Hang Gliding and Paragliding Association of Canada

Association Canadienne de Vol Libre

FLIGHT SAFETY INVESTIGATION REPORT

PARAGLIDING ACCIDENT

JUNE 10, 2021

MONT YAMASKA, QC

HPAC/ACVL performed an investigation of this event solely to promote flight safety

Issued 2021-09-18

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INTRODUCTION

This document is the final report concluding an investigation undertaken at the request of the HPAC/ACVL Board of Directors. The investigation and analysis were performed by volunteers who were selected for their expertise in their respective task. The investigation was undertaken in the interest of determining the cause(s) and contributing factor(s) that led to the Accident with the ultimate objective of identifying actions that may be taken to reduce the future possibility of a similar occurrence.

The lead investigator was selected for proximity to the accident location, French language, and familiarity with accident investigation protocols. The lead investigator activities were limited to collection of data, interviewing witnesses, coordinating the expert committees, and preparing a draft report. The HPAC/ACVL Board of Directors reviewed the data gathered by the investigation and found it to be objective and consistent with the evidence. The HPAC/ACVL Board of Directors then discussed and produced this final report and authorized its publication.

This report contains certain terms that are either unique to the sport of paragliding or have specific meaning in the context of paragliding. Please refer to the glossary in appendix 11.

While the investigative work was carried out in a French language environment, the work and production of this final report by the HPAC/ACVL Board of Directors took place in the English language. The final report in French was produced by professional translators. In cases of discrepancies between the English and the French versions of this document, the English version shall prevail.

SUMMARY

On Thursday, June 10, 2021, a paragliding student (“Student”) took off from Mont Yamaska at around 12:18 p.m. During the following thirty-four (34) seconds, the Student moved forward and backward on a North-East axis. The student’s aircraft (the “Paraglider”, “Wing” or “Glider”) ultimately suffered a 40% to 50% collapse on the left side, which led to the Glider falling into a rapid autorotation to the left ending with an impact with the ground, approximately thirty (30) meters in front of, and below, the takeoff site. The Student suffered significant injuries and died in hospital the next day." (the “Accident”).

BACKGROUND INFORMATION

- Aircraft type: Ozone Mojo 1, Size Small paraglider, serial # MJS-H-42A-036 (see appendix 2), DHV-1 certified, all-up-weight 65-85 kgs, manufactured in 2003-2006 (first version); harness SupAir; helmet Charlie Insider 2020; radio Kenwood; GPS variometer Syride SYS'Nav V3.
- Location: North take off site, Parc de vol libre du Mont Yamaska (PVLMY).
- Date and time: June 10, 2021, approximately 12:18 p.m. local time.
- Flight type: training
- Injuries: (unofficial) cranial and upper body trauma
- Material damage: paraglider and harness damaged by rescue services, no known damage before or resultant from the Accident.
- Student age: 26 years old
- Student weight: 63 kgs, source: Student's school (the "School")
- Student qualifications: Hang Gliding and Paragliding Association of Canada HPAC/ACVL P1 Rating (awarded by Instructor/School, not submitted to HPAC/ACVL)
- Student experience: Nineteen (19) flights completed, with a total of 2.25 hours airtime; the accident flight was the Student's 20th flight.

INFORMATION SOURCES

Aviation weather: (see appendix 8)

- Club de vol libre Yamaska (CVLY)'s weather station, St-Paul d'Abbotsford, Québec
- Association de Vol à Voiles Champlain's weather station (glider club), St-Dominique, Québec
- Nav Canada's weather station at St-Hubert airport, Québec
- Canada Regional Atmospheric Soaring Predictor (RASP) based on Environment and Climate Change Canada's data.

Eyewitnesses, location at the time of accident:

- Instructor: Student's School instructor ("the Instructor"), HPAC/ACVL P4 rated pilot and paragliding instructor, on PVLMY's North takeoff site
- Witness #1: shuttle driver, had started his paragliding training, on PVLMY's North takeoff site
- Witness #2: tandem passenger, no paragliding experience, on PVLMY's North takeoff site
- Witness #3: HPAC/ACVL P2 rated pilot on CVLY's base site, where the North landing site is located (1200m from PVLMY's North takeoff site)
- Witness #4: HPAC/ACVL P4 rated pilot on CVLY's base site, where the North landing site is located (1200m from PVLMY's North takeoff site)
- Witness #5: HPAC/ACVL H4 rated hang glider pilot and P2 rated paraglider pilot, former HPAC/ACVL hang gliding instructor, on CVLY's base site, where the North landing site is located (1200m from PVLMY's North takeoff site)
- Witness #6: HPAC/ACVL P4 rated pilot and paragliding instructor, on CVLY's base site, where the North landing site is located (1200m from PVLMY's North takeoff site)

Photographs:

- Wing Identification Placard, taken at the School (see appendix 2)
- Google Maps satellite images (see appendix 3)
- Taken at PVLMY's North takeoff site (see appendix 4)
- Taken at CVLY's North landing site (see appendix 5)

Flight data

- Variometer/GPS Syride SYS'Nav V3 attached to Student's right riser (see appendix 6)

Reference Documents

- HPAC/ACVL SOP-410-8: Pilot Rating System (https://hpac.ca/files/sop/410-8_en.pdf)
- HPAC/ACVL P1/P2 Training Logbook (https://www.hpac.ca/files/training_logbook_en.pdf)

FLIGHT SEQUENCE

On Thursday, June 10, 2021, at approximately 11:40 a.m. the Student and his girlfriend (the “Girlfriend”) arrived at the School for a paragliding flight training day. The Student and the Girlfriend were both training with the same Instructor. According to the Girlfriend the Student got ready quickly as the shuttle was about to leave for the summit; there was also a tandem flight planned for Witness #2, with the Instructor as the tandem pilot. The Girlfriend, who only had accumulated a few flights, remained down at the base, because it had been assessed that the flight conditions, in particular the wind conditions, were beyond her abilities.

During the ride to launch the Student, the Instructor and Witness #2 chatted about various things, including weather conditions; they were seated in the open area of the shuttle, with Witness #1 (the driver) being inside the shuttle. The Instructor advised that he had told the Student and Witness #2 that whether the flights would take place was to be decided once they were on PVLMY’s North takeoff site. The Instructor advised that the plan was for the Student to take off before the tandem flight.

Once on PVLMY’s North takeoff site, the Instructor reported that the winds were from the North-East, but with nice lulls from the North. The Instructor recalled that he told the Student that he thought that the conditions were favourable but that, if the Student wasn’t feeling comfortable, the Instructor and his passenger (Witness #2) would do their tandem flight, and that the Instructor would then come back to the takeoff site to help the Student with his takeoff. To that, the Instructor reports that the Student told him that he would take off before the tandem flight, as planned.

The Student prepared his equipment and discussed the flight plan with the Instructor. Among other things, the plan called for taking off, clearing the mountain before making a right turn, and using the speedbar if required (the Instructor reported that the Student had already practised with the speedbar and was therefore familiar, however the training record (see appendix 1) does not reflect the extent and recency of this practice). Witness #1 and the Instructor state that a radio check between the Student and the Instructor was done successfully. The Student got into position for takeoff, facing the wing on the ground pointing North, at the centre of the takeoff site. The Instructor was observing him.

No eyewitness was able to describe how the Student evaluated the winds. The takeoff site is equipped with a windsock in very good condition at the left (Western) end, on a slight decline. There are no streamers elsewhere on the site but many leafy trees and bushes on either side and on the slope to the bottom of the mountain, including in the clear area immediately below the takeoff site, that can sometimes be used by experienced pilots to assess approximate wind characteristics. When the Student deemed the winds to be favourable, he inflated his Wing and performed a clean takeoff. The decision appears to have been autonomous, without any direct instructions from the Instructor.

The Student's flight path is known because flight data from his variometer/GPS was retrieved. The data (frequency: 1 sample per second) includes timestamp, latitude and longitude, and altitude (which allows applications to roughly calculate ground speed and vertical speed). The trajectory given by the flight data corresponds closely with the eyewitness testimonies which, moreover, differ little from each other. Flight data indicates that the flight started around 12:18 p.m. and lasted for approximately thirty-four (34) seconds. This data allowed the investigation to reconstruct the flight in the form of animation as well as to overlay the track on satellite imagery of the site; see appendix 6.

As soon as the Student lifted off from the ground, the wing turned to the right. He climbed very quickly, moved forward slowly toward the top of the row of trees to the right (to the North-East), which separates the takeoff site from the neighbouring house, then started moving back. The Instructor advised the Investigator that he instructed the Student to use the speedbar at that point, which it is assumed that the Student did immediately. The degree of speedbar application (half, full, etc.) is unknown. Witness #4 and Witness #6 then reported two to three (2 to 3) pitch oscillations, with no apparent correction from the Student (see appendix 5 to appreciate the view that they had). The wing started moving forward, possibly due to the speedbar being initiated by the Student, again toward the same row of trees. Flight data indicates that the Wing then moved back and forth again, but it is difficult to relate this portion of the flight path to the testimonies with precision. At some point, Witness #1 and Witness #6 report a small collapse of the right side of the Wing, which reinflated quickly; Witness #1 reports that the Instructor told the Student to “raise your hands, good”. It is presumed that the Student did, in fact, raise his hands given the latter comment of the Instructor, “good”.

Then and with little delay, a sudden and major collapse of the left side of the Wing occurred, between 40% and 50%. At this point, based upon the GPS tracklog, it seemed that the Student was a bit behind or above the row of trees in front of the takeoff site. The Instructor reports he immediately told the Student to “let go of everything” while Witness #1 recalled the Instructor saying “raise your hands”. Everyone agrees that the Wing reacted remarkably quickly; the Wing entered a left autorotation with a high rate of descent (flight data shows up to 14 meters/second). All testimonies also mention that the Student doesn't seem to have reacted or been in a position to react to regain control of the Wing: no apparent speedbar release, no apparent weight shifting, no apparent action on brakes. After a rotation between 180 and 270 degrees, the Student hit the terrain about thirty (30) meters in front of and below the takeoff site. The Instructor reported that he didn’t have time to give the Student other instructions given the speed of the rotation and descent.

The terrain below PVLMY’s North takeoff site is relatively clear and features groups of trees and bushes, especially on the right (east side), and several groups of rocks. The impact took place on one of those groups of rocks on the left side (west side). The Student was found face down, unconscious, without his helmet (it seems that one of the helmet straps broke under impact), his harness on top of him, the deflated Wing a bit behind on bushes (toward the North). See pictures at appendix 4.

Immediately, the Instructor rushed to the point of impact while calling the Student on the radio, climbing down on the left side (west side) of the takeoff site. Witness #1 rushed down from the right side (east side). Witness #1 was first on the scene and as a qualified first responder for a neighbouring town immediately took the appropriate actions, while the Instructor was still approaching. Witness #1, who didn’t have his phone, continued providing first aid while the Instructor climbed back to the summit of the takeoff site to call 911 with his phone.

Other Relevant Information

During the investigation, other relevant information which could help to supplement the analysis of the Accident was gathered but a sufficient correlation cannot be established due to lack of resources. These elements were not considered during the analysis but are included here because they were considered while developing the recommendations presented later in this report:

- Two other takeoffs with significant risks involved the same Instructor in 2020. This is documented by written testimony and video footage.
- The owner of the School and himself an instructor, who conducted the apprenticeship portion of the Instructor’s training, seems to have made a similar assessment of the weather forecasts and observations on the day of the Accident. This is documented by the Instructor's testimony as well as by a report in a local newspaper quoting a representative of the School.
- Some expert reports expressed surprise that the Instructor and/or even the School seem to accept that accidents are to be expected and that this one accident was just bad luck, instead of making an effort to learn from previous incidents and accidents and try to avoid future occurrences. This position is documented in the interview with the Instructor as well as in emails from the Instructor and the School.
- Immediate first aid was timely in this accident since a witness was an off-duty first responder, however the local emergency services were delayed due to apparent lack of familiarity with and access to the site. It has been noted that discussions between a city representative and the local hang gliding and paragliding community took place shortly after this accident in order to improve on future responses.

ANALYSIS

During the Field phase, the flight safety investigation collected testimonies (recorded with permission) from the seven (7) eyewitnesses, reviewed the best available sources of weather data for that day, visited the accident site on two occasions, reviewed satellite images and pictures taken on the site, inspected the flight equipment, reviewed files for the Student at the School, obtained the flight data from the vario GPS, and interviewed other witnesses with information relevant to this event. This made it possible to reconstruct the flight path as described above and to move on to the Analysis phase. It should also be noted that the investigator was asked by the Sûreté du Québec to support them in their investigation and did so.

