By Sapienza Space Team

SapSat Mission Guide 2026

Reentry Probe

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1. Introduction

The SapSat project is a design-build-fly competition that provides teams with an opportunity to experience the design life-cycle of an aerospace system. It is designed to reflect a typical aerospace program on a small scale and includes all its aspects, from the preliminary design review to post flight review.
The mission and its requirements are designed to reflect various aspects of real world missions including telemetry, communications, and autonomous operations. Each team will be scored on real-world deliverables such as schedules, design review presentations, and demonstration flights.

1.1 Competition Description

The competition is divided in 4 simple phases:

Phase 1: The *PDR*. Each team shall develop a design to fulfill all the mission tasks and objectives. To succesfully complete phase 1 the teams shall redact a (PDR) *Preliminary Design Review* document, using the provided Template and presenting tested mechanisms and prototypes.
The document will only be accepted in a PDF format.
The judges will evaluate the contents of the document, it will be reviewed for completeness and potential errors, if the document is accepted by the judges a time slot will be scheduled to discuss the document. Each team shall present the contents of the document in a 30 min time window.
If the document is deemed insufficient the team will be asked to submit a better one.
Once the PDR is completed teams will move directly to the next prototyping phase, where each design proposed shall be implemented until the full project is complete.
If major design changes appear during this phase, the team shall write a brief document (*CDR*) *Critical Design Review*, containing only the major changes of the original design.

Phase 2 Finally to move to the launch phase the team shall pass the *environmental tests*.
The SapSat built by each team must survive 2 tests:
Drop Test, Fit Test

Phase 3 *Launch day*

Phase 4 is the Post Flight Review (*PFR*), it is a 20 minute presentation of the flight results and 5 minutes for questions.

Awards* will be presented at the end of all the post Flight Reviews.
For teams to receive certificates of accomplishment and be considered for awards, they must complete all phases of the competition.
*Awards will only be given if more than one team presents a SAPSAT project; otherwise, it will simply consist of the development of a project and score feedback from the judges (senior team members).

2. Mission Overview

Design a SapSat that consists of payload for a rocket. The payload shall deploy from the rocket when the rocket reaches peak altitude and the rocket motor ejection forces a separation.
The payload shall descend at a rate of no more than 20 meters/second deploying an **heatshield** that deploys at separations (automatically or forced).
At 200 meters the payload release a **parachute** and the descend rate shall be 5 meters/second.

The SapSat shall collect sensor data during ascent and descent in an SD card and transit telemetry to the ground station.

The **sensor data** shall include interior temperature, battery voltage, altitude, acceleration, rate, angular rate, magnetic field.

Bonus tasks:

- The SapSat shall collect sensor data during ascent and descent in an external memory (no SD).
- A video camera shall show the descend of the payload.

3. Score Evaluation

The work will be evaluated by judges using a score associated with various aspects of the mission, such as:

- PDR
- Presentations
- Environmental tests
- Launch
- Post flight review
- Nice name
- Bonus

4. Requirements

Operational Requirements

Requirement Number	Requirement
1	Total mass of the SatSap shall be maximum 400grams
2	SapSat shall fit in a cylindrical envelope of 90 mm diameter x 300 mm length. Tolerances are to be included to facilitate container deployment from the rocket fairing.
3	The payload shall not have any sharp edges to cause it to get stuck in the rocket payload section which is made of cardboard.
4	The probe shall be solid and fully enclose the science probes. Small holes to allow access to turn on the science probes are allowed. The end of the probe where the probe deploys may be open.
5	The rocket airframe shall not be used to restrain any deployable parts of the SapSat.
6	The rocket airframe shall not be used as part of the SapSat operations.
7	0 altitude reference shall be at the launch pad.
8	All structures shall be built to survive 15 Gs of launch acceleration
9	All structures shall be built to survive 30 Gs of shock
10	All electronics and mechanical components shall be hard mounted using proper mounts such as standoffs, screws, or high performance adhesives.

Requirement Number	Requirement
11	All mechanisms shall be capable of maintaining their configuration or states under all forces.
12	Mechanisms shall not use pyrotechnics or chemicals.
13	Mechanisms that use heat (e.g., nichrome wire) shall not be exposed to the outside environment to reduce potential risk of setting vegetation on fire.
14	The probe shall be labeled with team contact information including email address.
15	Cost of the SapSat shall be low. Ground support and analysis tools are not included in the cost. Equipment from previous years shall be included in this cost, based on current market value.
16	The probe shall include an easily accessible power switch that can be accessed without disassembling the cansat and science probes and in the stowed configuration.
17	The shall include a power indicator such as an LED or sound generating device that can be easily seen or heard without disassembling the cansat and in the stowed state.
18	An audio beacon is required for the probe. It shall be powered after landing.

