CANADIAN FORCES
FLIGHT SAFETY INVESTIGATION REPORT

FINAL REPORT

FILE NUMBER: 1010-C-GCLR (DFS 2-4-2)
DATE OF REPORT: 12 October 2004

AIRCRAFT TYPE: SZ2-33
DATE/TIME: 20 Sep 2003, 1630L
LOCATION: Alexandria, Ontario
CATEGORY: "A" Category Accident

SYNOPSIS

During the final flight of the day, a Cadet Instructor Cadre glider pilot crashed while manoeuvring to land at the Alexandria airfield. The aircraft suffered "A" category damage. The pilot was uninjured in the crash, but his passenger, also a Cadet Instructor Cadre pilot, suffered minor injuries to his lower back. The passenger was removed from the accident site by an ambulance and transported to hospital.

TABLE OF CONTENTS

1. FACTUAL INFORMATION

1.1 History of the Flight

This was the final flight of the day, commonly referred to as the “hangar flight”. The two Cadet Instructor Cadre (CIC) instructors planned to have the Quinte Gliding Centre’s Bellanca Scout tow plane launch from runway 25 and tow their SZ2-33 glider up to 2000’ AGL to the north of the field, where the pilot would then practice steep and medium turns prior to returning to the airfield.

Prior to launch, the pilot and his passenger had a discussion about which runway they would land on. It was decided that the auxiliary field would be used, as landing on it would mean that the glider would not have to be pushed very far to its overnight parking spot. A regular pattern for runway 25 would be flown, with a 90? turn to the left prior to the button of runway 25 in order to align the glider with the auxiliary field which is oriented north/south.

The pilot sat in the rear seat, with his passenger in the front seat. The launch and practice manoeuvres went as planned, after which the pilot returned to the airfield.

The pilot flew a standard profile up until he was established on final for runway 25. At this point, at an altitude of between 500’ AGL and 400’AGL, he fully opened the spoilers and lowered the nose to begin a rapid descent. The aircraft was then levelled at approximately 50’ AGL at an approximate airspeed of 85 MPH. The pilot then executed a 30? angle of climb pull-up until he reached approximately 100’ AGL and 50 MPH. The pilot then executed a 45?-60? angle of bank turn to the left in an attempt to line up on the auxiliary field. The spoilers remained open throughout this manoeuvre.

The left wingtip contacted the ground, while the aircraft was still in the turn, which spun the glider around 180? from its original heading. Then, in rapid succession and with the aircraft travelling backwards, the nose hit the ground and bounced up, the tail dug into the soft earth of the auxiliary field, and the glider’s fuselage was bent, in the longitudinal axis, 80? from true.

1.2 Injuries to Personnel

Other than a small abrasion from the glider’s restraint system, the pilot was uninjured.

The passenger complained of a sore back. He was transported to hospital and kept overnight for observation. He suffered a compression fracture to the L1 vertebrae and was released from hospital the next day.

1.3 Damage to Aircraft

The aircraft was destroyed.

1.4 Collateral Damage

Collateral damage was minimal, consisting only of divots in the grass field.

1.5 Personnel Information

Table 1: Personnel Information

Position	Pilot	Passenger
Rank	2Lt	Lt
Last Check Ride	Sep 2003	Jul 2003
Flying Time (24 hrs – SZ2-33 – Total)	0.4 – 150 - 200	0.5 – 200 - 250
Time on Duty in previous 24 Hrs	8.0 Hrs	8.0 Hrs

1.6 Aircraft Information

The SZ2-33 is a conventional, two-place, tandem, intermediate training glider manufactured by Schweizer Aircraft Corporation. Its construction is all-metal with a fabric cover on the fuselage and tail surfaces. It has a one-piece canopy for increased visibility. The wings are tapered in the outboard section and incorporate spoilers.

