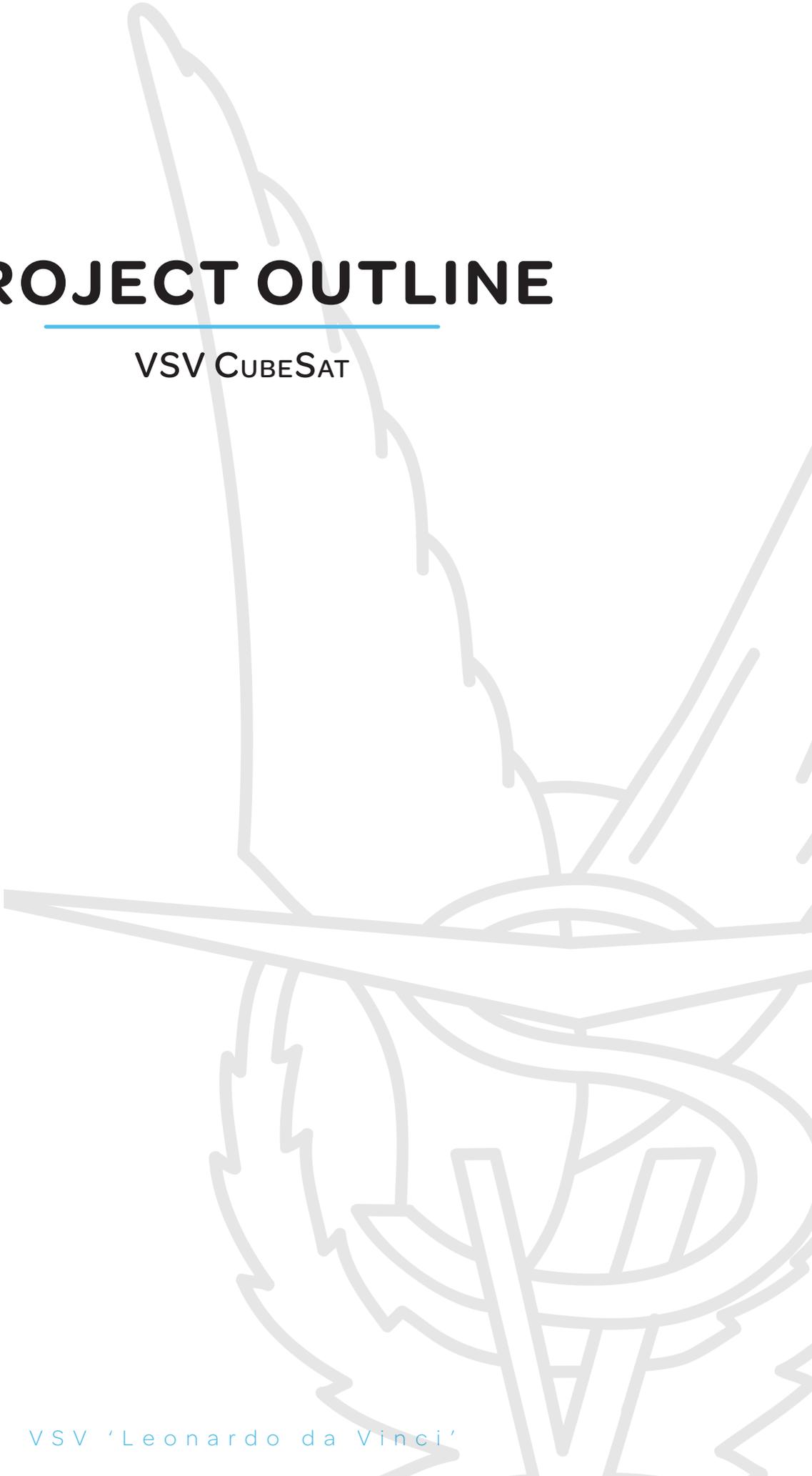


PROJECT OUTLINE



VSV CUBESAT

INTRODUCTION

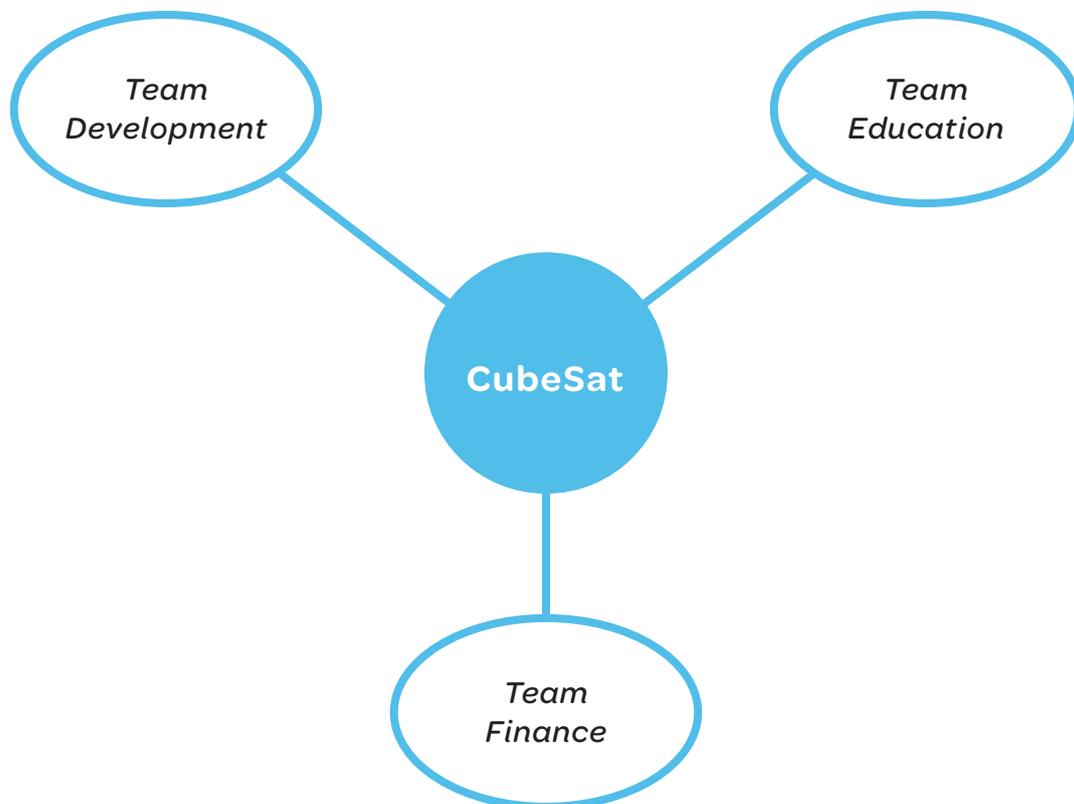
In honor of her seventy-fifth birthday, the Study Association of Aerospace Engineering, VSV 'Leonardo da Vinci', has started a unique project. Its goal:

Inspiring the youth of the Netherlands and enthusing them for spaceflight and thereby emphasizing the impact of spaceflight on our society.

To realize this, the association intends to bring a CubeSat with educational purposes into orbit around the Earth. An accompanying educational curriculum will offer many students from primary and secondary schools in the Netherlands the possibility of coming into contact with spaceflight. This is how we, as an association, will give back to society in honor of the VSV's lustrum.

Considering the size of this project, a committee has been formed which is tasked with realizing the CubeSat and its accompanying educational curriculum. The committee exists of 16 students which are divided into three teams, each with their own responsibilities: Team Development, Team Education and Team Finance.

Currently, we are working on transferring the project to a new team, which is divided into a Core Team, a Technical Support Team and a Non-Technical Support Team. They will be running the project from halfway through September onwards.



TEAM DEVELOPMENT

A very important part of the project is designing, building and launching the satellite. As this is quite an ambitious task, Team Development was created to handle structuring and executing every aspect of this process.

Designing

The satellite will be designed by students. A preliminary design is made during the annual Design Synthesis Exercise (DSE) of the study Aerospace Engineering of the TU Delft, aimed at bachelor's students in their final year. A group of 10 students, supervised by dr.ir. Chris Verhoeven, will work for 10 weeks on creating the preliminary design. Their assignment, the so-called 'DSE proposal', has been attached to this document. During these 10 weeks, Systems Engineer ir. Wouter Weggelaar of ISIS will also guide the students. Furthermore, additional experts have expressed their willingness to help answer any potential questions that these students might have.

In cooperation with various parties, the final design will be realized. The aforementioned Design Synthesis Exercise will be developed during the months of April, May and June of 2019. After this design exercise, the next steps of the design process will be determined in collaboration with ISIS, Hyperion and other external parties.

Building

The difficulty level of building the satellite is not yet known, as different options are being considered at the moment. To increase the reliability of the satellite, all stages of the building process will be overseen by an external expert. The current setup of the build involves both TU Delft students, as well as higher education students (HBO) with an expertise in for instance electrical or mechanical engineering, possibly doing an internship at one of our partner companies. Building the satellite could take place in a cleanroom at the TU Delft, as well as at external parties.

