CANADIAN FORCES
FLIGHT SAFETY INVESTIGATION REPORT (FSIR)
FINAL REPORT

FILE NUMBER: 1010-C-GFME (DFS 2-3-3)
DATE OF REPORT: 25 July 2006

AIRCRAFT TYPE: Schweizer 2-33A Glider
DATE/TIME: 31 2132Z July 2003
LOCATION: Central Region Air Cadet Gliding School, Picton, ON
CATEGORY: "A" Category Accident

SYNOPSIS

The standards instructor pilot (IP) and a student were conducting a pre-solo check flight in the Central Region Air Cadet Gliding School (CRGS) program. During the very early stages of the air-tow, the student encountered difficulties maintaining the normal tow position behind the tow-plane. The instructor noted a large amount of slack developing in the tow-rope and, at very low level over the runway departure-end trees, took control and released the glider from the tow-plane. The standards IP then attempted to land in a field within a heavily wooded area; however, the glider's left wing contacted a tree in the process. Upon impact, the glider rotated approximately 150^0 to the left and sank to the ground with the left wing still firmly wrapped around the tree. The impact location was approximately 250 meters from the departure end of runway 17. The glider came to rest in a stand of trees facing the direction of the approach path. Both occupants egressed uninjured and on their own before contacting an overhead tow-plane via radio.

The glider sustained "A" category damage.

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1. FACTUAL INFORMATION

GENERAL

The Schweizer 2-33A is a tandem seat glider used by the Air Cadet organization for training. The high wing construction allows excellent visibility from either the front or rear seat. The 2-33A's rugged construction withstands the rigors and demands of ab-initio flying, making it well suited to the Air Cadet training environment. Additionally, the glider's exceptional occupant protection has been well documented during its years of Air Cadet service.

The cockpit avionics consist of an Air Speed Indicator, Vertical Speed Indicator, altimeter, and a panel-mounted radio with hand-held microphone that is secured within the cockpit. Flight controls additional to the rudder pedals and control column are a control column trim and over/under wing spoilers. Braking action for the single fuselage-mounted wheel is controlled by movement of the spoiler control handle past the fully extended position. Both wingtips have an outrigger wheel that prevents ground-wingtip contact.

1.1. History of the Flight

The standards instructor pilot (IP) and student pilot were conducting the pre-solo check flight at the Central Region Gliding School (CRGS) at Picton, Ontario. The accident flight was the student's first flight of the day and the IP's third. The glider had been previously flown that day on seven flights without any noted problems. The occurrence flight was scheduled for an early afternoon launch.

The objective of the flight was to complete lesson plan (LP) D24 of the syllabus; a check to ensure that the student could safely and effectively perform all previously learned manoeuvres prior to the first solo flight.

The IP assisted in readying the gliders and equipment for afternoon flying and conducted the daily flying operations briefing. The operations brief covered the weather, the small number of useable off-field landing sites off of runway 17, and the possible impact of turbulent airflow during take off due to the surrounding trees.

Just prior to the pre-flight briefing, the student verbally reviewed the LP profile with the regular instructor. The student pilot then briefed with the standards IP on all the manoeuvres that the student was to perform in addition to numerous aspects of technique, airmanship, and the expected left crosswind on take-off.

During the accident flight, the student was in the front seat and the IP was in the rear seat. Due to the warm temperature, the IP elected to leave the rear-seat window open.

During the early stages of the climb out at 65 mph, the glider encountered a left crosswind which resulted in the student having difficulties maintaining the normal tow position behind the tow-plane. As the glider quickly moved high and to the right of the normal tow position, the IP verbally directed the student to keep the wings level before attempting to correct back to position. As the tow-plane and glider continued to climb, both the IP and ground witnesses noted that clearance over the runway departure-end trees was between 25'- 40'.

The student corrected for the high position by pushing forward on the control column causing slack in the tow-rope. The IP noticed the slack as it drifted to the right of the glider's nose and aft underneath the glider's right wing strut. The IP perceived the slack tow-rope's clearance over the trees to be 5'.

The IP believed that the slack in the tow-cable posed an immediate hazard to the glider and tow-plane and consequently released the tow-rope at approximately 40'- 50' AGL. The glider then climbed to approximately 100' AGL and decellerated to an airspeed of 50 MPH at which point the IP proceeded to glide towards one of only two suitable landing fields within 350 metres of the departure end of runway 17.