The accident glider had accumulated 6191.1 hours total time since new. A 100-hour check was carried out on 10 Sep 2003 at 6174.5 hours. In March of 2002, at 5868.5 hours, the glider was completely dismantled and stripped for the Structural Integrity Repair Program. The weight and balance was last updated in Sept 2002, and a pitot static check was carried out on 09 June 2003. Pilots who had recently flown the accident glider noted that there was no play in any of the flight controls, which made the glider very responsive and accurate.

1.7 Meteorological Information

Meteorological data for the Alexandria airfield is collected on-site:

Winds 260/11 knots G18 knots (12.6 MPH gusting 20.7 MPH)

Visibility 10 Statute Miles

Temperature 22?C, Dewpoint 9?C

Altimeter setting 30.12

Clouds 6000’ Broken

1.8 Aid to Navigation

N/A

1.9 Communications

The entire gliding operation, including the pilots, maintains continuous communications via VHF radio. Cell phones were also used at the gliding site to report the accident to the 911 Operator and to the Directorate of Flight Safety.

1.10 Aerodrome Information

The Alexandria airfield is privately owned and operated. The primary runway is 07/25, which is 2020' by 100' turf, and sits at 260' ASL. There is an auxiliary field, which is not listed in the official airfield documentation, but is used as an emergency landing site for glider operations. It is a north/south grass strip located perpendicular to runway 07/25. It begins adjacent to the button of runway 25 and heads south. It is approximately 1800' long. It was this field that the accident pilot was attempting to land on.

1.11 Flight Recorders

N/A

1.12 Wreckage and Impact Information

The wreckage was contained in a very compact area, approximately 200' by 75'. The fact that the field was composed of turf ensured that ground impact scars were very clear.

The site was initially guarded by the OPP. The officers treated the crash site as a crime scene, preventing unauthorized entry and disturbing of evidence until the DFS Investigator-in-Charge relieved them.

1.13 Medical

A toxicology sample was taken from the pilot by the hospital medical staff; however, the results were not released to the FSI Team. There is no requirement for civilians to submit such samples to military authorities.

1.14 Fire, Explosives Devices, and Munitions

N/A

1.15 Survival Aspects

The Emergency Response Officer initiated the Emergency Response Checklist after the crash. Once the glider came to rest, the pilot released his harness and attempted to egress the glider. The canopy could not be released from inside the glider, so the first responders pulled the external hinge release. The passenger complained of a sore back. He was laid out on his back until the ambulance crew affixed a neck brace and placed him on a backboard for the trip to the hospital.

1.15.1 Accident Survivability

The crash was survivable. Damage to the glider was extensive but the cockpit maintained a survivable volume due to the robust nature of the airframe structure.

1.15.2 Aircrew Life Support Equipment (ALSE)

The glider seats are equipped with a four-point harness system and Temperfoam cushions. No abnormalities were observed with this equipment.

1.15.3 Post Accident Response

Crash response was immediate. The Emergency Response Officer ran to get the crash response van, while the Launch Control Officer called 911. Other members of the ground party extricated the crew from the glider, as the glider's canopy could not be opened from the inside. A local ambulance arrived on scene in less than 10 minutes and transported the passenger to the Glengarry Memorial Hospital.

1.16 Test and Research Activities

N/A

1.17 Organizational and Management Information

In discussions and interviews with the Quinte Gliding Centre staff, it was discovered that the reason for landing on the auxiliary field at the end of the flying day was primarily one of convenience. Landing on the longer runway, as was done the vast majority of the time, would have meant that the glider would have to be pushed a greater distance to its overnight parking area.

1.18 Useful Investigative Techniques

The investigation team requested that the Ontario Provincial Police treat the accident scene as they would a crime scene, in the sense that no one was allowed to disturb the crash site in any way. This ensured that all physical

evidence, such as ground scars and the position of flight controls, remained intact.

1.19 Additional Information

Nil.