Primary analysis

During the Analysis phase the investigation conducted a detailed review of all information. Many aspects did not, at first glance, reveal a material impact on the accident. In summary:

- the Student and the Instructor were in good physical and psychological condition. The Student had expressed a little frustration in the period leading up to the day of the flight because he would no doubt have to complete his planned move (in mid-June) to another region of Quebec without having been able to complete his course at the School. Since the weather forecast seemed encouraging for the period of June 10-12, he hoped to accumulate flights to make progress.
- the Instructor confirmed that the Student had covered all the training elements necessary for such a flight. According to the HPAC/ACVL training logbook, this includes, among other things, the assessment of the weather conditions beforehand and at the take-off site, the theoretical and practical use of the speedbar, as well as the theoretical and practical management of an asymmetric collapse. HPAC/ACVL Standard Operating Procedure ("SOP") 460-1a requires all instructors to provide P1/P2 students with the appropriate HPAC/ACVL Training Logbook and use it to sign off all training activity as it is completed. Note, however, that the School does not systematically use the HPAC/ACVL training logbook for its students but rather uses its own (much less detailed) register of flights performed; there is therefore no written evidence of the Student’s exact progression. Note also that HPAC/ACVL did not receive notification from the Instructor about his rating the Student as P1 (this is not unusual as many schools wait for students to “graduate” with a P2 before submitting the rating to HPAC/ACVL).
- the flight equipment examined by the Investigator at the School appeared to be adequate, in good condition, and properly configured (including fastened speedbar). The Wing had been inspected and certified by a specialist maintenance shop in July 2020, valid until July 2022 (see appendix 7), and its behavior during post-accident kiting did not reveal any obvious defects. The Student's weight was estimated at 63 kgs, for an estimated all-up-weight of 75-78 kgs, in the mid-range of the wing (65-85 kgs). The Girlfriend reports that the Student had not yet managed to adjust his footrest to his liking, but there is no evidence whether this had an impact on his ability to operate the speedbar or to weight shift.
- the North PVLMY take-off area was in good condition: grass maintained, free of obstacles, with one windsock on the left-hand side in excellent condition.

Many other pieces of information, however, seemed to have the potential to reveal the causes of the accident:

- all eyewitnesses (excluding Witness #2, the tandem passenger) reported winds from the North-East; eyewitnesses #3, #4, #5 and #6 reported winds too strong for paragliding.
- the information from the few local aviation meteorological stations also document winds from the North-East albeit of different strengths (see appendix 8).
- a video footage of the CVLY's North-East takeoff windsock taken coincidentally by a pilot at approximately 12:00 p.m. shows strong gusts.
- at the time of the accident, at around 12:18 p.m., the driver of the CVLY shuttle had already made three trips up to the CVLY North-East take-off, for a total of about 20 paraglider pilots (qualifications varying from P2 to P4) and 6 hang gliding pilots, but none of them had yet taken off due to the winds deemed too strong (the first hang glider - that can typically take off in much stronger winds than a paraglider - took off at about 1 p.m., see his GPS track which incidentally shows a North-North-East drift at appendix 9).
- at the time of the accident, several students were at the landing site of the neighboring CVLY club, but their instructor (Witness #6) had decided to wait until the end of the day before going up to the North-East takeoff because they felt the winds were too strong.
- the accident occurred at PVLMY’s North takeoff site of which it is of interest to note the following characteristics given the North-East winds (see appendix 10):
    - the takeoff axis is oriented North-North-West (estimated at 330 degrees)
    - the takeoff site is bordered on the right (North-East) by a row of trees approximately 5-7 meter high
    - the mountain terrain includes an incline of about 30 meters starting about 175 meters away to the North-East and going up to the takeoff point

Therefore, the investigation focused on these two key aspects: first, weather conditions and aerology at the PVLMY North takeoff site, and second, Student and Instructor decision-making.

To analyze those key aspects in an expert and objective way, the investigation asked for the support of two expert committees, one for each aspect. The expert committee on weather conditions and aerology was led by an HPAC/ACVL P4 rated competition pilot, while the expert committee on Student and Instructor decision-making was composed of three HPAC/ACVL Senior Instructors, each of whom had no connection to any of the School, the Instructor and/or the Student, and were deemed to be independent and without any conflict of interest.

The two expert committees submitted written reports to the Investigator. For weather conditions and aerology, the fundamental question was: What apparently caused the sudden and major collapse of the left side of the Wing? For Student and Instructor decision-making, the fundamental question was: On the day of the accident, which actions taken by the Student and/or the Instructor caused or contributed to the Accident? The following two sections are a consolidation of these expert committee reports.

Weather conditions and aerology

Note: This section of the analysis is written in the first person by the leader of the expert committee.

Methodology

I have consulted with two advanced pilots with whom I had discussions, and they have provided me with information. The first, a very experienced competition pilot, helped me analyze the conditions of the day. The second as a commercial airline pilot, was able to access the weather conditions history for that day and provided me with an analysis of the air mass conditions. I have been a pilot for thirty (30) years myself, am an active competitor and I can be considered as an experienced pilot.

I took many factors into consideration, while excluding as requested any decision-making factor (human factors).

The factors considered are aircraft, the manoeuvre, terrain proximity, wind strength, wind direction relative to the takeoff and air mass activity.

Factor #1: aircraft

The wing is a student wing, DHV-1 certified. The model is Mojo, made by Ozone, which is a wing used for the first learning step of paragliding. This type of wing is used by schools as it is a lower performance wing and is therefore safer. The behaviour of DHV-1 certified wings is much more sedate; it is more forgiving for pilot errors, requires less pilot action to manage incidents and behaves less aggressively in turbulence.

The Ozone MOJO pilot's manual can be found at:

https://cdn1.flyozone.com/wp-content/uploads/sites/1/2019/01/mojo.pdf

The test report at DHV for the Ozone MOJO is available here:
http://www.dhv.de/db1/technictestreport2.php?item=-126&lang=en

Arms up (and not using the speedbar), the Mojo flies at approximately 35 km/h.

Factor #2: the manoeuvre (acceleration)

The acceleration corresponds to a change in the wing’s angle of attack through the use of controls (speedbar or trims) in order to move faster in the air mass. The speedbar can be used, among others, to counter strong winds.

Based on the testimonies, it seems that at the time of collapse, which created a change in the flight trajectory, the Wing was accelerated. This increase in speed can create stronger reactions from the aircraft and weaken the wing’s leading edge (front of the wing), due to the change in the angle of attack, which can cause more pronounced collapses and wider pendulum movements for the pilot. By collapsing on one side (asymmetrical collapse), the wing collapses in a stronger way and causes an eccentric movement (pendulum) for the pilot, which can increase the heading change angle and make the wing dive into a spiral called autorotation. In test conditions (neutral aerology), the wing reinflates spontaneously and stops the spin in less than 360 degrees.

It should be noted that the manufacturer’s manual contains an explicit warning to avoid using the speedbar (accelerator) near the ground or in turbulent conditions (page 6 – English, page 21 – French).

Factor #3: terrain proximity

In addition to the possible aerology effects on the air mass discussed below, terrain proximity adds to the risk in case of an incident. In paragliding, the height above the ground adds a safety margin and often allows for the avoidance of accidents by giving the pilot time to recover from potentially dangerous situations. That is why you move away from the terrain as soon as possible after takeoff.

The terrain also causes various aerology phenomena described below (compression, turbulence, mountain breeze).

Factor #4: wind strength

Mont Yamaska is located East of St-Hubert airport (CYHU). The forecast (TAF) between 12 p.m. and 2 p.m. on June 10, 2021, showed that winds were forecast to be from the East/Northeast between 15 and 34 km/h. Weather report (METAR) history shows winds from the Northeast averaging 18 km/h, gusting 32 km/h on the ground (appendix 8).

Takeoff sites in Mont Yamaska are located at the summit of the mountain, at an altitude of approximately 300 m (1000 ft). The winds are usually stronger up at altitude than what is reported on the ground in METARs.

When the wind is directly facing the takeoff site, the first effect due to terrain is wind acceleration due to compression and ascending winds along the slope of the mountain. Close to the terrain, you can therefore experience stronger winds than if you are farther from it, at a constant altitude. Stronger winds create amplified phenomena, such as stronger turbulence.

It is good practice to avoid taking off if the weather (excluding compression) shows winds stronger than 20 km/h at the takeoff site altitude.

Factor #5: wind direction relative to the direction of the takeoff

To take off safely, one of the key factors to consider is the wind direction relative to the direction of the takeoff. Crosswinds can create turbulence, just like a rock in the middle of a river. The leeward side is therefore riskier.

Based on the testimonies, it seems that the wing ended up being parallel to the terrain, when it turned right after takeoff. It seems to indicate that the prevailing wind at the time (direction of the weather wind) was from the right and not facing the direction of the takeoff.

In case of crosswinds during takeoff, it is possible that the wind temporarily seems to be facing the direction of the takeoff after an ascending thermal passes along the slope. Advanced pilots can take advantage of the opportunity to take off, while being at risk of being in weather wind turbulence once in the air, due to an obstacle (rock, summit, line of trees, etc.).

Factor #6: air mass activity

This factor provides an indication of the air mass encountered in flight.

Typically, calmer periods for flying are in the morning or late in the afternoon.

This year, since the beginning of spring, we have been in a very dry and sunny period in Quebec, which translates to days with very active air masses (often too much for paragliding).

June 10 was a clear day. Therefore, the HRDPS model (appendix 8) showed a strong instability for the period. That is characterized by an active air mass (refer to screen shots) and strong ascending winds that can create turbulence in the air and strong gusts on the ground.

Conclusion:

The Wing behaviour can most probably be explained as follows:

- Immediately after takeoff, quick gain in altitude probably due to air compression on the mountain, and perhaps also a thermal generating a mountain breeze.
- Orientation and movement to the right (North-East) toward the line of trees which borders the takeoff site (while moving forward and away from the terrain at a slow ground speed), because the average of all the weather data sources (forecast and observations) indicate winds from the North-East; the Wing therefore had a normal tendency to turn into the wind during the takeoff phase, at the time of moving away from the terrain.
- The Wing's forward progress halted almost immediately and it started moving backward, as the trim speed of the Wing used (35 km/h) was far inferior to the wind gust at the time. With 33-35 km/h on the ground (average of all the weather data sources, both forecast and observations), a gust at 300 m in a compression with possible ascending winds (unstable air mass) could reach over 40 km/h during the takeoff.
- Speedbar activation (extent unknown), which allowed the Wing to move faster but made the Wing more susceptible to collapse.
- Pitch oscillations (2-3 from back to front) due to turbulent air. Professional flight tests show that a wing on speedbar can pitch up to 45 degrees in such conditions.
- Small collapse of the right side of the Wing as it met some turbulence due to the wind hitting the terrain off axis, which brought the angle of attack below that required to maintain the wing profile while on speedbar, followed by an immediate reinflation, as professional flight tests show that this is the expected behaviour for that Wing in such circumstances.
- Significant collapse (40-50%) of the left side of the Wing, as it met stronger turbulence caused by the wind hitting the terrain off axis, which brought the angle of attack far below that required to maintain the Wing profile while on speedbar.
- Left autorotation (testimonies report between 180 and 270 degrees of rotation) and rapid loss of altitude, no indication of configuration change (no action on brakes, no weight shifting, fixed speedbar), return to terrain, impact. The professional flight tests in undisturbed air show that the wing can require up to 180 degrees to reinflate by itself (more in disturbed air). The altitude above ground was therefore insufficient to allow the Wing to return to normal flight.

Student and Instructor decision-making

After the expert committee on weather conditions and aerology produced its report, the expert committee on Student and Instructor decision-making began its work. Given their task of analyzing decision-making, this expert committee also had access to the transcript of the interview conducted with the Instructor as part of this flight safety investigation. The three HPAC/ACVL Senior Instructors in this expert committee each independently produced a report. The consolidation of these reports follows:

Decision to fly in winds too strong and too turbulent

If a student receives a specific briefing on the use of the speedbar before the flight, this already shows that the Instructor is aware of the severe conditions. Allowing a student take off between (thermal) gusts violated two operational limits in HPAC/ACVL standard SOP 410-8 for a P2 pilot (therefore even worse for a P1 student): 1) Should not fly in thermal lift exceeding your ability to maintain control; 2) Avoid flying in wind speed that exceeds ⅔ of your glider’s trim speed. The maximum wind speed for this wing was 23 km/h (⅔ of 35 km/h). The conditions were much stronger (between 32 and 40 km/h), see conclusions of the expert committee on weather conditions and aerology. A pilot should never fly at the edge of the safety envelope - weather conditions and equipment selection. This is even more true for a student. According to the expert committee reports, the Instructor should never have given the Student the green light to fly.

Decision not to emulate decisions made by other pilots and instructors

In making the decision to take off, the Student and the Instructor knew that none of the other pilots on the other take-off had taken off, but they did not take that sufficiently into account. This principle of observing and integrating the decisions made by other pilots and instructors is part of airmanship. This was a clear indication that the weather conditions at the time were not favorable.

Decision to do a tandem flight while supervising a student

The Instructor was likely distracted by the tandem flight or divided between the need to ensure the safety of his Student and the need to complete the tandem flight for pay. This negatively affected the degree of attention the Instructor should have given the Student. It was pointed out that the Instructor had other options, such as doing the tandem flight but forbidding the Student to fly (the shuttle had stayed and could therefore be used to bring the Student back down).