Launching

At present, we have not yet established a definitive launch opportunity. We are in close contact with Jeroen Rotteveel of ISIS for this, who has presented us with different possibilities. We aim to send our satellite into space at the end of 2020.

TEAM EDUCATION

To fulfill the primary goal of the project, 'Enthusiasing the youth of the Netherlands for spaceflight', an educational curriculum will be created. This is the main responsibility of Team Education. The conscious decision was made to incorporate this enthusiasm in a very broad way. Because the project needs to be relevant and challenging for students of all ages, the decision was made to create multiple modules. Educational modules will be developed for students in two different target groups: (1) primary education and (2) secondary education. Furthermore, to keep involving students of the TU Delft, designing the satellite will be incorporated into the Design Synthesis Exercise.

Regarding primary education, we are in contact with the Wetenschapsknooppunt Zuid-Holland and Science Centre Delft. With the support of these institutions, an educational curriculum will be created and presented to primary school students. In an accessible and interactive way, this introduces the Dutch youth to the concept of spaceflight to begin piquing their interest on the subject. To further play into the enthusiasm of children, a design contest will be launched for children in their 4th and 5th year of primary school. This will allow them to be a part of defining the payload of the satellite in a playful and creative way. The winning idea is then going to be developed and implemented in the satellite. We believe that, using the creativity of children, they will come up with ideas that can realistically be implemented. Wetenschapsknooppunt Zuid-Holland and Science Centre Delft have a direct reach of over 2500 teachers in the area, with further possibilities for expanding nationwide.

Regarding secondary education, we have found an easy connection within an already existing course given in many high schools in the Netherlands, called NLT (Nature, Life and Technology). Within this course, there is a wide variety of modules to be selected, one of which is dedicated to satellites and spaceflight technology. With the help of experts, this module will be revised and expanded to make the subject relevant to upper-secondary school students. As a first step, a retraining evening is organized for teachers from the subject areas of Physics, Engineering, NLT, Computer Science and O&O (Research & Design). Here, the goal will be to set up a Professional Learning Community (PLG) to work on realizing the additions to the module. The outline of this module will be built around our satellite project, from launch to telecommunications. With the help of the NLT Association, there is a possibility of going national to reach as many high schools as possible.

TEAM FINANCE

In realizing this project, a lot of costs are involved. To close the budget, Team Finance is responsible for raising funds and signing cooperation agreements with partners. Aside from this, Team Finance keeps a close eye on the budget and its developments over time.

PARTNERS

The VSV 'Leonardo da Vinci' has successfully realized ambitious projects in the past, for example its recurring Airshow. Part of what makes this possible is the close contact between our students and the industry, from which a lot of advice is received. The partners that we are currently collaborating with are providing services, knowledge and funding. This is considered very valuable, as these contributions make it possible to realize initiatives such as this satellite.

Several current partners:

