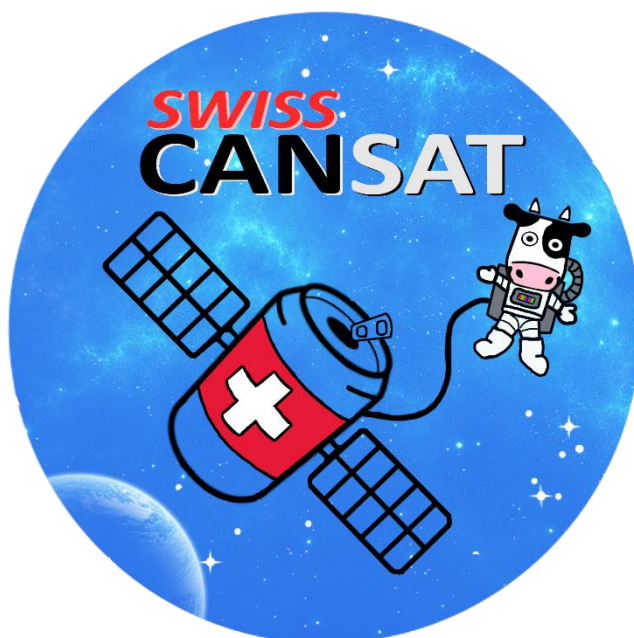


Swiss CanSat

CanSat Competition for Swiss High Schools

Guidelines: 2021-2022



Presented by HES-SO, Issue 2

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Overview of the SwissCanSat

Introduction

The **SwissCanSat** competition is an educational initiative for teams of **Swiss** secondary school students to design, build, and launch their own miniature **satellite**, to ensure the availability of a highly qualified workforce in the space (but not only!) industry of the future. The challenge for the students is to fit all the major subsystems found in a satellite, such as power, sensors, and a communication system, within the volume and shape of soft drinks **can**.

The CanSat is launched by an aerostatic balloon to an altitude of less than one kilometer. The CanSat mission starts from that altitude carrying out a scientific experiment and/or a technology demonstration, achieving a safe landing, and analyzing the data collected.

The missions

Scientists and engineers need to work together to create the best satellite design. Here, you will find the outline of your mission and hints to the hardware components you should include.

The team must build a CanSat and program it to accomplish the following **compulsory primary mission**:

- **After the release and during descent, the CanSat shall measure the following parameters once every second:**
 - **Air temperature**
 - **Air pressure**

The **secondary mission** of the CanSat must be selected by the team. Teams can take ideas from real satellite missions or collect scientific data for a specific project, make a technology demonstration for a student-designed component, or any other mission that would fit inside the CanSat and show its capabilities. Teams are invited to take inspiration [from ESA's \(European Space Agency\) missions](#) for designing their own secondary missions, which could form the basis of a real space mission! Teams should also keep in mind the limitations and requirements of the CanSat mission, and consider the feasibility (both technical and administrative, in terms of time and budget) of their chosen mission. Some example secondary missions:

1. *Advanced telemetry*

After the release and during descent, the CanSat measures and transmits telemetry, for example:

- Acceleration
- GPS (Global Position System) location
- Radiation levels

2. *Telecommand*

Scientists and engineers may need to recover their payload, and, therefore, a targeted landing is sometimes necessary. Your CanSat design could include advanced telemetry/telecommand to help navigate a targeted landing during the descent phase of your CanSat. Alternatively, your CanSat could incorporate a bespoke parachute or airbag.

3. Targeted landing

Your CanSat can simulate an exploration flight to a new planet, taking measurements on the ground after landing. You should define your exploration mission and identify the parameters necessary to accomplish it (e.g. pressure, temperature, samples of the terrain, humidity, etc.). This may require additional sensors to be included into your CanSat design.

Educational value and benefits of Participating

Through the CanSat project, the participating student teams experience all the phases of a real space project, from selecting the mission objectives, designing their CanSat, integrating the components, testing the system, preparing for launch, and analyzing the scientific data obtained. Throughout this process, the students will:

- Learn by doing;
- Get acquainted with the inquiry-based methodology that is typical of real-life scientific and technical professions;
- Acquire and/or reinforce fundamental Technology, Physics, and programming curricular concepts;
- Understand the importance of coordination and teamwork;
- Enhance their communication skills.

Eligibility to Participate

1. The team should comprise between 4 and 6 students, assisted by a teacher from their institution and a tutor from the HE (in French, Hautes Écoles) or HES (in French, Hautes Écoles Spécialisées). At least 4 of these students must be over 14 years of age at the time of the launch campaign and members must be enrolled full-time in a Swiss secondary school.
2. At least 50% of the students included in a team must be nationals of an ESA Member State, Slovenia, Latvia, or Canada (a full list of Member States can be found [here](#)).
3. University or higher education students cannot participate in this competition.
4. Each team should have a teacher and a tutor from HE or HES responsible for monitoring the team's technical progress, available to offer help and advice, and acting as the point of contact between the team and the Swiss national organizers. The teacher must be available to attend an introductory workshop and must accompany the team to the competition launch campaign.
5. A team may not participate in the SwissCanSat Challenge more than once, except for the teacher and mentor and, at most, one student from any former team.