Indirect pressure on the Student

The Instructor had essentially transferred the take-off decision-making responsibility to the Student; the latter therefore had to analyze the conditions himself and decide whether they were adequate. Note that the Instructor's very decision to transfer this responsibility to the Student with little experience was not adequate in these known marginal conditions. But the fact that the Instructor then told the Student that the conditions were acceptable and in addition told him that the Instructor himself was going to take off without a doubt (for the tandem flight) undermined this responsibility and distorted the judgment of the Student. This in fact put an indirect pressure on the Student to take off. The Student, who had already expressed his desire to accumulate as many flights as possible before leaving the region the following week, may not have wanted to wait for his Instructor to return to take off, a wait that could easily have lasted longer than 45 minutes.

Inappropriate decision to use the speedbar

Operating the speedbar close to the ground in conditions of high winds, gusts and turbulence is ill advised even for skilled pilots. With a Student of only nineteen (19) flights, there is never any talk of having to use the speedbar as a virtual guarantee after takeoff (especially since they are not supposed to be flying in conditions above 2/3 the trim speed of their wing, see discussion above). Note that the unexpected and abrupt collapse due to the accelerated Wing may have caused the Student to lose balance and lean into the turn instead of moving away from it, thereby accelerating the turn.

Decision to let a Student with insufficient recency fly in these weather conditions

The Student had started his P1 about 1 year before the accident, made his first high flight on August 8, 2020, suspended training in October 2020 after a total of 15 flights, resumed on May 24 with two flights, and again on May 28 with two flights. Thus, in the last seven (7) months before the accident, he had flown only four (4) times. As a result, some of the basic knowledge was not as up to date as a student taking a course in a much shorter period of time. Due to the lack of a detailed training log, it is not known when the Student received practical training in thermal flying; neither is his practice of managing a large asymmetric collapse known, so it is not clear to what extent he was able to recognize it and take corrective action.

Decision to use a wing that is too old

Several schools are of the opinion that a wing that is over 15 years old should not be used for flight training. A specialized workshop inspection and kiting on the ground can effectively assess the porosity of the fabric and length of the lines but cannot identify changes in wing behaviour under actual flight conditions caused by subtle deformities due to aging, stretching and softening of the fabric.

Inadequate overall risk management

Any aviation sport involves risks, and it is therefore essential to limit these risks. In this accident, it seems that several risk factors had accumulated without the Instructor recognizing and taking them into account: unsuitable weather conditions for a student, planned use of the speedbar near the ground in turbulent conditions, indirect pressure on the Student, use of a wing that is too old.

CONCLUSIONS AND RECOMMENDATIONS

Based on the information gathered and the analysis made by two expert groups of weather conditions, aerology, and decisions made by the Student and Instructor, the following conclusions and recommendations are made.

Causes

Based upon all of the evidence reviewed, and the reports of the Expert Committees, it is concluded that the following causes directly brought about the Accident:

- The left side of the Student's Wing suffered a large asymmetric collapse because it was hit by severe turbulence and because it was in an accelerated configuration. The severe turbulence was caused by gusts of off-axis winds (commonly referred to as crosswind) hitting the terrain and the trees bordering the take-off, mixed with thermal updrafts along the terrain;
- The Wing entered into a state of left autorotation with a faster and more violent loss of altitude than normal due to the accelerated configuration;
- The Wing's altitude was insufficient to allow the Wing to re-inflate on its own and regain normal attitude and flying configuration in time to safely clear the terrain;
- The Instructor was not able to give effective instructions in time to assist the Student;
- The Student was unable to take corrective actions that might have lessened the consequences on impact with the terrain.

Contributing factors

The contributing factors that created the situation allowing the causes to directly bring about this accident are as follows:

- The Student and Instructor did not properly assess the wind forecast for the day, the take-off wind observations, and the decisions made by other pilots not to take off;
- The Student and the Instructor did not properly assess the adequacy of the Student's true skills for the weather conditions at the time;
- The Instructor did not properly assess the adequacy of the certification and age of the Wing being used for the weather conditions at the time;
- The planned use of the speedbar close to the ground in the presence of turbulence was contrary to good airmanship and contrary to the warnings contained in the manual for the Wing being used; and
- Considering the difficult wind conditions and the pressure self-imposed by the Student to accumulate flights, the Instructor incorrectly assessed the reduced safety margin and erroneously delegated the decision to take off to the Student.

Risk Factors and Recommendations

The risk factors which may have played a role, and which could contribute to other accidents, along with recommendations for action by HPAC/ACVL are as follows:

- If a take-off site has only one windsock or streamer on one side, it is possible that an indication of wind in the axis does not represent the true conditions at the time and is in fact only the result of a momentary condition.

  R2021-1: It is recommended that HPAC/ACVL reiterate, in a publication, the good practice of having an indication of the winds on both sides of a take-off as well as on the down slope when possible.

- If a student's progress is not sufficiently documented it is possible that the student's progress suffers from gaps, or that training continuity by another instructor from the same school or from another school cannot be assured.

  R2021-2: It is recommended that the already existing obligation to use the HPAC/ACVL training log be reinforced by issuing the P2 and H2 qualifications only if the application submitted by the instructor contains a copy of the appropriate pages, signed by the student and by the instructor attesting to the complete progression.

- If a student or pilot is unfamiliar with their wing and/or has not completed all possible equipment adjustments on the ground before flying (e.g. footrest, harness straps, etc..), he or she may not be able to respond adequately to more demanding situations in flight.

  R2021-3: It is recommended that HPAC/ACVL reiterate, in a publication, the importance for pilots and instructors to be completely familiar with their (student's) equipment and to have completed all necessary adjustments before flying.

- If an instructor does not follow the HPAC/ACVL instructional requirements, guidelines and recommended operating limitations for students, there is a risk of a similar accident happening in Canada.

  R2021-4: It is recommended that HPAC/ACVL determine the nature of the deficiencies demonstrated by the Instructor (momentary on the day of the accident or specific to his competency); if related to competency, determine whether the manner in which the Instructor was certified conformed to the HPAC/ACVL system (SOP 420-9) and if any corrective measures are necessary.

- If instructors allow themselves to be occupied with other tasks while supervising a student, including but not necessarily limited to preparing to conduct a tandem, there is a risk that a similar accident will occur in Canada.

  R2021-5: it is recommended that HPAC/ACVL carry out more in-depth investigations and implement requirements as necessary relating to, at a minimum, simultaneous operations by the same instructor of a training flight and a tandem flight at the School and at other Canadian schools.

- If instructors and/or schools providing or recommending equipment to a student are influenced by factors not related to instruction and safety, there is a risk that equipment-related accidents will occur in Canada.

R2021-6: it is recommended that HPAC/ACVL assess the need for requirements and/or guidelines for the provision or recommendation of equipment to students, and to implement and communicate appropriate requirements and/or guidelines.

- If organizations or individuals responsible for flying sites do not ensure the availability of key emergency information to concerned parties, there is the risk of aggravated consequences of accidents happening in Canada.

R2021-7: It is recommended that HPAC/ACVL create and publish guidelines for flying sites to have an emergency response plan, review the plan with local emergency services, and post emergency response information at each launch and landing site.

Appendix 1: Student Training Record

Manuel et Carnet de vol remis ☐ Date:

Fiche de progression étudiant

Nom: [redacted] Tel: _____ Cell: [redacted]

Nom du Forfait: P1

Date d'achat: 16/06/20

Hrs/leçons restantes: 10
Vols Solos restants: 30

Montant payé: _____

Vols Tandem restants: _____

Parapente **Deltaplane** **Paramoteur**

Date	Leçon	Instruc.	Commentaire	No.	Hrs/leçons restantes	Vols Solos restants	Tandems restants
16/06		[redacted]	1h45 sol		8.25		
19/06			2h sol		6.25		
4/07			2h sol		4.25		
10/07			2h sol		2.25		
22/06			2h sol		0.25		
8/08			1 vol solo			29	
"			"			28	
15/08			"			27	
06/09			1 vol solo			26	
12/09			"			25	
12/09			"			24	
19/09			1 vol solo			23	
19/09			"			22	
3/10			2 vols solo			20	
2			1 vol solo			19	
11/10			2 vols solo			17	
25/10			2 vol			[illegible]	

Manuel et Carnet de vol remis ☐ Date:

Fiche de progression étudiant

Nom: [redacted] Tel: _____ Cell: [redacted]