2. ANALYSIS

2.1 Air Cadet Gliding Program (ACGP) Prohibited Manoeuvres

The Air Cadet Gliding Program Manual (A-CR-CCP-242/PT-005) outlines which manoeuvres are prohibited. Section 5, paragraph 1 states that:

"Aerobatics are **prohibited** in ACGP aircraft. Aerobatics…encompass manoeuvres intentionally performed by an aircraft involving an abrupt change in altitude, an abnormal attitude, or an abnormal variation in speed or flight path."

Within Quinte Gliding Center, there existed a prohibited low and fast approach manoeuvre named the Very Rapid Pull-Up (VRP). The VRP is entered when the pilot has established the glider on final. The glider is rapidly descended from 400' AGL to approximately 50' AGL. As the glider descends, it accelerates, eventually reaching 85-90 MPH. At the bottom of the dive, the pilot retracts the spoilers and then raises the nose to a 30? angle of climb. After levelling off at approximately 250 AGL and 50 MPH, a normal landing is then conducted using spoilers as required.

2.2 ACGP Circuit and Landing Procedures

The ACGP Manual outlines the proper circuit and landing procedure for the SZ2-33 glider. Specifically, the manual states that the turn to final is to be completed by 300' AGL and that the maximum authorized final approach speed is 65 MPH. Above 65 MPH the pilot must manoeuvre with caution. A pilot can inadvertently exceed the maximum load factor of 4.67 G with abrupt manoeuvres.

The manual also states that "gliding operations may be conducted in surface wind conditions not exceeding ...10 MPH 90? crosswind...the maximum permissible gust differential is…12 MPH."

2.3 Circuit and Landing Pattern Flown by the Pilot

The pilot flew an approach that would have been perfect for runway 25. It was always the pilot's intention, however, to land on the auxiliary field, which is orientated perpendicular to runway 25. This meant that the pilot would have to perform a low-level turn, below 300' AGL, in order to make the required 90? heading change. This is a manoeuvre in direct contravention of the ACGP Manual.

In addition to this low-level turn, the pilot decided to perform a VRP, which is also a manoeuvre that contravenes Air Cadet orders. The VRP was to be combined with the low-level turn to final.

With the spoilers fully extended throughout the pull-up (and subsequent low-level manoeuvring up to the point of impact) the glider climbed to 100' AGL, instead of the anticipated 250' AGL, before attaining the normal approach speed of 50 MPH.

At this point, the aircraft was in a wings level attitude and orientated such that a normal landing could have been made on runway 25; there were no vehicles or other obstacles on the runway preventing its use.

At 100' AGL and 50 MPH with the spoilers fully extended, the pilot used 45?-60? of bank in order to make the 90? heading change to line up on the auxiliary field. Approximately 3/4 of the way through this turn the left wingtip contacted the ground. The glider then cartwheeled through 180?, eventually coming to rest after about 200' of ground travel.

At the time of accident, the 90° crosswind component for the auxiliary field was approximately 12 MPH gusting to 20 MPH. This exceeded the maximum allowable 90° crosswind component by 2 MPH and the gust differential by 8 MPH.

2.4 Decision to Land on the Auxiliary Field

It is well-established that people can fall prey to the strength of an idea. In this case, the pilot had planned from the very beginning of his flight to land on the auxiliary field after completing the VRP. There was never any thought given to landing on runway 25, as that would have entailed extra work for the ground crew. The pilot also never considered carrying out a normal circuit to the auxiliary field, which would have removed any requirement to carry out a low-level turn. However, this approach would have violated crosswind landing limitations outlined in the ACGP regulations.

Even though he was 200' below the minimum final turn altitude and had available a useable runway, the plan was so firmly implanted in his mind that there was no deterring him from his pre-planned course of action.

The pilot believed that he was capable of performing a turn to final at such a low altitude due to his perceived high level of flying skill. Another possible influence in his decision to land was the hazardous attitude known as Macho (others include Anti-Authority, Impulsivity, Invulnerability, and Resignation). Macho is best described by the phrase "I can do it!" People with this hazardous attitude "prove" themselves by taking risks and by trying to impress others.

