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CubeSats for the monitoring of space debris

DebrEyes

Deliverable 1
Project Charter

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1 Project Charter

1.1 Project Purpose and Justification

Space debris is one of the main threats to space exploration nowadays. According to ESA (1), 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. The object's population growth is increasing each year, endangering the safety of space missions. Damage on satellites and space vehicles caused by debris result in important losses in operating companies. In Figure 1, a representation of space debris by ESA is shown.

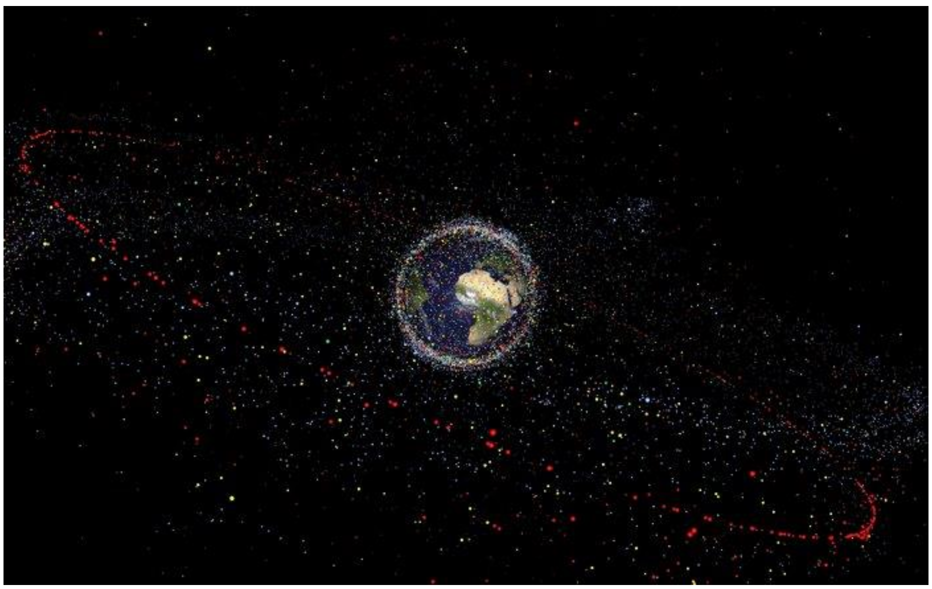

Figure 1. Representation of space debris (1)

The nature of space debris is diverse (see Figure 2). Despite large pieces of debris being potentially more harmful to space exploration, small pieces become especially dangerous because of the inability of the actual tracking systems to monitor them. International Space Station suffered impacts in its windows recently, with the consequent maintenance and cost implications. As an example of how dangerous small pieces of debris are, the result of a space debris impact simulation is shown in Figure 3. As can be seen, the effect of a small aluminium sphere striking a thick block of aluminium at high speed is critical.

1. **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.
2. **Bicket, Ryan D.** CCAR. *Cleaning up our Orbital Mess*. Colorado Center of Astrodynamic Research, 2011. (accessed September 28, 2015) http://ccar.colorado.edu/asen5050/projects/projects_2010/bicket/.

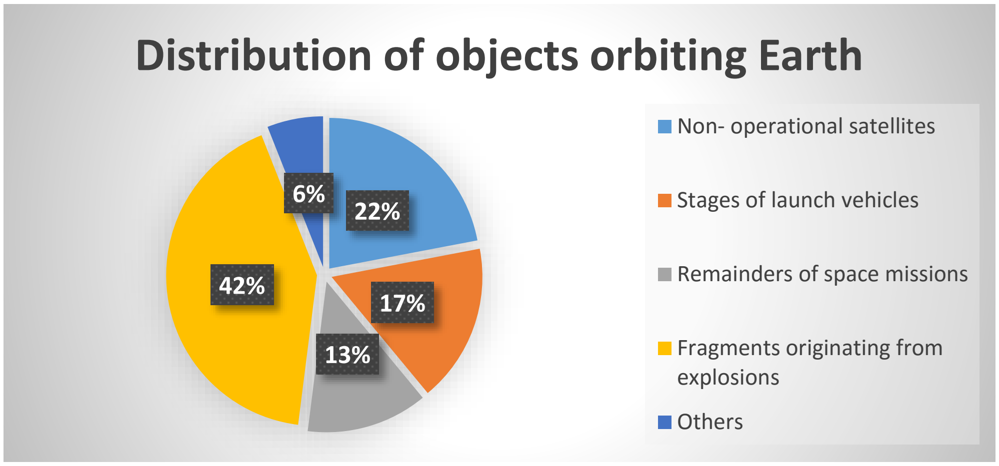

Figure 2. Distribution of objects orbiting Earth (2)

Figure 3. Impact of a small aluminium sphere into an aluminium block (3)

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.

