



The EU Framework Programme  
for Research and Innovation

# HORIZON 2020



## SME instrument Phase 2

### Administrative forms (Part A) Research proposal (Part B)

Version 1.3  
22 December 2015

#### Disclaimer

This document is aimed at informing potential applicants for Horizon 2020 funding. It serves only as an example. The actual Web forms and templates, provided in the online proposal submission system under the Participant Portal, might differ from this example. Proposals must be prepared and submitted via the online proposal submission system under the Participant Portal.

Research and  
Innovation

## History of changes

Version	Date	Change	Page
1.1	27.02.2014	▪ Part A added	1
		▪ Footnote was modified to align it with the Annotated Grant Agreement for the SME instrument-Phase2 (Part B)	12
		▪ Information on Evaluation added - scoring of proposals as they were submitted, rather than on their potential if certain changes to be made (Part B)	1
1.2	6.05.2014	▪ Addition of the reference to reimbursement rate of 100% (exceptional cases defined in the Work Programme)	
1.3	28.05.2015	▪ Section 4.1 – modification on how to subcontract third parties	14

Horizon 2020  
Call:  
SMEInst-2014-2015  
Topic:  
Space-SME-2015-2  
Type of action:  
SME-2 SME instrument phase 2  
Proposal number:  
123456  
Proposal acronym:  
DebrEyes

Section	Title	Action
1	General information	
2	Participants & contacts	
3	Budget	
4	Ethics	
5	Call-specific questions	

Proposal ID

Acronym

DebrEyes

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## 1 - General information

Topic

Space-SME-2015-2

Type of action

SME-2 SME instrument phase 2

Call identifier

SMEInst-2014-2015

Acronym

DebrEyes

Proposal title\*

CubeSats for the monitoring of space debris

*Note that for technical reasons, the following characters are not accepted in the Proposal Title and will be removed: < > " &*

Duration in months

24

Free keywords

*CubeSat; Space Debris; InfraRed Camera; Constellation; Satellites .*

## Abstract

The rising population of space debris increases the potential danger to all space vehicles, especially those with humans aboard. DebrEyes envisions the possibility of a periodically updated real-time 3D map of the predicted trajectory of space debris by means of a constellation of CubeSats for the prevention of collisions with operational satellites or spacecrafts. The framework for this ambitious final objective is the engagement of European SMEs in the space sector.

The purpose of this proposal is to develop the first phase of this project, leading to the following outcome:

- Design of an IR camera for debris detection, starting from a previous fully functional device developed by partners
- Design of a CubeSat
- Design of a constellation of CubeSats
- Post-processing software for the mapping of the debris

The operating window of the constellation includes the tracking of debris larger than 1mm in the range of altitudes where the density of debris is most severe – 600 to 1100km. Such a system would allow an improvement of the safety of space missions as well as the resilience of artificial satellites, hence helping secure European telecommunications and surveillance infrastructures – e.g. Galileo and Copernicus.

As importantly, the technological development of the project plans a coordination with other SMEs, which means an important contribution for the long-term competitiveness of the European market. The involvement of diverse entities – SMEs, universities – contemplates raising awareness on the importance of space exploration and debris threat to missions, which must not be lost sight of since the space industry continues to grow significantly.

The SMEs' income will derive from:

- Sale of the concept of the developed technology – CubeSat and constellation
- Shared patent of the IR camera technology
- Post-processing service of the data collected by the customers

The main commercial potential of the initiative lies in the use of the collected information.

Has this proposal (or a very similar one) been submitted in the past 2 years in response to a call for proposals under the 7th Framework Programme, Horizon 2020 or any other EU programme(s)?

☐ Yes ☒ No

Please give the proposal reference or contract number.

Proposal ID

Acronym

DebrEyes

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## Declarations

1) The coordinator or sole applicant declares to have the explicit consent of all applicants on their participation and on the content of this proposal.	<input checked="" type="checkbox"/>
2) The information contained in this proposal is correct and complete.	<input checked="" type="checkbox"/>
3) This proposal complies with ethical principles (including the highest standards of research integrity — as set out, for instance, in the <a href="#">European Code of Conduct for Research Integrity</a> — and including, in particular, avoiding fabrication, falsification, plagiarism or other research misconduct).	<input checked="" type="checkbox"/>
4) The coordinator or sole applicant confirms:	
- to have carried out the self-check of the financial capacity of the organisation on <a href="https://ec.europa.eu/research/participants/portal4/desktop/en/organisations/lfv.html">https://ec.europa.eu/research/participants/portal4/desktop/en/organisations/lfv.html</a> . Where the result was “weak” or “insufficient”, the coordinator confirms being aware of the measures that may be imposed in accordance with the H2020 Grants Manual (Chapter on Financial capacity check); or	<input checked="" type="checkbox"/>
- is exempt from the financial capacity check being a public body including international organisations, higher or secondary education establishment or a legal entity, whose viability is guaranteed by a Member State or associated country, as defined in the H2020 Grants Manual (Chapter on Financial capacity check); or	<input type="checkbox"/>
- as sole participant in the proposal is exempt from the financial capacity check.	<input type="checkbox"/>
5) The coordinator or sole applicant hereby declares that each applicant has confirmed:	
- they are fully eligible in accordance with the criteria set out in the specific call for proposals; and	<input checked="" type="checkbox"/>
- they have the financial and operational capacity to carry out the proposed action.	<input checked="" type="checkbox"/>
The coordinator is only responsible for the correctness of the information relating to his/her own organisation. Each applicant remains responsible for the correctness of the information related to him and declared above. Where the proposal to be retained for EU funding, the coordinator and each beneficiary applicant will be required to present a formal declaration in this respect.	

According to Article 131 of the Financial Regulation of 25 October 2012 on the financial rules applicable to the general budget of the Union (Official Journal L 298 of 26.10.2012, p. 1) and Article 145 of its Rules of Application (Official Journal L 362, 31.12.2012, p.1) applicants found guilty of misrepresentation may be subject to administrative and financial penalties under certain conditions.

## Personal data protection

Your reply to the grant application will involve the recording and processing of personal data (such as your name, address and CV), which will be processed pursuant to Regulation (EC) No 45/2001 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data. Unless indicated otherwise, your replies to the questions in this form and any personal data requested are required to assess your grant application in accordance with the specifications of the call for proposals and will be processed solely for that purpose. Details concerning the processing of your personal data are available on the [privacy statement](#). Applicants may lodge a complaint about the processing of their personal data with the European Data Protection Supervisor at any time.

Your personal data may be registered in the Early Warning System (EWS) only or both in the EWS and Central Exclusion Database (CED) by the Accounting Officer of the Commission, should you be in one of the situations mentioned in:

- the Commission Decision 2008/969 of 16.12.2008 on the Early Warning System (for more information see the [Privacy Statement](#)), or
- the Commission Regulation 2008/1302 of 17.12.2008 on the Central Exclusion Database (for more information see the [Privacy Statement](#)) .

Proposal ID

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## 2 - Administrative data of participating organisations

**PIC**

123456789 X

**Legal name**

DebreEyes S.L.

*Short name:* DebrEyes

*Address of the organisation*

Street C/Galileu 20

Town Terrassa

Postcode 08222

Country Spain

Webpage debreyes.cat

*Legal Status of your organisation*

Research and Innovation legal statuses

Public body ..... no

Non-profit ..... no

International organisation ..... no

International organisation of European interest ... no

Secondary or Higher education establishment ..... no

Research organisation ..... no

Small and Medium-sized Enterprises (SMEs) ..... yes

Legal person .....no

Nace code

Proposal ID

Acronym

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*Department(s) carrying out the proposed work*

**Department 1**

Department name

Project Management

Street

Town

Postcode

Country



Same as organisation  
address

Proposal ID

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*Person in charge of the proposal*

The name and e-mail of contact persons are read-only in the administrative form, only additional details can be edited here. To give access rights and basic contact details of contact persons, please go back to Step 4 of the submission wizard and save the changes.

Title

Dr.

Sex

☒ Male☐ Female

First name

Sergi

Last name

Pallejà Cabré

E-Mail

sergi.palleja@debreyes.cat

Position in org.

Project Manager

Department

Project Management

Street



Same as organisation address

Town

Post code

Country

Website

Phone

937 20 20 20

Phone 2

937 20 20 15

Fax

937 20 20 20



Proposal ID      Acronym      DebrEyes      Go to

## 3 - Budget for the proposal

Participant	Country	(A) Direct personnel costs/€	(B) Other direct costs/€	(C) Direct costs of sub- contracting /€	(D) Direct costs of providing financial support to third parties/€	(E) Costs of inkind contributions not used on the beneficiary's premises/€	(F) Indirect Costs/€ (=0.25(A+B-E))	(G) Special unit costs covering direct & indirect costs	(H) Total estimated eligible costs/€ (=A+B+C+D+F +G)	(I) Reimburse- ment rate	(J) Max. grant / € (=H*I)	(K) Requested grant / €
DebrEyes	ES	1,827,053	280,374	247.500			588,732		2,943,659	70 %	2,060,561	2.100.000
Total		1,827,053	280,374	247.500			588,732		2,943,659	70 %	2,060,561	2.100.000

Proposal ID

Acronym

DebrEyes

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## 4 - Ethics issues table

1. HUMAN EMBRYOS/FOETUSES		Page
Does your research involve <a href="#">Human Embryonic Stem Cells (hESCs)</a> ?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Will they be directly derived from embryos within this project?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they previously established cells lines?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does your research involve the use of human embryos?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does your research involve the use of human foetal tissues / cells?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
2. HUMANS		Page
Does your research involve human participants?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they volunteers for experiments in social or human sciences research?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they persons unable to give informed consent?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they vulnerable individuals or groups?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they children/minors?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they patients?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they healthy volunteers for medical studies?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does your research involve physical interventions on the study participants?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does it involve invasive techniques?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does it involve collection of biological samples?	<input type="radio"/> Yes <input checked="" type="radio"/> No	
If your research involves processing of genetic information, please also complete the section "Protection of personal data" [Box 4].		

Proposal ID	Acronym	DebrEyes	Go to
<b>3. HUMAN CELLS / TISSUES</b>			
Does your research involve human cells or tissues? If your research involves human embryos/foetuses, please also complete the section "Human Embryos/Foetuses" [Box 1].		<input type="radio"/> Yes <input checked="" type="radio"/> No	Page
Are they available commercially?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they obtained within this project?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they obtained within another project?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they deposited in a biobank?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
<b>4. PROTECTION OF PERSONAL DATA <sup>ii</sup></b>			
Does your research involve personal data collection and/or processing?		<input type="radio"/> Yes <input checked="" type="radio"/> No	Page
Does it involve the collection and/or processing of sensitive personal data (e.g.: health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction)?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does it involve processing of genetic information?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does it involve tracking or observation of participants?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does your research involve further processing of previously collected personal data (secondary use)?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
<b>5. ANIMALS <sup>iii</sup></b>			
Does your research involve animals?		<input type="radio"/> Yes <input checked="" type="radio"/> No	Page
Are they vertebrates?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they non-human primates?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they genetically modified? <sup>iv</sup> ( <a href="#">directive</a> - <a href="#">regulation</a> )		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they cloned farm animals?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Are they endangered species?		<input type="radio"/> Yes <input checked="" type="radio"/> No	

Proposal ID	Acronym	DebrEyes	Go to
<b>6. NON-EU COUNTRIES</b>			Page
Does your research involve non-EU countries?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Do you plan to use local resources (e.g. animal and/or human tissue samples, genetic material, live animals, human remains, materials of historical value, endangered fauna or flora samples, etc.)?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Do you plan to import any material - including personal data - from non-EU countries into the EU? If you consider importing data, please also complete the section "Protection of Personal Data" [Box 4].		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Do you plan to export any material - including personal data - from the EU to non-EU countries? If you consider exporting data, please also complete the section "Protection of Personal Data" [Box 4].		<input type="radio"/> Yes <input checked="" type="radio"/> No	
If your research involves <a href="#">low and/or lower middle income countries</a> , are benefits-sharing measures foreseen?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Could the situation in the country put the individuals taking part in the research at risk?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
<b>7. ENVIRONMENT PROTECTION</b> <small>vi <a href="#">Directive 2001/18/EC</a> - vii <a href="#">Directive 2009/41/EC</a> - viii <a href="#">Regulation EC No 1946/2003</a> - ix <a href="#">Directive 2008/56/EC</a> x <a href="#">Council Directive 92/43/EEC</a> - xi <a href="#">Council Directive 79/409/EEC</a> - xii <a href="#">Council Regulation EC No 338/97</a></small>			Page
Does your research involve the use of elements that may cause harm to the environment, to animals or plants?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does your research deal with endangered fauna and/or flora and/or protected areas?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
Does your research involve the use of elements that may cause harm to humans, including research staff?		<input type="radio"/> Yes <input checked="" type="radio"/> No	

Proposal ID	Acronym	DebrEyes	Go to
8. <a href="#">DUAL USE</a> <small>xiii</small>			Page
Does your research have the potential for military applications?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
9. MISUSE			Page
Does your research have the potential for malevolent/criminal/terrorist abuse?		<input type="radio"/> Yes <input checked="" type="radio"/> No	
10. OTHER ETHICS ISSUES			Page
Are there any other ethics issues that should be taken into consideration? Please specify		<input type="radio"/> Yes <input checked="" type="radio"/> No	

I confirm that I have taken into account all ethics issues described above and if any ethics issues apply,  
 I have attached the required documents.



