

# Da Vinci Satellite Project

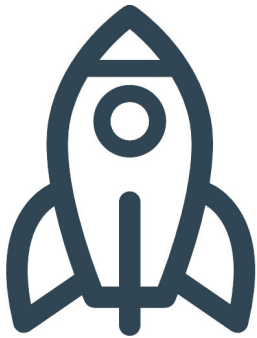


The 'Da Vinci Satellite' project is an initiative started by a non-profit student team of Delft University of Technology, with the goal:

*'To inspire and enthuse the youth of the Netherlands for technology and spaceflight, while emphasizing the impact of spaceflight on our society'.*

In order to achieve this, the Da Vinci Satellite team intends to put a satellite in orbit around the earth for educative purposes. The associated educational programme will offer many primary and secondary school students in the Netherlands the opportunity to come into contact with space travel.

## Mission



On the occasion of the 75th anniversary of the 'Vliegtuigbouwkundige' Study Association 'Leonardo da Vinci', it is the mission to design, build and launch the educational 'Da Vinci Satellite'. This satellite will provide a direct connection to space for primary and secondary school students.

By means of a teaching package, all satellite data will be brought directly into the classroom to make space more tangible for the children. In this way, students of all ages will be able to learn about space and everything related to space in an interactive way.

## Vision

Space travel is indispensable in everyday life these days. It is of social importance that people understand what is happening to the earth. By becoming acquainted with space travel from an early age, children can become inspired and motivated to discover the world. This may have to do with technology, global warming or sustainability.

With the 'Da Vinci Satellite', school children can interactively become acquainted with and learn about space and what is involved in it. Youth has the future, so it is important to create awareness. Together we elevate education to a higher level!



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## Teams

In order to have the ability to realise this project, a team of over 50 students from various faculties at the TU Delft has been assembled to develop this satellite and the corresponding educational module. These students all work together in order to achieve the aforementioned goals set. These teams, in collaboration with the aid of many professional partners from both educational and professional entities are working in order to be able to guarantee the quality and success of this project.

## Core team

The Core team of the 'Da Vinci Satellite' is the group of students leading this project. They are the small group tasked with navigating and controlling the actions of all the other teams in order to guarantee all teams are able to collaborate effectively.

## Technical team

An integral part of the 'Da Vinci Satellite' project is the design, construction and launch of the satellite. In order to achieve this ambitious task, the technical team is solely focussed on this engineering challenge. This team works closely with the engineering knowledge present within the TU Delft and within the space industry allocated in Delft, in order to assure the success of this mission.

The team is divided into 5 sections: the systems engineering group, the software engineering group, the electronics group, the payload group and the electrical engineering group. Each group is led by a corresponding chief engineer, all of whom organise the engineering process. The final responsibility lies with the technical manager, a member of the core team.

## Design

The initial preliminary design for this satellite has been completed by a group of 10 TU Delft aerospace engineering students as their design synthesis exercise. During this process they were guided by engineers from both the TU Delft and engineers from 'Innovative solutions in space' and 'Hyperion', both Delft-located space travel companies specialising in CubeSats. After this process was completed, the current technical team, in collaboration with many experts, is taking the subsequent steps in completing this design process to a more thorough, complete extent.

As of writing, they are in this process while simultaneously having started the programming of the OBC. In collaboration with our partners from the industry and the TU Delft, this detailed design will be evaluated by experts on various occasions in order to guarantee its quality.

## Construction and Testing

The different modules of the satellite will be constructed in separate manners. There are two

separate payloads that will be integrated within the satellite. The first, the “dice payload”, focused on the primary school students, is currently in construction process at the ‘Leidse Instrumentenmakers School’, this will be completed as a graduation project by one of the students there. The dice payload can most simply be described as a camera with a physical mechanism in front of it, that makes it possible to “throw” the dice. In reality, of course, it is a sweeping and clamping mechanism that simulates a dice throw. However, as a result, it does have the ability to portray the dice “floating” in microgravity, with Earth in the background. So, that allows for children to directly engage with space by observing Earth from it, as well as getting a first hand observation of micro gravity.