Requirement Number	Requirement
19	An easily accessible battery compartment shall be included allowing batteries to be installed or removed in less than a minute and not require a total disassembly of the SapSat.
20	If spring contacts are used for making electrical connections to batteries, make sure they do not disconnect. Shock forces can cause momentary disconnects.
21	The SapSat shall operate during the environmental tests .
22	The SapSat shall operate for a minimum of one hour when integrated into the rocket.
23	The probe shall release after the apogee.
24	The probe shall deploy a heat shield after leaving the rocket.
25	The heat shield shall be used as an aerobrake and limit the descent rate to 20 m/s or less.
26	At 200 meters, the probe shall release a parachute to reduce the descent rate to 5 m/s +/- 1m/sec
27	The probe telemetry shall include altitude, internal temperature, battery voltage, rate, angular rate, acceleration, magnetic field.
28	The SatSap shall have a funny name, inspired by an animal. (exp: ParaonoidSalamander, MeticolousFerret, TiburonBorracho) the coiche of the name and language shall be explained in detail to the jury

5. Environmental Tests

Two tests are to be conducted to test the construction quality and material performance. To verify test results, teams should provide: 1) Environmental Test Document based on the provided template file. 2) Videos of the tests performed as specified in the template document. If using a phone camera, orient the phone sideways for wider video view.

1. **Drop Test** - This test is designed to verify that the parachute and attachment point will survive the deployment. Component mounts and battery mount will also be tested. The drop test generates about 30 Gs of shock to the system.

    a. Drop Test Description: This test requires a 61cm non-stretching cord. The test was developed with a 1/8 thick kevlar cord. One end is secured to an eyebolt attached to a fixed point, such as ceiling or rigid structure with enough clearance to accommodate the cord, Cansat, and free space so the Cansat does not hit the ground. The other end is tied to the parachute. A floor mat or pillow may be placed under the Cansat for the drop test. The structure must not flex during the drop test. This test cannot be performed by holding the cord. The cord must be secured to a solid structure. Holding any part of the test structure is not valid.

    b. Drop Test Procedure:

        i. Power on SapSat.
        ii. Raise SapSat by the attached cord, so that the attachment points of the cord, on the eye bolt and the parachute, are at the same height.
        iii. Release the SapSat.
        iv. Verify the SapSat did not lose power.
        v. Inspect for any damage, or detached parts.
        vi. Verify telemetry is still being received.

2. **Fit Test** - This test is designed to verify deployment operation of the payload and to check the correct analysis of tolerances. The rocket airframe will be provided for the test. The payload must be designed to fit into the rocket for the ascent phase and must be capable of detaching from the rocket without any friction or protruding parts that could obstruct its exit from it.

Both tests will also be showed on the launch day.

6. Deliverable documents & Deadlines

Material Due / Event	Required FileName Format	Due Date
PDR	SapSat2026_XXXX_pdr.pdf	End of February
CDR	SapSat2026_XXXX_cdr.pdf	On a case-to-case basis
Environmental Tests	SapSat2026_XXXX_env.pdf	Two weeks before launch
Launch Day	/	April/May
Flight Telemetry Data	Flight_XXXX_.csv	The day after launch
PFR	SapSat2026_XXXX_pfr.pdf	The day after launch

*Lauch date will be defined soon (approximately end of April/beginning of May)

Not using the correct filename format or submitting after the deadline will cause a loss of points.

7. Team Member Launch Operations Crew Assignments

Crew assignments must be submitted before launch. The mission control officer will be given an identification so the flight coordinator and launch control officer knows who the mission control officer is. The mission operations manual will be reviewed at the flight readiness review.

Team Member Launch Operations Crew Assignments

In order to have a successful launch, teams need to coordinate among themselves and with the flight coordinator. Team members need to be assigned to specific tasks and develop a checklist for a successful flight. The following task assignments must be delegated:

- Mission Control Officer - This is a single person who is responsible for managing the team at the time of the launch. This person must verify with the ground station crew everything is ready. This person will do the countdown starting at 5. The rocket will be launched after the count reaches 1.
- Ground Station Crew - This is one or more persons who is responsible for monitoring the ground station for telemetry reception and issuing commands to the Cansat. Only the ground station crew should be at the ground station since there is limited space.
- Recovery Crew - This is one or two persons only responsible for tracking the Cansat and going out into the field for recovery.
- Cansat Crew - This is one or more persons responsible for preparing the Cansat, integrating it into the rocket, and verifying its status.