Language of Communication

English is the official language for written reports and oral presentations. Note that for the European CanSat Competition, the working language is English.

Registration Fee

Participation is free of charge.

Contact Information

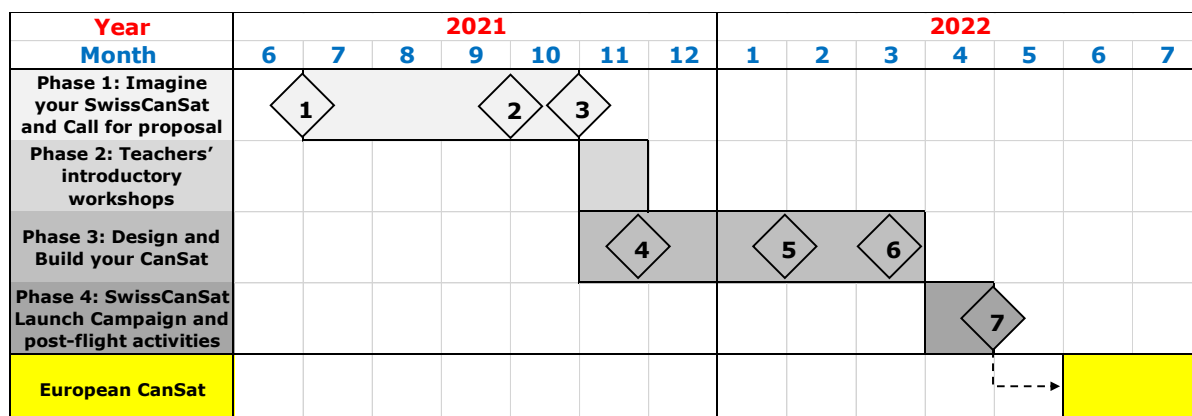
If you need help for getting started, feel free to contact us through the Website or by email at swisscansat@hes-so.ch.

Useful links and learning material

- SwissCanSat website: <https://www.hes-so.ch/swisscansat>.
- SwissCanSat Wiki: <http://mondzeu.ydns.eu/wikis/cansat>
- Supporting learning materials are available on the [ESA CanSat website](#) and on other national [CanSat competition websites](#).

Competition timeline

The timeline of the competition is shown in the following image with the corresponding key dates for the 2021 edition:



Phase 1: Imagine your CanSat and Call for proposal	
Activity/Event (Milestone M#)	Deadline
Call for proposal opens (M1)	July 2021
Deadline for application from prospective teams (M2)	October 2021
Announcement of selected teams (M3)	October 2021
Phase 2: Teachers' introductory workshops	
Activity/Event	Deadline
CanSat workshop for teachers	November 2021
Phase 3: Design and Build your CanSat	
Activity/Event (Milestone M#)	Deadline
Preliminary Design Review (PDR) package due from teams (M4)	November 2021
PDR review comments given to teams	December 2021
Critical Design Review (CDR) package due from teams (M5)	January 2022
CDR review comments given to teams	February 2022
Final Design Report (FDR) due from teams (M6)	March 2022
Phase 4: SwissCanSat Launch Campaign and post-flight activities	
Activity/Event (Milestone M#)	Deadline
Preparation of launch campaign(s)	April 2022
Swiss launch campaign(s)	April 2022
The 'Best SwissCanSat Project' prize will be awarded to the SwissCanSat winner (M7)	April 2022

Table 1: SwissCanSat Schedule

Some dates may be subject to change, particularly in the context of the ongoing global pandemic. Each phase is detailed in the following pages and, please, refer to the official [SwissCanSat webpage](#) for the exact dates of your year competition.

Phase 1: Imagine your CanSat and Call for proposal

Year	2021												2022						
Month	6	7	8	9	10	11	12	1	2	3	4	5	6	7					
Phase 1: Imagine your SwissCanSat and Call for proposal	1			2	3														
Phase 2: Teachers' introductory workshops																			
Phase 3: Design and Build your CanSat						4		5	6										
Phase 4: SwissCanSat Launch Campaign and post-flight activities												7							
European CanSat																			

Call for proposal: how to apply

Teams must submit their applications through the website www.hes-so.ch/swisscansat as follow:

- The SwissCanSat application form is available on the website www.hes-so.ch/swisscansat by the beginning of July (M1).
- The completed application form has to be sent via the section "Contact Us" on the website www.hes-so.ch/swisscansat, or by email to the following address: swisscansat@hes-so.ch.
- The deadline to submit the application (M2) is Friday 1st October 2021, 23:59 CET.
- When applying, please read our Guidelines carefully.
- The maximum number of students for each team is 6.

Team selection: criteria and jury

The jury, appointed by HES-SO (University of Applied Sciences and Arts of Western Switzerland) and MeteoSwiss, will be composed of CanSat experts, education experts, or engineers and scientists who will evaluate the received applications, taking into account the CanSat Pre-launch Reports. The jury will have 4-6 members, and their fields of expertise can vary from science to space engineering or education. The teams will be selected by assessing the following criteria:

1. **Team organization (2/5 of the total score)**
The jury evaluates the team structure and allocation of resources to reach the project scope.
2. **Scientific value (2/5 of the total score)**
The scientific value of the teams' secondary missions will be evaluated. This includes the scientific relevance of the mission and the team's scientific understanding of the scientific principles that underlie the project.
3. **Outreach program (1/5 of the total score)**
The jury will take into account how the project will be communicated to the school and the local community, taking into account web pages, blogs, presentations, promotional material, media coverage, etc.