The second payload, focused on secondary school students, will be purchased. It will provide secondary school students with an interactive memory module that shows high-school students in which ways radiation can affect spacecraft hardware. This will serve as an example of the harsh environment encountered in orbit, beyond the better-known challenges of operating in microgravity and in a vacuum. Students will be able to interact with the memory stored in this part of the payload, to see what happens, and why radiation protection is necessary.

The construction of the bus will mostly consist of the assembly, as the individual modules within the satellite will be obtained from our partners within the industry. This assembly will be done by us, assisted by experts from the industry and from within the TU Delft. This will overall be conducted either within the clean room facilities within the TU Delft, or within the clean room facilities of one of our industry partners.

The flatbed testing will be conducted at the TU Delft, using the facilities that have been made available there. The Environmental testing will be conducted at both the TU Delft and at the ‘Netherlands Aerospace Centre’ facility in Flevoland.

## Launch

As of this instance, no definitive launch date has been depicted. However, we are currently in extensive contact with various launch providers. We plan to have one of these professional entities launch our satellite in Q1 of 2022.

## Education team

In order to achieve the goal of the project, an educative lesson program is being set up for both primary school students and secondary school students. This is the main responsibility of the education team. This educational purpose has intentionally been branched as wide as possible, affecting all levels of education. Thus in making this project relevant and challenging for all ages, all of these age groups will have to be tailored to. This, is achieved by developing two educational payloads. One specifically for the primary school students and one specifically for the high school students. In addition to this, as an educational experience for university students, this project was started as an aerospace engineering bachelor graduation project, and has been continued by a team of university students from numerous faculties at the TU Delft and other universities.

## Primary School

For the primary school education module, a contest amongst primary school students was held in order to determine what would be the most interesting educational payload to them. What would spark their interest in space travel the most? What did they want to learn about space? For they themselves are eventually the best at determining what they want to learn about space, what intrigues them about space. As a result of this contest, the payload was decided, around which the primary lesson package will be centered. The primary school payload will be a zero-gravity dice game, a mechanism that can physically throw dice and make a video of said dice 'hanging' in zero gravity. In this manner, we will bring a direct enjoyable connection to space and technology into the primary school classroom in order to achieve our mission within this age group.

## **Secondary School**

In communication with many teachers and educational entities, the team is currently working to construct lesson packages, for the secondary school age-group. It was determined that the most effective method to include these lesson packages into the Dutch educational system was to make it such that they can be used to teach principles that have to be taught simultaneous to the information about space travel.

As a result, the planning is to have the secondary school payload be an memory module that practically shows the effect of radiation on computers in space. High school students can experiment with this by uploading and storing images in both radiation-protected and unprotected memory. In this manner, we try to reach students in an educational manner to provide a direct connection to space, and make space a more tangible topic to discuss.

As of this moment, the education team has started the process of developing the aforementioned educational modules. The past year they have been working on establishing a foundation of what we want to achieve and gaining the experience and connections to do so.

## **Acquisition team**

When realising this project, there is a significant financial burden to bear. In order to guarantee that we are able to complete this project financially, we have team acquisition. This team is exclusively focused on obtaining the finances required to launch this entire project. Through communication with external parties, obtaining funds is made possible by them.

This team works in different strategies of obtaining funds on different schedules. Please refer to the attached general overview for these timelines.

## **Team PR**

In order to achieve the goals set for this project, it is necessary to have an awareness of all we are doing from the space travel community and the educational community in the Netherlands. This national outreach is the responsibility of the PR team. They are what allow us to spread all the things achieved by the team throughout the Netherlands.

## Partners

This project would not be possible without the numerous parties involved in every branch of this entire project. From the technical parties, supplying us with the parts and field expertise to truly produce this satellite, to the educational partners allowing us to truly bring this into the classroom, to the financial partners making all the required investments possible. The project would not be possible without all of their efforts.

These are some of the current partners we are collaborating with:



HYPERION TECHNOLOGIES



Universiteit Utrecht