Proposal ID

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### 3 - Call specific questions

#### Call specific declaration(s)

I declare on my honour that: Neither I nor any of the members of the consortium (if relevant) are involved in concurrent submission or implementation with another SME instrument Phase 1 or Phase 2 project.



Does your proposal build on a SME instrument Phase 1 project? Please indicate.

☐ Yes☒ No

Please give the proposal ID Phase 1 project or the acronym.

#### Excluded Reviewers

You can provide up to three names of persons that should not act as an evaluator in the evaluation of the proposal for potential competitive reasons.

First Name

Last Name

Institution

Town

Country

Webpage



<i>Proposal ID</i>	<i>Acronym</i>	DebrEyes	<i>Go to</i>
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# Validation result

Section	Description
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## COVER PAGE

TITLE OF PROPOSAL:

CubeSats for the monitoring of space debris

LIST OF PARTICIPANTS:

Participant Nº	Participant organisation name	Country
1	DebrEyes	Spain
2	TU Delft	Netherlands
3	TU Denmark	Denmark
4	ISIS	Netherlands
5	SatNOGS	Greece

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# 1 Excellence

## 1.1 Objectives

### *The situation*

**Space debris** is one of the main threats to space exploration nowadays. According to ESA<sup>1</sup>, more than 20,000 debris larger than a softball and more than 500,000 of the size of marble are orbiting the Earth. Furthermore, many millions of pieces of debris are too small to be tracked from earth, endangering the **safety** of space missions.

### *The problem*

Damage on satellites and space vehicles caused by debris result in important **economic losses** in operating companies.

### *The solution*

Aiming to overcome this problem, the purpose of the project is to design a **CubeSat network that monitors debris'** orbits by means of the identification of their position and velocity, specially focusing on these pieces that cannot be observed from Earth due to their small size. The identification of debris will produce a database of debris.

### *The effect*

- Be able to **prevent impacts** between debris and operational space vehicles and satellites,
- Benefits in terms of mission **safety**, systems **reliability** and maintenance **cost**.
- Increasing the **lifetime** of the current and future satellites of EU

In order to implement this solution some objectives have to be achieved. These consist on fulfilling a specific scope within the specified period of the project, without overrunning the budget and assuring the quality standards of any deliverable. Specifically, state of the art IR camera needs to be developed, since the actual technology does not fit the requirements of the project. This is both a challenge and an opportunity for the project, since we are boosting the development of a need driven technology that will have applications far beyond this project.



Figure 1: Representation of current space debris (not to scale) (ESA).

Scope	
Design and Infrared camera	<b>Time:</b> 2 years
Design the CubeSat	<b>Cost:</b> 3M €
Develop the Software	<b>Quality</b> - Prototype - Documentation
Produce and test a prototype	
Design a ground communication system	

## 1.2 Relation to the work programme

The Debris project answers to the Space Topic of the Horizon 2020 PROTEC-2-2014: Access technologies and characterisation for Near Earth Objects (NEOs), in which it is necessary to acquire in-depth information of the nature of s NEOs for impact mitigation missions. By means of the development of the project, several specific technologies and instruments will be available to conduct missions to debris, aiming to acquire in-depth information of its nature and potential harm to European satellites and space vehicles, which is mandatory for any mitigation or deflection mission.

<sup>1</sup> **ESA.** ESA. *Space Debris*. European Space Agency, April 18, 2013 (accessed September 25, 2015) [www.esa.int/Our\\_Activities/Operations/Space\\_Debris/About\\_space\\_debris](http://www.esa.int/Our_Activities/Operations/Space_Debris/About_space_debris).

### 1.3 Concept and approach

The positioning technology of orbiting objects is a TRL 9, since it has been proven in operational environment. However, since the project aims to monitor small debris, specific technology is a TRL3, as the IR camera for the required specifications is in an experimental proof of concept. The project will take advantage of the maturity of the concept to boost the development of the specific application for which the project aims for. Once the technology is developed, the CubeSat network will be ready to be tested in earth orbit, both validating the design and giving feedback for European satellites to avoid collisions.



Figure 2: Root concept.

### 1.4 Ambition

*The lack of accurate data means inability to act. Proper information at the proper time means huge economic savings in maintenance and the ability to keep satellites in optimum productive conditions.*

Space agencies and satellite operators are blind to small space debris. Despite the development of technologies to monitor debris, there is no company that has yet developed a technology able to track them. The project aims to become a source of information that all involved parties will consider as crucial for safely operating space vehicles in earth's orbit.

The technology that will be developed by the project aims to provide information that will be considered as essential for space missions. An accurate prediction of space debris is the key for potential cost savings for space agencies or private operators, since there are no alternatives for monitoring this kind of objects at the moment.

## 2 Impact

### 2.1 Expected Impacts

#### 2.1.1 Users / Market: market segment analysis, competitors, targets

The rise of space systems dependence plus the rise of space debris generate a potential fatal scenario that cause enormous losses to space industries. DebrEyes is a safety measure that prevents fatal debris collisions to highly valuable satellite infrastructure. For these reason, **any high profile company that owns medium/big satellites that provide indispensable services** can benefit from this service and thus, **is a potential user**.

The orbital debris problem is addressed in the following ways:

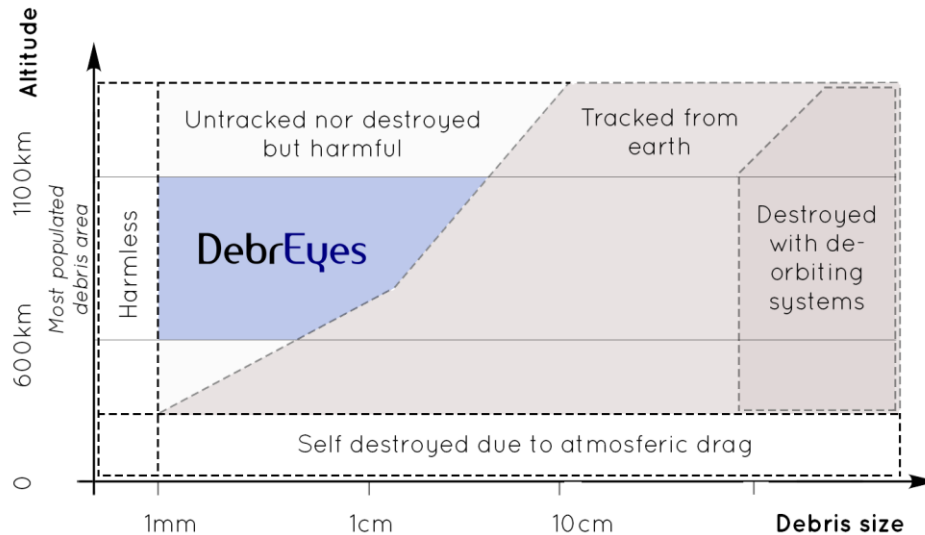


Figure 3: How orbital debris is addressed depending on size and orbit height.

DebrEyes is aiming to cover this specific group of debris: small debris in far-from-earth orbits and very small but damaging debris. No company is currently providing an on space debris monitoring system. This fact gives DebrEyes a very valuable strategic advantage.

The market that our product addresses is very concentrated niche market, aiming specifically to high profile companies owning medium to big satellites providing indispensable services. For example: the European Space Agency by protecting the International Space Station, or the Germany government by protecting its military satellites SAR-Lupe<sup>2</sup>. Currently, there are approximately 400 medium/large satellites orbiting between 600 and 1100 km high<sup>3</sup>, of which 64 are exclusively owned by European countries.

However, the product outcome of the DebrEyes project will encounter a number of market barriers that must be studied and overcome.

Table 1. List of market barriers

Market Barrier	Potential problem	Counteract measure
<b>Product differentiation</b>	Aerospace companies rely on the very few established competitors available who have gained customer loyalty and brand identification	Airbus Defence will take care of commercialization and through its well-established brand the product will overcome this barrier
<b>Access to channels of distribution</b>	Established competitors control the logical channels of distribution	Key stakeholders and targeted users will be reached by periodic updates plus workshops and seminars organized by our company

### 2.1.2 Company: Relevance, growth, extra funding

DebrEyes project is meant to be the gate for our SME to set our pioneer technology in space debris detection while benefiting Europe both by improving the current technologies and ensuring safer operations in space missions as well as creating new technological networks between member states at a public and private level.

The product will be mainly used by European space agencies with a projected market share of a 10% of the satellites owned by European parties orbiting in the operation range of the project's product over the first two years after its deployment onto the market. The present debris situation shows a trend that this product will be

<sup>2</sup> <https://directory.eoportal.org/web/eoportal/satellite-missions/s/sar-lupe>

<sup>3</sup> <http://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database.html#.Vmhl1omThCRd>

mandatory to any satellite in a midterm future. Accordingly, this 10% will upscale to 100% and the product will extend its market scope to non-European space agencies.

The budget of the project consists on incomes from different companies and organizations, public or private. The whole budget for the project is 3M€, from which 1.95M€ are requested from the call.

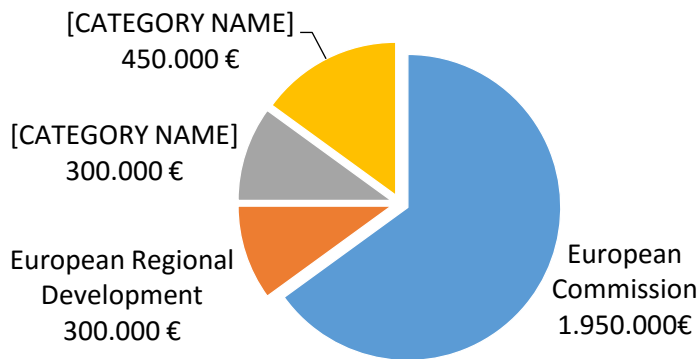


Figure 4: Budget partition.

## 2.2 Measures to maximize impact

### 2.2.1 Dissemination and exploitation of results: Full strategy plan to sell

Around the DebrEyes project there are three main groups of stakeholders, which are key to get involved for making a successful commercial exploitation of the resulting product. A specific action must be performed towards each group as stated in the following table:

Table 2. Classification of the stakeholders

Key stakeholders group	Category	Action
<ul style="list-style-type: none"> <li>European Commission</li> <li>European Space Agency</li> <li>Airbus Defense and Space European Investment Bank</li> </ul>	Investors	<ul style="list-style-type: none"> <li>Manage closely</li> </ul>
<ul style="list-style-type: none"> <li>NASA</li> <li>Télédiffusion de France</li> <li>Deutsche Telekom</li> <li>NSSL Global LTD</li> </ul>	Potential customers	<ul style="list-style-type: none"> <li>Keep informed</li> <li>Monitor</li> </ul>
<ul style="list-style-type: none"> <li>European Council</li> <li>Spanish Government</li> </ul>	Regulators	<ul style="list-style-type: none"> <li>Keep satisfied</li> <li>Monitor</li> </ul>

The DebrEyes project will fully design and develop the technology of the space debris monitoring system and its ground testing and validation. However, at that phase the technology will not be sellable. It will be necessary to test and validate it in space through a follow-up project. At that point the technology will be fully tested and validated and thus, it will be out-licensed. **DebrEyes S.L. will get revenue from licensing the technology.** One of our stakeholders, Airbus Defence and Space, is already interested and is going to take care of the commercialization and production. **DebrEyes S.L. will keep the rights of post-processing** and get revenue by providing this service to those users who buy the product.

After the DebrEyes project, 3 years of further tasks will be necessary before the deployment of the product into the market. The business plan scheme is illustrated below with its approximate time intervals.

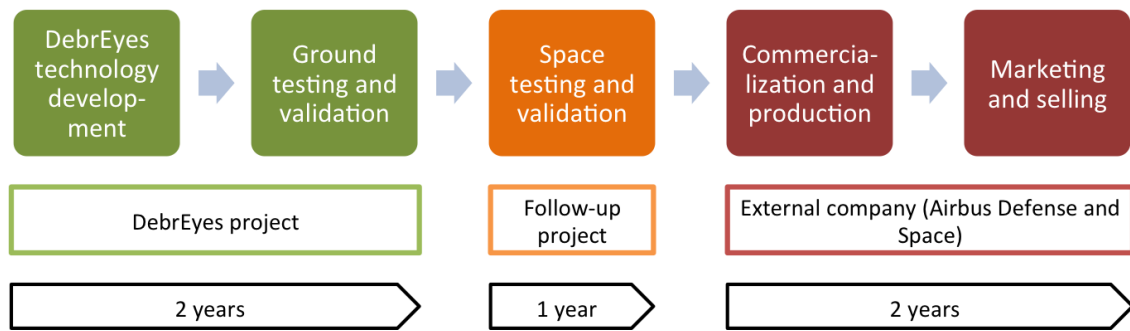


Figure 5: DebrEyes project future.