Nom du Forfait: P1

Date d'achat: 16/06/20

Hrs/leçons restantes: 25

Vols Solos restants: 15

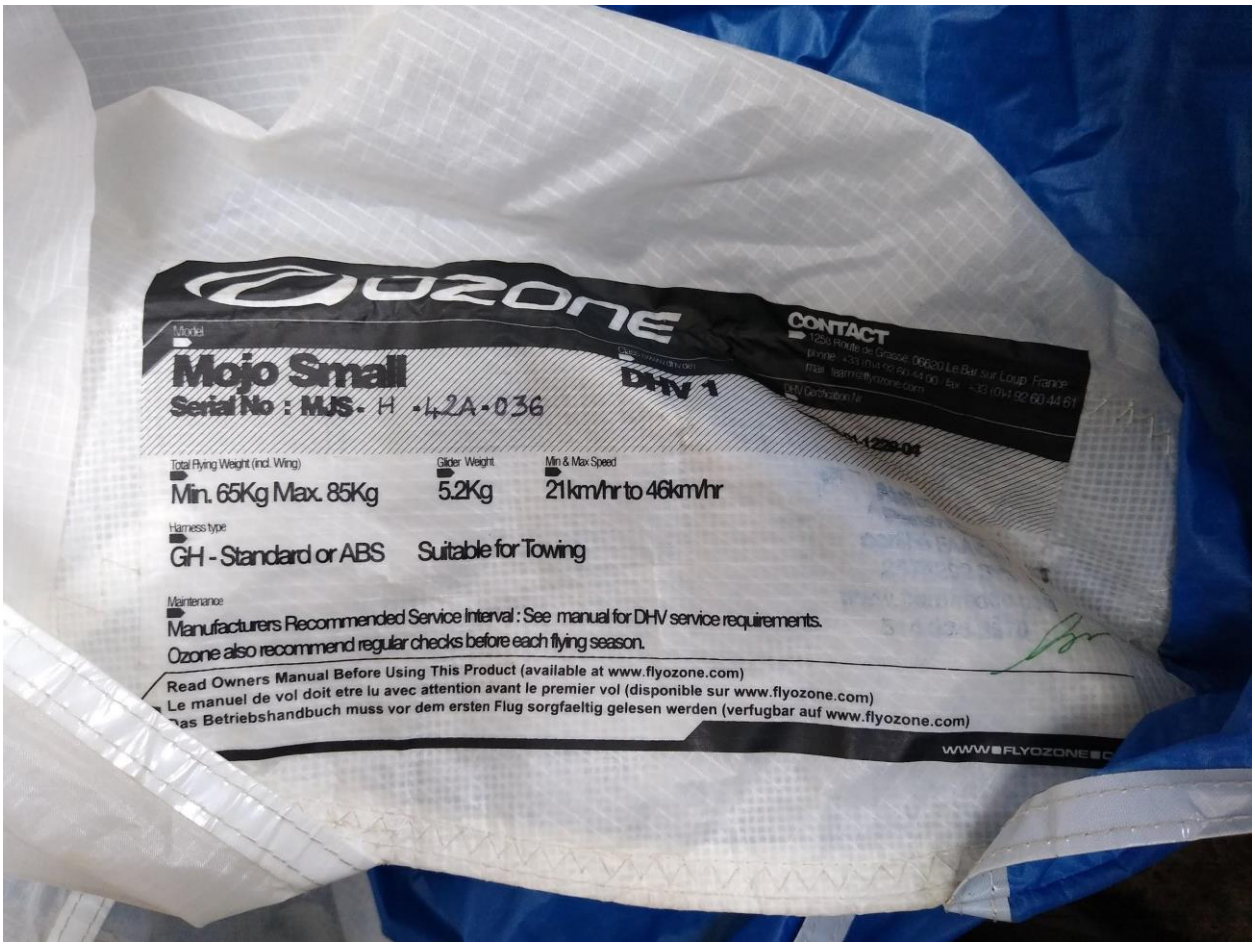
Montant payé: _____

Vols Tandem restants: ~~0~~

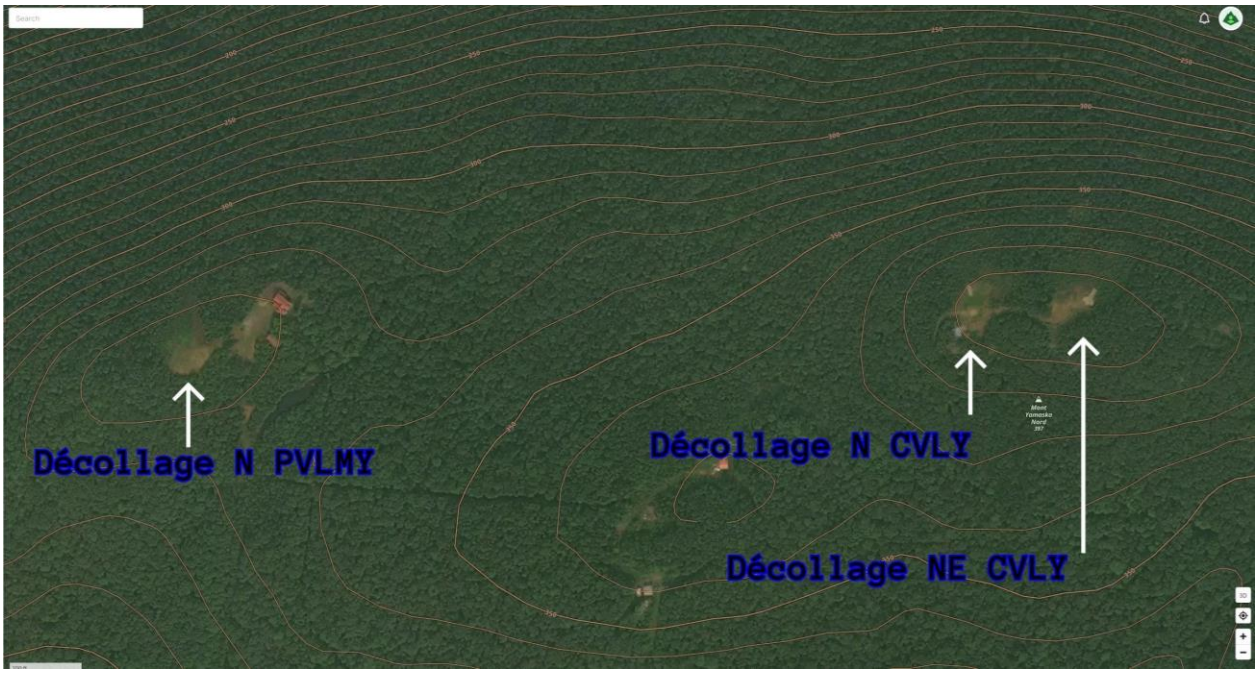
Parapente **Deltaplane** **Parameteur**

Date	Leçon	Instruc.	Commentaire	No.	Hrs/leçons restantes	Vols Solos restants	Tandems restants
24/05		[redacted]	vol 15h			14	
"			vol 47h			13	
28/05			vol 16h			12	
"			vol 47h			11	
16/06			20e EVENT			10	

Appendix 2: Wing Identification Placard



Appendix 3: Satellite pictures of the North PVLMY launch




Google
Imagery ©2021 Maxar Technologies, Map data ©2021 Canada Terms Privacy Send feedback 10 m

Appendix 4: Photographs of the North PVLMY launch

Overview of the takeoff site (panoramic format)

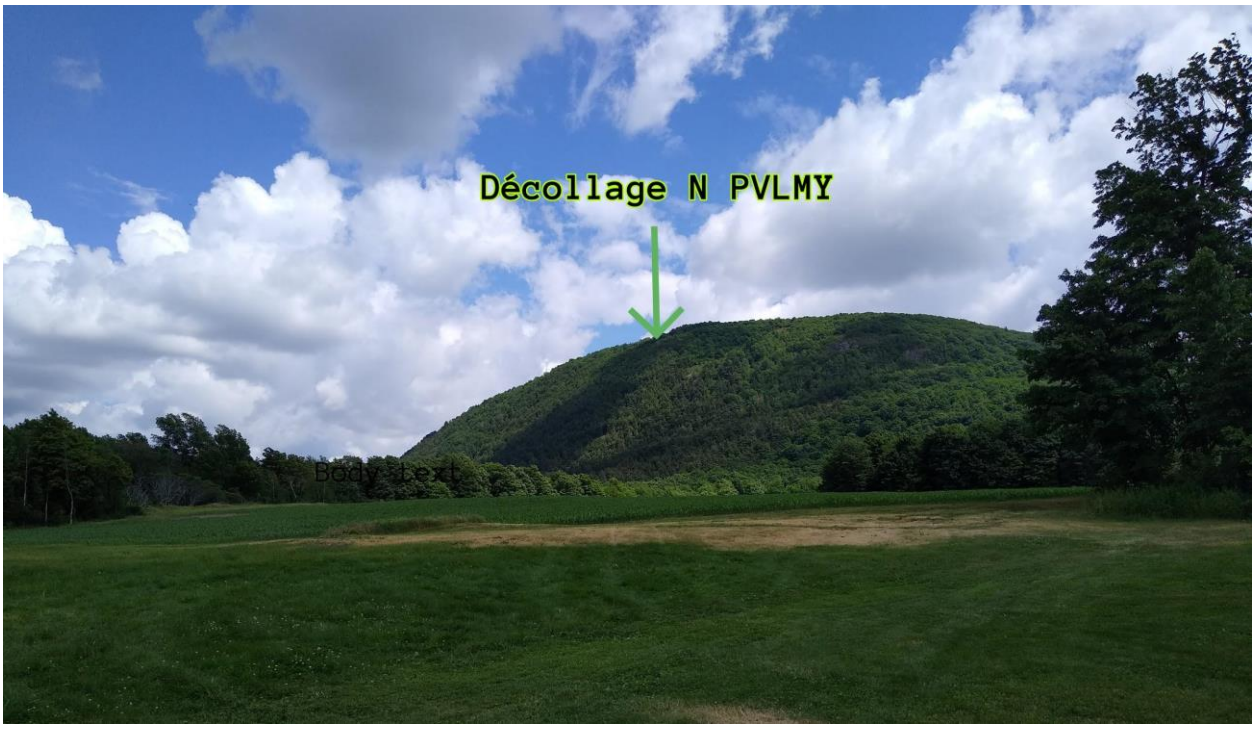
Windsock (top right) and rocks at impact point (bottom left) (panoramic format)

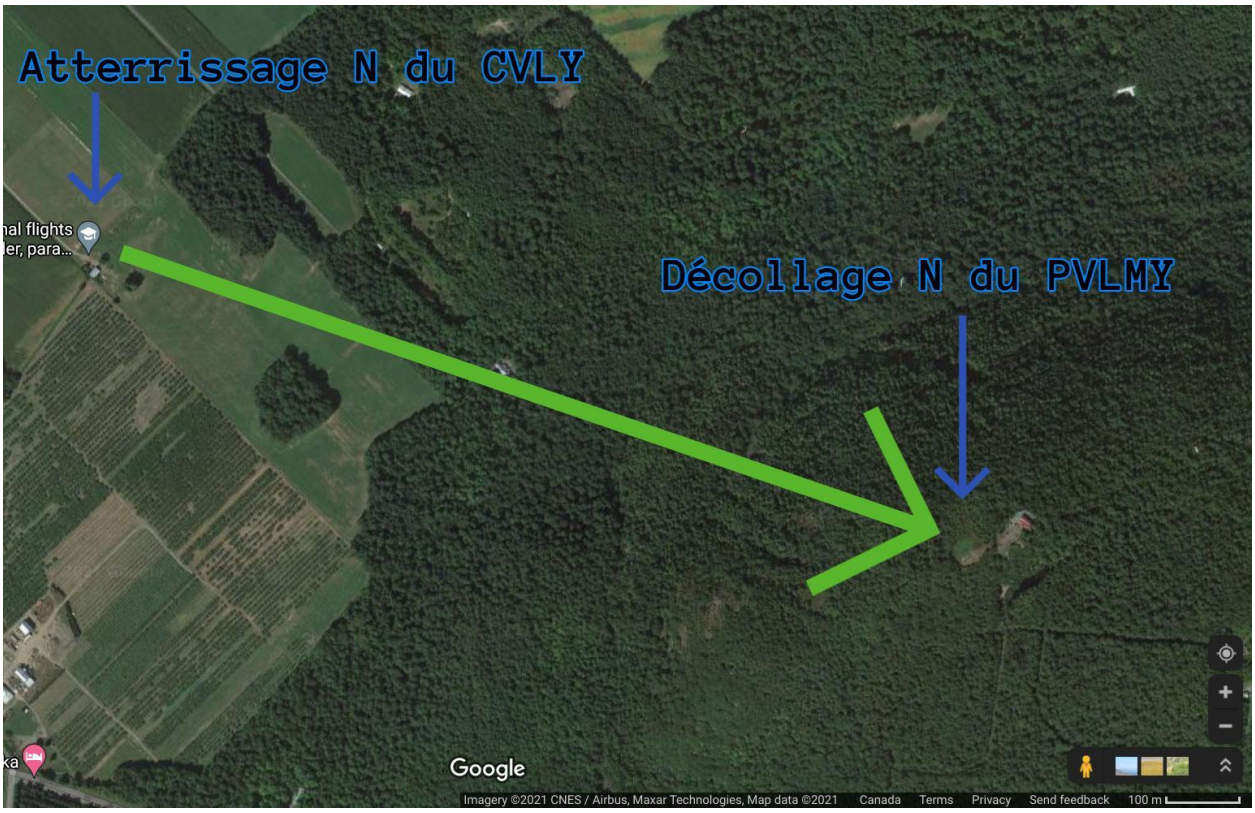
Terrain just below the flat part of the takeoff site (left side, NW)

Terrain just below the flat part of the takeoff site (right side, North-East)

Rocks at impact point

Appendix 5: View of the North PVLMY takeoff site from the North CVLY landing site

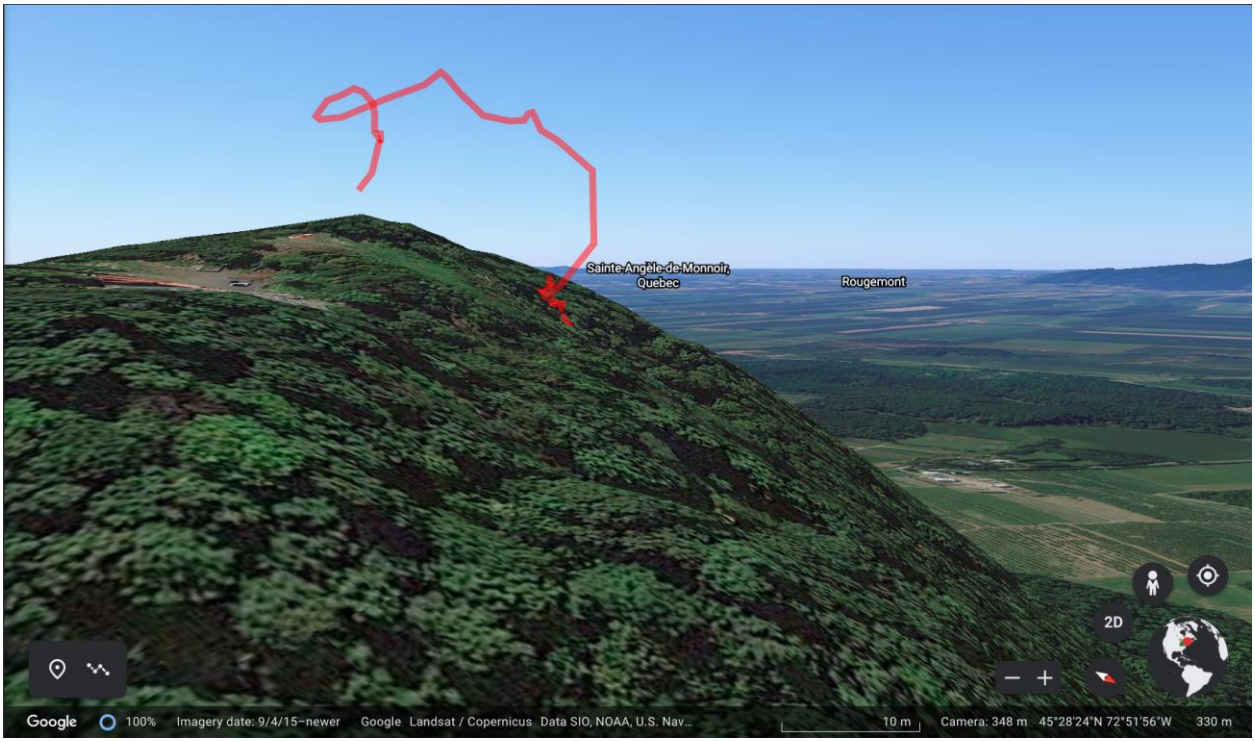




Appendix 6: Flight data from the Variometer/GPS Syride SYS'Nav V3

Flight path seen from above (Google Earth)