By the end of October (M3), all applicant teams will be noticed with the outcome of the selection.

Due to the time constraints and logistics of holding the launch campaign(s), not all teams which apply may be selected. A maximum number of teams is fixed at 6 for the 2021-22 competition.

Phase 2: Teachers' introductory workshops

Year	2021							2022						
Month	6	7	8	9	10	11	12	1	2	3	4	5	6	7
Phase 1: Imagine your SwissCanSat and Call for proposal	1			2	3									
Phase 2: Teachers' introductory workshops														
Phase 3: Design and Build your CanSat						4		5	6					
Phase 4: SwissCanSat Launch Campaign and post-flight activities											7			
European CanSat														

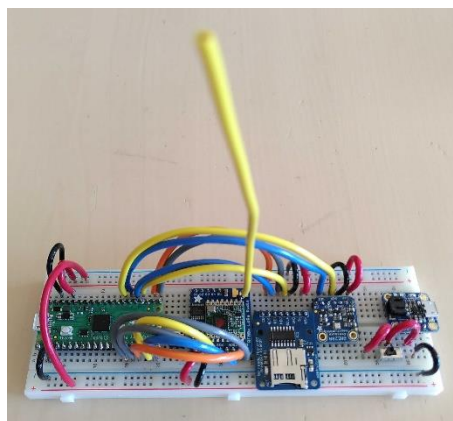
Before the students start work on their projects, a workshop will be held for the teachers of each team. The workshop aims at introducing the CanSat concept, demonstrating how the hardware and software work, and allowing teachers to build their own CanSat. For the 2021-22 competition, these workshops will be accessible online from November 2021 and teachers will be notified by the email indicated in the Application Form (image after).

In the Application Form

Contact details	
Team name	
Students' names, ages and dates of birth	1: 2: 3: 4: 5: 6: <i>Maximal student number: 6</i>
Contact for communication with organisers	Name: Phone: E-mail:
Teacher/tutor from the team's institution	Name: Phone: E-mail:
Teacher/tutor from the HE/HES	<input type="checkbox"/> We have a teacher/tutor from the HE/HES for our team: <ul style="list-style-type: none"> Name: Phone: E-mail: <input type="checkbox"/> We do not have a teacher/tutor from the HE/HES for our team yet. In this case, a teacher will be assigned to you by the organisers.
School name and town/city	Name: Location:

CanSat Kit

A CanSat kit can be provided to the secondary level teachers if they want to use it and if the team is selected. The following picture shows the breadboard model to implement the primary mission.



This implementation comprises the necessary hardware items to be used on the day where the CanSat competition will be presented to the secondary level teachers who will lead the competition groups.

There will be a different CanSat kits freely available for schools (corresponding value of the kit is of 150 CHF). These will be available on a first-come-first-served basis and team can express their interest to use the kit by the Application Form (see image below).

In the Application Form

Organisation	
How will you distribute the work among the team members? Consider all aspects of your experiment (structure, parachute, power, software, communications, data analysis)	
Do you have access to a workshop or a laboratory?	
How much time will your team have available to work on your CanSat, and how will you spend it?	
How does your team plan to finance its expenses? Are you supported by your school or other sponsors?	
Do you have all the material and equipment needed for your mission? If not, how do you plan to obtain it? Do you require assistance in obtaining any equipment?	
Are you going to use the CanSat kit for primary mission?	<input type="checkbox"/> Probably yes. <input type="checkbox"/> Probably no.

Phase 3: Design and Build your CanSat

Year	2021							2022						
Month	6	7	8	9	10	11	12	1	2	3	4	5	6	7
Phase 1: Imagine your SwissCanSat and Call for proposal	1			2	3									
Phase 2: Teachers' introductory workshops														
Phase 3: Design and Build your CanSat						4		5	6					
Phase 4: SwissCanSat Launch Campaign and post-flight activities											7			
European CanSat														

CanSat construction and test activities

Under the supervision of their teachers, all the teams participating in CanSat will have to carry out technical work on their CanSats, applying the procedures used in the typical lifecycle of a real space project, which are:

- Selection of mission objectives;
- Definition of technical requirements necessary to achieve these objectives;
- Design of hardware and software;
- Reporting;
- Design of ground station/ground telecommunication system;
- Integration and testing of the CanSat before the launch campaign starts.

Teacher/tutor from the HE or HES

A teacher from either HE or HES will be chosen and associated to each team. Whether the team has already a potential tutor from HE/HES, the team can state him/her in the Application Form (see image after). Otherwise, the organizers will select and assign one to your team.