### 2.2.2 Intellectual Property, knowledge protection and regulatory issues

The global resulting system and its implementation is property of DebrEyes S.L., and it will be patented. Each technology co-developed with research collaborators is owned by the respective participants, for example the IR camera. Each entity will sign a confidentiality agreement to not misuse technologies developed by other participants.

Table 3. List of intellectual properties

IPR item	Owner	Protection
Debris detecting CubeSat technology	1. DebrEyes S.L.	Patent pending
IR camera	1. DebrEyes S.L. 2. TU Delft	Patent pending
Each subsystem co-developed	1. DebrEyes S.L. 2. Its respective collaborator (if any)	Confidentially agreement

DebrEyes S.L. guarantee that any technology developed or used in the development of the DebrEyes project will be thoroughly researched to ensure it is patent free and otherwise, license its use. At this stage, the product as a whole or its parts is not blocked by any patent hold by competitors. At the end of the full system validation, the technology will hold a worldwide “freedom to operate” state i.e. ensuring that the commercial production, marketing and use of their new product, process or service does not infringe the intellectual property rights of third parties.

The DebrEyes project will have three different information levels inside one single website using an intranet. This communication process must be selective enough to give the proper pieces of information, assuring the necessary grade of confidentiality. Responsible personnel from the DebrEyes project will control and monitor which information is available at each level.

1st level: Public access	<ul style="list-style-type: none"> <li>• <b>Toward who?</b> General public</li> <li>• <b>What?</b> Informative publications about the project</li> <li>• <b>Goal?</b> Attract public attention and increase expectation</li> </ul>
2nd level: Partially restricted	<ul style="list-style-type: none"> <li>• <b>Toward who?</b> Stakeholders</li> <li>• <b>What?</b> Project status reports and specific aspects</li> <li>• <b>Goal?</b> Keep informed, generate trust</li> </ul>
3rd level: Confidential	<ul style="list-style-type: none"> <li>• <b>Toward who?</b> DebrEyes staff and direct collaborators</li> <li>• <b>What?</b> DebrEyes database and all internal information</li> <li>• <b>Goal?</b> Protect any intellectual property resource (IPR) generated inside the project</li> </ul>

Figure 6: Communication levels.

The DebrEyes project does not simply settle for improving product and service quality; instead it is deploying extensive activities to pursue top quality management methods in order to provide the highest level of satisfaction to our customers and stakeholders. To achieve this, the quality department sets up various quality improvement activities, with special attention given to quality management. The following General Quality Standards (ISO/EN) will be followed to maximize the quality of the resulting documents; thus, DebrEyes S.L. will not purchase the certification:

- 9100 - Quality System for Aerospace Manufacturers
- 9101 - Checksheet for 9100
- 9110 - Quality System for Aerospace Repair Stations
- 9111 - Checksheet for 9110
- 9120 - Quality System for Distributors
- 9121 - Checksheet for 9120

### 2.2.3 Communication: How to reach audiences

The communication plan of the DebrEyes Project is focused on keeping the industry aware of the project and on getting the general public to know the project attracting them to it. According to this thesis, it will face two directions for its external communications:

#### 2.2.3.1 General public

To keep the general public attracted to the project, DebrEyes S.L. will perform the following actions:

- Design a website and keep it updated.
- Be present and active at the different social networks.
- Perform a "Know DebrEyes Day" when interested people will be able to enter our facilities and see different production points and models.

#### 2.2.3.2 Aerospace Sector

DebrEyes S.L. will showcase its exploitable results amongst the aerospace industry through different ways:

- During the project duration, 2 internal workshops per year will be organised with the relevant Business Units in the different countries of the European Union to assume the dissemination of the results and to shorten the time between research and commercial exploitation.
- Periodically publish articles in specialized magazines and websites.
- Have stands at the sector meetings, fairs and congresses.
- Periodically publish articles in specialized magazines and websites such as the followings:
  - Aerospace Science and Technology
  - Space Science & Engineering International Journal
  - CEAS Space Journal
  - Progress in Aerospace Sciences
- Have stands at the sector meetings, fairs and congresses such as the followings:
  - International Paris Air Show Le Bourget
  - The Japan International Aerospace Exhibition
  - ILA Berlin Air Show
- Attract students to work for DebrEyes project as scholarship holders so universities will be interested in the DebrEyes project as well.

### 3 Implementation

#### 3.1 Work plan – Work packages, deliverables and milestones

##### 3.1.1 Overall Structure

The Work Plan of the DebrEyes project has been established following a logical structure to accomplish the project's objective. A proportionate amount of resources has been allocated in each Work Package to carry out the tasks.

There are 6 major work packages:

The first two work packages are Management (WP.1) and Communication, dissemination, and exploitation (WP.2). They include all the necessary components and tasks to ensure a successful development of the project in terms of organization and finances. Internal and External Communication are also included in Work Package 2. The components and tasks stated in them guarantee a clear and fluid internal communication. They also define the strategy of the project to get to know with potential clients and interested organizations.

Finally, the last 3 Work Packages (WP.3, WP.4 and WP.5) refer exclusively to technical aspects to give an innovative solution to the call being answered in this proposal.

The overall structure is presented in Figure 7:

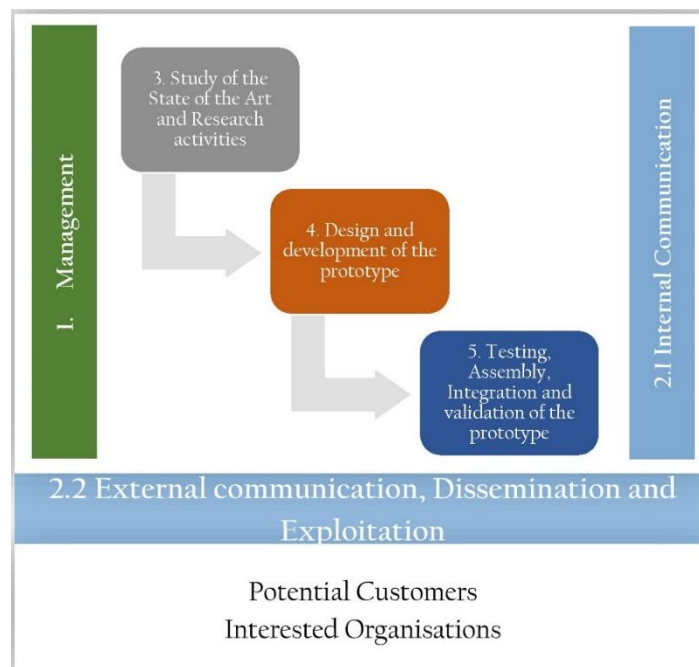


Figure 7: Overall Structure of DebrEyes Work Plan



### 3.1.2 Timing of the Work Plan

The timing of the Work Plan is presented in the Gantt chart below (Figure 8). The project is started at the beginning of 2016 and finishes at the end of 2017. During the first and a half year, all the technical development is carried out, whereas the half year left is devoted to validate all the results.

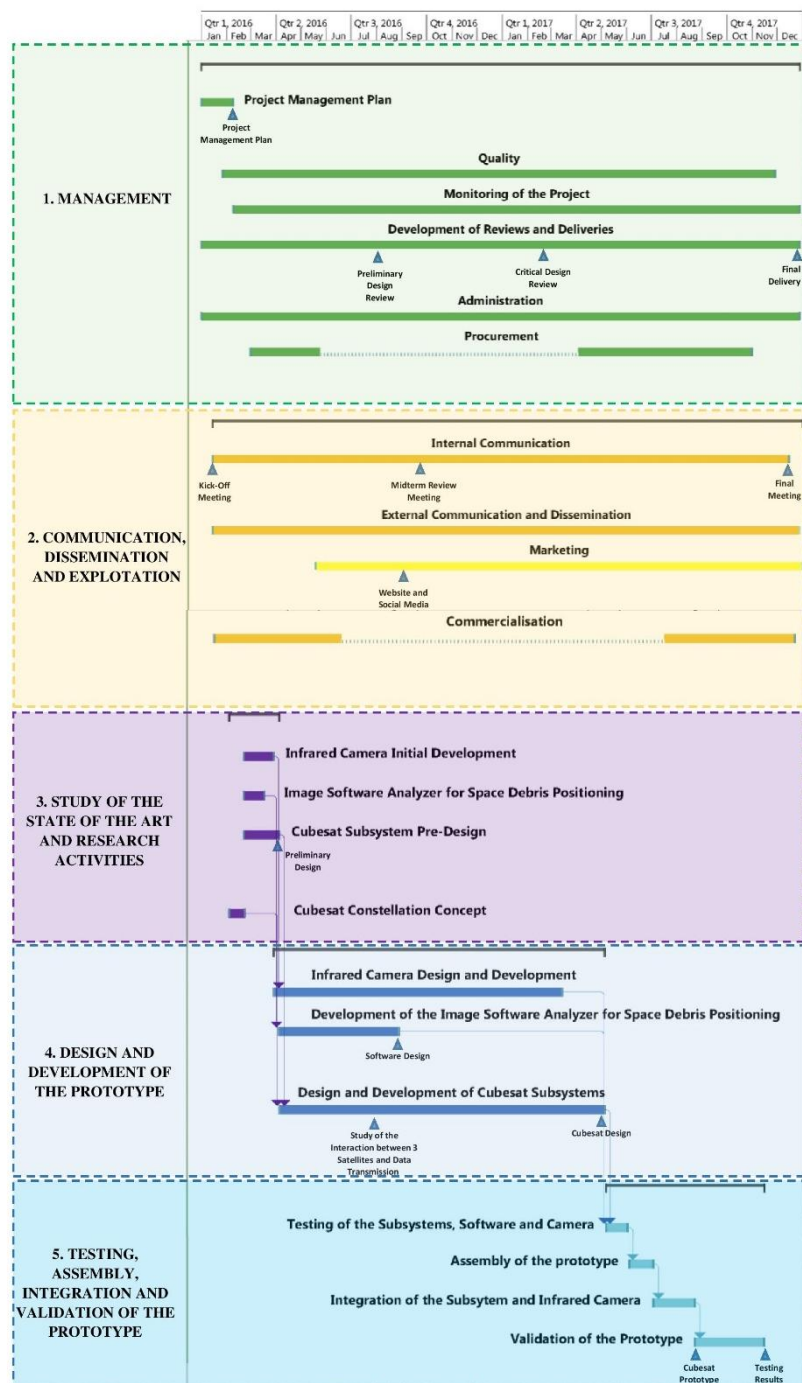


Figure 8: Work Plan Schedule



### 3.1.3 Description of Work Packages and Resources allocated

A detailed list of the main work packages of the project is shown in the following table.

*Table 4. List of Work Packages*

Work Package No	Work Package Title	Lead Participant No	Lead Participant Short Name	Person Months	Start Month	End Month
<b>WP.1</b>	Management	1	DebrEyes	12.72	January 2016	December 2017
<b>WP.2</b>	Communication, dissemination and exploitation	1	DebrEyes	4.79	January 2016	December 2017
<b>WP.3</b>	Study of the State of the Art and Research activities	5	DebrEyes TU Delft TU Denmark SatNOGS ISIS	10.32	January 2016	April 2016
<b>WP.4</b>	Design and development of the prototype	5	DebrEyes TU Delft TU Denmark SatNOGS ISIS	59.11	March 2016	May 2017
<b>WP.5</b>	Testing, assembly, integration and validation of the prototype	1	DebrEyes	4.11	August 2016	October 2017
				<b>94.57</b>		

A detailed description of the work packages is provided in the following table.

*Table 5: Work Package 1*

Work package number	1	Start Date or Starting Event	January 2016
Work package title	Management		
Participant number	1		
Short name of participant	DebrEyes		
Person/months per participant	16.24		
Objectives:			
The main objectives of this work package are described below:			
<ul style="list-style-type: none"><li>Organize all the documents and transmit the information clearly and consistently along all the development of the project.</li><li>Control the development of the project and guide it to success.</li><li>Prepare a clean and visual presentation.</li><li>Recruit people with professional skills and in a fair way in order to not have gender discrimination.</li></ul>			
Description of work:			
In this work package, DebrEyes S.L. is the only participant and the project manager is the main responsible. The main tasks of this work package can be classified as following:			
<ul style="list-style-type: none"><li>Development of the project management plan in order to have the guidelines to be able to control the project.</li><li>Keep constant track of the current status of the project.</li><li>Ensuring that tasks are on date and drawing up the appropriate report.</li><li>Carry out a multidisciplinary technical review to ensure that the system can advance into manufacture, demonstration and test.</li><li>Prepare guidelines for the documentation and carry out document revision, rectification and approval.</li><li>Writing the document on certifications and legal requirements.</li><li>Continuous control, checking and management of human resources, being aware of any change needed to ensure a satisfactory end of the project.</li><li>Development of the financial plan. Evaluate the cost required by each of the departments so as to carry on the project.</li></ul>			
Deliverables:			
Project Management Plan, Midterm Review, Critical Design Review, Certification and Legal Requirements, Final Report.			