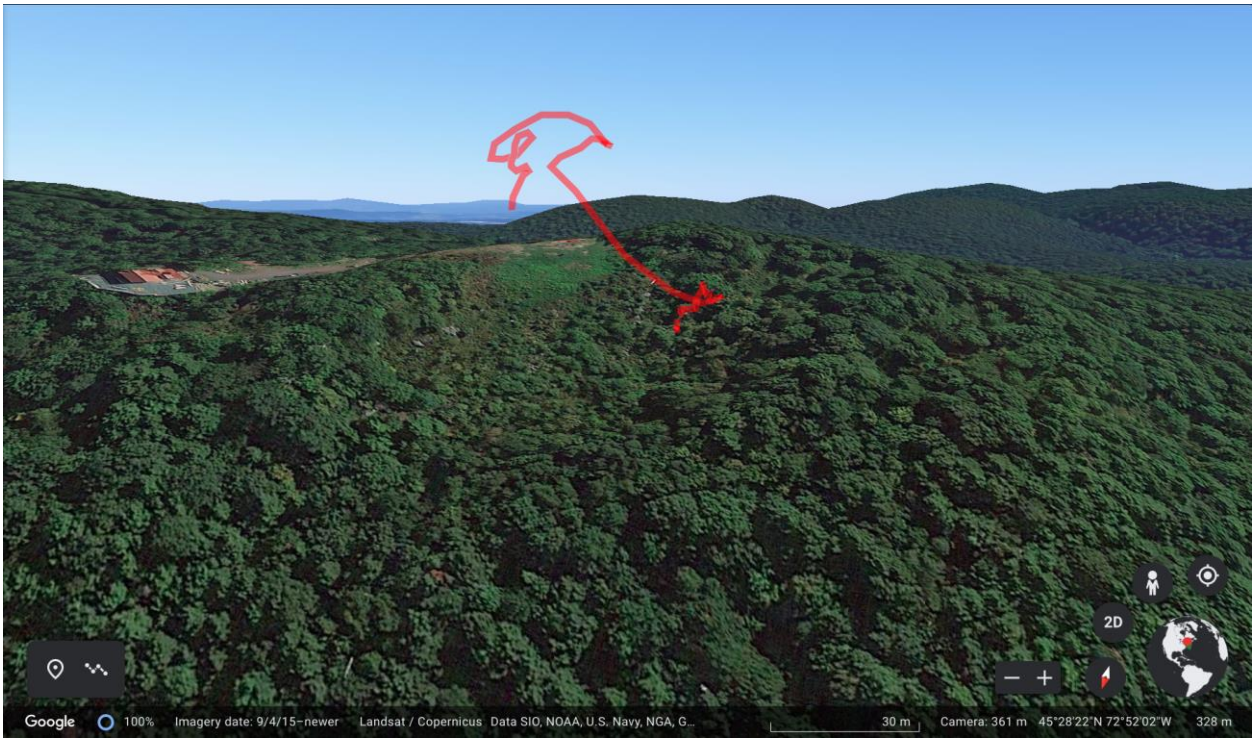
Flight path seen from the North-East (Google Earth)



Flight path seen from the North, from afar (Google Earth)

Flight path seen from the North (Google Earth)

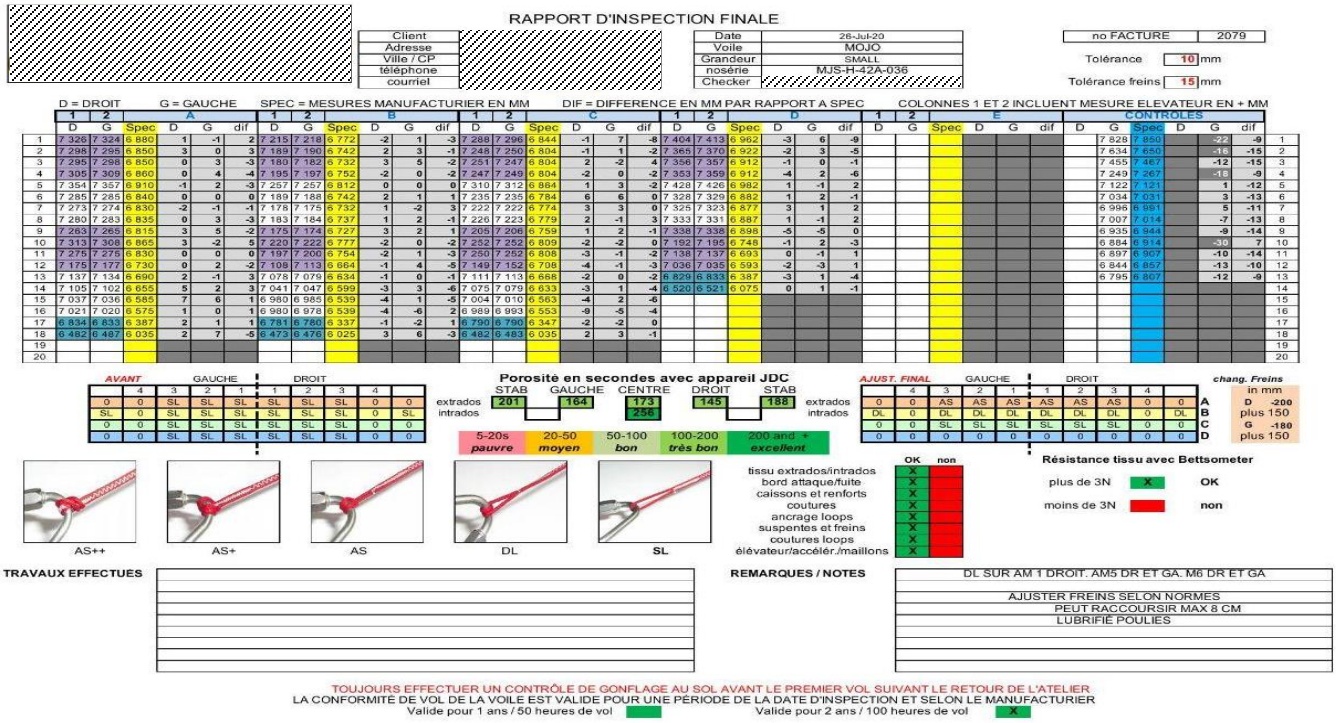
Flight path seen from the North-North-West (Google Earth)



Flight path seen from above, with all three take off sites as references (Google Earth)

Graphic showing altitude (upper orange line), ground speed (red line) and vertical speed (green light) (XContest)

Appendix 7: Certified inspection of the wing



RAPPORT D'INSPECTION FINALE

Client	
Adresse	
Ville / CP	
téléphone	
courriel	

Date	26-Jul-20
Voile	MOJO
Grandeur	SMALL
nosérie	MJS-H-42A-036
Checker	

no FACTURE	2079
Tolérance	10 mm
Tolérance freins	15 mm

D = DROIT G = GAUCHE SPEC = MESURES MANUFACTURIER EN MM DIF = DIFFERENCE EN MM PAR RAPPORT A SPEC COLONNES 1 ET 2 INCLUENT MESURE ELEVATEUR EN + MM

	1 A D	2 A G	A Spec	A D	A G	A dif	1 B D	2 B G	B Spec	B D	B G	B dif	1 C D	2 C G	C Spec	C D	C G	C dif	1 D D	2 D G	D Spec	D D	D G	D dif	1 E D	2 E G	E Spec	E D	E G	E dif	CONTROLES 1 D	CONTROLES 2 G	CONTROLES Spec	CONTROLES D	CONTROLES G	CONTROLES dif	
1	7 326	7 324	6 880	1	-1	2	7 215	7 218	6 772	-2	1	-3	7 288	7 296	6 844	-1	7	-8	7 404	7 413	6 962	-3	6	-9							7 828	7 850		-22	-9		1
2	7 298	7 295	6 850	3	0	3	7 189	7 190	6 742	2	3	-1	7 248	7 250	6 804	-1	1	-2	7 365	7 370	6 922	-2	3	-5							7 634	7 650		-16	-15		2
3	7 295	7 298	6 850	0	3	-3	7 180	7 182	6 732	3	5	-2	7 251	7 247	6 804	2	-2	4	7 356	7 357	6 912	-1	0	-1							7 455	7 467		-12	-15	3	
4	7 305	7 309	6 860	0	4	-4	7 195	7 197	6 752	-2	0	-2	7 247	7 249	6 804	-2	0	-2	7 353	7 359	6 912	-4	2	-6							7 249	7 267		-18	-9	4	
5	7 354	7 357	6 910	-1	2	-3	7 257	7 257	6 812	0	0	0	7 310	7 312	6 884	1	3	-2	7 428	7 426	6 982	1	-1	2							7 122	7 121		1	-12	5	
6	7 285	7 285	6 840	0	0	0	7 189	7 188	6 742	2	1	1	7 235	7 235	6 784	6	6	0	7 328	7 329	6 882	1	2	-1							7 034	7 031		3	-13	6	
7	7 273	7 274	6 830	-2	-1	-1	7 178	7 175	6 732	1	-2	3	7 222	7 222	6 774	3	3	0	7 325	7 323	6 877	3	1	2							6 996	6 991		5	-11	7	
8	7 280	7 283	6 835	0	3	-3	7 183	7 184	6 737	1	2	-1	7 226	7 223	6 779	2	-1	3	7 333	7 331	6 887	1	-1	2							7 007	7 014		-7	-13	8	
9	7 263	7 265	6 815	3	5	-2	7 175	7 174	6 727	3	2	1	7 205	7 206	6 759	1	2	-1	7 338	7 338	6 898	-5	-5	0							6 935	6 944		-8	-14	9	
10	7 313	7 308	6 865	3	-2	5	7 220	7 222	6 777	-2	0	-2	7 252	7 252	6 809	-2	-2	0	7 192	7 195	6 748	-1	2	-3							6 884	6 914		-30	7	10	
11	7 275	7 275	6 830	0	0	0	7 197	7 200	6 754	-2	1	-3	7 250	7 252	6 808	-3	-1	-2	7 138	7 137	6 693	0	-1	1							6 897	6 907		-10	-14	11	
12	7 175	7 177	6 730	0	2	-2	7 108	7 113	6 664	-1	4	-5	7 149	7 152	6 708	-4	-1	-3	7 036	7 035	6 593	-2	-3	1							6 844	6 857		-13	-10	12	
13	7 137	7 134	6 690	2	-1	3	7 078	7 079	6 634	-1	0	-1	7 111	7 113	6 668	-2	0	-2	6 829	6 833	6 387	-3	1	-4							6 795	6 807		-12	-9	13	
14	7 105	7 102	6 655	5	2	3	7 041	7 047	6 599	-3	3	-6	7 075	7 079	6 633	-3	1	-4	6 520	6 523	6 075	0	1	-1												14	
15	7 037	7 036	6 585	7	6	1	6 980	6 985	6 539	-4	1	-5	7 004	7 010	6 563	-4	2	-6																			15
16	7 021	7 020	6 575	1	0	1	6 980	6 978	6 539	-4	-6	2	6 989	6 993	6 553	-9	-5	-4																			16
17	6 834	6 833	6 387	2	1	1	6 781	6 780	6 337	-1	-2	1	6 790	6 790	6 347	-2	-2	0																			17
18	6 482	6 487	6 035	2	7	-5	6 473	6 476	6 025	3	6	-3	6 482	6 483	6 035	2	3	-1																			18
19																																					19
20																																					20

AVANT GAUCHE DROIT

4	3	2	1	1	2	3	4
0	SL	SL	SL	SL	SL	SL	0
SL	SL	SL	SL	SL	SL	SL	SL
0	SL	SL	SL	SL	SL	SL	0
0	SL	SL	SL	SL	SL	SL	0

Porosité en secondes avec appareil JDC

STAB extrados	GAUCHE intrados	CENTRE extrados	CENTRE intrados	DROIT intrados	STAB extrados
201	164	173	256	145	188

5-20s	20-50	50-100	100-200	200 and +
pauvre	moyen	bon	très bon	excellent

AJUST. FINAL GAUCHE DROIT

4	3	2	1	1	2	3	4	
0	0	AS	AS	AS	AS	AS	0	A
DL	0	DL	DL	DL	DL	DL	0	B
0	0	SL	SL	SL	SL	SL	0	C
0	0	0	0	0	0	0	0	D

chang. Freins in mm

D	-200
B	plus 150
G	-180
D	plus 150

AS++

AS+

AS

DL

SL

	OK	non
tissu extrados/intrados	X	
bord attaque/fuite	X	
caissons et renforts	X	
coutures	X	
ancrage loops	X	
suspentes et freins	X	
coutures loops	X	
élévateur/accélér./maillons	X	

Résistance tissu avec Bettsometer

plus de 3N	X	OK
moins de 3N		non

TRAVAUX EFFECTUES

REMARQUES / NOTES

DL SUR AM 1 DROIT. AM5 DR ET GA. M6 DR ET GA
AJUSTER FREINS SELON NORMES
PEUT RACCOURSIR MAX 8 CM
LUBRIFIÉ POULIES

TOUJOURS EFFECTUER UN CONTRÔLE DE GONFLAGE AU SOL AVANT LE PREMIER VOL SUIVANT LE RETOUR DE L'ATELIER
LA CONFORMITÉ DE VOL DE LA VOILE EST VALIDE POUR UNE PÉRIODE DE LA DATE D'INSPECTION ET SELON LE MANUFACTURIER
Valide pour 1 ans / 50 heures de vol
Valide pour 2 ans / 100 heures de vol X

