to the torque caused by the application of full power.

2.2.2 The infield

The aircraft travelled 500 Ft through the unprepared area to the left of the runway before coming to rest in a shallow ditch. Halfway through its “off road” travel, the aircraft crossed a four-foot ditch (photo 4) without dropping into it, indicating that the aircraft was still travelling with enough speed to sustain partial flight. A Cessna 172 traveling on an unprepared grass area at idle power would most likely have stopped before the four foot ditch or at worst would have slowed down sufficiently to be unable to cross this ditch. This evidence leads to the conclusion

that the power was not retarded prior to leaving the paved surface, as stated by the student, but most likely closer to the first ditch, indicating that he was still attempting to take-off when he left the runway or that he was “shocked” by what was happening.

2.3 The pilot

2.3.1 Fatigue

There is evidence to suggest that the student was fatigued. Research has determined that the average human needs 7.5 to 8.5 hours of sleep each night to operate effectively. Without the proper amount of rest, thought processes and response times can be significantly reduced. Fatigue can also lead to poor judgement and to the tendency to react automatically rather than with forethought when unusual events occur. The student averaged 7 hours of sleep each night since he started the course and had slept 6.5 hours on the three previous nights. Although the amount of sleep loss on each night is not significant, the cumulative effect may have played a part in this accident by slowing down the student’s thought processes enough to allow the aircraft to get ahead of the pilot on power-up.

2.3.2 Attitude/Experience

The principal cause of this accident is most likely the student’s inappropriate response to the power-up/crosswind combination, in turn caused by his lack of experience combined with his overconfidence. He had only 24.1 dual hours and 5.9 solo hours at the time of the accident. The student was expecting to complete the course with significantly less hours than the average student, indicating that he assessed himself as a fast learner. Other witness testimony confirmed the investigators’ assessment that this student was overconfident. Unfortunately, his low experience and overconfidence combined with the fatigue mentioned earlier, probably led the student to inadequately control the torque and the crosswind during the power-up.

If there were any “lateral excursions” during the previous two touch-and-go (a fact that is not supported by the evidence on the runway), they would have also been pilot induced. The student’s lack of experience may have caused him to misdiagnose this as a mechanical problem. His overconfidence also led him to attempt to troubleshoot a perceived mechanical problem instead of aborting the take-off and requesting assistance from the school.

2.4 Medical

Although the cadet was seen the next day by a flight surgeon, it is uncertain that all Accompanying Officers are aware of the requirement of A-GA-135-001/AA-001, Chapter 7, Para 8, that all members of the crew be seen by a flight surgeon as soon as practicable after an accident.

2.5 Investigation

The flying school owners were unaware of the requirement for DFS to investigate this accident. Since the Cadet Flying Scholarship is subsidized by DND, the aircraft are considered to be Military Conveyances and accidents are subject to DFS investigation under Article 18 (3)(4) of the Canadian Transportation Accident Investigation and Safety Board Act.

Immediately after they were notified of the accident, the owners of the flying school contacted the Regional Office of the TSB. Since there were no major injuries and the aircraft was not destroyed, the TSB investigator collected data from the owners and released the aircraft from quarantine (class five response). Meanwhile, the Regional Cadet Air Operations Officer contacted DFS to report the accident. Since the aircraft sustained "B" category damage, DFS liaised with the National Office of the TSB for a joint investigation of the accident. After some coordination between the National and Regional offices of the TSB, the aircraft was re-impounded but not before it had been removed from the ditch by maintenance personnel and transported to a hangar in Bromont.

Had the school owners been aware of the requirement for DFS to investigate the accident, the aircraft would not have been moved from the occurrence site.

3. CONCLUSIONS

3.1 Findings

3.1.1 The aircraft was fully serviceable and properly maintained in accordance with existing regulations prior to the accident.

3.1.2 The pilot was properly licensed (student pilot licence), briefed and authorized to carry out the mission as assigned.

3.1.3 The weather was not a factor and the winds were within limits.

3.1.4 Tire marks on the runway indicated that the aircraft travelled in a straight line until it made a sharp turn to the left and exited the runway.

3.1.5 The aircraft flew over the first ditch, indicating that the speed was still sufficient at this point to maintain partial flight.

3.1.6 The student had slept 6.5 hours on the previous three nights.

3.1.7 The student exhibited an overconfident attitude.

3.1.8 It is uncertain that Supervising Officers are aware of the requirement that all personnel involved in an accident be seen by a flight surgeon as soon as practical.

3.1.9 The owners of the flying school were not aware of the requirement for DFS to investigate the accident.

3.2 Causes and contributing factors

3.2.1 This accident was caused by the student's inadequate correction for the crosswind and the engine torque during the power-up. The reasons for this failure include:

3.2.1.1. Probably most significantly, his lack of experience.

3.2.1.2. The student's overconfidence may have contributed to the accident if he attempted to troubleshoot a perceived mechanical problem instead of landing and requesting assistance from the school.

3.2.1.3. Fatigue may also have played a role in this accident by slowing the students thought processes enough to reduce his response time and allowing him to fall behind the aircraft.

4. SAFETY MEASURES

4.1 Safety Measures Taken

After the accident, the student flew with an instructor to reassess his competence and rebuild his confidence. He has subsequently completed the course and obtained his private pilot licence.

4.2 Further Safety Measures Required

4.2.1 All Regional Cadet Air Operations Officers should ensure that the Officers supervising the Cadets on flying scholarship maintain an environment conducive to learning by more closely monitoring their cadet's rest and nutrition. They should also keep a closer watch on the cadets performance and attitude. Any observation should be immediately brought to the attention of the school's Chief Flying Instructor.