In the Application Form

Contact details	
Team name	
Students' names, ages and dates of birth	1: 2: 3: 4: 5: 6: <i>Maximal student number: 6</i>
Contact for communication with organizers	Name: Phone: E-mail:
Teacher/tutor from the team's institution	Name: Phone: E-mail:
Teacher/tutor from the HE/HES	<input type="checkbox"/> We have a teacher/tutor from the HE/HES for our team: <ul style="list-style-type: none"> • Name: • Phone: • E-mail: <input type="checkbox"/> We do not have a teacher/tutor from the HE/HES for our team yet. In this case, a teacher will be assigned to you by the organizers.
School name and town/city	Name: Location:

Reporting

Each team needs to submit different reports to the national organizers to track the team's progress. These reports are:

- Preliminary Design Review (PDR), M4
- Critical Design Review (CDR), M5
- Final Design Review (FDR), M6

Please see Annex 1 – Reporting for the reports.

Each review must be submitted to SwissCanSat via email (swisscansat@hes-so.ch) no later than the respective deadlines, before 22:00 CET, with the name of the team and name of the document submitted clearly written in the subject line (e.g., for the CDR, "Team X Critical Design Review"). The document should be attached as a PDF with the following file name format: TeamX_CriticalDesignReview.pdf. The exact deadlines for the review submissions (M4, M5 and M6) will be communicated to the teams after the selection and only to the involved teams.

Phase 4: Launch your CanSat - SwissCanSat Launch Campaign and post-flight activities

Year	2021							2022						
Month	6	7	8	9	10	11	12	1	2	3	4	5	6	7
Phase 1: Imagine your SwissCanSat and Call for proposal	1			2	3									
Phase 2: Teachers' introductory workshops														
Phase 3: Design and Build your CanSat						4		5	6					
Phase 4: SwissCanSat Launch Campaign and post-flight activities											7			
European CanSat														

In order to be eligible for the SwissCanSat launch, the teams will need to have a fully functioning CanSat ready that will have to be delivered to the Payerne aerological station¹, no later than 7 April 2022.

Unfortunately, due to COVID-19 pandemic, travelling and meetings have been heavily impacted in the last year. Beyond a moderate optimism, there is no guarantee that travelling and organize meetings will be allowed in spring 2022, therefore three alternative scenarios are foreseen for the launch campaign (M7):

1. "The SwissCanSat launch campaign is run on-situ"

National Swiss personnel will conduct the launches with the presence of the student teams. An outline of the launch campaign schedule is provided after (subject to modifications):

Day 1	Opening, online presentation of projects to the jury and final integration and technical inspection (by organizers)
Day 2	Launch (by organizers) and recovery operations of CanSats (by teams)
Day 3 (about a week after Day 2)	Online presentation of results by CanSat teams and the awards ceremony in the HES-SO buildings.

2. "The SwissCanSat Competition launch campaign is run by the Swiss organizers and followed online by the student teams"

National Swiss personnel will conduct the launches without the presence of the student teams (rather like a real satellite launch campaign).
An outline of the launch campaign schedule is provided here (subject to modifications):

¹: Please consider the following address: Office fédéral de météorologie et de climatologie MétéoSuisse, Chemin de l'Aérologie 1, CH-1530 Payerne

Day 1	Opening, online presentation of projects to the jury and final integration and technical inspection (by organizers)
Day 2	Launch and recovery operations of CanSats (by organizers).
Day 3	Online presentation of results by CanSat teams Online awards ceremony

A report on the results from the launch is required from each team. The competition winners will then be chosen based on the team's performance throughout the project, as well as the final flight operations and results.

3. "Cancellation of the CanSat Competition Launch Campaign, in the case of tightened COVID-19 restrictions"

Under this scenario, Swiss national personnel would be unable to run Launch Campaign, therefore resulting in cancellation of the event. Therefore, in such a scenario, no flight reports will have to be submitted.

In any case, the organizers cannot be held responsible of launch campaign's cancellation, modification or postponement for reasons beyond their control or any other justified necessity.

As written in the general requirement section, it is recommended to use bright colored fabric for your CanSat, and you could consider other system, like acoustic or radio emitters on your CanSat, to facilitate the recovery missions after landing. Moreover, remote sensing instrumentation available at the launch site could support the CanSats' recovery missions. On the other hand, CanSats are expected to be found within a large area around the launch site: CanSat recovery is not guaranteed.

Primary mission: required data to send

The measurements taken during the flight must be stored in a file (*.CSV format). The participants will send the CSV file with the data to the organizers before "Day 3" as well as the graph(s) of flight data with a PNG image(s).

