

## Payload Challenge

The aim of project HEIDI is to design, test and manufacture a sounding rocket for the 2019 Spaceport America Cup next June in New Mexico, USA. This competition is the world's largest university rocket engineering competition where students are challenged to engineer a rocket capable of launching a 4kg payload to a target altitude of 10'000 feet with a reusable rocket. The 4 kg payload of HEIDI will be realised using three geometrical CubeSats (build volume of 10x10x10cm). Three independent ideas will be implemented guaranteeing maximum scientific output. One is in planning at the HSLU. The other two are determined with the payload challenge.

The payload challenge starts on the 16th of December and every interested student can submit their proposal for an experiment until the 17th of February. Afterwards the best two proposals are selected and the winner will be announced on the 24th of February. Through this process we hope to find creative and interesting experiments with great scientific value and ultimately win in the category "Payload" at the Spaceport America Cup.

## Chances and Opportunities

If your idea is one of the best two, you will be given a **budget of CHF 400** to realize your experiment. You will have the opportunity to build your CubeSat at the ARIS hub and the Student Project House. The ARIS members come from various backgrounds and are motivated to help with their experience. In the Student Project House you will have access to 3D printers, laser cutters and a wide range of other tools. In the end, your experiment will compete for the award 'Best Payload' at the Spaceport America Cup and the **prize money of up to \$750** will be yours if your experiment wins.

The requirements are also opportunities. The rocket will make its way up to 10'000ft and back. During flight the experiment will be accelerated up to 11 G and during the recovery it receives a shock when the parachute deploys. Make use of this extraordinary environment to perform exciting experiments.

## Requirements

Your experiment must fulfil various criteria, otherwise the payload either does not qualify for an award at the Spaceport America Cup or it endangers the rocket during flight. The following criteria need to be fulfilled by your experiment:

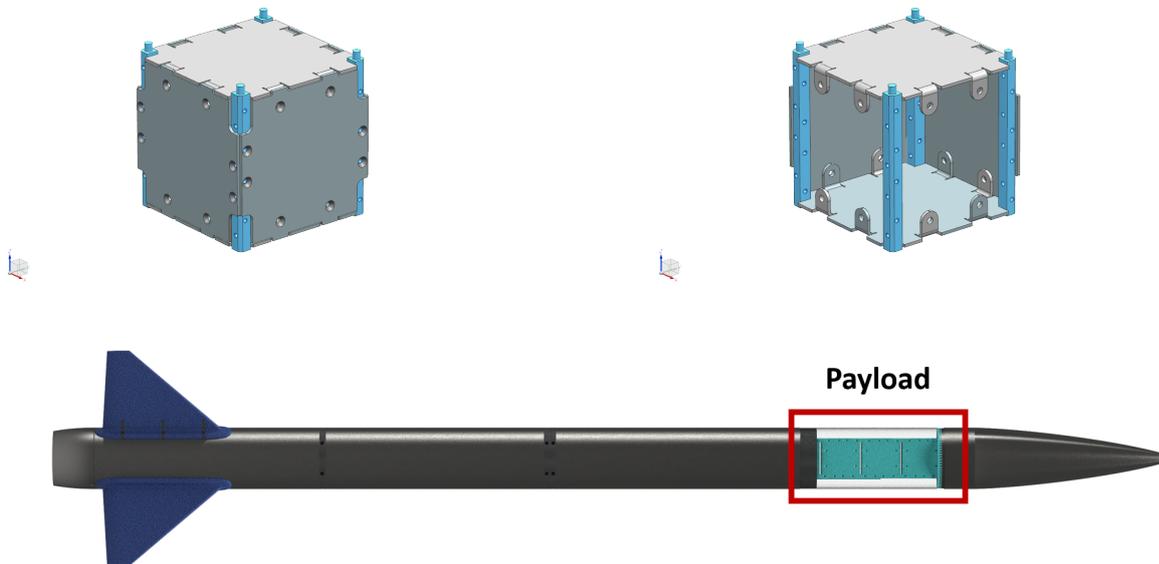
1. It shall fit inside a Volume of **96x96x92** and include the spacers (8x8 mm) in the corners of the volume (picture below).
2. The experiment itself has to weigh **0.83 kg** and be installed into a CubeSat for a total weight of 1.33 kg.
3. The power budgeted is **1200 mAh with 11.1 Volt** (provided by the launch vehicle, no batteries are required in the CubeSats.) The voltage transformer shall be integrated in the experiment to meet your needs
4. It shall use less current than 5 Ampere at any time
5. The power outlet is given by a circular connector on one side of the cube
6. An "On" signal for the experiments power supply is provided, afterwards the system needs to be operational for at least **2.5h** (due to possible delays at the launch pad)
7. The boot procedure shall not exceed 2 minutes
8. It shall store any generate data itself
9. It shall work in a Temperature range from **-10°C up to 80°C** and should itself not exceed this range
10. It shall work in a pressure range of 0.6 bar to 1.1 bar
11. It shall withstand accelerations of up to **16G**
12. The centre of mass shall not be further away then 1cm from the central axis
13. It shall not have moving parts and shall hold under vibrations

14. Hazardous materials like lead, radioactive sources, explosives, etc. are forbidden
15. All materials used shall fulfil standard commercial transportation regulations (including planes) or shall be able to be organised at the Spaceport America Cup
16. No live or vertebrate animals are allowed in the experiment

You should also consider these additional points while designing your experiment.

- The CubeSat is located in the upper part of the rocket.
- It is embedded in the inner structure and surrounded by an outer shell. Thus, it will not be possible to access the atmosphere or use barometers.
- It will be built into the rocket 16 hours before launch and cannot be accessed afterwards.

The CubeSat will be provided by ARIS and ensures a secure implementation into the rocket. There are small mounting structures inside the CubeSat to attach the side plates, which in turn attach the CubeSat to a rack. This structure cannot be altered but the rest of the side plates can be adjusted to suit your experiment.



## Next Steps

Work out exciting ideas, consider the design and manufacturing process and send your proposal via online form provided on [aris-space.ch](http://aris-space.ch) until the **17th of February 2019**. The proposal should include the following:

- Detailed description of your experiment and why it is the best payload for HEIDI
- Description of the set-up, implementation and goal of the experiment
- A short description (and a timetable) of the planned manufacturing process

The proposal will be rated on feasibility, scientific value and creativity. Incomplete proposals will be considered but are less likely to be chosen. A team of selected judges will then analyse your ideas and announce the winning proposals on 24th February. After a first meeting with ARIS to discuss the details of your experiment, the manufacturing process starts.

**For any further questions feel free to contact us via [payload@aris-space.ch](mailto:payload@aris-space.ch)**