2.5 Failure to Retract Spoilers Prior to Pull-up

As stated earlier, the VRP is a prohibited manoeuvre, and as such is neither taught nor demonstrated to glider students or instructors. It is a completely self-

taught procedure, with no independent verification of a pilot's ability or competence to carry it out safely.

The pilot believed that he had in fact fully retracted the spoilers. Photographic evidence, both in-flight and post-crash, indicated otherwise. No definitive explanation could be found for this discrepancy. Possibly, due to his fixation with landing on the auxiliary field or his becoming task-saturated with the VRP manoeuvre, the pilot believed he had retracted the spoilers.

2.6 Interaction Between Pilot and Passenger

Both occupants of the glider were Cadet Instructor Cadre pilots. The passenger was fully aware of the pilot's intentions as the flight profile was briefed prior to take-off. At no time was there any discussion between the pilot and the passenger about the safety or legality of carrying out a VRP or of combining a VRP with a low-level turn to the auxiliary field.

2.7 Human Factors

The pilot was well rested, nourished, and hydrated prior to commencing the accident flight. He began his duty day at 0800 when he conducted the daily inspection on C-GCLR. He then completed his 90-day check ride and was graded "above average." There were no abnormal stressors in his life, nor was he ill.

2.8 Flight Safety Culture at the Quinte Gliding Centre

During interviews with various Quinte Gliding Centre staff members, it was determined that no one in a leadership position at the Alexandria flying site would have spoken out against the pilots had they been able to complete the prohibited VRP successfully. In fact, the successful completion of such a manoeuvre was considered a sort of "badge of honour," signifying great flying skills and ability.

When the same staff members were asked what they would have done had they witnessed a student carrying the same manoeuvre, they were very clear that the student would have been spoken to and reprimanded.

Unfortunately, the VRP and low-level turn to final manoeuvres were never carried out in a vacuum. Impressionable young Air Cadets were likely always nearby to witness staff in leadership positions ignoring established rules and regulations. With this attitude present in any organization, it then becomes very difficult to instil in young personnel a sound safety culture.

The next level of supervision at the gliding site rested with the Site Commander. This individual made no attempt to end the practice of the VRP at the Quinte Gliding Centre, nor did he ever speak to or report the individuals involved. It should be noted that that the VRP was only performed away from the Central

Region Gliding School (CRGS), Mountainview, ON, and always when no senior Air Cadet CRGS staff were present. It was in this manner that the practice of the VRP remained hidden from the view of senior Air Cadet leadership.

The Site Commander did not have any flying supervisory training. Furthermore, Flight Safety Surveys had always been scheduled events, giving ample opportunity for the Quinte Gliding Centre staff to create the appearance that sound practices and attitudes were in place.

Possible methods of preventing unsafe practices during deployed operations are constant reinforcement by senior leadership to junior staff members of the requirement to follow the ACGP Manual, attendance on the 1 CAD Flying Supervisors Course, and no-notice inspections similar to those conducted by TRSET on CC130 aircrew.

3. CONCLUSIONS

3.1 Findings

3.1.1 The SZ2-33 glider was serviceable at the time of the accident.

3.1.2 The pilot was a fully qualified SZ2-33 CIC glider instructor, with an up-to-date medical and a just-completed 90-day check ride.

3.1.3 The pilot was not under the influence of any life or physiological stressors.

3.1.4 The winds at the time of the accident were within established parameters for landing on runway 25; they were not, however, within established parameters for landing on the auxiliary runway.

3.1.5 Runway 25 was unobstructed and available for use.

3.1.6 In order to avoid the extra time it would take to push the glider from the end of runway 25 to the overnight parking area located at the end of the auxiliary field, the pilot chose to land on the auxiliary field without due consideration for crosswind limits or safety.

3.1.7 The pilot conducted a prohibited manoeuvre, known as the Very Rapid Pull-up, prior to landing on the auxiliary field.

