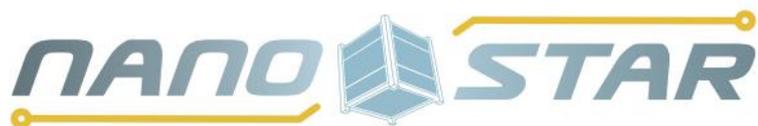


Interreg Sudoe



European Regional Development Fund



Research and innovation

Student booklet

Mission design challenge

NANOSTAR consortium



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INTRODUCTION

This NANOSTAR challenge consists in **predesigning a nanosatellite** that is built around a **scientific based space mission**. The nanosatellite, equipped with a living payload, shall ensure Roscoff worms, a photosymbiotic marine worm species, will not only survive but perform their daily duty during the time of the mission (e.g. worms behavior and CO2 recycling performances retrieved via video observations and measurements).

This is a competitive challenge, in which **multidisciplinary teams of students** from the NANOSTAR universities will have to develop and present their design solutions to satisfy a set of mission requirements. Students will be assisted by expert faculty and learn how to create a space mission cooperatively in the framework of concurrent engineering.

This document contains the **competition rules and fundamental information** for the students on how to participate. The application form, the set of mission requirements and constraints, and additional links and information can be found at the **NANOSTAR website**: <http://nanostarproject.eu>.

HOW TO PARTICIPATE IN THE COMPETITION

Students participate to the NANOSTAR challenges in teams. You can **register with your friends or ask to join a team of other students**: the idea is to learn together as you develop your system solution. We encourage the participation of **multidisciplinary, mixed teams of about 5 women and men**. You can participate with your university colleagues or form an international group that spans several NANOSTAR institutions.

Each team will be **assigned an advisor** who will be your point of contact with the NANOSTAR network. **To solve any doubts**, you will be able to ask questions anytime to the **Support Faculty** of the NANOSTAR institutions: together, they offer an ample expertise on space systems that is at your disposal. You may reach each the Support Faculty following the indications given by your advisor.

The **internal organization** of the team and the role definition of each member is completely up to you, but we provide some recommendations and advices in the following pages.

At the end of the competition, you will be asked to hand in a **design file** with the definition of your solution, a **preliminary design report**, and to showcase your results in a **presentation**. An **Evaluation Committee**, composed of members from all NANOSTAR institutions, will evaluate the received designs and select the **winning proposal**. The awarded design will be extended and serve as **the baseline for the future NANOSTAR challenges**, which will focus on the detailed **development and testing of parts of a nanosatellite and related facilities**.

To formalize your participation in NANOSTAR, you will need to **fill in the application form on the NANOSTAR website as soon as possible**, so that we can provide you with help materials and include you in the discussion groups.

COMPETITION RULES

The **following rules** detail several aspects of the NANOSTAR design competition. They are intended as a means to **articulate your participation** and **maintain the fairness** of the competition.

1. Bachelor-, Master- and Doctoral-level students of technical or managerial disciplines can be part of a Team and participate in the NANOSTAR competition (post-docs and employees acting within the scope of their employment, or contract, may not compete).
2. Students shall communicate immediately any changes to their student condition if this affects the eligibility for the participation to the NANOSTAR challenges.
3. A competing Team can be composed by 3-10 students, with 5 students being the preferred number. The number of students in a Team will be taken into account in the evaluation of the project.
4. Each Team will nominate a Team Leader, which will act as point of contact of the team with the NANOSTAR Evaluation Committee.
5. A competing Team is considered Multidisciplinary if its members cover at least two different disciplines (e.g. aerospace and telecommunications). Multidisciplinary is encouraged and will be taken into account in the evaluation of the project.
6. A competing Team is considered Mixed if it contains at least one man and one woman. Mixed Teams are encouraged and this will be taken into account in the evaluation of the project.
7. A competing Team is considered Inter-institutional if it spans two or more NANOSTAR institutions. Inter-institutional Teams are encouraged and this will be taken into account in the evaluation of the project.
8. A student can only be part of a single team. Participation in more than one team is not allowed.
9. Participation in the NANOSTAR competition is voluntary and not remunerated.
10. To be part of the competition, a Team must submit the application form found in NANOSTAR website before the deadline detailed in this document.
11. To be eligible for evaluation, all deliverables associated to the work of a Team must be submitted through the NANOSTAR website strictly before the deadline detailed in this document.
12. The deliverables associated to the work of the Team must describe a preliminary design, according to the ECSS-E standards. There are three deliverable items:
 - a. A preliminary design report, of maximum 50 pages (excluding title pages and appendices).
 - b. A link to an online video where the Team presents the work, of maximum 15 min.
 - c. An IDM-CIC file with the final design, of maximum 10 MB.More details can be found in the Section “Student Deliverables”. The templates provided on the NANOSTAR website shall be used to prepare the first deliverable.
13. The official communication language in NANOSTAR is English. All communications, emails, documents and deliverables must be in English.
14. Each team will have an Advisor, assigned by the project consortium and belonging to the NANOSTAR institutions. The Advisor will serve as point of contact with the NANOSTAR Support Faculty to answer student questions and doubts.
15. Project Evaluation will take place by an Evaluation Committee formed by members of all NANOSTAR institutions. For more information on the project evaluation, see Section “Project evaluation” of this document.