Table 6: Work Package 2

Work package number	2	Start Date or Starting Event	January 2016
Work package title	Communication, dissemination and exploitation		
Participant number	1		
Short name of participant	DebrEyes		
Person/months per participant	4.79		
<b>Objectives:</b>			
The main objectives of this work package are described below:			
<ul style="list-style-type: none"><li>• Distribute all kind of relevant information of the project to universities and customers.</li><li>• Establish contact and relationships with other SME and private companies, as well as universities throughout Europe.</li><li>• Design a modern and clear website and carry out all the social media responsibilities.</li></ul>			
<b>Description of work:</b>			
Some activities included in this work package are outsourced to an external company. This company is in charge of all the aspects related to the external communication of the project, and also is the maximum responsible of the fulfillment of the tasks according to the schedule. The rest of activities are carried out by DebrEyes S.L. The main tasks of this work package can be classified as following:			
<ul style="list-style-type: none"><li>• Development and maintenance of the project website.</li><li>• Development of applications and activities to enable users to participate in social networking.</li><li>• Development of the communication plan in order to have the guidelines to manage the contact with future users and general population.</li><li>• Study of the possible suppliers for any external resource necessary to carry out the project and the assembly of the CubeSat.</li><li>• Purchase of all the external resources needed to carry out the project.</li><li>• Analysis of all the companies in the market to identify any potential customer of the output of the project.</li><li>• Start the contact with the selected potential customers in order to introduce the product and create a business relationship.</li></ul>			
<b>Deliverables:</b>			
Communication Plan, Website.			

Table 7: Work Package 3

Work package number	3		Start Date or Starting Event		January 2016	
Work package title	Study of the State of the Art and Research activities					
Participant number	1	2	3	4	5	
Short name of participant	DebrEyes	TU Delft	TU Denmark	SatNOGS	ISIS	
Person/months per participant	6.63	0.25	1.40	1.15	0.89	

**Objectives:**

The main objectives of this work package are described below:

- Ensure the fulfilment of the project requirements carrying out studies for each subsystem and using current technologies.
- Research and investigate new methods or technologies for the fulfilment of the requirements which cannot be met using current technologies.

**Description of work:**

In this work package, DebrEyes S.L. works in collaboration with other companies and technical universities. The Project Manager is in charge of supervising all the collaborations and their success. The main tasks of this work package can be classified as following:

- Information research about the trace and size of debris and their increase ratio along time. As well as research of studies of their potential dangers and studies about reducing their impact.
- Research of infrared technologies for CubeSats. Study of the characteristics and requirements of the infrared camera for debris detection.
- Study of the requirements of the telecommunications equipment (ground control station, CubeSat data transmission system, Galileo data transmission).
- Research of the attitude control methods available for CubeSats.
- Study of the requirements needed to develop a tracking unit. Research of the most suitable orbits for an optimum performance. Study of the maneuvers needed for preserving the integrity and functionality of the constellation.
- Study of the energetic requirements for one CubeSat and its subsystems. Study of the current methods available for energy obtaining and energy storage for CubeSats.
- Study of the current thermal isolators and heat sinks used for CubeSats. Study of the thermal properties of each of the subsystems.
- Study of the requirements for the CubeSat structure based on lightweight materials for space applications.
- Study of the requirements for the post-processing software and for the on-board software of the CubeSat.

**Deliverables:**

CubeSat Requirements, Infrared Camera Requirements, Telecommunications Requirements.

Table 8: Work Package 4

Work package number	4	Start Date or Starting Event				March 2016
Work package title	Design and development of the prototype					
Participant number	1	2	3	4	5	
Short name of participant	DebrEyes	TU Delft	TU Denmark	SatNOGS	ISIS	
Person/months per participant	36.50	0.63	8.22	1.40	12.37	

**Objectives:**

The main objectives of this work package are described below:

- Design and develop all the subsystems according to the requirements specified in the previous work package.
- Manufacture all the CubeSat subsystems following the design developed previously in order to assemble the prototype.

**Description of work:**

In this work package, DebrEyes S.L. works in collaboration with other companies and technical universities. The Project Manager is in charge of supervising all the collaborations and their success. The main tasks of this work package can be classified as following:

- Preliminary design of the subsystems of the CubeSat (Infrared camera, telecommunications equipment, attitude control system, energy system, thermal control system, software, and structure).
- Integration and assembly of the preliminary designs of the subsystems.
- Final design of the subsystems of the CubeSat (Infrared camera, telecommunications equipment, attitude control system, constellation, energy system, thermal control system, software, and structure).
- Integration of the final development of the subsystems.
- Manufacturing and assembly of the subsystems of the CubeSat prototype (communications subsystem, attitude control subsystem, energy subsystem, thermal control subsystem, software, and structure subsystem).

**Deliverables:**

Infrared Camera Preliminary Design, Attitude Preliminary Design, Telecommunications Preliminary Design, Thermal Preliminary Design, Energy Preliminary Design, Structure Preliminary Design, Preliminary Design Review, Constellation Study, On-Board Software Specifications, On-Board Software, Post-processing Software Specifications, Post-processing Software, Attitude Final Design, Infrared Camera Final Design, Telecommunications Final Design, Thermal Final Design, Structure Final Design, Energy Final Design, CubeSat Specifications, Infrared Camera Specifications.

Table 9: Work Package 5

Work package number	5	Start Date or Starting Event	August 2016
Work package title	Testing, assembly, integration and validation of the prototype		
Participant number	1		
Short name of participant	DebrEyes		
Person/months per participant	4.11		
<b>Objectives:</b>			
The main objectives of this work package are described below:			
<ul style="list-style-type: none"><li>• Assembly and integration of all the subsystems into the final prototype.</li><li>• Testing and validation of all the subsystems of the CubeSat (Infrared camera, telecommunications equipment, constellation simulation, energy system, post-processing software, on-board software, and structure).</li></ul>			
<b>Description of work:</b>			
In this work package DebrEyes S.L. is the main participant, and the manager of each department is the maximum responsible of the success of the tasks. Some tasks of this work package are outsourced to an external company. This external company is in charge of all the aspects related to the testing of the subsystems, and also is the maximum responsible of the fulfilment of the tests according to the schedule. The main components of this work package can be classified as following:			
<ul style="list-style-type: none"><li>• Assembly of the prototype</li><li>• Integration of the subsystems and the infrared camera</li><li>• Testing of the subsystems of the prototype (<i>OUTSOURCED</i>)</li><li>• Validation of the prototype</li></ul>			
<b>Deliverables:</b>			
CubeSat Prototype, Validation.			

### 3.1.4 List of Deliverables

A detailed list of the deliverables of the project is shown in the following table.

Table 10: List of deliverables

Deliverable	Deliverable name	Work package number	Short Name of lead participant	Type	Dissemination level	Delivery date
WP 1.1	Project Management Plan	1	DebrEyes	R	CO	Month 1
WP 1.2	Midterm Review	1	DebrEyes	R	CO	Month 8
WP 1.3	Critical Design Review	1	DebrEyes	R	CO	Month 16
WP 1.4	Certification and Legal Requirements	1	DebrEyes	R	CO	Month 18
WP 1.5	Final Report	1	DebrEyes	R	CO	Month 24
WP 2.1	Communication Plan	2	DebrEyes	R	CO	Month 1
WP 2.2	Website	2	DebrEyes	DEC	PU	Month 2
WP 3.1	Infrared Camera Requirements	3	DebrEyes, TU Delft	R	CO	Month 3
WP 3.2	Telecommunications Requirements	3	DebrEyes, SatNOGS	R	CO	Month 3
WP 3.3	CubeSat Requirements	3	DebrEyes	R	CO	Month 3
WP 4.1	Attitude Preliminary Design	4	DebrEyes, TU Denmark	R	CO	Month 3
WP 4.2	Thermal Preliminary Design	4	DebrEyes, ISIS	R	CO	Month 4
WP 4.3	Telecommunications Preliminary Design	4	DebrEyes	R	CO	Month 5
WP 4.4	Infrared Camera Preliminary Design	4	DebrEyes, TU Delft	R	CO	Month 5
WP 4.5	Energy Preliminary Design	4	DebrEyes, ISIS	R	CO	Month 6
WP 4.6	Structure Preliminary Design	4	DebrEyes, ISIS	R	CO	Month 7
WP 4.7	Preliminary Design Review	4	DebrEyes	R	CO	Month 8
WP 4.8	Constellation Study	4	DebrEyes	R	CO	Month 8
WP 4.9	On-Board Software Specifications	4	DebrEyes, TU Denmark	R	CO	Month 8
WP 4.10	Post-processing Software Specifications	4	DebrEyes	R	CO	Month 8

Deliverable	Deliverable name	Work package number	Short Name of lead participant	Type	Dissemination level	Delivery date
WP 4.11	Attitude Final Design	4	DebrEyes, TU Denmark	R	CO	Month 8
WP 4.12	Thermal Final Design	4	DebrEyes, ISIS	R	CO	Month 8
WP 4.13	Structure Final Design	4	DebrEyes, TU Denmark ISIS	R	CO	Month 8
WP 4.14	On-Board Software	4	DebrEyes, TU Denmark	R	CO	Month 9
WP 4.15	Post-processing Software	4	DebrEyes	R	CO	Month 9
WP 4.16	Telecommunications Final Design	4	DebrEyes	R	CO	Month 9
WP 4.17	Infrared Camera Specifications	4	DebrEyes, TU Delft	R	CO	Month 15
WP 4.18	Infrared Camera Final Design	4	DebrEyes, TU Delft	R	CO	Month 15
WP 4.19	Energy Final Design	4	DebrEyes, ISIS	R	CO	Month 15
WP 4.20	CubeSat Specifications	4	DebrEyes, ISIS	R	CO	Month 16
WP 5.1	Validation	5	DebrEyes	R	CO	Month 17
WP 5.2	CubeSat Prototype	5	DebrEyes	R	CO	Month 22

### 3.1.5 Inter-relation between components

The inter-relations between components are presented in the following pert chart (Figure 9).

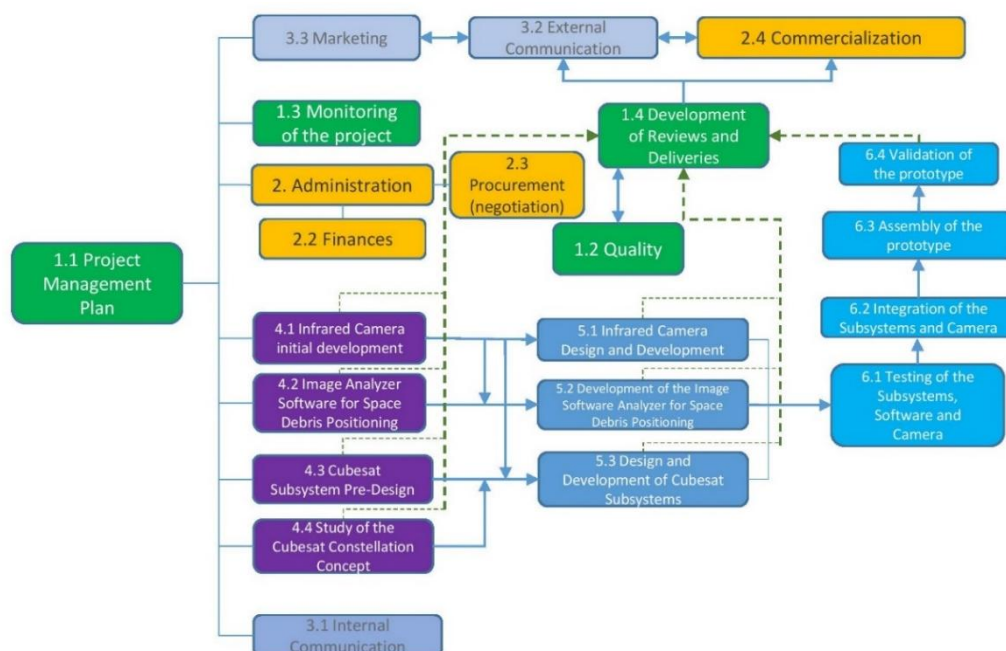


Figure 9: Inter-relation between components.



## 3.2 Management structure and procedures

In this section, the organizational structure, the project acceptance criteria and milestones are explained. In addition to that, the organizational structure, the quality management, as well as the risk management, are described relating to the complexity and scale of the project.