3.1.8 During the VRP, the pilot exceeded the maximum authorized approach airspeed of 65 MPH.

3.1.9 During the VRP the pilot failed to retract the spoilers and subsequently caused the glider to attain only 100' AGL during the climb instead of the anticipated 250'.

3.1.10 The pilot conducted a final turn to the auxiliary field below the 300' AGL minimum authorized altitude.

3.1.11 The pilot used 45?-60? of bank during the final turn to the auxiliary field.

3.1.12 Despite the glider's close proximity to the ground, the pilot believed that he was capable of completing the turn.

3.1.13 The left wingtip contacted the ground approximately ¾ of the way through the turn to final, causing the glider to cartwheel and crash.

3.1.14 Emergency response was rapid and well co-ordinated.

3.1.15 A culture of non-compliance was present among the staff of the Quinte Gliding Centre. This led to instructors carrying out prohibited manoeuvres, specifically the VRP, and receiving accolades from their peers for their perceived flying ability.

3.1.16 Supervisors at the Quinte Gliding Centre did not stop the practice of instructors performing the VRP during deployments to auxiliary fields.

3.1.17 Supervisors at the Quinte Gliding Centre allowed senior instructors to ignore the rules and regulations of the Air Cadet Gliding Program.

3.1.18 The Site Commander did not have the appropriate training to carry out his duties.

3.2 Causes and Contributing Factors

3.2.1 Causes

3.2.1.1 The pilot attempted to perform a prohibited manoeuvre, the Very Rapid Pull-up. During the manoeuvre, the pilot neglected to retract the spoilers at the bottom of the VRP and, as a result, the glider attained a height of 100' AGL instead of the anticipated 250' AGL.

3.2.1.2 The pilot attempted to complete a turn to final at 100'AGL when he was required to have been established on final by 300'AGL.

3.2.2 Contributing Factors

3.2.2.1 The pilot was fixated with landing on the auxiliary field in order to minimize the amount of ground crew work required post flight

3.2.2.2 The pilot was overconfident in his ability to successfully carry out a landing by commencing a turn to final below the minimum authorized height.

3.2.2.3 A culture of non-compliance was present among the staff of the Quinte Gliding Centre. This led to instructors carrying out prohibited manoeuvres, specifically the VRP, and receiving accolades from their peers for their perceived flying ability.

3.2.2.4 Supervisors at the Quinte Gliding Centre did not stop the practice of instructors performing the VRP during deployments to auxiliary fields.

3.2.2.5 Supervisors at the Quinte Gliding Centre allowed senior instructors to ignore the rules and regulations of the Air Cadet Gliding Program.

3.2.2.6 The Site Commander did not have the appropriate training to carry out his duties.

4. SAFETY MEASURES

4.1 Safety Measures Taken

4.1.1 At the time of accident, it was recommended that the Regional Cadet Air Operations Officer conduct a review of the safety culture of the Alexandria Gliding Site.

4.1.2 A National Air Cadet Glider Standards Evaluation Team (SET) was established in the summer of 2004.

4.2 Further Safety Measures Recommended

4.2.1 It is recommended that the senior leadership of the Air Cadet program determine the extent of non-compliance with orders.

4.2.2 It is recommended that a defined qualification process be introduced for all Site Commanders.

4.2.3 It is recommended that key supervisory personnel within the Air Cadet Gliding Program be required to attend the 1 CAD Flying Supervisors Course in order to ensure that they develop the tools to effectively and safely supervise gliding operations.

4.3 Other Flight Safety Concerns

Nil.

4.4 DFS Comments

For the past few years, the flight safety organization has emphasized the requirement for a strong safety culture. It is our firm belief that encompassing a just culture, a reporting culture, a flexible culture and a learning culture is a fundamental requirement for an effective safety program. Accordingly, the safety culture concept has been taught on our Basic and Advanced Flight Safety Courses and has been highlighted in a variety of our flight safety promotion mechanisms.