4.2.2 The National Cadet Air Operations Officer should include in the contracts between DND and the various schools a clause requiring them to abide by the articles of the A-GA-135-001/AA-001 in case of an accident. More specifically, the need to warn DFS through the Supervising Officer.

4.2.3 All Regional Cadet Air Operations Officers should ensure that the Supervising Officers of Flying Scholarship Cadets are aware of the requirement to follow the articles of the A-GA-135-001/AA001 in case of an accident. These officers should be made familiar with the publication and should more closely liaise with the school Chief Flying Instructor on matters of Flight Safety.

5. DFS Comments

It appears that this accident was caused primarily by the inexperience of a solo student. Since all pilots must work through a period of inexperience, our obligation is to ensure that the environment in which these students learn is healthy and to provide them every opportunity to gain experience safely. Supervising Officers should also keep an eye open for character traits and attitudes that may be detrimental to flight safety. That is a challenging task for cadet flying supervisors who are often quite inexperienced themselves, but our cadet instructors and supervisors have often proved they are up to the task. Frequent reminders of the criticality of their role are, however, warranted.

Ron Harder
Colonel
Director of Flight Safety

Annex A: Photographs

Photo 1: Final Resting Place (Aircraft in second ditch, tail on ground)

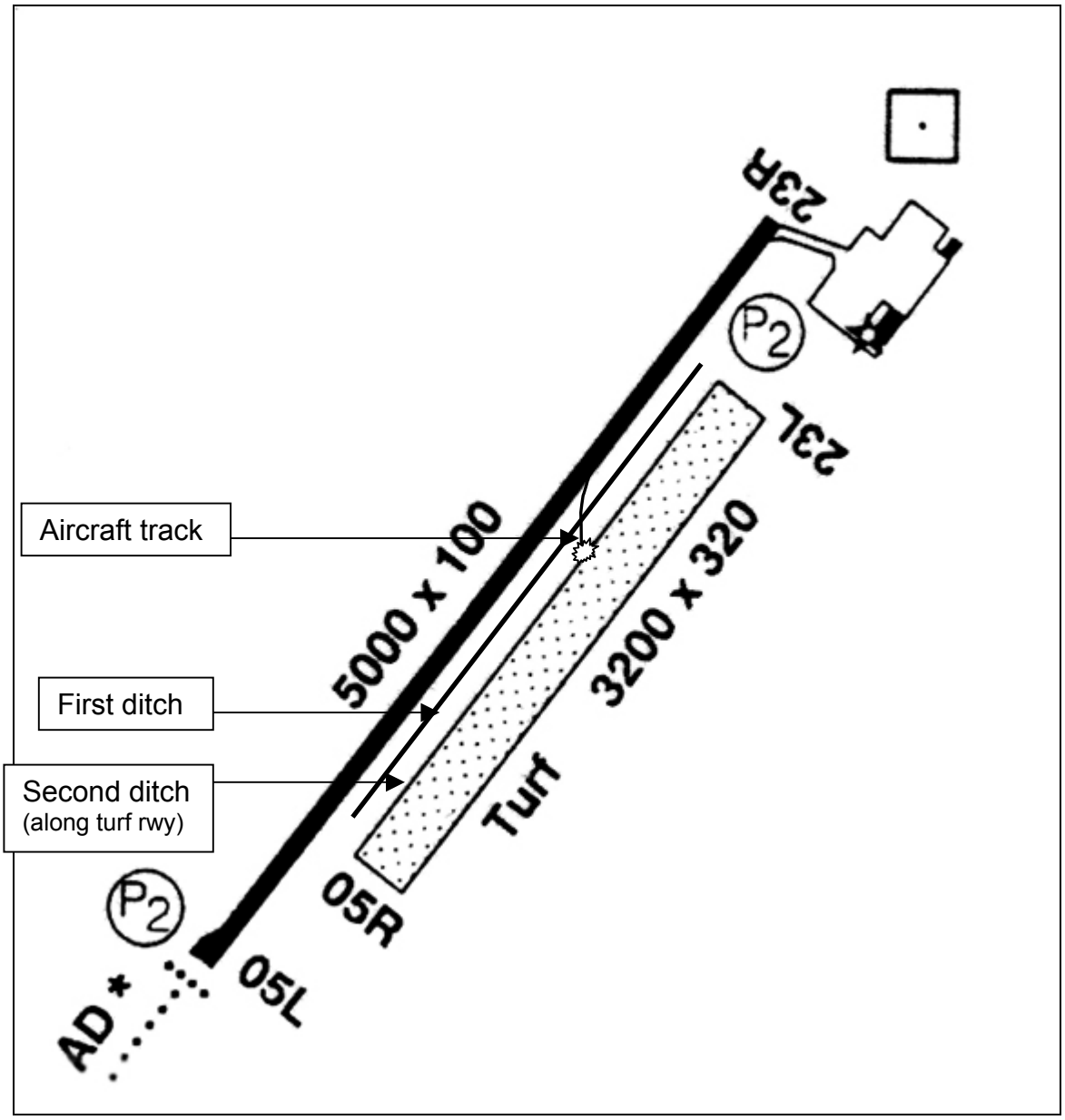
Photo 2: Aircraft tracks in grass (aircraft removed, personnel at first ditch)

Photo 3: Tire marks on runway

Photo 4: First ditch

Photo 5: Damaged propeller

Annex B: Maps and Charts



Bromont Site map