16. The decision of the Evaluation Committee will be announced to the students on the NANOSTAR website.
17. The decision of the Evaluation Committee is final and cannot be protested.
18. Participation in the challenge implies the acceptance of these rules, as well as the regulations of your institution(s).
19. By participating, you accept that your work, part of your work, and photographs, videos or interviews of you and your Team may be used by the NANOSTAR network for communication and dissemination purposes and as the baseline of future student challenges.
20. Copycats are forbidden in all NANOSTAR deliveries and specific software will be used to track them. Instead, you are required to quote and credit all your original sources. Please consider referring to your institution copycat charter or code of ethics for more details.
21. Any Team where at least one of its members is found infringing the above rules, acting on ill will or against the spirit and fairness of the NANOSTAR competition, or otherwise making an irresponsible usage of the institutional resources, will be disqualified from the competition.
22. Any changes to these rules, the mission requirements and constraints, the evaluation criteria, or the deadlines, will be announced to the students through the NANOSTAR website and forwarded by the NANOSTAR slack channel or your advisor.

STUDENT DELIVERABLES

The student Deliverables are these three:

- **Preliminary design report**
- **Video presentation** of your Design (showing a remote/virtual oral presentation)
- **IDM-CIC file** with the final design

All documents will be in English. Refer to the sections below for a more detailed description.

PRELIMINARY DESIGN REPORT

The report should contain **all your work and results**. Producing a good report is no easy task, as it happens with other types of technical documentation. The NANOSTAR preliminary design report template details the recommended structure and contents of this report and can be downloaded from the NANOSTAR website.

The preliminary design report document shall be presented as a standard pdf file and should not exceed, under any circumstances, a **50 pages limit (excluding title pages and appendices)**. This is considered the first deliverable.

Again, the consortium expects this piece of work as being yours entirely. It shall not plagiarize neither web resources nor previous NANOSTAR projects in any way. Only light quotes with original sources credit are allowed (e.g. COTS main technical characteristics from datasheet, choice justification based on a reference paper). Commercial COTS description accurate transcripts are to be avoided.

PRESENTATION VIDEO

The presentation video shall not last more than **15 minutes**. The video ought to **feature all Team members explaining their work and the highlights of the final design**. The video shall be uploaded to an online platform, and the link to the video (which must not be password protected, etc.) will be considered the second deliverable.

Suggested video contents: team members' sole voice describing tables and charts; overall, semi-close-up or close-up plans on teammates overlaid on a slideshow describing the project; 3D animation of orbits or mechanical structure of the nanosatellite with some piece of music; pictures of COTS along with their main characteristics matching your study; any combination of these or other great ideas, all video techniques are yours.

Please note that accelerating voice records to fit the 15 minutes timeframe is not allowed. Be also certain that all materials (pictures, sounds, animations, music, movie, text) be copyright-free and in no way copycats (video upload platforms regulations do apply).

Pay attention that this video might be rated by several evaluation committee members that are not required to read the associated PDR nor check the IDM-CIC file. It is therefore very important that the

video itself shows everything, in a lighter and different way than the PDR does, that matches all the Nanostar project evaluation criteria.