In reviewing this report, it is clear that the safety culture at the Alexandria Gliding Site was very poor. In particular, evidence of a just culture was lacking. The pilots at this site apparently understood the difference between what constituted acceptable behaviour and unacceptable behaviour in that they knew the rules and regulations as well as the aircraft operating limitations. However, by routinely allowing some personnel to operate outside of the acceptable limits, supervisors and CIC glider pilots effectively undermined the safety culture of this site. In addition, a number of impressionable young Air Cadets observed this

behaviour. The conclusions that this latter group drew can only be postulated; but I suspect that they do not bode well for a strong safety culture.

So what can be learned from this accident? To me, this accident reinforces my belief that a good safety culture is critical to a safe flying operation. While a good safety culture will not prevent all accidents, it is highly likely that it would have prevented this one. Another point that needs to be emphasized is that a safety culture is not something that is practiced only by some members of the organization or only within sight of senior supervisors. By definition, a safety culture is a full time commitment by everyone.

AD Hunter

Colonel

Director of Flight Safety

Annex A: Photographs, Maps, and Diagrams

Photo 1: Pilot begins the VRP with spoilers set to 100%.

Photo 2: Glider is level at 100' AGL and starting to turn towards the Auxiliary field.

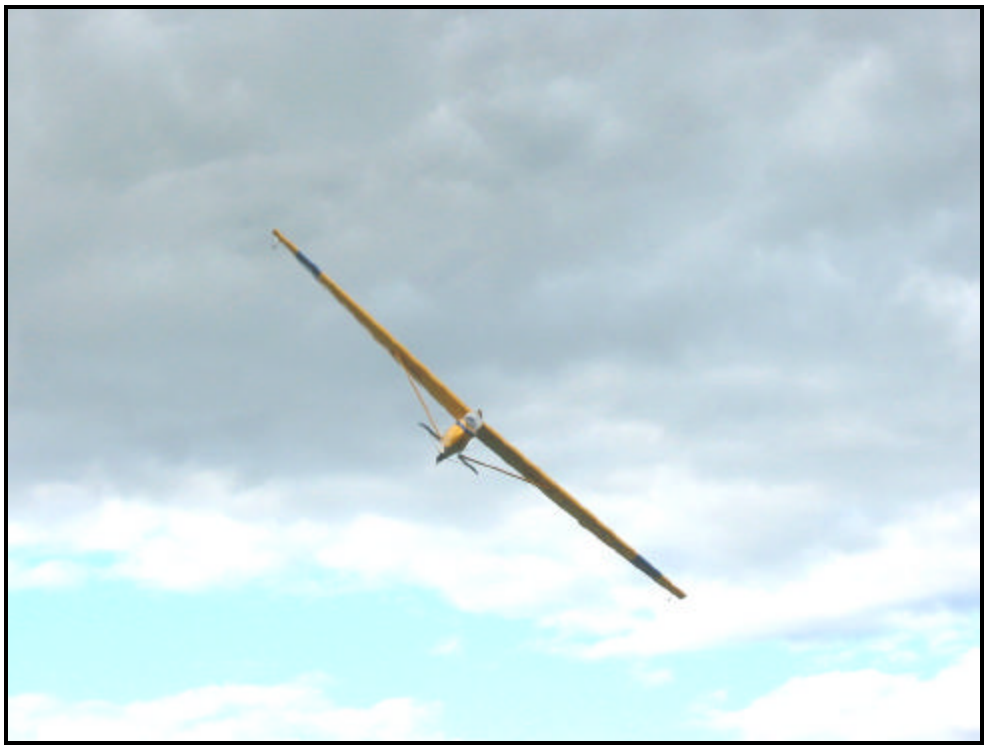

Photo 3: Glider is through approximately ½ of the turn towards the Auxiliary field.

Photo 4: Left wingtip is approximately 5’ AGL.

Photo 5: Gliding Centre members released the canopy from the outside.

Photo 6: Note that the spoilers are fully extended.