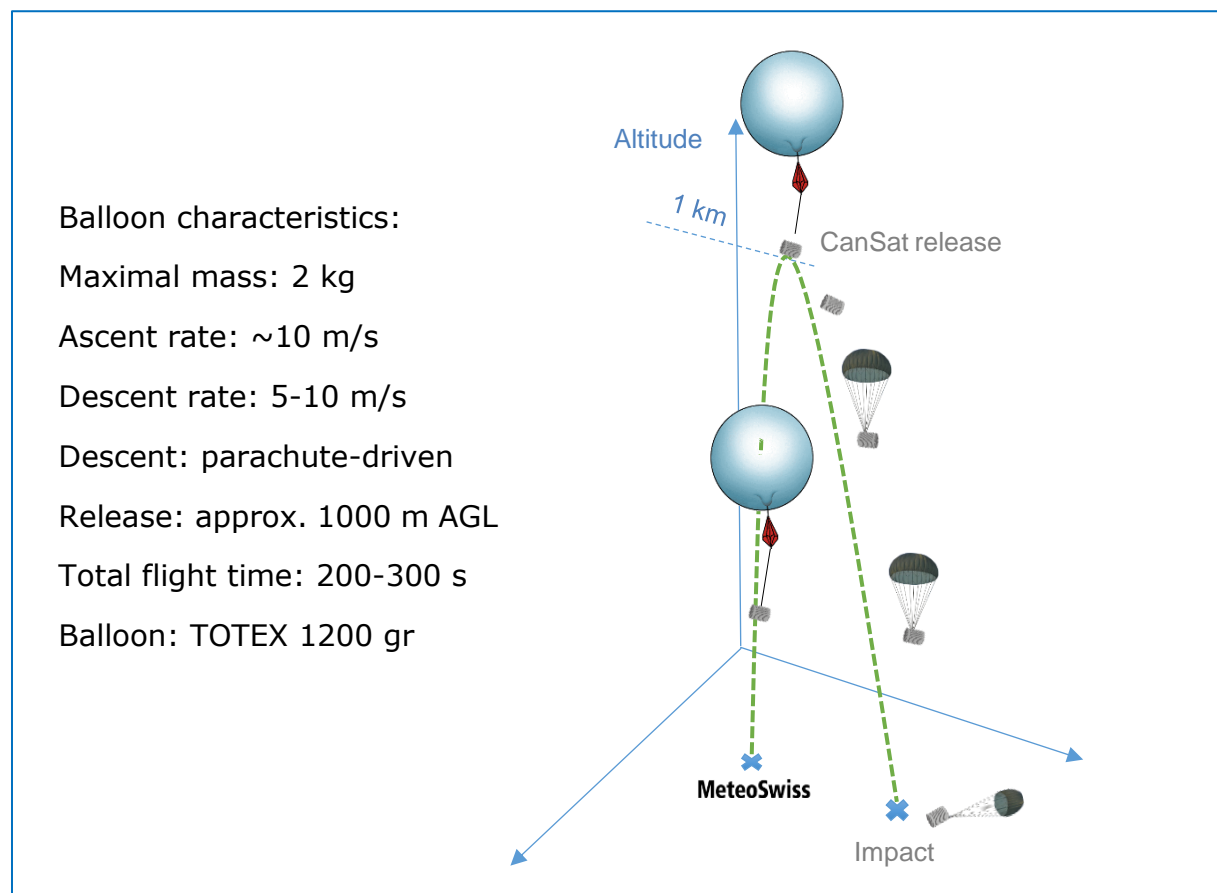
Technical requirements

The CanSat competition is designed to simulate all aspects of a real satellite mission including design, development, testing, launch, operations, and data analysis, by means of teamwork.

Balloon specifications

MeteoSwiss will provide the launch platform for the competition. The CanSats will be launched by aerostatic balloons, to an altitude of approximately from 500 m to 1000 m.

The balloon with the attached CanSats is launched from the aerological station of MeteoSwiss in Payerne (Switzerland). An automatic release system attached to the balloon and hosting the CanSat will release the payload at the target of 1 km AGL altitude. Once the CanSats are released, after the deployment of its embedded parachute, the descent is smoothed until ground impact. The CanSat is usually found within 1-3 km from the launch site as it is shown and described in the next paragraph. The best near-real-time impact forecast will be provided using the remote sensing instrumentation available at the MeteoSwiss Payerne site like wind lidar and wind profiler technologies. However, recovery of the CanSats cannot be guaranteed. An example of balloon drop-off from the altitude of 1 km AGL (above ground level) is given in the image below.



The criteria set for the wind force to decide whether a CanSat flight will be performed or not, are defined on the basis of the closest-in-time wind profile by the windprofiler of Payerne and the COSMO model. In case these limits will be exceeded, the launch day will be postponed.

SwissCanSat requirements

To verify that the CanSats are suitable for launch, a technical inspection will take place at the beginning of each CanSat launch campaign. The evaluated requirements are:

- Air temperature and air pressure must be stored at least every second in an on-board removable memory card. This card must be easily accessible/removable to the launch operators.
- Live radio frequency reception are possible, but it has to be discussed with the organizers to decide whether the data should be stored in an on-board removable memory card and/or transmitted to ground.
- The CanSats must include a loud audible retrieval system (e.g. beeper) since data could be stored only on-board.
- The CanSat must include a visual indicator (e.g. LED) to show the power is switched ON. This will help the launch operators to check the CanSat is ready for launch.