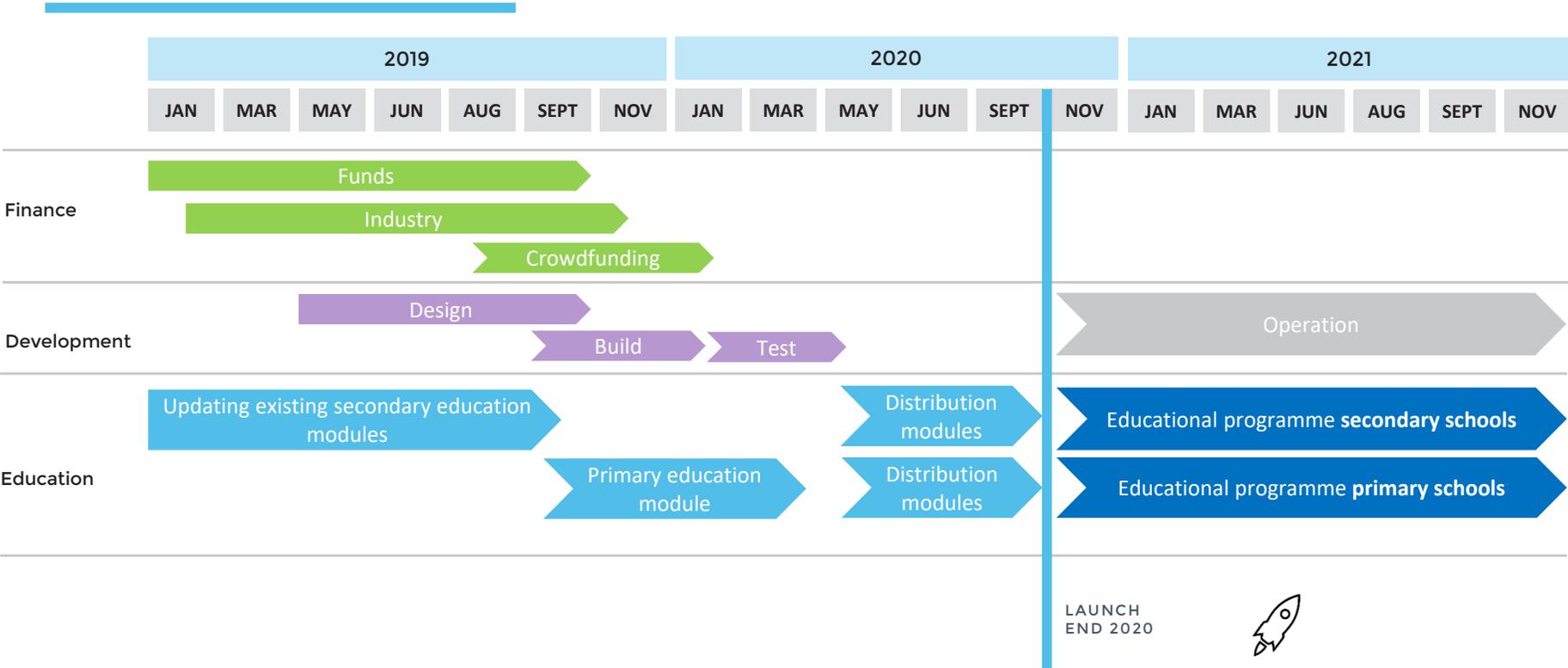


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|----|---------------------------|----|------------------------------------|
| 1) | Schedule Overview | 3) | Design Synthesis Exercise proposal |
| 2) | Work Breakdown Structures | 4) | Organogram |

GLOBAL PLANNING

Time Schedule



DESIGN SYNTHESIS EXERCISE PROPOSAL

In 2020, the Society of Aerospace Engineering Students, VSV 'Leonardo da Vinci' exists 75 years. In the past, some 5-year anniversaries were celebrated with monuments commemorating important moments in (Dutch) aerospace history or world record attempts. For the coming year, the VSV would like to launch a CubeSat, completely developed by students.

The design of the CubeSat will take place throughout the DSE project, in the period April until July. It is important that a detailed Test plan and an in-depth Verification & Validation plan are written. After the DSE project, the design will be verified by System Engineers from companies such as ISIS. The development and testing phase of the satellite will start in the summer. The roll-out of the satellite is scheduled in May 2020, the launch will be by the end of 2020. This DSE project gives you a unique opportunity to work on a design that will actually be developed and launched into space. Furthermore, you can have an enormous impact with a variety of stakeholders.

There are several goals for this satellite. The first aim is providing the opportunity for undergraduate students to work during a DSE on a satellite that will be developed and launched in a short time window. This unique DSE project will give you hands-on experience on developing an actual satellite, a great opportunity. Secondly, there is the goal to spark an interest for space, by means of the development of educational projects for primary and secondary schools in the Netherlands. The production of these projects is not part of the DSE project, however two payload modules have to be designed. One *Educational Module* that provides the data for the educational projects. The second module will be devised by primary school students and has to be designed during the DSE. Lastly, a goal of the project is that the satellite is academically relevant and challenging in the space industry. Therefore the mission goal of the project will be:

Design an Ultrareliable CubeSat (10x10x10 cm) that can have up to 4 PocketCubes (5x5x5 cm) mounted as payload

Such an ultrareliable CubeSat is new in the space industry. The idea is that the CubeSat fulfills all the tasks (except the payload tasks) necessary for the PocketCubes, i.e. power, telemetry, ADCS. By this, companies that want to launch a satellite can focus on the development of the payload instead of the subsystems.