### 3.2.1 Organizational structure

In this section, the roles, members and responsibilities of the project are described in order to show how the decision making mechanisms work in this project. The groups of participants described below have been defined to guarantee a fluid communication in order to promote cooperation, participation and coordination between all stakeholders, investors and DebrEyes project Team. The companies which take part in the consortium are shown in section 3.3. In addition, the DebrEyes project Engineering organization departments are:

- Attitude control
- Energy
- Mechanical
- Software
- Sensing
- Space
- Structure
- Thermal control
- Telecommunication
- Testing and assembly

Table 11: Organizational structure

Roles	Members	Responsibilities
<b>Steering Committee</b>	<ul style="list-style-type: none"> <li>DebrEyes' Project Manager</li> <li>European Space Agency</li> <li>Airbus Defence and Space</li> <li>European Investment Bank</li> <li>Institut Català de Finances</li> <li>Caixa d'Enginyers</li> </ul>	<ul style="list-style-type: none"> <li>Strategic direction.</li> <li>Solve conflicts.</li> <li>Expedite a process.</li> <li>Providing resources.</li> <li>Leadership, support and assist in departmental policies.</li> </ul>
<b>Project Management</b>	<ul style="list-style-type: none"> <li>Project Manager</li> <li>Administration Manager</li> <li>Financial Manager</li> <li>Quality Manager</li> <li>Engineering Manager</li> <li>HHRR Manager</li> <li>Sales Manager</li> <li>Communications Manager</li> </ul>	<ul style="list-style-type: none"> <li>Communicating scope, schedule and costs risks.</li> <li>Monitoring scope, schedule and costs.</li> <li>Checking that all relevant information related is consistent.</li> <li>Communication between Steering Committee and Project Team.</li> <li>Communication with the European Commission.</li> </ul>
<b>Advisory Committee</b>	<ul style="list-style-type: none"> <li>DebrEyes' Project Manager</li> <li>Sapienza Consulting representative (External)</li> <li>Capgemini Consulting representative (External)</li> <li>ESA representative</li> <li>Technical Manager</li> <li>TU Denmark representative</li> <li>TU Delft representative</li> <li>ISIS representative</li> <li>SatNOGS representative</li> </ul>	<ul style="list-style-type: none"> <li>Introduce external know-how</li> <li>Provide leadership and direction.</li> <li>Review progress, risks, and issues and recommend resolutions.</li> <li>Make recommendations to the project sponsor.</li> <li>Assure DebrEyes implementation by educating district and program staff, provide means for training, and support implementation efforts.</li> </ul>

Roles	Members	Responsibilities
<b>Business Project Team</b>	<ul style="list-style-type: none"> <li>• DebrEyes' Project Manager</li> <li>• European Space Agency representative</li> <li>• Airbus Defence and Space representative</li> <li>• Technical Manager</li> <li>• Caixa d'Enginyers representative</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure successful implementation of business decisions from the Steering Committee.</li> <li>• Acquire information and demands from potential customers.</li> <li>• Define requirements.</li> <li>• Perform user testing.</li> <li>• Accept products and solution.</li> </ul>
<b>Technical Project Team</b>	<ul style="list-style-type: none"> <li>• Managers of different project departments and companies of the consortium</li> <li>• Engineers of different project departments and companies of the consortium</li> </ul>	<ul style="list-style-type: none"> <li>• Development, documentation, data conversion, implementation and ongoing operational support.</li> <li>• Developing, providing and conducting training to the state for the project.</li> <li>• Deliver a system that meets all the functional requirements of the contract.</li> <li>• Deliver the system per the schedule that will be described in the state approved in the Project Management Plan.</li> <li>• Work on the solution.</li> <li>• Report any issues impacting the project.</li> <li>• Provide recommendations to resolve issues.</li> <li>• Assist the Project Manager in successful implementation of the project.</li> <li>• Provide all the project information to the Project Manager.</li> <li>• Collect and gather all the information related to the project from the subcontractors.</li> </ul>
<b>Outsourcing companies</b>	<ul style="list-style-type: none"> <li>• Detrazos</li> <li>• Gutmar</li> <li>• Astro</li> <li>• Sener</li> </ul>	<ul style="list-style-type: none"> <li>• Inform and secure commitment from this group to support and participate in DebrEyes project.</li> <li>• To participate in the DebrEyes project with the appropriate resources, program management, and policies to support their participation.</li> <li>• Develop communications messages, materials and activities that respond to the needs of the DebrEyes project.</li> <li>• Evaluate the Project Communications plan by measuring customer satisfaction.</li> </ul>

### 3.2.2 Project Acceptance Criteria and Milestones

In this section, the acceptance criteria, which are shown in Table 12, are needed to be achieved before the final delivery in order to fulfil the scope and objectives of the project. They are also considered to verify the milestones of the project which are presented in Table 13.

Table 12: Acceptance Criteria

Acceptance Criterion	Acceptance Condition
<b>IR Camera Performance Requirements</b>	The IR camera must be capable of detecting 1mm debris.
<b>Constellation Requirements</b>	The DebrEyes constellation must be able to cover the range between 600 and 1100km, where the density of debris is the most severe.
<b>Telecommunications Requirements</b>	Both the design of the constellation and the design of the ground control system must ensure the permanent communication between all the CubeSats with the latter.

Acceptance Criterion	Acceptance Condition
Electronic Hardware Reliability	The electronic hardware must be able to withstand the harsh environment of launching and prolonged operation in space, such as extreme temperatures from hundreds of degrees below freezing to many hundreds of degrees above.
Structure reliability	The structure must be able to withstand the harsh environment of launching and prolonged operation in space.
Post-processing Software Requirements	The post-processing software must be able to process the data and use it to generate an updated real-time 3D model map of the predicted trajectory of the debris.
Energetic Autonomy	The energy subsystem must at all-time provide the required energy to run all vital subsystems for the mission.
Lifespan	The entire constellation must have an operational lifetime of 5 years from the end of its setup.
Technical Documents	All the technical details necessary for the development of the project must be properly recorded in reports, in order to keep track of the development and also to allow future improvements. User's guides for the developed software and hardware must be performed.
Quality and Presentation	All the documents must be organized and the information must be transmitted clearly and consistently along all the development. The presentation must be clean and visual. All the documents must be printable.
Research and Innovation	Research and innovation have to allow the fulfilment of the requirements which cannot be met using current technologies.
Sustainability and Reliability	The materials used in this project and also the energy resources must be as sustainable, reliable and efficient as possible. Component life must both be known and accomplish the requirements.
Collaboration	The project must collaborate with other SME and private companies, as well as universities throughout Europe.
Transparency	All kind of relevant information must be distributed to universities and customers.
Gender equality	The recruitment must be fair and professional skills must be taken into account in order not to have gender discrimination.
Tests and Validations	For the acceptance of the validations, the results of the tests – which must be certified – have to be successful* in order to prove the good performance of the new technology. Each of the results has to be recorded and so do the necessary improvements for achieving the final device or system.
	*The results will be considered successful when the degree of correlation between simulations and real tests is similar to the expected.

In the following table, the milestones of the project are described considering the related work packages, the estimated date and means of verification.

Table 13: List of milestones

Milestones number	Milestone name		Related work package(s)	Estimated date (month)	Means of verification
M1	Kick-Off Meeting		1, 2	Month 1	The meeting is successful, so that the agenda and minutes are taken into account.
M2	Project Plan	Management	1	Month 1	The report is properly finished, so that and it accomplish the acceptance criteria.

Milestones number	Milestone name	Related work package(s)	Estimated date (month)	Means of verification
M3	Preliminary Design	3	Month 7	The preliminary design report is properly finished, so that so that it accomplish the acceptance criteria.
M4	Website and Social Media	2	Month 8	The website and social media are properly finished, so that it accomplish the project objectives and acceptance criteria.
M5	Study of the Interaction between 3 Satellites and Data Transmission	3	Month 9	The report is properly finished, so that it accomplish the project objectives and acceptance criteria.
M6	Midterm Review Meeting	1, 2	Month 9	The meeting is successful, so that the agenda and minutes are taken into account.
M7	Software Design	3, 4	Month 13	The software is working properly according to project objectives and acceptance criteria.
M8	CubeSat Design	4	Month 15	The CubeSat design is properly finished, so that it accomplish the project objectives and acceptance criteria
M9	CubeSat Prototype	4,5	Month 22	The CubeSat prototype is properly finished, so that it accomplish the project objectives and acceptance criteria.
M10	Testing Results	5	Month 23	The results are successful, so that the components accomplish the project objectives and acceptance criteria, as well as, regulations.
M11	Final Meeting	1, 2	Month 24	The meeting is successful, so that the agenda and minutes are taken into account.

### 3.2.3 Quality Management

#### 3.2.3.1 Quality Control Approach

Quality control plan has been designed considering four different parts of the project:

- **Internal quality protocols**, which establishes the periods for quality controls
- **Technical quality plan**, which will ensure that the final product of the project fulfils the initial requirements
- **Documentation quality plan**, in order to ensure that all documents, both internal and external such as EU deliverables reach the project standards
- **Internal quality plan**, in order to ensure that the project regular activities are carried out in an effective and efficient way.

##### 3.2.3.1.1 Internal Quality Protocols

The protocols establish the periods at which meetings and surveys must be performed in order to assure that high level requirements and the general standards are met at the end of the project. They are explained below.

**Once per stage** (pre-production, production and post-production)

- Survey charter updates
- Survey plan content and updates, DebrEyes' priorities, and the task duration estimation.

**Every two weeks**

- Survey the following project activities:
  - Monitoring of the project.
  - Activities related to the infrared camera
  - Activities related to the development of the communications system
  - Software,
  - Activities related to the energy system

**At closure**

- Survey reports resulting from the closure of project phases.

**3.2.3.1.2 Technical quality**

Being the final product of the project an assembly of different technical components, every part has to be tested in order to ensure that it accomplish its requirements. Quality test can be carried out by external companies or by technical staff from the project. In order to do so, quality has to be checked at each stage of the production:

1. **Preliminary quality plan.** Before the beginning of the engineering process of any part or components, quality acceptance criteria have to be defined in each phase.
2. **Design phase.** According to the quality protocols indicated in Documentation Quality. The acceptance criteria for this step have to be set up according to, but not only, the high level requirements of the project. For example, all components have to fulfil the “End of Life” requirement.
3. **Production.** At the end of the production, components or parts have to pass a quality check according to the acceptance criteria defined at the beginning.
4. **Manipulation.** After the production quality check has been carried out, an accurate historic register of manipulations will be held in order to track any irregularity affecting the quality of the product.
5. **Delivery.** The quality of the product will be ensured, according to the fulfilment of all the previous acceptance criteria carefully registered with the certificates and manipulations log.

**3.2.3.1.3 Documentation quality**

All documents prepared during the project need to follow documentation quality plan, which consists on a mandatory series of steps to be followed. This documents can be both internal documents and external deliverables.

1. **Definition of the document**, which will be done previous to the document preparation.
  - Describe content of the document
  - Define acceptance criteria
  - Define roles involved in the document approbation route.
    - Responsible
    - Checkers
    - Approvers
  - Indicate if any guidelines, or regulation have to be followed in order to prepare the document.
  - Indicate deadline and milestones if necessary.
2. **Preparation**, which will be carried out by someone, not necessarily the responsible of the document. During this stage, quality department will be available in order to give support and clarify doubts, so that the number of iterations of the document will be reduced as much as possible.
3. **Approbation route.** The document needs to follow the approbation route. This workflow will be supported by the management software, which will be able, not only to store files and documents, but also to handle the required communication for this process. Checking and approval tasks are indicated in line for simplicity, however they can be carried out in parallel.
4. **Quality department supervision.** Quality department will check randomly internal documentation in order to make sure that all agents involved are following the company standards. They will also check all deliverables.

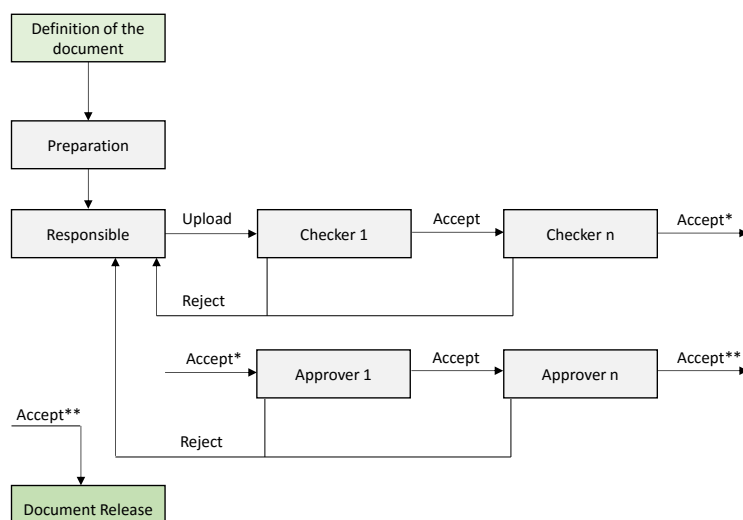


Figure 10. Approval route

#### 3.2.3.1.4 Internal quality

Despite internal quality not having a direct impact of the final product of the project, it is crucial in order to ensure an effective and efficient development of the project. Quality department take an important role in this plan, similarly to the supervision on the documentation quality plan.

It mainly consists on defining quality rules that ensure homogeneity in the daily procedure of the project.