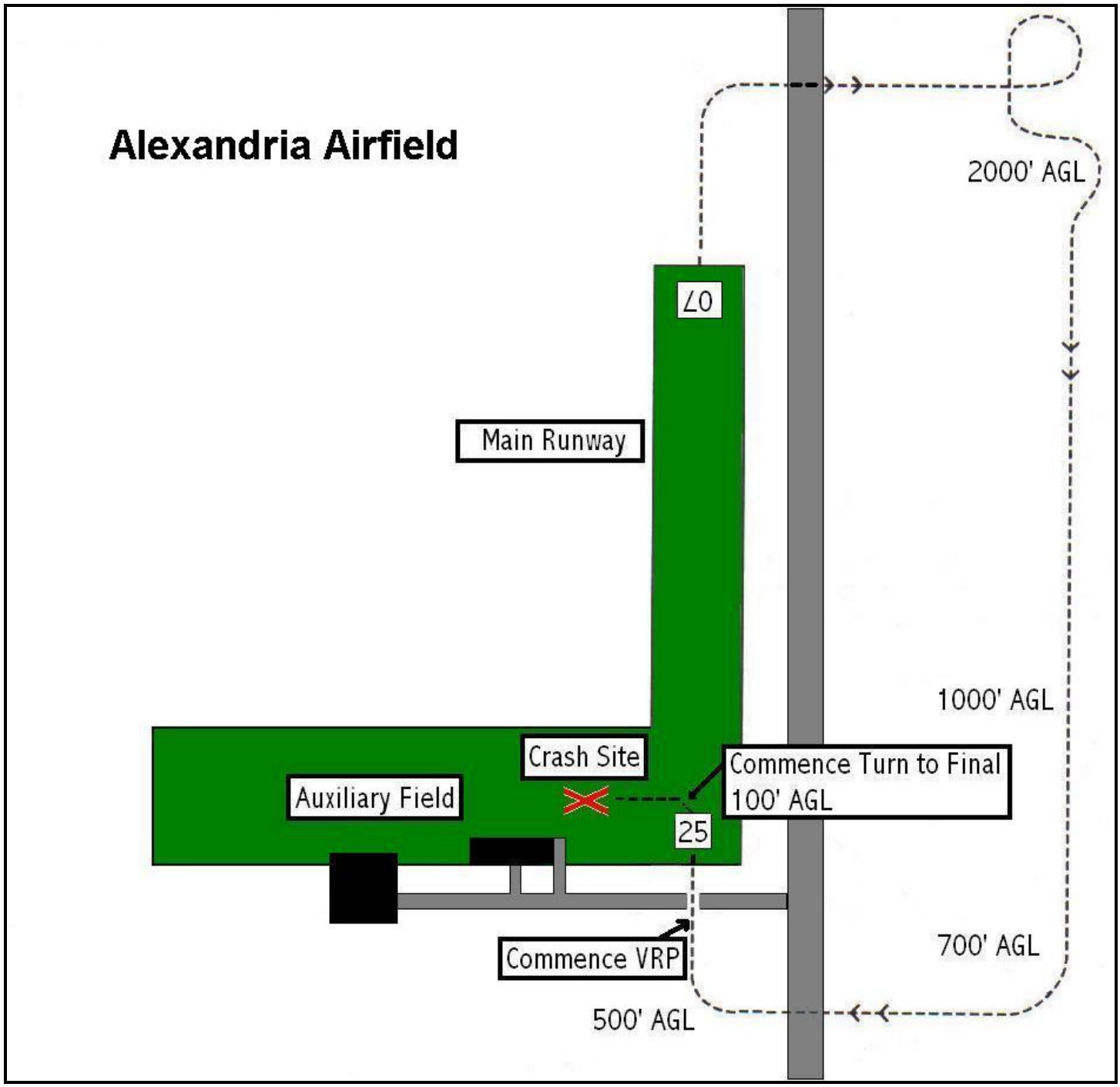

Diagram 1: **Site Diagram of Alexandria Gliding Site.**