Despite the glider's forward slip with spoilers fully open, the IP realized that his intended landing field was too close. The IP then turned to the left in an attempt to land in the only remaining area suitable for landing. The IP then recognized that the glider would probably land short of the newly selected field and the IP adapted the flight path to pass between a large tree on the left and a large group of bushes on the right that bordered on the edge of the intended field. Just prior to landing, and at approximately 40-45 MPH with the spoilers fully open, the left wing of the glider struck a tree 10' up from the ground. Upon impact, the glider rotated approximately 150° to the left and sank to the ground with the left wing still firmly wrapped around the tree. Impact location was approximately 250 meters from the departure end of runway 17. Both pilots egressed uninjured but due to the jamming of the student's canopy, the student climbed over the front seat and exited via the IP's door. Once safely out of the glider, the IP contacted an overhead tow-plane via the glider's radio.

1.2. Injuries to Personnel

There were no injuries in this accident.

1.3. Damage to Aircraft

The glider sustained "A" category damage (Photo 1).

The left wing suffered extensive damage (Photo 2): the midpoint of the leading edge struck the tree first and, as the glider then pivoted around the tree, the leading edge was peeled away from the wing radially outwards from the initial impact point and the outboard section of the wing was folded forward in the

horizontal. The right wing exhibited severe skin deformation. Flight control surfaces on both wings were seized as a result of impact forces. The cockpit remained intact and undamaged. Minor cracking of the overhead cockpit canopy was noted. The forward canopy could not be opened during the egress. Numerous punctures of the glider's skin were noted. Deformation of the skin and longerons was also evident in the tail section.

1.4. Collateral Damage

The crash site was located in a farmer's cow pasture that was surrounded by a fence. To facilitate the glider's removal from the crash site, it was necessary to destroy a portion of this fence. Access through the fence was made after receiving permission from the land owner. Satisfactory repairs were completed after glider recovery. No cattle were injured as a result of the crash. There are no anticipated claims against the crown.

1.5. Personnel Information

Table 1: Personnel Information

	Instructor	Student
Rank	LT	Cadet
Currency/Category valid	Yes	U/T
Medical Category valid	Yes	Yes
Total Flying Time (Hrs)	275	5
Instructional (Hrs)	95	0
Flying hours on type	225	5
Flying hours last 30 days	8	5
Duty time last 24 hrs	4	6

1.6. Aircraft Information

The aircraft was serviceable prior to the accident. All maintenance and inspections were up to date. The weight and balance was within limits.

1.7. Meteorological Information

The meteorological reports from 8 Wing Trenton at the time of accident were:

METAR: 312100Z 130/06KT 15SM BKN100 OVC250 25.4/15.1 A3010 RMK AC6CI2 SLP194 56009 SKY9X=

312200Z 11003KT 15SM BKN100 OVC250 25.4/15.1 A3008 RMK AC6CI2 ACC EMBD SLP188 SKY99=

TAF: CYTR 311730Z 311818 13010KT P6SM SCT050 OVC250

Density Altitude: 1588 feet

Pressure Altitude: 102 feet

The meteorological observations from the nearby Point Petre Automatic Weather Observation Site (AWOS) were:

METAR: CWQP 312000Z AUTO 08009KT 23.5/18.8 RMK ALTM MISG SLP193 58015=

CWQP 312200Z AUTO 08008KT 23.0/19.2 RMK ALTM MISG SLP192 56013=

The weather at the time of launch was within limits for glider operations.

The Picton gliding site relies on weather information from both Trenton and Point Petre. Interpolation of data from both sites is required to provide an accurate weather picture for local gliding operations. At the time of accident, the LCO reported winds on the field at Picton to be 160 degrees from 6 to 8 knots.

1.8. Aid to Navigation

Nil.

1.9. Communications

The glider operation at Picton utilizes the mandatory frequency (MF) for all operations. The LCO, tow-planes, and gliders all monitor the MF while in the local areas and circuit. There were no ground-glider communications made during the accident flight.

1.10. Aerodrome Information

The Picton glider site is located 40 km southeast of 8 Wing Trenton. It has a triangular runway layout with grass strips suitable for aircraft operations abeam each runway. Glider and tow-plane launches are conducted on the runways and grass strips while recoveries are made, simultaneously from left and right circuits, to the grass strips.

The LCO monitors and controls all Air Cadet flying operations, giving launch clearances. A site supervisor oversees the entire operation while an Emergency Response Officer (ERO) is also on site to manage and coordinate actions required during any emergency situation.

The cadets, instructors, and staff, including LCO and ERO, maintain a position in the centre of the runway, abeam the touchdown points on the grass landing areas. After a glider has landed, cadets retrieve and align the glider for re-launch.