- **Management.** Quality department has to prepare the rules and supervise the application of the project management tools and documents. In case of noncompliance of the directives, the responsible will be notified and progress of the changes will be tracked.
- **Procurement.** Quality department has to prepare the rules and supervise the application of the project procurement processes, so that they are carried out in a clear and responsible way. In case of noncompliance of the directives, the responsible will be notified and progress of the changes will be tracked.
- **Accountability.** Quality department and accountability responsible have to prepare the rules and supervise the application of the project accountability register, so that they are carried out in a clear and responsible way. In case of noncompliance of the directives, the responsible will be notified and progress of the changes will be tracked.
- **File management.** Quality department has to prepare the rules and supervise the application of the file management structure, regarding also the versions of the files. In case of noncompliance of the directives, the responsible will be notified and progress of the changes will be tracked.
- **Meeting and minutes.** Similarly, to the previous guidelines, it is necessary to set up indications for every group in the project so that meetings are scheduled, prepared, realized properly, and their results are clear, available and useful. In case of noncompliance of the directives, the responsible will be notified and progress of the changes will be tracked.

#### 3.2.3.2 Quality Improvement Approach

During the project development it will be necessary, not only to supervise the quality of all the aspects indicated before, but also to be able to revise guidelines, rules and protocols according to possible improvements. A **dynamic quality management** will be held, that is the **Deming Cycle**<sup>4</sup> or PDCA cycle will be applied which takes into consideration a continuous feedback loop that contains the following steps: Plan, Do, Check and Act to identify and change the parts of the quality process that need to be improved. In order to do so, a representation of different groups of people that form the project will meet regularly every two months with the quality department so as to,

- Control actual effectiveness and efficiency
- Evaluate actual systems of quality control
- Consider and execute possible modifications of the quality plan (**Deming Cycle**).

<sup>4</sup>Balanced Scorecard Institute, Strategy Management group. *The Deming Cycle*. [Online] Balanced Scorecard Institute [Cited: 15/12/2015] <https://balancedscorecard.org/Resources/Articles-White-Papers/The-Deming-Cycle>

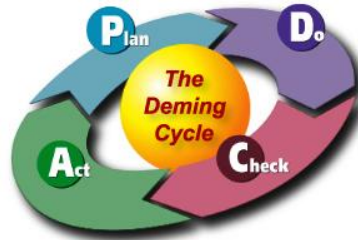


Figure 11. The PDCA Cycle of Continuous Improvement<sup>5</sup>

The agents involved in this meetings will be,

- Representation of all the employees, as users of most of the quality tools.
- Management representation, considering all employees holding management positions.
- Specific departments, those with specific tools, such as accountability, procurement, technical development, etc.

Also, in order to keep the project manager up to date with the quality assessments and improvements, regular meetings with the Quality Department will be held every month.

In order to be able to evaluate the effectiveness of the quality plan, some indicators will be used

- Number of iterations of a document to be approved. The less iterations the most effective.
- Number of incidence created by the quality department with documents against the quality plan rules. The less incidences the most effective.
- Number of communications to the quality department in order to solve doubts regarding quality plan. The more communications the most effective.
- Time devoted to quality management. This can be evaluated via surveys. The less time the most efficient.
- Employees' satisfaction with quality management plan. This can be evaluated via surveys.

### 3.2.3.3 Quality Roles and Responsibilities

Table 14. Responsibilities of the quality staff In this section, the staff that have to perform quality responsibilities and their tasks concerning these issues will be described – see Table 14.

Table 14. Responsibilities of the quality staff

Roles	Responsibilities
<b>Project Manager</b>	<ul style="list-style-type: none"> <li>• Coordinate all other managers to ensure the application of the quality assurance plan.</li> <li>• Schedule meetings to discuss quality assurance aspects.</li> <li>• Certifies that all final documents are quality-approved.</li> <li>• Responsibility of managing the project and keeping the planning updated with tasks duration and project's priorities.</li> <li>• Responsible for analysing the development of tasks.</li> <li>• Create and apply to the project quality control measures.</li> <li>• DebrEyes maximum quality responsible</li> </ul>
<b>Project Manager Secretary</b>	<ul style="list-style-type: none"> <li>• Make Project Manager's work lighter by fulfilling responsibilities he may delegate on him except for signing documents and official final certifications.</li> </ul>
<b>Administrative Services Manager</b>	<ul style="list-style-type: none"> <li>• Keep constant communication with stakeholders about the work done to ensure quality.</li> </ul>

<sup>5</sup>IACBE. *Continuous Quality Improvement and the Deming cycle*. [Online] International Assembly for Collegiate Business Education [Cited: 16/12/2015] <http://iacbe.org/qa-cqi.asp>

Roles	Responsibilities
<b>Quality Manager</b>	<ul style="list-style-type: none"> <li>• Be the main quality filter for all documents to be approved.</li> <li>• Designing the quality assurance methods and approve them with the Project Manager.</li> <li>• Supervise that quality methods are well applied into processes.</li> <li>• Keep the Project Manager abreast of DebrEyes quality current status.</li> </ul>
<b>Quality Secretary</b>	<ul style="list-style-type: none"> <li>• Make Quality Manager's work lighter by fulfilling responsibilities he may delegate on him mainly to work as a first quality filter.</li> </ul>
<b>Engineering Managers</b>	<ul style="list-style-type: none"> <li>• First contact point for the Project Manager to get feedback about the development of engineering tasks.</li> <li>• First contact point for engineers to give feedback about positive and negative aspects found during the production process.</li> <li>• Responsible for managing his work package in terms of scheduling and having the project's point of view.</li> <li>• Give first certification of the work developed by their module.</li> <li>• Responsible for providing the technical guidance to the project. It is mandatory to be aware of the latest usable technology in their areas.</li> <li>• Provide assistance and training to his team.</li> <li>• Specially double-checks the quality for the project's requirements.</li> <li>• Assures that quality control measures are being applied and this application is documented and adequate regarding the agreed quality standards.</li> </ul>
<b>Engineers</b>	<ul style="list-style-type: none"> <li>• Know and apply to processes the project's quality assurance methods</li> <li>• Inform his Engineering Manager about quality errors found in their work or in the application of quality assurance methods to the processes.</li> <li>• Be pro-active and suggest improvements for the application of the quality assurance methods if necessary.</li> </ul>

### 3.2.4 Risk management plan

#### 3.2.4.1 Definitions of Probability

In order to evaluate the probability of the potential risks to happen, a scale of 1% to 100% is used. This scale goes from unavoidable risks (100%) from risks that are really difficult to occur (1%). The different intervals are represented in the table below. The impact score is linearly divided in five sections corresponding with the qualitative description provided below:

*Table 15. List of definitions of probability*

Probability	Description	Probability Score
<b>Very High</b>	It is unavoidable	(81 - 100) %
<b>High</b>	High probability to happen	(61 - 80) %
<b>Medium</b>	Half likely to happen or not	(41 - 60) %
<b>Low</b>	Difficult to happen	(21 - 40) %
<b>Very Low</b>	Really difficult to happen	(1 - 20) %

#### 3.2.4.2 Definitions of impacts by objective

The impacts on all three categories (scope/quality, schedule and costs impacts) are quantified by a numerical index ranging from 1 to 5 in a linear way through the five categories described. A 5 means the highest impact and 1 the lowest impact on the project.



Table 16. List of scope/quality, schedule and cost impacts

Impact		Description	Impact Score
Very High	Scope/Quality	Be unable to satisfy all or a large part of the most critical acceptance criteria	5
	Schedule	Extremely significant impact, delaying the schedule by more than 6 months	
	Cost	Final cost of the project is heavily increased by more than 15%, requiring significant extra funding	
High	Scope/Quality	Impact that prevents the results from part of critical acceptance criteria	4
	Schedule	Highly significant impact, delaying the schedule from 3 to 6 months	
	Cost	Final cost of the project is increased between 12.5% and 15%	
Medium	Scope/Quality	Impact that reduces the final quality of the project not satisfying some acceptance criteria, but fulfilling the essential technical goals of the project	3
	Schedule	Significant impact, delaying the schedule from 1 to 3 months	
	Cost	Final cost of the project is increased between 10% and 12.5%, slightly further the contingency plan	
Low	Scope/Quality	Impact that moderately reduces the final quality of the project without affecting any relevant acceptance criteria	2
	Schedule	Slightly significant impact, delaying the project a considerable amount of days but less than 1 month	
	Cost	Final cost of the project is increased between 5% and 10%, not exhausting the contingency plan	
Very Low	Scope/Quality	Very slight impact that disturbs or affects minor details completely unrelated to any relevant acceptance criteria	1
	Schedule	No significant impact, delaying the project less than a week	
	Cost	Final cost of the project is not significantly increased, approximately between 0% and 5%	

### 3.2.4.3 Probability and impact matrix

In the probability and impact matrix, each combination of probability and degree of impact correspond to a level of priority. Taking into account the scope, quality, schedule and costs impact and the characteristics of each risk, the table should address the approximate relevance of the given risk.

On the one hand, extreme priority risks should be reduced to at least high priority by mitigation or prevention due to its possible critical effect on the project. On the other hand, null priority risks, as the name suggest, will not be taken into account during risk management.

		Probability				
		Very low	Low	Medium	High	Very high
Impact	Very high	Low priority	Medium priority	High priority	Extreme priority	Extreme priority
	High	Low priority	Medium priority	Medium priority	High priority	Extreme priority
	Medium	Low priority	Low priority	Medium priority	Medium priority	High priority
	Low	Null priority	Low priority	Low priority	Medium priority	Medium priority
	Very low	Null priority	Null priority	Low priority	Low priority	Low priority

Figure 12. Probability and impact matrix

#### 3.2.4.4 Risk rating

The position of each risk in the probability and impact matrix of the previous section should be determined by a risk rating that calculates the overall impacts of the risk taking into account the different impacts in scope, schedule and costs of the risk.

The formula used to calculate the risk rate is the following:

$$Impact = w_{scope} \cdot I_{scope} + w_{schedule} \cdot I_{schedule} + w_{costs} \cdot I_{costs}$$

Where  $w$  is the weight of each impact (the sum of the three weights must be the unit) and  $I$  is the individual impact for each risk (a number between 1 and 5).

The individual impacts must be evaluated for each task and the weight of each type of impact is decided according to the nature of the project. In consequence, considering that scope and costs have higher weights, they are defined as:

$$w_{scope} = 0.35 \quad ; \quad w_{schedule} = 0.3 \quad ; \quad w_{costs} = 0.35$$

Using all the data explained before, a measure could be applied to the risks using our method in order to know how important are the risks in our project regarding probability and impacts in the different three fields.

#### 3.2.4.5 Risk identification and mitigation measures

In this section, the risks identification, the work packages involved and the risk-mitigation measures are shown relating to project implementation.

Table 17: Risk identification and mitigation measures

Description of risk	Work package(s) involved	Proposed risk-mitigation measures
Low batteries lifetime	3, 4, 5	New batteries will be installed in the CubeSat
Poor camera performance	3, 4, 5	Redesign of the infrared camera to perform as expected
Lack of communication	1, 2	Extensive use of collaborative software
Delays in production and manufacturing	1	Dedication of more resources to meet the deadlines
Financial problems	1	Other financial sources have to be considered in order to face the economic cost of the project
Human resources issues	1	Personnel control and anticipation in unexpected personnel reduction
Lack of information	1, 2	A huge bibliographic research must be done before the development of the project
Interferences between electronic systems	3, 4, 5	Avoid interferences between components using electromagnetic shielding.
Material overrun	1	Control the prices of the materials needed in the project
Delays in components deliveries	1, 2	Control the delivery schedules of the materials needed in the project
Quality control of components unsuccessful	1, 5	Have exhaustive and regular quality controls to avoid problems in components in the final test
Software malfunction	3, 4, 5	Check the software performance during its development in order to detect programming errors as soon as possible

### 3.3 Consortium as a whole

The consortium proposed to develop this project is led by DebrEyes and supported by an efficient combination of European universities and SMEs. In one hand, the involved universities, TU Delft and TU Denmark, provide the advanced technologies and the research & innovation required for this project. In the other hand, the reliable and solid SMEs have the experience and the valuable how-know that enhance the development of the plan exposed. A representation of the consortium structure is represented in Figure 13.

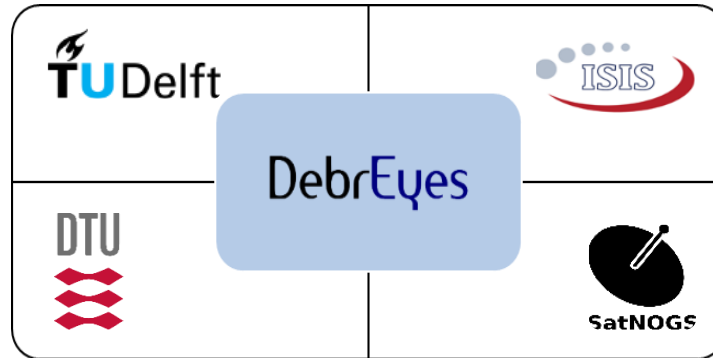


Figure 13. Partners of the consortium

The consortium exposed boost the competitiveness of the SMEs involved and enhance their innovation capacity and bridge the gap between research and development and the commercialization of innovation. In addition, the different partners complement each other with their particular expertise in the different fields involved in the project as it is summarized in Figure 14.