Appendix 8: Weather station observations

CVLY meteorological station

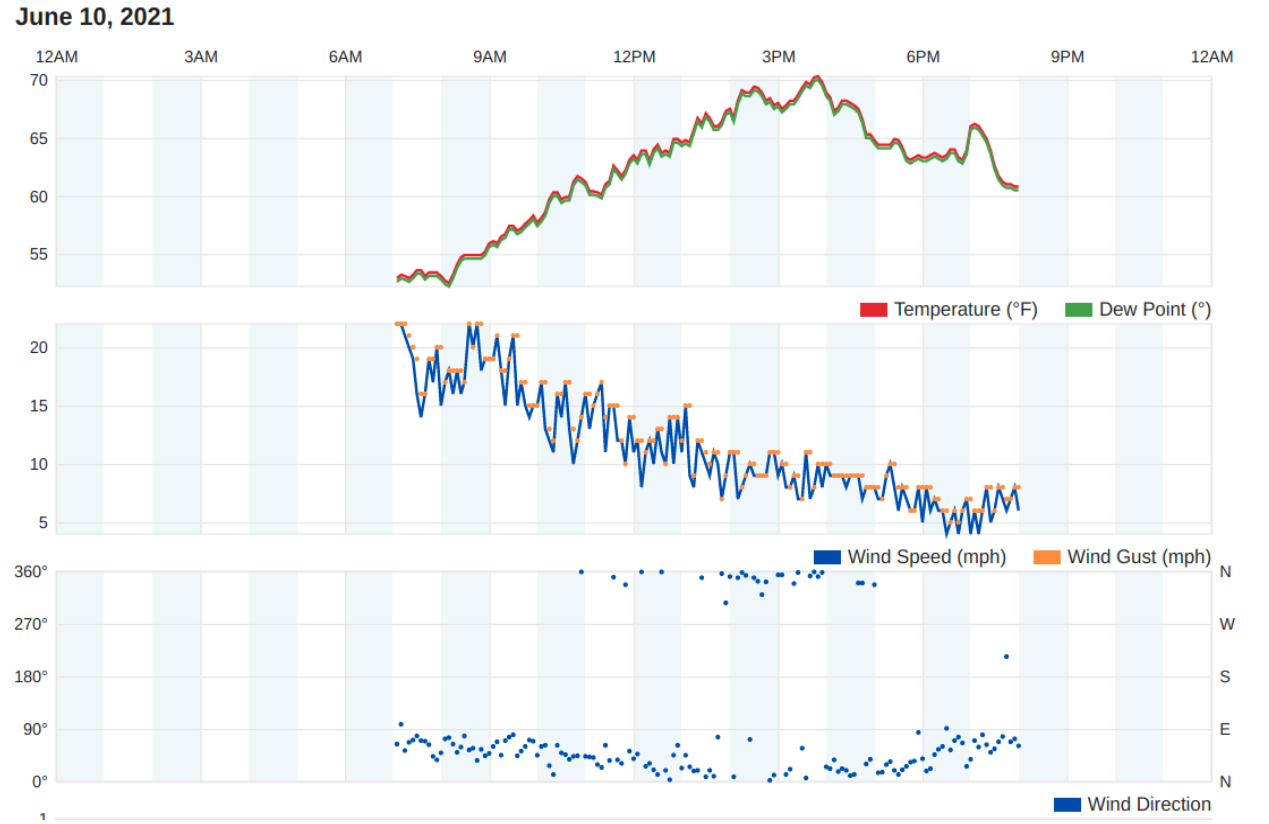
Note: this station is located on the West side of the mountain, on the leeward side of North winds, and is thus known for not being reliable when the wind is from the North

June 10, 2021

	High	Low	Average
Temperature	**70.3** °F	**52.5** °F	**62.9** °F
Dew Point	**70.0** °F	**52.2** °F	**62.6** °F
Humidity	**99** %	**99** %	**99** %
Precipitation	**0.00** in	--	--

	High	Low	Average
Wind Speed	**22.0** mph	**0.0** mph	**6.6** mph
Wind Gust	**22.0** mph	--	**9.5** mph
Wind Direction	--	--	**NE**
Pressure	**29.00** in	**28.91** in	--

Graph | Table



10:54 AM	61.3 °F	61.0 °F	99 %		8.2 mph	9.4 mph	28.99 in	0.00 in	0.00 in	w/m²
10:59 AM	60.5 °F	60.2 °F	99 %	NE	10.4 mph	14.9 mph	28.99 in	0.00 in	0.00 in	w/m²
11:04 AM	60.4 °F	60.1 °F	99 %	NE	9.8 mph	13.1 mph	28.99 in	0.00 in	0.00 in	w/m²
11:09 AM	59.9 °F	59.6 °F	99 %	NE	10.6 mph	14.4 mph	28.98 in	0.00 in	0.00 in	w/m²
11:14 AM	60.1 °F	59.8 °F	99 %	NNE	10.4 mph	14.1 mph	28.98 in	0.00 in	0.00 in	w/m²
11:19 AM	59.7 °F	59.4 °F	99 %	NNE	9.4 mph	14.3 mph	28.98 in	0.00 in	0.00 in	w/m²
11:24 AM	60.5 °F	60.2 °F	99 %	ENE	6.2 mph	11.2 mph	28.98 in	0.00 in	0.00 in	w/m²
11:29 AM	61.1 °F	60.8 °F	99 %	NE	8.5 mph	14.4 mph	28.98 in	0.00 in	0.00 in	w/m²
11:34 AM	62.2 °F	61.9 °F	99 %		7.1 mph	11.5 mph	28.98 in	0.00 in	0.00 in	w/m²
11:39 AM	61.8 °F	61.5 °F	99 %	NE	8.8 mph	11.9 mph	28.98 in	0.00 in	0.00 in	w/m²
11:44 AM	61.5 °F	61.2 °F	99 %	NNE	6.9 mph	10.2 mph	28.98 in	0.00 in	0.00 in	w/m²
11:49 AM	61.9 °F	61.6 °F	99 %	NNW	5.6 mph	9.7 mph	28.98 in	0.00 in	0.00 in	w/m²
11:54 AM	62.8 °F	62.5 °F	99 %	NE	6.5 mph	10.8 mph	28.98 in	0.00 in	0.00 in	w/m²
11:59 AM	62.9 °F	62.6 °F	99 %	NE	6.2 mph	9.9 mph	28.98 in	0.00 in	0.00 in	w/m²
12:04 PM	63.0 °F	62.7 °F	99 %	NE	7.9 mph	11.7 mph	28.98 in	0.00 in	0.00 in	w/m²
12:09 PM	63.0 °F	62.7 °F	99 %		6.5 mph	8.5 mph	28.98 in	0.00 in	0.00 in	w/m²
12:14 PM	63.5 °F	63.2 °F	99 %	NNE	8.2 mph	10.6 mph	28.98 in	0.00 in	0.00 in	w/m²
12:19 PM	62.7 °F	62.4 °F	99 %	NNE	8.0 mph	11.3 mph	28.98 in	0.00 in	0.00 in	w/m²
12:24 PM	63.5 °F	63.2 °F	99 %	NNE	5.2 mph	7.4 mph	28.98 in	0.00 in	0.00 in	w/m²
12:29 PM	64.2 °F	63.9 °F	99 %	NNE	7.4 mph	10.9 mph	28.98 in	0.00 in	0.00 in	w/m²
12:34 PM	63.4 °F	63.1 °F	99 %		6.4 mph	9.3 mph	28.98 in	0.00 in	0.00 in	w/m²
12:39 PM	63.5 °F	63.2 °F	99 %	NNE	7.7 mph	9.6 mph	28.98 in	0.00 in	0.00 in	w/m²
12:44 PM	63.6 °F	63.3 °F	99 %	North	7.4 mph	11.6 mph	28.98 in	0.00 in	0.00 in	w/m²
12:49 PM	64.4 °F	64.1 °F	99 %	NE	4.9 mph	7.7 mph	28.97 in	0.00 in	0.00 in	w/m²
12:54 PM	64.3 °F	64.0 °F	99 %	ENE	8.3 mph	11.9 mph	28.98 in	0.00 in	0.00 in	w/m²

Meteorological station at the St-Dominique Association de Vol à Voiles Champlain

Note: this station is at ground level, 18 km away from the PVLMY North takeoff site

Weather History for ISAINTDO30

Previous | Daily Mode | June | 10 | 2021 | View | Next

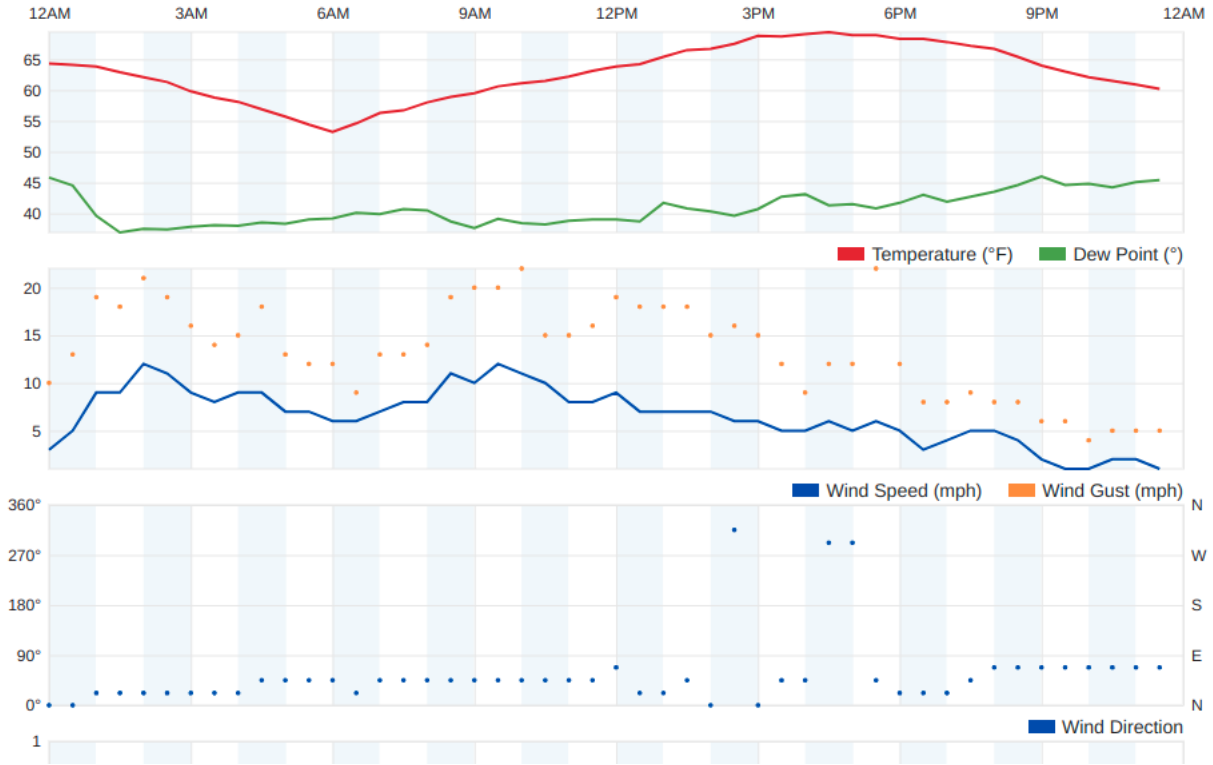
Summary
June 10, 2021

	High	Low	Average
Temperature	69.4 °F	53.2 °F	62.7 °F
Dew Point	46.0 °F	36.9 °F	40.8 °F
Humidity	59 %	36 %	45 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	12.0 mph	1.0 mph	6.5 mph
Wind Gust	22.0 mph	–	13.5 mph
Wind Direction	--	--	NNE
Pressure	30.23 in	30.12 in	--

Graph | Table

June 10, 2021



Weather History for ISAINTDO30

Previous | Daily Mode | June | 10 | 2021 | View | Next

Summary
June 10, 2021

	High	Low	Average
Temperature	69.4 °F	53.2 °F	62.7 °F
Dew Point	46.0 °F	36.9 °F	40.8 °F
Humidity	59 %	36 %	45 %
Precipitation	0.00 in	--	--

	High	Low	Average
Wind Speed	12.0 mph	1.0 mph	6.5 mph
Wind Gust	22.0 mph	–	13.5 mph
Wind Direction	--	--	NNE
Pressure	30.23 in	30.12 in	--