General requirements

The CanSat hardware and mission must be designed following these requirements and constraints:

1. The components of the CanSat must fit inside a standard soft drinks can (115 mm height and 66 mm diameter), with the exception of the parachute. Radio antennas and GPS antennas can be mounted externally on the top or bottom of the can, depending on the design, but not on the sides.
Note: The payload area usually has 4.5 cm of space per CanSat available, along the can's axial dimension (i.e. height), which must accommodate all external elements, including parachute, parachute attachment hardware, and any antennas.
2. The weight of the CanSat must be between a 300 gr and 350 gr. CanSats that are lighter must take additional ballast with them to reach the 300 gr minimum mass limit required.
3. Explosives, detonators, pyrotechnics, and inflammable or dangerous materials are strictly forbidden. All materials used must be safe for the personnel, the equipment, and the environment. In case of doubt by organizer, Material Safety Data Sheets (MSDS) may be requested from the teams.
4. The CanSat must be powered by a battery and/or solar panels. It must be possible for the systems to remain switched on for four continuous hours.
5. The battery must be easily accessible in case it needs to be replaced/recharged.
6. The CanSat must have an easily accessible master power switch.
7. The CanSat should have a recovery system, such as a parachute, capable of being reused after launch. It is recommended to use bright colored fabric, which will facilitate recovery of the CanSat after landing.

8. The parachute connection must be able to withstand up to 500 N of force. The strength of the parachute must be tested to ensure that the system will operate nominally.
9. For recovery reasons, a maximum flight time of 120 seconds is recommended. If attempting a directed landing, then a maximum of 170 seconds flight time is recommended.
10. A descent rate between 8 and 11 m/s is recommended for recovery reasons. However, the CanSat's descent speed must not be lower than 5 m/s or higher than 12m/s for safety reasons. Additionally, the airfield or weather conditions might determine additional mandatory restrictions on the velocity.
11. The CanSat must be able to withstand an acceleration of up to 20 g.
12. The total budget of the final CanSat model should not exceed 550 CHF. Ground Stations (GS), ground support equipment, such as laptops, power supplies, antennas, and any related non-flying item will not be considered in the budget. If provided to your school the CanSat kit, please consider a cost of 150 CHF into your budget. More information regarding the penalties in case the teams exceed the stated budget can be found in the next section.
13. In the case of sponsorship, all sponsored items should be specified in the budget with the actual corresponding costs on the market.
14. Live radio frequency reception are possible but it has to be discussed with the national organizers who will decide whether the data should be stored in an on-board removable memory card and/or transmitted to ground. If radio communication is accepted by the organizers, the assigned frequency must be respected by all teams in the Launch Campaign and radio transmission to ground will be based on a LoRa system at 433 MHz. It is recommended that teams pay attention to the design of the CanSat in terms of hardware integration and interconnection, so the radio frequency can be easily modified if necessary.
15. The CanSat must be flight-ready by the deadline specified by the organizer.

Meeting the general requirements for the Swiss Launch Campaign

To verify that the CanSats are suitable for launch, a technical inspection and a drop test will take place at the beginning of each Swiss CanSat launch campaign. The way the requirements are evaluated is as follows:

- **Requirements 1, 2, 6 and 10 will be evaluated** on site by a dedicated SwissCanSat technical team. If the physical event takes place with online participation from the student teams, these tests will be carried out by Swiss operators and therefore teams will only have 1 chance to pass.
- **Requirements 8 and 11** refer to tests that should be carried out prior to the SwissCanSat launch campaign and the proof of these tests being successful should be stated in the PDR.
- A statement of confirmation that the rest of the requirements are met should be included in the final design report, paying special attention to the COVID-19 requirements and **requirement 12**, which must be stated in the document.

Evaluation and Scoring

The jury

The jury, appointed by HES-SO and MeteoSwiss, will be composed of CanSat experts, education experts, or engineers and scientists who will evaluate the teams' performances during "Launch your CanSat – SwissCanSat Launch Campaign and post-flight activities", taking into account the CanSat Pre-launch Reports. The jury members will score the teams during the launch campaign and announce the results from their scoring in the Closing Ceremony. The jury will have 4-6 members, and their fields of expertise can vary from science to engineering or education. The jury board is usually composed of:

- Space science/engineering expert(s)
- IT/Electronics expert(s)
- Education expert(s)

Scoring

The teams will be evaluated on an ongoing basis, with the following items being taken into account:

1. *Technical achievement*

The jury will take into account how the teams obtained the results, how reliable and robust the CanSat was, and how the CanSat performed. Innovative aspects of the project will be judged (e.g. the tools selected and the hardware/software used). The aspects evaluated will be:

- **Mission's technical complexity:** The CanSat's technical level, understanding of the technical concepts and the originality of the engineering aspects of the mission.
- **Performance of the Primary mission:** The CanSat's technical performance in terms of deployment and data collection for the Primary Mission.
- **Performance of the Secondary mission:** The CanSat's technical performance in terms of deployment and data collection for the Secondary Mission

2. *Scientific value*

The scientific value of the teams' missions and the teams' scientific skills will be evaluated. This includes the scientific relevance of the mission, the quality of the technical reporting (both written and oral) and the team's scientific understanding that will be assessed from the team's ability to analyze and interpret results appropriately. The aspects evaluated will be:

- **Scientific relevance:** Assessment of whether measurements are done with a clear and well-founded scientific purpose, the extent to which the CanSat is used in an original way and if the data collection is appropriate for reaching the objective.
- **Scientific understanding:** Level of understanding of the scientific principles that underlie the project.
- **Technical reporting:** Ability to summarize with clarity and provide a readable and complete Pre- Launch report, the proper labelling of the graphs and use of the correct units and the ability to present

scientifically sound data and interpretations during the launch campaign.