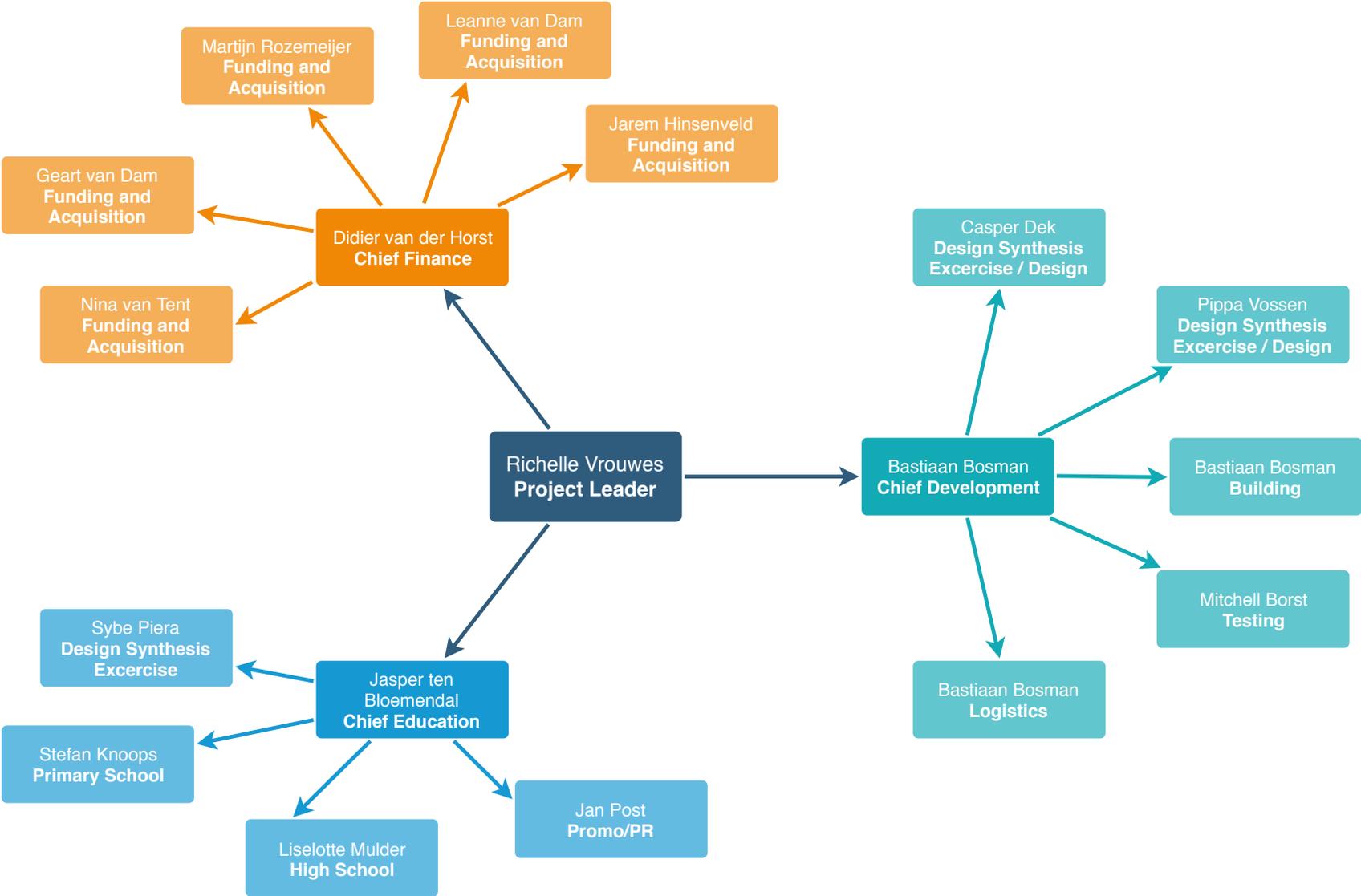
For the CubeSat that will be designed during the DSE and developed afterwards, the 4 PocketCubes that will be used are:

1. *Educational module* that will provide (semi-)live data for primary and secondary educational projects. This module will be designed during DSE
2. *TBD module* for which ideas are proposed by primary school classes (age 10-11). The winning idea will be communicated to the DSE group and this module will be designed during DSE.
3. *TBD payload module*. This spot will be sold to a company that wants to launch a PocketCube.
4. *TBD payload module*. This spot will be sold to a company that wants to launch a PocketCube.

There are four top-level requirements for the CubeSat. These are:

1. Total project costs are not to exceed € 250,000, with a goal of <€200,000.
2. Design, development, testing and roll-out should be done before May 2020.
3. Two payload modules should be designed: an educational module and a TBD module.
4. The expected lifetime of the satellite should exceed 2 years.

ORGANOGRAM 2018-2019



ORGANOGRAM 2019-2020