The gliding operation at Picton utilizes Bellanca Scout tow-planes to conduct aero-tow launches with 250' tow-ropes attached to the glider. Runway 17/35 at Picton is 2520' long.

1.11. Flight Recorders

Air Cadet gliders are not equipped with any onboard voice or flight data recording devices.

1.12. Wreckage and Impact Information

The wreckage was located on the edge of a small field outside of the Picton airfield boundary and approximately 250 meters from the departure end of runway 17. Due to the slow airspeed at the time of impact, the wreckage was contained in and around the base of the tree that the left wing initially struck; there were no indications of other impact sites or ground scarring. The field was bordered by a wooden fence and contained a herd of cattle. A portion of this fence was removed in order to gain site access and to facilitate glider removal.

1.13. Medical

Both aircrew were attended to by the 8 Wing Trenton Flight Surgeon. Basic toxicology samples from both aircrew were drawn and all results were negative.

The IP was required to fly wearing corrective vision glasses in accordance with a Transport Canada Medical Certificate. During the accident flight, the IP was wearing neither glasses nor contact lenses

1.14. Fire, Explosives Devices, and Munitions

Nil.

1.15. Survival Aspects

Both crewmembers successfully egressed the glider on their own. The student's egress was slowed somewhat by the requirement to exit via the IP's door because the students door had jammed due to airframe warping as a result of impact forces.

1.15.1. Crash Survivability

The crash was survivable. The cockpit maintained its survivable volume and was undamaged. The deceleration forces were within the tolerance level of the human body.

1.15.2. Life Support Equipment

The glider's ruggedness and four-point harness systems likely prevented injury from occurring.

1.15.3 Emergency Transmitters

The glider was not equipped nor was it required to be equipped with any type of aviation Emergency Locator Transmitter (ELT).

1.16. Test and Research Activities

Nil.

1.17. Organisational and Management Information

The CRGS is a summer gliding scholarship program for eligible Central Region Air Cadets. The school is six weeks long and qualifies the students to Ministry of Transport licensing standards. Approximately 98 students were participating in the 2003 CRGS at the Picton and nearby Mountainview gliding sites.

1.18. Additional Information

This was the second accident at the gliding site. The first accident was a hard landing that had occurred three days prior to this accident.

1.19. Useful or Effective Investigation Techniques

Nil.

2. ANALYSIS

2.1. The Aircraft

The glider was serviceable prior to the accident. All inspections were up to date and all maintenance records were in order.

2.2. The Briefing

The briefings were adequate given the purpose of the instructional flight. For this trip, instructors are to question students on selected emergencies. Slack rope procedures are specifically covered in lesson plan D4, and are reviewed periodically throughout the students training.

2.3. The Launch

The launch was conducted within specified limits with respect to launch parameters, including density altitude, weather and aircraft weight and balance.

2.4. The Flight

The take-off roll proceeded as expected. The IP had the rear-seat window open. Although the Schweizer 2-33A aircraft operating instructions allow the aircraft to fly with the rear window open, the A-CR-CCP-242/PT-005 (Air Cadet Gliding Program Manual), the glider checklist, as well as flying orders at CRGS do not. It is felt, especially on pre-solo check flights, that the cockpit environment should be maximized for communication. The open rear window may have caused the student pilot to become distracted during the early take-off phase.

On warm, humid, high-density altitude days, such as the accident day, tow-planes often require a longer than normal take-off roll. In these conditions, the tow-plane will clear the departure-end trees with as little separation as 25' and the pilot can anticipte mechanical turbulence caused by the surrounding trees. It was estimated that the glider cleared the departure end trees by between 25' and 40'.

It is common practice to allow the students as much latitude as is safely possible given the comfort and experience level of the IP. As this was the student's pre-solo check flight, the IP was assessing how a student would handle all likely scenarios that they could encounter on their first solo. IPs are given guidance on safety limits. The dilemma is to determine how far to let a student go to allow the student time to analyze and correct errors without exceeding the capabilities of the student, instructor, glider, or manoeuvre.

The IP felt that the student remained within the box boundaries; however, the glider maintained a position which was high and to the right of the normal tow position despite the student's efforts to correct. Although the IP felt that the

student's response was gentle and normal, ground witnesses reported seeing the glider diving back down behind the tow-plane. This diving motion immediately caused a significant amount of slack to develop in the tow-rope. The IP did not take control at the initial point of the student's corrective manoeuver however he did take control shortly thereafter. It is felt, considering the small margin for error at this critical point of the flight, that the IP should have taken control from the student as soon as the student was significantly outside of the normal tow position.