3. Professional competencies

The Jury will assess the team's collaboration and coordination, adaptability and communication skills. The aspects evaluated will be:

- **Teamwork:** Collaborative effort of the team in order to complete the tasks in the most effective and efficient way.
- **Communication:** Oral presentation skills, the ability to provide a captivating presentation involving confident speaking skills and a visually appealing presentation.

4. Outreach

The team will be awarded points on how the project is communicated to the school and the local community, taking into account web pages, blogs, presentations, promotional material, media coverage etc.

Marking scheme

Each member of the Jury will rank from 1 to 10 for each criterion, and the final score per criterion is the average of the individual marks awarded by the jury's members.

The best overall score is calculated by weighting the individual marks per criterion with the weight indicated in the table below:

#	Best overall score	100%	
1	Technical achievement	35%	
2	Scientific value	35%	
3	Professional competencies	20%	
4	Outreach	10%	

Penalties

Teams' final scores will be penalized with 1% per day of late submission of the CanSat Pre-Launch Report. Similarly, 1% of the final score will be subtracted per 10 CHF extra spent over the maximum CanSat budget of 550 CHF.

Prizes

The award scheme is designed to acknowledge teams' strengths in as fair a way as possible. At the SwissCanSat competition, the prizes will be awarded according to the following categories:

- **Best SwissCanSat Project:** this prize will be awarded to the team with the best overall score. The overall winning team will then be invited to take part in ESA's European CanSat competition alongside the overall winners from other ESA member states taking part in the competition. More information about the European competition and the guidelines for taking part can be found [here](#).
- **Highest Technical Achievement:** this prize will be awarded to the team with the best score in the "Technical Achievement" field.
- **Outstanding Science Mission:** this prize will be awarded to the team with the best score in the "Scientific value" field.
- **Most Professional Team:** this prize will be awarded to the team with the best score in the "Professional competencies" field.
- **Best Outreach prize:** this prize will be awarded to the team with the best score in the "Outreach" field.
- **The Junior Team:** among the teams which participated to the SwissCanSat competition and with a successful primary mission, this prize will be awarded to the team with the youngest student.

The following rules will also apply:

- A team cannot receive more than one prize.
- The 'Best SwissCanSat Project' prize will always be awarded to the team with the highest overall score.
- If a team is ranked the highest in several categories, priority will be given to the highest weighting prizes (Outstanding Science Mission (35%) or Highest Technical Achievement (35%)); in case a team is ranked the highest both in the Scientific value and Technical Achievement fields, the prize awarded will be for the category in which the team has the highest score margin, ahead of the 2nd ranked team in that field.

For example, if one team has the best scores in both Technical Achievement (scoring 8.5 out of 10) and Outreach (scoring 9.5), they will then be granted the Highest Technical Achievement prize because this category has a higher weighting, and the Best Outreach prize will be granted to the second best score in that field.

In a different scenario, where a team has both the best overall score (scoring 8.5) and the best score in Outreach (scoring 9.5), this team will be awarded the SwissCanSat prize instead, as this prize needs to be awarded to the best overall score, and the 2nd ranked team in the 'Outreach' field would receive the respective prize.

Material and intellectual property

The teams will be responsible of the used material (e.g. within their communication programme): videos, images, photos, texts, etc. must be used in agreement with the natural or legal persons who have contributed to their production. Teams must ensure that the texts, visuals and sounds used in their images or in their videos are free of all intellectual or other property rights that third parties may hold or that, failing that, their use has been authorized by the rights holders or by law.

Teams guarantee that they are indeed the authors of the creations that they present within the framework of the competition and that failing this, plagiarism or forgery could be reproached to them and that the team concerned would then be excluded from the competition.

Responsibility

SwissCanSat organizers cannot be held responsible for any failure or abuse of third parties' material, misbehavior of any kind of harm or prejudice to involved people, nor any negative consequences of their activity.

Teams must behave professionally and be respectful. In particular, harassment of any kind, sexist, racist, or exclusionary comments or jokes and offensive comments or jokes related to individual characteristics, for example: age, sexual orientation, disability, physical appearance or religion, are prohibited.

Personal data

By applying and submitting the teams' application, a set of personal data is required from each participant. Their personal data shall be processed only for the purposes of the SwissCanSat organization, and shall not be used for any other purpose. In particular, SwissCanSat organizers do not sell or make available in other ways personal data for commercial purposes. Your data shall be kept as long as it is necessary for the competition organization, and shall be deleted after.

Claims

Any legal remedy regarding the SwissCanSat competition is excluded.

Acceptance of the guidelines

By applying and participating to the SwissCanSat, the participants accept these guidelines. The SwissCanSat organizers may therefore exclude any participant/team from the competition if a participant or team do not respect these guidelines. The exclusion from the competition can be done at any time and without notice.

Finance

This section outlines the expectations as to ownership of costs for the competition. This is for guidance only and does not constitute an agreement between HES-SO and any third party.