Graph | Table

June 10, 2021

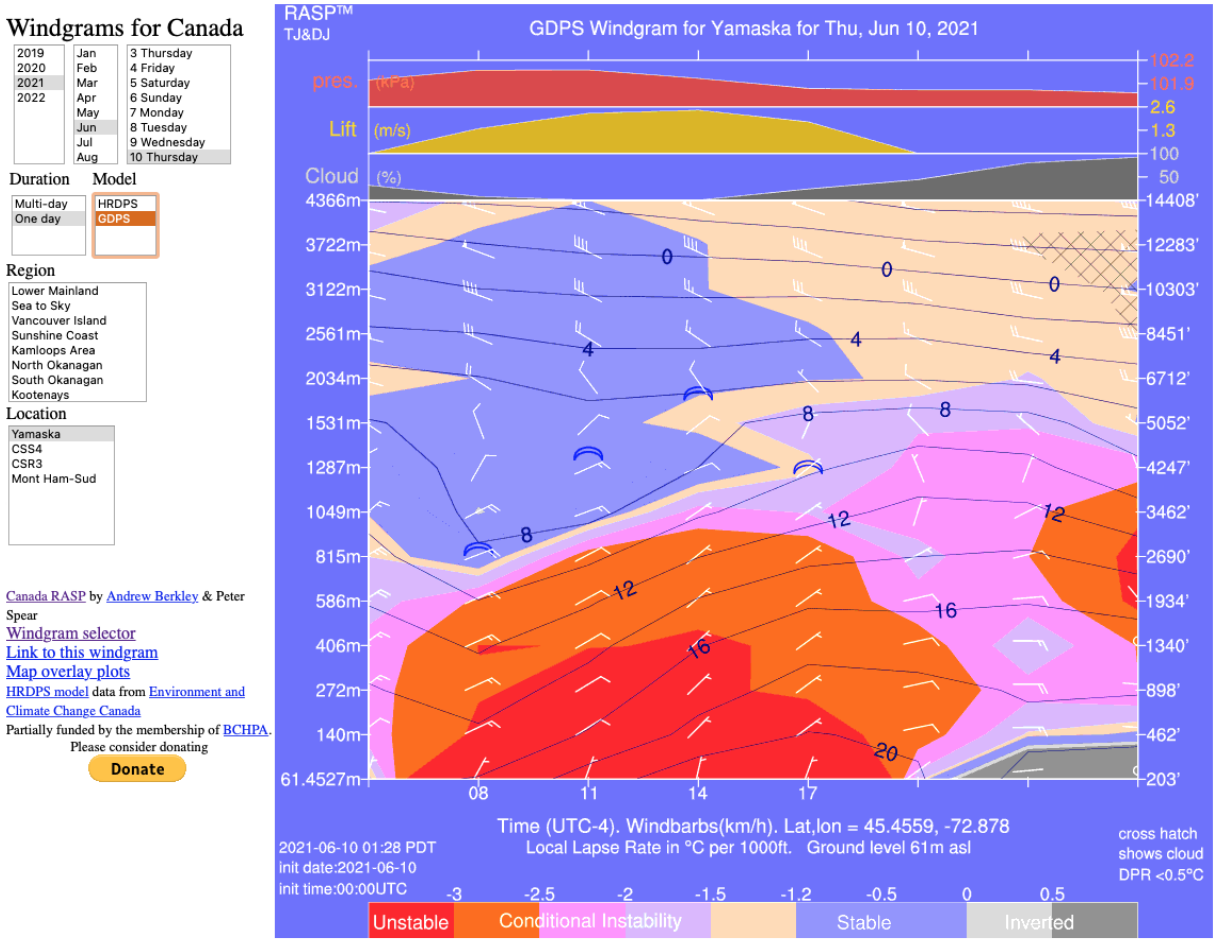
Time	Temperature	Dew Point	Humidity	Wind	Speed	Gust	Pressure	Precip. Rate.	Precip. Accum.	UV	Solar
12:00 AM	64.3 °F	45.8 °F	51 %	North	3.0 mph	10.0 mph	30.12 in	0.00 in	0.00 in		w/m²
12:30 AM	64.1 °F	44.5 °F	49 %	North	5.0 mph	13.0 mph	30.13 in	0.00 in	0.00 in		w/m²
1:00 AM	63.8 °F	39.6 °F	41 %	NNE	9.0 mph	19.0 mph	30.14 in	0.00 in	0.00 in		w/m²
1:30 AM	62.9 °F	36.9 °F	38 %	NNE	9.0 mph	18.0 mph	30.14 in	0.00 in	0.00 in		w/m²
2:00 AM	62.1 °F	37.5 °F	40 %	NNE	12.0 mph	21.0 mph	30.12 in	0.00 in	0.00 in		w/m²
2:30 AM	61.3 °F	37.4 °F	41 %	NNE	11.0 mph	19.0 mph	30.13 in	0.00 in	0.00 in		w/m²
3:00 AM	59.8 °F	37.8 °F	44 %	NNE	9.0 mph	16.0 mph	30.14 in	0.00 in	0.00 in		w/m²
3:30 AM	58.8 °F	38.1 °F	46 %	NNE	8.0 mph	14.0 mph	30.14 in	0.00 in	0.00 in		w/m²
4:00 AM	58.1 °F	38.0 °F	47 %	NNE	9.0 mph	15.0 mph	30.15 in	0.00 in	0.00 in		w/m²
4:30 AM	56.9 °F	38.5 °F	50 %	NE	9.0 mph	18.0 mph	30.15 in	0.00 in	0.00 in		w/m²
5:00 AM	55.7 °F	38.3 °F	52 %	NE	7.0 mph	13.0 mph	30.16 in	0.00 in	0.00 in		w/m²
5:30 AM	54.4 °F	39.0 °F	56 %	NE	7.0 mph	12.0 mph	30.17 in	0.00 in	0.00 in		w/m²
6:00 AM	53.2 °F	39.2 °F	59 %	NE	6.0 mph	12.0 mph	30.18 in	0.00 in	0.00 in		w/m²
6:30 AM	54.6 °F	40.1 °F	58 %	NNE	6.0 mph	9.0 mph	30.19 in	0.00 in	0.00 in		w/m²

6:30 AM	54.6 °F	40.1 °F	58 %	NNE	6.0 mph	9.0 mph	30.19 in	0.00 in	0.00 in	w/m²
7:00 AM	56.3 °F	39.9 °F	54 %	NE	7.0 mph	13.0 mph	30.19 in	0.00 in	0.00 in	w/m²
7:30 AM	56.7 °F	40.7 °F	55 %	NE	8.0 mph	13.0 mph	30.20 in	0.00 in	0.00 in	w/m²
8:00 AM	58.0 °F	40.5 °F	52 %	NE	8.0 mph	14.0 mph	30.22 in	0.00 in	0.00 in	w/m²
8:30 AM	58.9 °F	38.7 °F	47 %	NE	11.0 mph	19.0 mph	30.23 in	0.00 in	0.00 in	w/m²
9:00 AM	59.5 °F	37.6 °F	44 %	NE	10.0 mph	20.0 mph	30.22 in	0.00 in	0.00 in	w/m²
9:30 AM	60.6 °F	39.1 °F	45 %	NE	12.0 mph	20.0 mph	30.22 in	0.00 in	0.00 in	w/m²
10:00 AM	61.1 °F	38.4 °F	43 %	NE	11.0 mph	22.0 mph	30.22 in	0.00 in	0.00 in	w/m²
10:30 AM	61.5 °F	38.2 °F	42 %	NE	10.0 mph	15.0 mph	30.23 in	0.00 in	0.00 in	w/m²
11:00 AM	62.2 °F	38.8 °F	42 %	NE	8.0 mph	15.0 mph	30.21 in	0.00 in	0.00 in	w/m²
11:30 AM	63.1 °F	39.0 °F	41 %	NE	8.0 mph	16.0 mph	30.21 in	0.00 in	0.00 in	w/m²
12:00 PM	63.8 °F	39.0 °F	40 %	ENE	9.0 mph	19.0 mph	30.21 in	0.00 in	0.00 in	w/m²
12:30 PM	64.2 °F	38.7 °F	39 %	NNE	7.0 mph	18.0 mph	30.20 in	0.00 in	0.00 in	w/m²
1:00 PM	65.4 °F	41.7 °F	42 %	NNE	7.0 mph	18.0 mph	30.19 in	0.00 in	0.00 in	w/m²
1:30 PM	66.5 °F	40.8 °F	39 %	NE	7.0 mph	18.0 mph	30.18 in	0.00 in	0.00 in	w/m²
2:00 PM	66.7 °F	40.3 °F	38 %	North	7.0 mph	15.0 mph	30.18 in	0.00 in	0.00 in	w/m²
2:30 PM	67.5 °F	39.6 °F	36 %	NW	6.0 mph	16.0 mph	30.19 in	0.00 in	0.00 in	w/m²
3:00 PM	68.8 °F	40.7 °F	36 %	North	6.0 mph	15.0 mph	30.18 in	0.00 in	0.00 in	w/m²
3:30 PM	68.7 °F	42.7 °F	39 %	NE	5.0 mph	12.0 mph	30.16 in	0.00 in	0.00 in	w/m²
4:00 PM	69.1 °F	43.1 °F	39 %	NE	5.0 mph	9.0 mph	30.15 in	0.00 in	0.00 in	w/m²
4:30 PM	69.4 °F	41.3 °F	36 %	WNW	6.0 mph	12.0 mph	30.15 in	0.00 in	0.00 in	w/m²
5:00 PM	68.9 °F	41.5 °F	37 %	WNW	5.0 mph	12.0 mph	30.15 in	0.00 in	0.00 in	w/m²
5:30 PM	68.9 °F	40.8 °F	36 %	NE	6.0 mph	22.0 mph	30.13 in	0.00 in	0.00 in	w/m²
6:00 PM	68.3 °F	41.7 °F	38 %	NNE	5.0 mph	12.0 mph	30.13 in	0.00 in	0.00 in	w/m²
6:30 PM	68.3 °F	43.0 °F	40 %	NNE	3.0 mph	8.0 mph	30.12 in	0.00 in	0.00 in	w/m²
7:00 PM	67.8 °F	41.9 °F	39 %	NNE	4.0 mph	8.0 mph	30.13 in	0.00 in	0.00 in	w/m²
7:30 PM	67.2 °F	42.7 °F	41 %	NE	5.0 mph	9.0 mph	30.13 in	0.00 in	0.00 in	w/m²
8:00 PM	66.7 °F	43.5 °F	43 %	ENE	5.0 mph	8.0 mph	30.13 in	0.00 in	0.00 in	w/m²
8:30 PM	65.4 °F	44.6 °F	47 %	ENE	4.0 mph	8.0 mph	30.14 in	0.00 in	0.00 in	w/m²
9:00 PM	64.0 °F	46.0 °F	52 %	ENE	2.0 mph	6.0 mph	30.14 in	0.00 in	0.00 in	w/m²

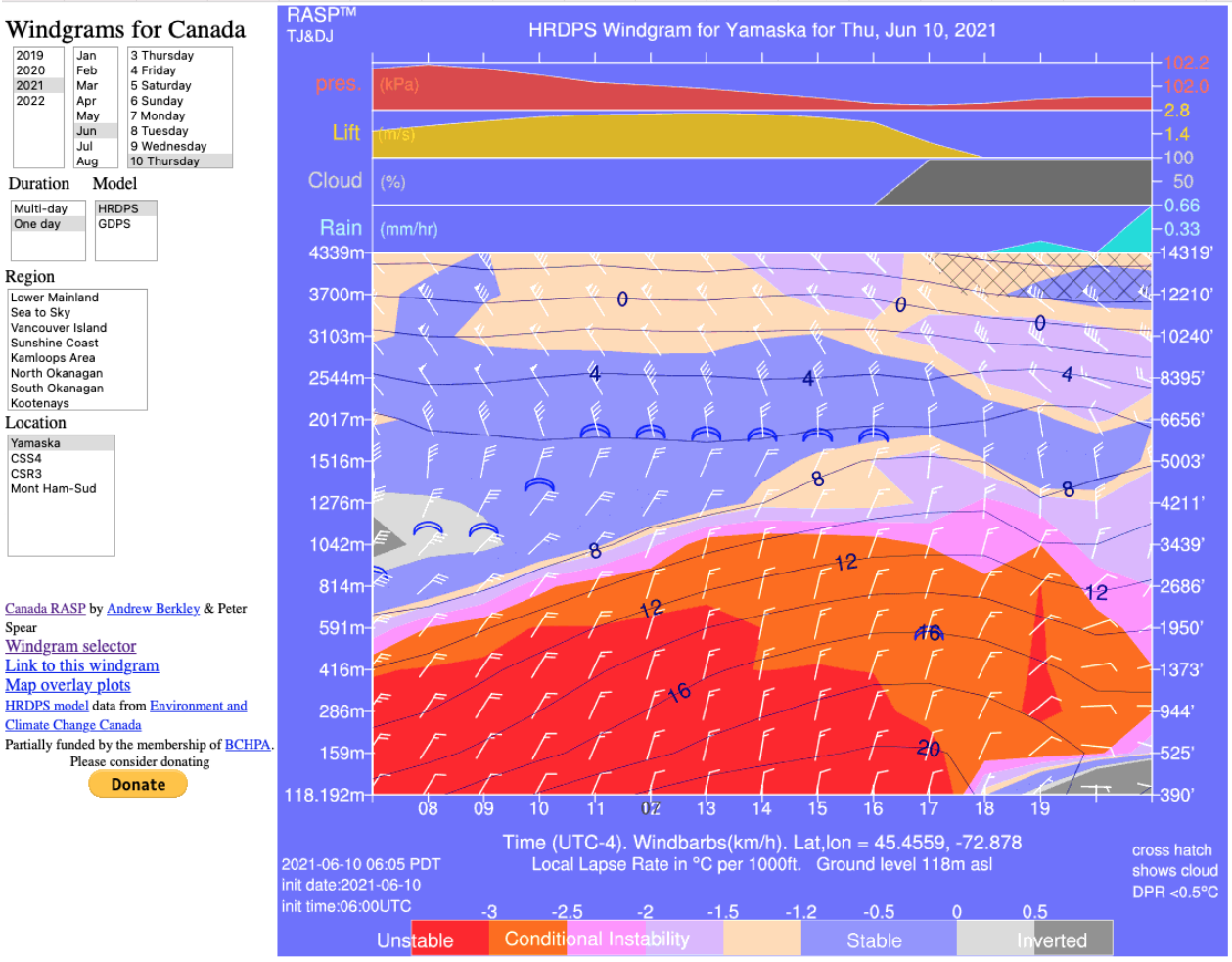
Nav Canada's weather station at St-Hubert airport, Québec