The management structure and procedures summarized in the previous section, combined with the reasons mentioned above, ensure the effectiveness of the parts working together as a consortium developing this project.

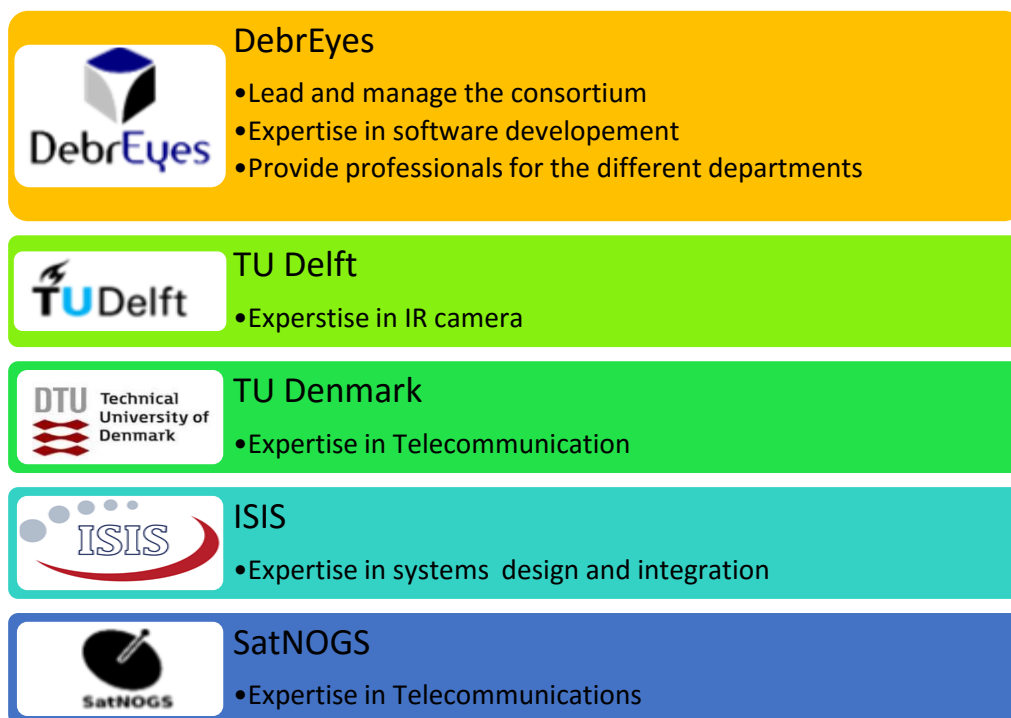


Figure 14. Consortium expertise

### 3.4 Resources to be committed

In the following table, the resources to be committed are shown considering the work packages and participants. The lower right box indicates the total of person/month.

*Table 18: Summary of staff effort*

	WP1	WP2	WP3	WP4	WP5	Total Person/Months per Participant
1) DebrEyes	16.24	4.79	6.63	36.50	4.11	68.27
2) TU Delft	-	-	0.25	0.63	-	0.88
3) TU Denmark	-	-	1.40	8.22	-	9.62
4) SatNOGS	-	-	1.15	1.40	-	2.55
5) ISIS	-	-	0.89	12.37	-	13.26
<b>Total Person/Months</b>	16.24	4.79	10.32	59.12	4.11	<b>94.57</b>

## 4 Members of the consortium

This section deepens in the suitability of all the persons and companies involved in the development of the DebrEyes project in case it was approved by the European Commission. The purpose is to demonstrate that the present proposal would be completely fulfilled and that all personnel in charge are highly qualified.

First of all, the curricula of all persons collaborating in the DebrEyes project from DebrEyes S.L. are presented in the following pages.

## AURA AMORÓS TORNÉ



Date of birth: 09/01/1994      Age: 21  
 Nationality: Spanish  
 Telephone number: +34 627 69 93 99  
 Email: aat1994@gmail.com

## EDUCATION AND TRAINING

- |   |                        |
|---|------------------------|
| <ul style="list-style-type: none"> <li>• <b>Master's Degree in Aeronautical Engineer</b><br/>ETSEIAT, Polytechnic University of Catalonia (UPC)</li> </ul>            | Sept. 2015- Ongoing    |
| <ul style="list-style-type: none"> <li>• <b>Bachelor's Degree in Aerospace Vehicles Engineering</b><br/>ETSEIAT, Polytechnic University of Catalonia (UPC)</li> </ul> | Sept. 2010 - July 2015 |

## EMPLOYMENT EXPERIENCE

- | Occupation, Name of Company  | Dates of employment    |
|--|------------------------|
| <ul style="list-style-type: none"> <li>• Internship in Seapower srl<br/>Development of the Bachelor's Degree final project: <i>Development of a Design and Optimization MATLAB Toolbox for Stall-Regulated Wind Turbines.</i><br/>Scuola Politecnica e delle Scienze di Base, Università degli Studi di Napoli Federico II<br/>ETSEIAT, Polytechnic University of Catalonia (UPC)</li> </ul> | Feb. 2015 - July 2015  |
| <ul style="list-style-type: none"> <li>• Private teacher</li> </ul>  | Sept. 2009- Sept. 2014 |
| <ul style="list-style-type: none"> <li>• Teacher in Academia Learning Center (Bell-lloc d'Urgell)</li> </ul>   | Jan. 2009 - Sept. 2012 |

## IT SKILLS

- **Office:** Microsoft Office (Word, Excel, PowerPoint).
- **CAD:** Solidworks.
- **Programming:** MATLAB, C++, VHDL.
- **Simulation:** OpenFoam, ANSYS, Simulink.
- **Other:** Agilent Design System.

## LANGUAGES

- **Catalan** (native)
- **Spanish** (native)
- **English** (C1)
- **French** (B1)
- **Italian** (B1)
- **German** (A2)

## FURTHER INFORMATION

- B driving license and own vehicle

# GUILLEM BENOSA ESPINET



**Date of birth:** 20/08/1992      **Age:** 23  
**Nationality:** Spanish  
**Telephone number:** +34 610373598  
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## EDUCATION AND TRAINING

- Master's Degree in Aeronautical Engineer** Feb. 2015 – Ongoing  
 ETSEIAT, Polytechnic University of Catalonia (UPC)
- Bachelor's Degree in Aerospace Technology Engineering** Sep. 2010 – Feb. 2015  
 ETSEIAT, Polytechnic University of Catalonia (UPC)

## PUBLICATIONS

- Benosa, G.** (2011). Disseny i simulació d'un flying wing (Design and simulation of a flying wing).  
 Sant Cugat del Valles: Memorial Manuel Vazquez Montalban. B 22586-2011.

## AWARDS

- 1st prize on 7th edition of Technological High School Graduation Projects Awards given by the ARGO Foundation from the Autonomous University of Barcelona, Catalonia, Spain
- 1st prize on the 5th edition of High School Graduation Projects Awards given by the Manuel Vázquez Montalban Foundation, Catalonia, Spain
- 4th prize on the 4th edition of Engineering and Applied Mathematics Projects Awards given by the Pompeu Fabra University, Catalonia, Spain

## IT SKILLS

- Operative systems:** OS X, Microsoft Windows (Word, Excel, PowerPoint).
- Office:** Microsoft Office.
- Programming:** C++, MatLab, HTML, LATEX.
- Finite Elements:** ANSYS.
- CAD:** AutoCAD, SolidWorks, CATIA.
- Others:** Photoshop CS6, Final Cut Pro, Logic Pro.

## LANGUAGES

- Catalan** (native)
- Spanish** (native)
- English** (IRL level 4)

## FURTHER INFORMATION

- B driving licenses and own vehicle

## ORIOL CASAMOR MARTINELL

**Date of birth:** 26/01/1993      **Age:** 22  
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**Telephone number:** 618 926 733  
**Email:** oriolcasamor@gmail.com




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### EDUCATION AND TRAINING

- |   |                        |
|---|------------------------|
| <ul style="list-style-type: none"> <li>• <b>Master's Degree in Aeronautical Engineer</b><br/>ETSEIAT, Polytechnic University of Catalonia (UPC)</li> </ul>            | Sept. 2015- Ongoing    |
| <ul style="list-style-type: none"> <li>• <b>Bachelor's Degree in Aerospace Vehicles Engineering</b><br/>ETSEIAT, Polytechnic University of Catalonia (UPC)</li> </ul> | Sept. 2010 - July 2015 |
- 

### EMPLOYMENT EXPERIENCE

Occupation, Name of Company	Dates of employment
<ul style="list-style-type: none"> <li>• Vibrations and acoustics Internship, SENER</li> </ul>	2015-Ongoing
<ul style="list-style-type: none"> <li>• Shop assistant in a coffee shop and in a farm shop (8weeks)</li> </ul>	2010 – 2012
<ul style="list-style-type: none"> <li>• Private tutoring</li> </ul>	2009 - 2015

---

### IT SKILLS

- **Microsoft Office:** Word, Excel, PowerPoint (Word, Excel, PowerPoint)
  - **Programming:** MATLAB and C++
  - **CAD:** SolidWorks
- 

### LANGUAGES

- **Catalan** (native)
  - **Spanish** (native)
  - **English** (C1)
- 

### FURTHER INFORMATION

- B driving licenses and own vehicle



# IRENE JIMÉNEZ FORTUNATO



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## EDUCATION AND TRAINING

- |   |                       |
|---|-----------------------|
| <ul style="list-style-type: none"> <li>• <b>Master's Degree in Aeronautical Engineer</b><br/>ETSEIAT, Polytechnic University of Catalonia (UPC)</li> </ul>              | Feb. 2015 – Ongoing   |
| <ul style="list-style-type: none"> <li>• <b>Bachelor's Degree in Aerospace Technology Engineering</b><br/>ETSEIAT, Polytechnic University of Catalonia (UPC)</li> </ul> | Sep. 2010 – Feb. 2015 |

## EMPLOYMENT EXPERIENCE

- | Occupation, Name of Company  | Dates of employment    |
|--|------------------------|
| <ul style="list-style-type: none"> <li>• International Editor Member, EUROAVIA Terrassa</li> </ul> | Oct. 2013 – Oct. 2015  |
| <ul style="list-style-type: none"> <li>• President, EUROAVIA Terrassa</li> </ul>                   | March 2014 – Oct. 2014 |

## IT SKILLS

- **Operative systems:** Microsoft Windows (Word, Excel, PowerPoint)
- **Office:** Microsoft Office (Word, Excel, Power Point...)
- **Programming:** C++, MatLab
- **Finite Elements:** ANSYS
- **CAD:** AutoCAD, SolidWorks, CATIA
- **Cloud Computing:** Google Drive, Dropbox, Mega, Copy

## LANGUAGES

- **Catalan** (native)
- **Spanish** (native)
- **English** (B2)
- **German** (A2)

## FURTHER INFORMATION

- B driving licenses and own vehicle

# ORIOL JIMÉNEZ PAVIA



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**Email:** orioljp@gmail.com

## EDUCATION AND TRAINING

- |  |                       |
|--|-----------------------|
| • <b>Master's Degree in Aeronautical Engineer</b><br>ETSEIAT, Polytechnic University of Catalonia (UPC)              | Feb. 2015 – Ongoing   |
| • <b>Bachelor's Degree in Aerospace Technology Engineering</b><br>ETSEIAT, Polytechnic University of Catalonia (UPC) | Sep. 2010 – Feb. 2015 |

## EMPLOYMENT EXPERIENCE

Occupation, Name of Company	Dates of employment
• Responsible of maintenance of Swimming pools in Serinagua SL	July 2012 – Aug. 2012
• Trainee in LITEM (Laboratory for the technological innovation in structures and materials)	April 2013 – July 2013

## IT SKILLS

- **Office:** Microsoft Office (Word, Excel, PowerPoint)
- **CAD:** Catia, Solid Works, AutoCAD
- **Programming:** Matlab, Octave, C++
- **Others:** Hypermill, Agilent Design System, 4NEC2

## LANGUAGES

- **Catalan** (native)
- **Spanish** (native)
- **English** (C1)
- **German** (A1)

## FURTHER INFORMATION

- B driving licenses and own van
- Volunteer Workcamp in Germany in July 2014
- Bronze medal in the 21st Spanish Physics Olympiad held in Alicante (2010)
- Initiated in drones manufacturing and flight

## PERE ANTONI MARTORELL POL



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**Email:** p.antoni.martorell@gmail.com

### EDUCATION AND TRAINING

- |  |                        |
|--|------------------------|
| • <b>Master's Degree in Aeronautical Engineer</b><br>ETSEIAT, Polytechnic University of Catalonia (UPC)            | Sept. 2015- Ongoing    |
| • <b>Bachelor's Degree in Aerospace Vehicles Engineering</b><br>ETSEIAT, Polytechnic University of Catalonia (UPC) | Sept. 2010 - July 2015 |