IDM-CIC FILE

The software IDM-CIC, produced by CNES, allows to define several aspects of a space system, and is widely used in preliminary design. The **IDM-CIC file detailing your system, its mechanical design along with its thermal and power budgets** is considered as the third deliverable. More information on IDM-CIC and tutorials on its usage can be found on the NANOSTAR website.

PROJECT EVALUATION

The Evaluation Committee is **composed by one member from each NANOSTAR institution**, and will apply the same criteria to the evaluation of all student proposals.

After the submission deadline, the NANOSTAR Evaluation Committee shall convene and **evaluate all the valid submitted projects** to determine the **winning proposal**.

Evaluation will be carried out **based on:**

- Compliancy with the top-level requirements of the mission
- Project consistency, risk analysis, and physical soundness
- Maximization of the mission figures of merit (refer to the mission requirements document)
- Solution innovativeness
- Document quality
- Presentation quality
- Team management and organization
- Correct usage of NANOSTAR resources, tools, and methodology.
- Team size, multidisciplinary, gender balance, and interinstitutionality

Further description and grade details can be found in the project evaluation criteria matrix for preliminary mission designs document on NANOSTAR web site.

AWARDS

The winner of the competition will be unveiled within one month of the competition deadline on the NANOSTAR website

All participating students will receive a **Participation Diploma** from NANOSTAR as proof of the work carried out in the Design Challenge.

The **First Prize Team** (and up to a Second and a Third Prize teams, under the discretion of the Evaluation Committee) will receive **Award Diplomas stating their result in the competition.**

Several **ancillary diplomas** will be awarded under the discretion of the Evaluation Committee:

- Best oral presentation (based on the video only)
- Best predesign document (based on the PDR only)
- Most innovative mission
- Best management practices

Other awards, which may comprise economic and/or material prizes (e.g. attendance to an International Conference to present their work, or a visit to a space center), may be awarded to the First Team, and will be defined soon and announced on the NANOSTAR website: <http://nanostarproject.eu/student-challenges..>

Local prizes awarded by each institution to the participating students, may likewise be defined soon and announced on the NANOSTAR website: <http://nanostarproject.eu/student-challenges>.

All awards will be given according to strict **non-discriminatory, free-competition and publicity** principles and standards.

Results of the competition, including photographs, videos, and interviews with the winners will be featured on the **NANOSTAR website and communicated through the NANOSTAR institution media.**

IMPORTANT DATES

Registration open:	September 2, 2019 – November 4, 2019
Challenge start:	September 2, 2019
Deliverable submission deadline:	January 5, 2020
Evaluation period:	January 6-24, 2020
Winner Announcement:	January 30, 2020

PRACTICAL INFORMATION

Below you can find some **general recommendations** for a successful work-flow during the design challenge:

- Remember that **the main point** of the challenge is to **learn** how to design space systems and **create a great collaborative work**. Read and ask!
- While each person in the Team will probably have a **defined area of expertise**, it would be a great mistake to blindly do one's tasks alone: there are **multiple interactions** between the subsystems of a nanosatellite and identifying them requires the collaboration of all members in the team.
- Agree early on **how you are going to work together** in your team, who is responsible for what, and the general organization of the work: meetings, work plan, responsibilities, task allocation etc.
- Design work is inherently **iterative**: you will start with a loose idea of what to do. As you advance and iterate within your Team, things will gradually become more defined.
- Be sure you **understand well the top-level requirements** and their implications before you start.
- In preliminary design, engineers want to acquire a **wide and consistent overview** of the system, without delving in detail: simple analyses, well-reasoned estimations, similar-mission data, and good margins are usually sufficient at this point.
- Remember that **tables, graphs, and bulleted lists** are far more effective for conveying certain types of information than long paragraphs.
- Use the **tools and methodology of NANOSTAR** network to your advantage: they can notably simplify your efforts in obtaining a successful design.

Good luck!

SUPPORT FACULTY, TOOLS AND METHODOLOGY

All the information on the NANOSTAR **software tools, facilities, Support Faculty, and methodology** can be found at the NANOSTAR website: <http://nanostarproject.eu>.

CONTACTING THE EVALUATION COMMITTEE

For any **issues or doubts** of the competition, your Team Leader can contact the evaluation committee, following the indications found on the NANOSTAR web page.