The IP did yaw away from the slack tow rope but did not open the spoilers to reduce the airspeed and consequently reduce the slack condition of the tow rope. The IP was not aware of this technique as indicated in the the Air Cadet training manual.

The IP was concerned with the close proximity of the rope to the trees at the departure end of the runway and elected to release from the tow. The IP believed that either the cable would snap once the slack was taken up, or a tow-plane upset would occur if the cable caught the tree tops, or that the tow-rope would back-release from the glider's attachment point.

Due to the low altitude of release, not many options were available to conduct an off-field landing and the closest reasonable site was chosen. Unfortunately, the initial site was too close which necessitated the selection of an alternate site. While manouvering for the second landing field the pilot of the tow plane observed the glider turn between 90 and 180 degrees to the left. Such a turn would be contrary to the A-CR-CCP-242 emergency procedures which state that, for a premature release below 200 feet, "the glider pilot should attemp to land straight ahead making minor deviations to avoid obstacles" and that "if a straight ahead landing is not possible, turns up to 90 degrees may be executed at altitudes above 100 feet AGL."

It was recognized in 2001 by CRGS that all the runways at Picton are shorter than most other Air Cadet gliding sites. In the past, the surrounding trees have infringed on several departure paths; particularly runways 10 and 17. This became evident when Picton was added to the CRGS in 2001. The amount of departure path clearance has been a concern; particularly by tow-plane pilots who have said that clearances are sometimes as little as 25'. This problem is especially critical on high density altitude days. To address this issue, during the fall 2002, CRGS embarked on a tree-clearing program. All trees within the airfield boundary have been trimmed, and, it is assessed that the hazards posed by the trees have been mitigated.

2.5 Others Issues

The night before the accident, the CRGS staff held a social function. During this function the IP consumed the equivalent of five beers, finishing the last drink by 0100 on the morning of the accident. The IP was asleep by 0400 but was up briefly at 0800 to take some acetominophen (Tylenol) for relief from a headache. This issue of self medication was not revealed in the toxicology test following the accident because basic toxicology tests will not reveal the presence of acetominophen (Tylenol). After waking at 1200, the IP had a normal lunch in preparation for flying duties which commenced at 1300. The IP did not feel any ill effects from the previous evening's activities and felt capable of conducting the flight duties. The interupted sleep may have played a factor in this mishap, but it is difficult to ascertain. The issue of self-medication is in contravention to both the Civlian Aviation Regulations (CARS), and A-CR-CCP-242/PT-005 which states that ACGP personel using any drug shall not engage in flying activities until approval has been granted by a CF Flight Surgeon or a Civil Aviation Medical Examiner. A survey conducted during the fall of 2005 indicated that the guidance for physiological restrictions as per A-CR-CCp-242/PT-005 section 4 is not fully understood in all regions. In addition, the mechanism to 'ground' and 'unground' is not consistent in all gliding sites.

As well, the IP was not wearing any corrective vision devices as required by the Ministry of Transportation (MOT) medical certificate. Visual impairment, by not wearing eyeglasses, may have affected the perception of the amount of slack in the tow rope during the various stages leading up to and including release from the tow plane.

3. CONCLUSIONS

3.1. Findings

3.1.1. The aircraft was serviceable prior to the occurrence. (2.1)

3.1.2. The weather was within limits. (2.3)

3.1.3. The crew was qualified and current for the mission. (1.5)

3.1.4. The student received a proper briefing prior to launch. (2.2)

3.1.5. The IP was not wearing glasses as required by Transport Canada. (2.5)

3.1.6. The IP self-medicated during the morning of the accident day. (2.5)

3.1.7. The IP had the rear-window open during the take-off sequence, contrary to the flying orders at CRGS at that time. This resulted in a less than optimum instructional environment in the cockpit. (2.4)

3.1.8. The student pilot was allowed to place the glider in a position that was significantly outside the normal tow position and from which a safe recovery was very difficult. (2.4)

3.1.9. The IP was not aware of all known tow-rope slack reducing techniques. (2.4)

3.1.10. There were not many clear field-landing options available at the departure end of the accident runway. (2.4)

3.1.11. While attempting to land at a second alternate field, the glider was maneuvered in a manner that contravened A-CR-CCP-242/PT-005, chapter 2, section 7.