### EMPLOYMENT EXPERIENCE

Occupation, Name of Company	Dates of employment
• Production Organization Internship, EGO Appliance Controls S.L.	June 2015- October 2015
• Web Development Internship, EGO Appliance Controls S.L.	October 2015- Ongoing

### IT SKILLS

- **Operative Systems:** Linux and Windows
- **Office:** LaTeX and Microsoft Office (Word, Excel, PowerPoint, Access)
- **Programming Languages:** C++, MATLAB, Visual Basic, Bash, PHP, HTML, JavaScript, SQL
- **CFD:** OpenFoam
- **CAD:** SolidWorks

### LANGUAGES

- **Catalan** (native)
- **Spanish** (native)
- **English** (B2)

### FURTHER INFORMATION

- B driving licenses and own vehicle

## ELOI MIRAMBELL MASRAMON



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 Nationality: Spanish  
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---

**EDUCATION AND TRAINING**

- |  |                        |
|--|------------------------|
| • <b>Master's Degree in Aeronautical Engineer</b><br>ETSEIAT, Polytechnic University of Catalonia (UPC)            | Sept. 2015- Ongoing    |
| • <b>Bachelor's Degree in Aerospace Vehicles Engineering</b><br>ETSEIAT, Polytechnic University of Catalonia (UPC) | Sept. 2010 - July 2015 |

---

**EMPLOYMENT EXPERIENCE**

Occupation, Name of Company	Dates of employment
• Engineering Department Manager, SENOBLE UK	2013-2015
• R&D Engineer, Mecanitzats Gurri, S.L.	2012-2013

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**IT SKILLS**

- **Office:** Microsoft Office (Word, Excel, PowerPoint)
- **CAD:** AutoCAD, SolidWorks, Catia
- **Programming:** C++ and MATLAB
- **Simulation:** OpenFOAM CFD, ANSYS CFX

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**LANGUAGES**

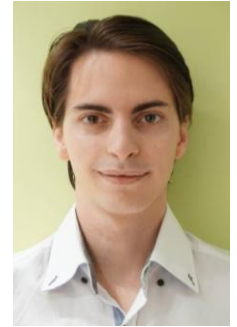
- **Catalan** (native)
- **Spanish** (native)
- **English** (B2)

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**FURTHER INFORMATION**

- B driving license and own vehicle

## CARLES MOLINS DURAN



**Date of birth:** 09/01/1992      **Age:** 23  
**Nationality:** Spanish  
**Telephone number:** +34 627 01 81 29  
 carmoldu@hotmail.com

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**EDUCATION AND TRAINING**

- |   |                       |
|---|-----------------------|
| • <b>Master's Degree in Aeronautical Engineer</b><br>ETSEIAT, Polytechnic University of Catalonia (UPC)                   | Feb. 2015 – Ongoing   |
| • <b>Bachelor's Degree in Aerospace Technology Engineering</b><br>ETSEIAT, UPC, Polytechnic University of Catalonia (UPC) | Sep. 2010 – Feb. 2015 |

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**EMPLOYMENT EXPERIENCE**

- | Occupation, Name of Company   | Dates of employment   |
|---|-----------------------|
| • Internship in AMES maintenance department.  | July 2012 – Aug. 2012 |
| • Voluntary work as monitor, intendant and treasurer in the Scout Center "AEG Mare de Déu de Montserrat". | 2010-2012             |
| • Private teacher in mathematics, physics and chemistry.  | 2009-2012             |
- 

**IT SKILLS**

- **Office:** Microsoft Office (Word, Excel, PowerPoint, Access).
  - **CAD:** Catia, Solidworks, AutoCad.
  - **Programing:** Matlab, C++, Arduino, HTML, SQL.
  - **Simulation:** OpenFoam, Ansys.
- 

**LANGUAGES**

- **Catalan** (native)
  - **Spanish** (native)
  - **English** (Proficiency)
  - **French** (A2+)
- 

**FURTHER INFORMATION**

- |   |           |
|---|-----------|
| • B driving licenses and own vehicle  |           |
| • Initiated in light airplane, sailplane and autogyro flight.                           |           |
| • Initiated in design, construction and piloting of radio controlled airplanes.         |           |
| • Member of Trecalós Team, ETSEIAT, UPC, participating in the Air Cargo Challenge 2013. | 2012-2013 |
| • Guitarist, composer and leader of <i>The Narwhals</i> rock band.                      | 2012-2014 |

# SERGI PALLEJÀ CABRÉ



**Date of birth:** 27/09/1993      **Age:** 22  
**Nationality:** Spanish  
**Telephone number:** +34 658 22 65 18  
 sergi.paca@gmail.com

## EDUCATION AND TRAINING

- |  |                        |
|--|------------------------|
| • <b>Master's Degree in Aeronautical Engineer</b><br>ETSEIAT, Polytechnic University of Catalonia (UPC)            | Sept. 2015- Ongoing    |
| • <b>Bachelor's Degree in Aerospace Vehicles Engineering</b><br>ETSEIAT, Polytechnic University of Catalonia (UPC) | Sept. 2010 - July 2015 |

## EMPLOYMENT EXPERIENCE

Occupation, Name of Company	Dates of employment
• Internship Quality Control Engineering, MOL-MATRIC S.C.C.L	Oct. 2014 – Feb. 2015
• Physics Professor, ASES	Oct. 2014 – Feb.2015

## IT SKILLS

- **Operative systems:** Windows, Mac
- **Office:** Microsoft Office (Word, Excel, PowerPoint), Apple Pages, Notes & KeyNote
- **Programming:** C, C++, MatLab
- **Finite Elements:** ANSYS.
- **CFD:** openFoam
- **CAD:** SolidWorks, CATIA
- **Metrology:** Metrolog
- **Cloud Computing:** Google Drive, iCloud, Dropbox, Mega, Copy

## LANGUAGES

- **Catalan** (native)
- **Spanish** (native)
- **English** (C1.2)

## FURTHER INFORMATION

- B driving licenses and own vehicle

## MARC SANS FÀBREGAS

**Date of birth:** 30/09/1993      **Age:** 22  
**Nationality:** Spanish  
**Telephone number:** +34 629 13 05 92  
**Email:** marcsansfabregas@gmail.com




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### EDUCATION & TRAINING

- **Master's Degree in Aeronautical Engineer** Sept. 2015- Ongoing  
ETSEIAT, Polytechnic University of Catalonia (UPC)
  - **Bachelor's Degree in Aerospace Vehicles Engineering** Sept. 2010 - July 2015  
ETSEIAT, Polytechnic University of Catalonia (UPC)
  - European drone piloting license (< 25kg) 2015
  - Camp counselor for children 2011
- 

### EMPLOYMENT EXPERIENCE

- Teenagers' tutor June 2011- Sept. 2013
  - Camp counsellor, Albaserveis June 2011-July 2011
  - Scholar, UPC fluid mechanics department Sept. 2013- June 2014
  - Futsal coach (U16 and U18), Alella FS Aug. 2013 -Ongoing
- 

### IT SKILLS

- **Office:** Microsoft Office (Word, Excel, PowerPoint) and LaTeX
  - **Programming:** C, C++, VHDL, Matlab
  - **CAD:** Catia, SolidWorks
  - **Simulation:** OpenFoam and ANSYS
- 

### LANGUAGES

- **Catalan** (native)
  - **Spanish** (native)
  - **English** (C1))
  - **French** (A2)
- 

### FURTHER INFORMATION

- B, A1 driving licenses and own vehicles
- 1-star scuba diver
- Captain of the U21 Catalan national futsal team Oct. 2012 – Jan. 2014

DebrEyes S.L. also works with different companies which supply knowledge and components as a consortium. These companies are:

#### **TU DELFT**

The Delft University of Technology (Delft, Netherlands) is a university known for its excellence and capable of achieving high levels of depth in their research. Specifically, they are specialized in certain areas of interest for the development of the infrared camera.



Previous projects related to the field DebrEyes is interested in TU Delft has worked on:

- NEMO - Project where self-developed IR Cameras are used to measure the drying of some specific nearshore zones.
- Article written: "Detection of vehicles in infrared imagery using shared weight neural network feature detectors"
- Low turbulence tunnel. The infrared camera is used for flow visualization purposes.

#### **TU DENMARK**

The Denmark University of Technology (Lyngby, Denmark) is a university known for its excellence and capable of achieving high levels of depth in their research. They have professionals specialized in certain areas of interest for the development of the telecommunications system. DTU has accomplished successfully a relevant number of projects related to it.



#### **ISIS**

Based in the Netherlands, ISIS is a vertically integrated small satellite company, focused on providing high value, cost effective space solutions by making use of the latest innovative technologies. As one of Europe's leaders in the nanosatellite domain, ISIS offers contract research, innovative satellite systems and turnkey space solutions to a broad range of customers for small satellite missions and applications. ISIS provides solutions for all parts of the satellite lifecycle and provides subsystems, missions, ground segments, support equipment and launch services.



#### **SatNOGS**

Is a Greek project with a complete platform of an Open Source Networked Ground Station. Its aim contains the construction of a full ground station, so the cooperation with them has the certain possibility of creating a new European synergy that will make both develop robustly. It has a wide application in DebrEyes project.





## 4.1 Third parties involved in the project

This consortium is not capable of accomplishing all tasks so a few of them are subcontracted to other companies. The participant of the consortium that subcontract several tasks is DebrEyes.

Table 19. Third parts involved

Participant	DebrEyes
Does the participant plan to subcontract certain tasks	Yes
Does the participant envisage that part of its work is performed by linked third parties	No
Does the participant envisage the use of contributions in kind provided by third parties	No

The description of the third parties involved is developed in the following paragraphs and their participation is detailed in Table 20.

### Astro

Astro is a German company specialized in space and flight technology. They won the ESA spin off award in 2012, which demonstrates its capability in the sector. They use their engineering expertise and know-how to provide development and design services so they are a suitable candidate for carrying the testing tasks.



### Gutmar

Gutmar is a Spanish company specialized in precision machining of technologically high level assemblies for aerospace. This company will be the responsible for manufacturing the structure subsystem prototype.



### Detrazos

Detrazos is a Spanish company with a wide experience in the communication sector. They offer unique and personalized global solutions to communication needs. This makes them capable of solving the whole communication programme and so, capable of interrelating the different aspects of communication, which may represent an interesting contribution.



### Sener

Sener is a Spanish company backed by more than 50 years of experience which has brought it to be an international leader in different areas such as aerospace engineering. It is an innovative international company.



Table 20. Subcontracted tasks.

WBS ID	Work Package Name	Justification of choosing this subcontractor	Name of Subcontract	Amount [€]
<b>2</b>	<b>Communication, dissemination and exploitation</b>			
3.1	<i>Website development</i>	Is a professional team with wide experience in the field and various skills so they can offer global solutions to communication necessities. Different tasks can be subcontracted to the same company	Detrazos	Firm fixed price contract 12,500
3.2	<i>Social Media management</i>	Is a professional team with wide experience in the field and various skills so they can offer global solutions to communication necessities. Different tasks can be subcontracted to the same company	Detrazos	Fixed price with economic price adjustment contract 15,000
3.3	<i>Development of the Communication plan</i>	Is a professional team with wide experience in the field and various skills so they can offer global solutions to communication necessities. Different tasks can be subcontracted to the same company	Detrazos	Firm fixed price contract 7,500
<b>5</b>	<b>Testing, assembly, integration and validation of the prototype</b>			
5.4.5	<i>Manufacturing of the structure subsystem prototype</i>	Is a company specialized in precision machining and high level of technological assemblies for the aerospace sector. Are able to work with any sort of material	Gutmar	Firm fixed price contract 35,000
5.5.1.	<i>Infrared Camera Testing</i>	Won an ESA award, specialised in space technology to provide development and desi Wide experience.	Astro	Fixed price with economic price adjustment contract 45,000
5.5.2.	<i>Telecommunications ground testing</i>	Won an ESA award, specialised in space and flight technology to provide development and design services. Wide experience.	Astro	Firm fixed price contract 35,000
5.5.3.	<i>Constellation simulation</i>	Won an ESA award, specialised in space and flight technology to provide development and design services. Wide experience.	Astro	Fixed price incentive fee contract 30,000
5.5.4.	<i>Energy testing</i>	Won an ESA award, specialised in space and flight technology to provide development and design services. Wide experience.	Astro	Firm fixed price contract 25,000
5.5.5.	<i>Structures testing</i>	Won an ESA award, specialised in space and flight technology to provide development and design services. Wide experience.	Astro	Firm fixed price contract 40,000

## 5 Ethics and Security

### 5.1 Ethics

After strong evaluation of the project, DebrEyes can assure that no ethical issues will appear during the development nor as a result of its posterior implementation.

### 5.2 Security

After strong evaluation of the project, DebrEyes can assure that no security issues will appear during the development nor as a result of its posterior implementation.

DebrEyes does not use any EU-classified information as background.