HES-SO will pay for:

- Catering for the day 2 and day 3 during the launch campaign (for scenario "The SwissCanSat launch campaign is run on-situ")

The school or sponsors will pay for:

- Transport to and from each event outlined above.
- Any additional electronic equipment required for the secondary mission or ground support.
- Costs associated with more than one teacher and six students from each team attending an event.
- Any costs of cover for teaching.
- Any other costs incurred by the team not specified above.

Further reference

- CanSats in Europe Portal <http://www.esa.int/Education/CanSat>
- CanSat in Europe Facebook page www.facebook.com/cansatsineurope/

Annex 1 – Reporting for PDR, CDR and FDR

Instructions: *this is a template for the CanSat reports – please copy and paste the below template into a separate document and follow it as it is. Maximum page limit for the report is 30 pages, plus unlimited appendices. You should consider your technical solution, your outreach and teamwork and lessons learnt from the process.*

For the final report: *For the final version of this report, we have included sections on the launch day and lessons learned to be included.*

SwissCanSat Report

Team Name

School

Preliminary Design Review (PDR)

Critical Design Review (CDR)

Final Design Review (FDR)

(delete as applicable)

Date: DD/MM/YYYY

Introduction

1.1 Team Organization and Roles

(This part should contain a simple list of people involved, their skills and expected roles)

1.2 Mission Overview

1.2.1 Mission Objectives

(This part is not a description of the CanSat, it is only a summary of the main goals that you CanSat will achieve, and a sentence on what these goals achieve with relation to scientific/engineering objectives)

Primary Mission:

(This part should contain a list of primary objectives of your mission – such as given in CanSat requirements)

Secondary Mission:

(This part should contain a concise list/description of the secondary mission you are planning to achieve)

1.2.2 What will you measure, why and how?

(Concise description of what measurements your CanSat will make, why will you take these measurements and what sensing capabilities will be required. Include some thought on how will you analyze the data)

2 CANSAT DESCRIPTION

2.1 Overview

(A summary on the configuration of your CanSat – detailed information is included in the sections below. A high-level description of CanSat and how the implementation will be performed).

2.2 Mechanical design

(This part should involve a high-level design description of mechanical parts and must include easy to understand sketch of the CanSat, its components and ideas of suitable materials (and their justification))

2.3 Electrical design

(High-level description of initial electrical design. Must have a block diagram of the electronic system, devices and how they are interconnected as well as ideas for these devices (and their justification))

2.4 Software design

(High-level description and initial block diagrams or flow diagrams of the operation of software)

2.5 Landing and recovery system

(Ideas and justification for landing and recovery system/parachute. This section should be more in-depth if the mission includes some special landing gear or separating parts)

2.6 Ground support equipment

(High-level description of ground equipment and block diagrams of mechanics, electronics and operation. This includes your laptops, Yagi antennas, or any other equipment that you need on the ground to support the launch.)

3 PROJECT PLANNING

3.1 Time schedule

(A detailed project time plan which shows the tasks required to complete the project and the time (suggested to be hours required) allocated to each step. This should cover all scientific, technical and outreach tasks that need to be done and is updated with each report. A Gantt chart may be used to display this project planning.)

(This must be at least a high-level weekly plan)

3.2 Team and External Support

(Your team is your most vital resource. You must be aware of your competencies and be able to identify where you may need to expand the team or ask for external

support. Please describe the tools and support available to you and what external support you are planning to get. Please identify, based on your team skills, what support you may need).

3.3 Risk Analysis

(What could go wrong for the project? Think about the team, time constraints, equipment or technical issues. This will change as the project develops.)

3.4 Test Plan

(A brief summary of ideas for testing. The test plan should detail how you are going to test your equipment to show the CanSat will meet your objectives given in Part 1. How can you best simulate the conditions for your launch?)

4 OUTREACH PROGRAMME

(Consider all types of media to promote and disseminate information about your project. Write a general summary of media and schools that are planned to be reached)

5. LAUNCH DAY PREPARATION

5.1 Launch checklist/countdown

(a ordered list of tasks with times, durations and team members responsible that you shall follow on the launch day to setup your CanSat and ground support equipment ready for launch)

5.2 Post mission checklist

(a ordered list of tasks with times, durations and team members responsible that you shall follow once your can is back on the ground. Might be as simple as "1. save data 2. turn can off")

5.3 Results analysis procedure

(description of procedure of how you are to interpret and use your sensor data for use in your presentation. Include details of any calculations used and how this analysis relates to your primary/secondary mission objectives. How will you determine if your measured data is valid and what is your criteria for a successful mission?)

(description of procedure of how you are to interpret and use your sensor data for use in your presentation. Include details of any calculations used and how this analysis relates to your primary/secondary mission objectives. How will you determine if your measured data is valid and what is your criteria for a successful mission?)

5.4 Results and data analysis*

(A summary of the collected flight data by means of tables and graphs relates to your primary/secondary mission objectives. Include also a data analysis with your interpretations of the results.)

6 LESSONS LEARNED*

(Reflect on the last 6 months. What have you learnt from the process? Has this changed anything for you in terms of subject or career decisions? What has been the most challenging part? What has been the best part?)

*Only required for final report