3.1.12. The procedure to ‘ground’ and ‘unground’ aircrew is not consistent in all Gliding Regions. (2.5)

3.2. Cause Factors

3.2.1. This accident was the result of a premature tow-rope release due to a significant slack cable situation and subsequent landing in an unprepared alternate field. (2.4)

3.2.2. The slack situation developed because the student pilot was allowed to place the glider in a precarious position. (2.4)

3.2.3. Not all possible slack reduction techniques were utilized prior to releasing from the tow plane. (2.4)

3.3. Contributing Factors

Nil.

4. SAFETY MEASURES

4.1. Safety Measures Taken

4.1.1. CRGS flying operations were ceased for two days following the crash. Prior to the re-commencement of flying, senior CRGS leadership held separate staff and student discussions focused on instructional techniques, decision-making at low levels, towing procedures, slack tow-rope procedures, off-field landings and general airmanship. Ground training lectures were conducted on the handling of slack cable procedures, self-medication, and the requirement to have the glider rear window closed prior to take-off.

4.1.2. Tow plane standard operation procedures at Picton were changed to using half-full fuel tanks instead of the 5/8s full tanks previously used. This reduces tow-plane all-up-weight (AUW) at take off and allows for a greater rate of climb on take off. This resulted in significant improvement in obstacle clearance at the departure end of Runway 17.

4.1.3. Obstacle clearances on the departure ends of runways 10 and 17 were reviewed and tree clearing was performed where required.

4.1.4. A DFS member now attends the Annual Air Cadet Flying Training Conference, with the aim of identifying general deficiencies within the gliding system and determining possible solutions.

4.1.5. A Standards Evaluation Team (SET) has been established.

4.1.6. A Glider Instructor Refresher program is held prior to the start of the Regional Gliding School, usually in the three weeks prior to the arrival of the cadets, while the camp is being set up and new instructors complete their full course. It consists of selected mandatory classes and a set number of instructional flights with a standards pilot, the last trip constituting a check ride.

4.1.7. The cadets now use the same Flight Instructor Course (FIC) Handbook as the regular force pilot training system. The cadet ground school is patterned on the same material and the air lessons follow the same Phase I and II models of the Canadian Forces Flight Instructor School.

4.2. Safety Measures Recommended

4.2.1. Prior to commencing flying at any Regional Gliding School, all flying personnel should be briefed on the physiological restrictions of A-CR-CCP-242/PT-005, section 4. (3.1.6)

4.2.2. The Glider SET has proposed changes to the A-CR-CCP-242/PT-005 chapter one, section four, to ensure that the physiological restrictions of the Air Cadet Gliding Manual can be met. Coordination between OAA and AMA is

required to validate the medical aspect of the proposed changes, so they can be adopted as soon as possible. (3.1.11)

4.2.3. All CRGS staff and students should be reminded that it is imperative that they follow all mandatory decisions as indicated on their MOT medical certificate including the required wearing of prescription glasses/sunglasses. (3.1.5)

4.3. Other Safety Concerns

Nil.

4.4. DFS Remarks

This accident was one of seven gliding accidents that occurred during the summer of 2003. This was an unusually high number of accidents for the Air Cadet Gliding Program. While it was recognized that the safety record of this organization was still excellent, this rash of accidents was still cause for significant concern.

An analysis of the accidents revealed that the standards established for the Air Cadet Gliding Program did not appear to be universally applied across the five gliding regions. In addition, it appeared that there were some differences in instructional processes amongst the regions. Accordingly, a Glider Program Standards and Evaluation Team (SET) was established in 2004 by Comd 1 Cdn Air Div. This SET has rectified a number of the problems identified in the accident investigations and has helped to improve the already impressive record of the Air Cadet Gliding Program.

A.D. Hunter
Colonel
DFS

ANNEX A: PHOTOGRAPHS

Photo 1: Final Resting Place

Photo 2: Left Wing Damage

Annex B: Abbreviations

AGL	Above Ground Level
AIA	Airworthiness Investigative Authority
ASI	Air Speed Indicator
AUW	All Up Weight
CF	Canadian Forces
CRGS	Central Region Gliding School
DFS	Director of Flight Safety
DND	Department of National Defense
ELT	Emergency Locator Transmitter
ERO	Emergency Response Officer
FIC	Flight Instructor Course
FIS	Flight Instructor School
IP	Instructor Pilot
LCO	Launch Control Officer
LP	Lesson Plan
MF	Mandatory Frequency
MND	Minister of National Defense
MOT	Minisrt Of Transportation
MPH	Miles Per Hour
RGS	Regional Gliding School
SET	Standards and Evaluation Team
VCDS	Vice Chief of Defense Staff
VFR	Visual Flight Rules
VSI	Vertical Speed Indicator