Canada Regional Atmospheric Soaring Predictor (RASP) based on Environment and Climate Change Canada's data

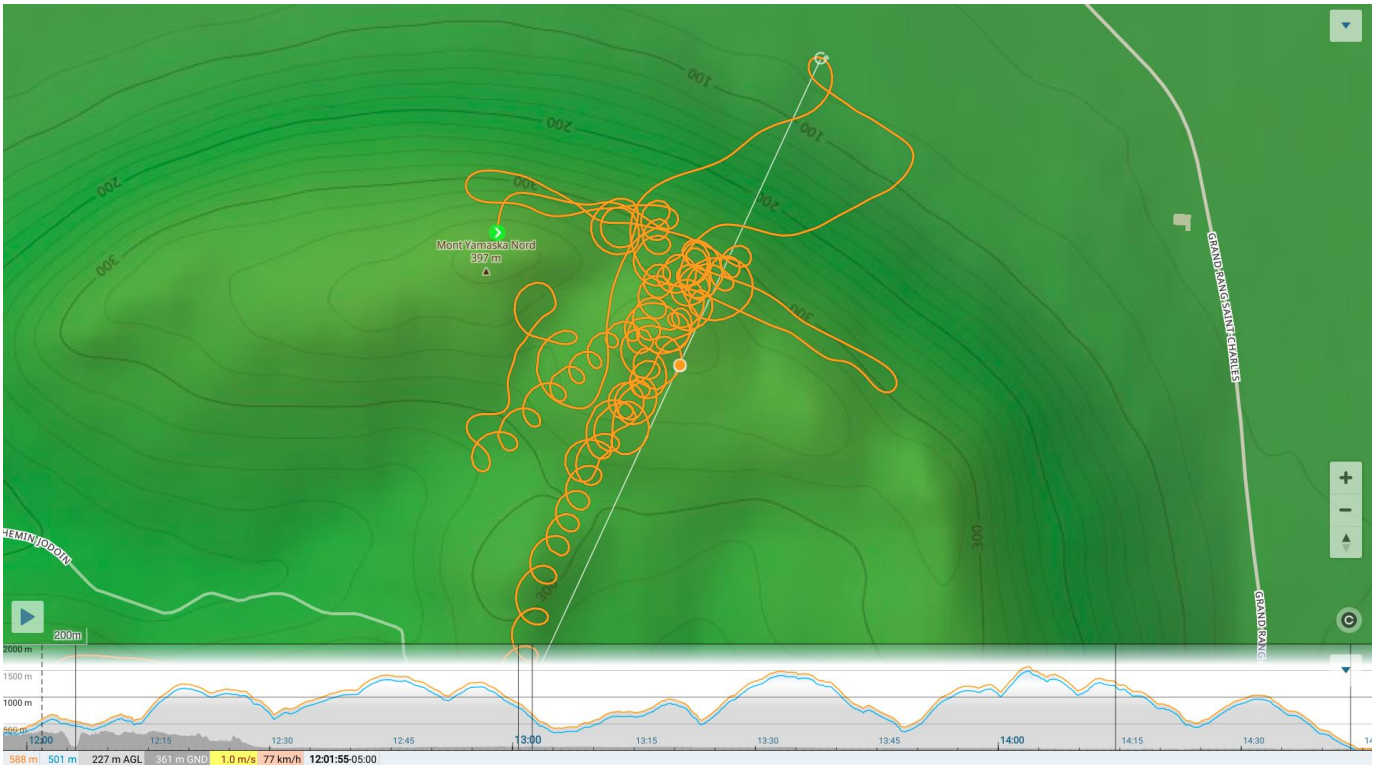
Windgram GDPS



Windgram HRDPS



Appendix 9: GPS track of the first hang glider that took off at 1 p.m.



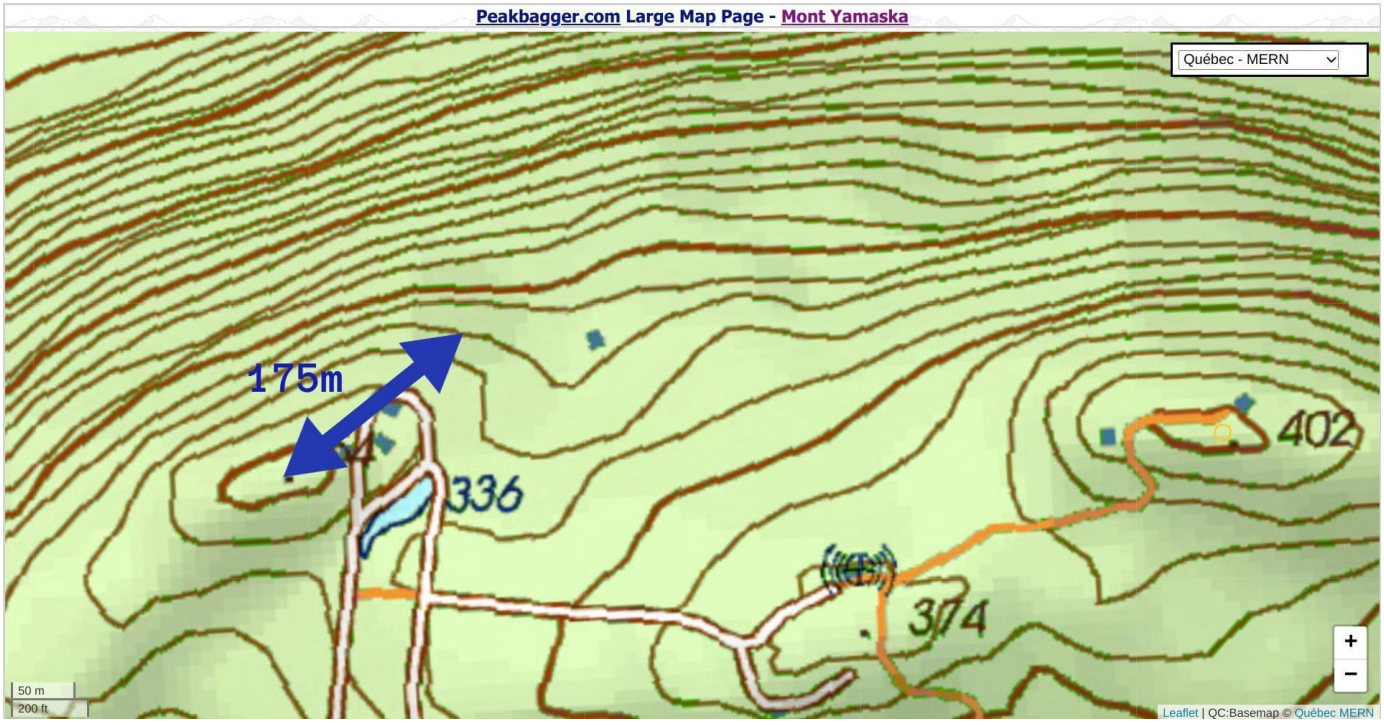
Note: discussion with the pilot confirms that the hour posted by XContest from which this screenshot was taken is erroneous; it should read 13:01:55.

Appendix 10: Characteristics of interest of the North PVLMY takeoff site

Takeoff orientation axis

Tree line on the North-East, right-hand side of takeoff site

Mountain terrain profile close to the North PVLMY takeoff site



Appendix 11: Glossary

Aerology	(micrometeorology) In the context of Paragliding: The study of atmospheric effects (wind gradient, rotors, eddies, turbulence) on very small scales down to tens of meters that directly affect a paraglider in flight.
All-up-weight	(in-flight weight, MTOW) combined weight of the aircraft, pilot, and equipment. The all-up-weight range of a paraglider indicates the minimum and maximum all-up-weight for which the wing was certified.
Arms Up	A term indicating a condition wherein the pilot is not applying the brakes.
Autorotation	A spontaneous un-commanded turn left or right due to asymmetry in forces acting upon the wing.
Brakes	Two control lines with handles for the pilot that pull down the left and right outer trailing edge of the wing, increasing drag and increasing the angle of attack on that side. Applying one brake causes the wing to turn to the side with the applied brake. Applying both brakes slows down the whole wing and is commonly used during the landing flare.
Collapse	An in-flight deflation or partial deflation (expressed in % of the wing that has collapsed) of a paraglider wing. Asymmetric collapse occurs when one side of the wing deflates more than the other side. Can be caused by a strong downdraft such as when exiting a strong thermal or flying in rotor turbulence behind an obstacle. Certain pilot inputs, including use of speedbar, increases the possibility of a collapse.
Dynamic Flight	A type of soaring flight using either thermal lift or orographic (ridge) lift to sustain a glider in extended flight.
CVLY	Club de vol libre Yamaska A not-for-profit club that owns several takeoff and landing sites on and around Mont Yamaska.
DHV	Deutscher Gleitschirm- und Drachenflugverband e.V. German Paragliding and Hang Gliding Association
DHV-1	A paraglider certification issued by the DHV Technical Department, considered equivalent to EN-A (European Standard EN-926) for paragliders suitable for training beginner pilots. They are required to demonstrate high passive safety with high resistance to pilot errors and turbulence, and rapid recovery from upsets without pilot input. However, these passive safety characteristics can be adversely affected by pilot input including use of the speedbar.
HPAC/ACVL	The Hang Gliding and Paragliding Association of Canada / Association Canadienne de Vol Libre A not-for-profit association of hang glider and paraglider pilots.

Kiting	Inflating a paraglider without intent to launch. Typically performed on flat or slightly sloping ground to train new pilots to manage their wing in various wind conditions. Also used as a means inspecting a wing to look for obvious defects in shape and structure.
Paraglider	A lightweight, free-flying, foot-launched glider aircraft with no rigid primary structure, wherein the pilot sits in a harness suspended below a hollow fabric wing whose shape is formed by the fabric geometry, its suspension lines, the pressure of air entering vents in the front of the wing and the aerodynamic forces of the air flowing over the outside.
PVLMY	Parc de vol libre du Mont Yamaska A private organization that owns, and offers annual or weekly paid access to, several takeoff and landing sites on and around Mont Yamaska, including the landing/training field used by the School.
Risers	Two straps (left/right) that connect the pilot harness to the multitude of main lines that extend up to the sail.
SOP-410-8	HPAC/ACVL Pilot Rating System, defines the requirements to attain, and recommended operating limitations for, various levels of pilot ratings. P1 Beginner Paraglider Pilot P2 Novice Paraglider Pilot P3 Intermediate Paraglider Pilot P4 Advanced Paraglider Pilot H1 Beginner Hang Glider Pilot H2 Novice Hang Glider Pilot H3 Intermediate Hang Glider Pilot H4 Advanced Hang Glider Pilot
Speedbar	(accelerator, speed system) A feature of many paragliders that reduces the angle of attack of the wing thereby increasing airspeed. The speedbar is typically implemented as a bar (footrest) at the pilot's feet with two or more steps not unlike a rope ladder. By placing their feet on a particular rung and extending their legs partially or fully a pilot may select a particular airspeed. Note: Paraglider static safety tests are performed with no speedbar applied and with no pilot input ("hands up") at the manufacturer's standard angle of attack. Paraglider stability and resistance to collapse is adversely affected by the application of the speedbar.
Streamer	(flame, telltale) A more sensitive wind indicator comprising a thin and/or tapered strip of plastic or light fabric, typically mounted a short distance upwind and/or to the side of a launch location, intended to indicate wind speed, direction, and localized turbulence in the immediate vicinity.
Trims	(trim system) a system installed on the risers of some paragliders to adjust the angle of attack of the wing, similar in function to the speed bar, but instead designed to be adjusted infrequently by hand.

Vario	(Variometer) A flight instrument sensitive to small changes in altitude capable of indicating changes in vertical velocity virtually instantaneously. Employed by paraglider pilots to help detect and center themselves within rising air and avoid sinking air.
Vario GPS	A Vario with an integrated Global Positioning System (GNSS) receiver, used by paraglider pilots for navigation and logging flights; typically capable of logging flight data including position, ground speed, heading and altitude at regular intervals as short as once per second.
Weight-Shift	A technique used alone or with application of one brake to turn the wing. Pilot leans to one side shifting more of their weight to one riser which induces a tendency to turn to that side.
Windsock	A wind indicator comprising a tapered cylinder of fabric, typically mounted well above obstructions, intended to indicate the prevailing wind speed, direction, and significant turbulence.