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3. **Warren, J., et al.** RPI. *Annex B – Air, Land, Sea and Space Fod Issues*. Ressenlear Polytecnic Institute, 07 / April / 2011 (accessed September 30, 2015) http://www.ewp.rpi.edu/hartford/~roberk/IS_Climate/Papers/TR-AVT-094-ANN-B.pdf.
4. **ESA.** ESA. *Space debris analysis and prediction*. European Space Agency, April 19, 2013 (accessed September 25, 2015) http://www.esa.int/Our_Activities/Operations/Space_Debris/Analysis_and_prediction.

In particular, this network will be designed to operate at altitudes between 600 and 1.100 km, where the debris density is most severe, as shown in Figure 1. Indeed, in this range of altitudes, objects orbit at relative velocities of 7-8 km/s. The identification of debris will produce a map that will be of high interest to prevent impacts between debris and operational space vehicles and satellites, with obvious benefits in terms of mission safety, systems reliability and maintenance cost (**Error! Reference source not found.**). The collected information would allow safer missions and it would increase the lifetime of the current and future satellites of EU and allies that would use this service, and could make the necessary corrections to evade fatal collisions.

1.1.1 Vision

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.

1.1.2 Objectives

The key OBJECTIVES for this project are

- Improve the resilience of artificial satellite by means of a greater mapping of the potentially dangerous debris.
- Help secure critical European space telecommunication infrastructures such as Galileo and boost both citizen and business trust towards them, protecting sectors that are essentially dependent from them.
- Build the basis of a near field space debris mapping system developed mainly by European entities.
- Develop state of the art technologies aiming to get further knowledge of space debris, through research and innovation.

The social OBJECTIVES for this project are

- Make transparency and gender equality a major asset in the development of the project.
- Focus on the energy system of the satellite, aiming to find a sustainable, reliable and efficient solution.
- Work towards techniques to reduce the cost of CubeSat development in order to make this technology more accessible for research entities and universities in developing countries.

The European Union focused OBJECTIVES for this project are

- Raise awareness on the importance for space exploration and debris threat to missions, by bringing potential customers close to the project, aiming to understand their needs and boost market-driven innovation.

- Approach universities all over Europe in order to spread knowledge and bring technology to society and get them to participate in the project by enabling them the public use of space data.
- Coordinate the specific technological development of our CubeSat with other SMEs supported by Horizon 2020 program, in order to work for the long-term competitiveness of the European market.

1.1.3 Scope

The SCOPE for this project is:

- Development of a small infrared camera for space debris.
- Study and design of a CubeSat to carry the infrared camera, the following subsystems are included:
    - Structural subsystem.
    - Power supply: solar panels and batteries in order to produce power to have the camera on always.
    - Communications: Send the data of debris' positioning to Earth.
    - Thermal control.
    - Attitude control.
    - Positioning CubeSat using Galileo.
    - Positioning debris with image analyses.
- Study of the orbit dynamics and manoeuvres.
- Development of the ground segment to receive the data sent by the CubeSats.
- Assembly of one prototype for test purposes.
- Study of a future CubeSat Constellation which includes:
    - Communication between CubeSats.
    - Relative position between CubeSats.
    - Collaboration between CubeSats to track debris.

The following items are considered to be OUT OF THE SCOPE of this project:

- Assembly of three CubeSats.
- Launching of three CubeSats.
- Design the launch system.
- Procedure to recover CubeSats in order to avoid adding more debris.
- Development of the image analysing software for determining the space debris' position and velocity.

1.2 Project Description

These days, when space technology keeps going forward, there is a big threat for every single project concerning space, and this menace grows bigger and bigger year after year. This threat is the space debris.

Nowadays, only on-earth methods which cannot sight debris beyond certain sizes and altitudes are used, and this is far from getting data of a sufficient volume, thus it is clear that there is a huge need in this issue.

The DebrEyes project consists in a CubeSat constellation which goal is to warn and prevent space missions from the danger of space debris.

To accomplish this goal, these CubeSats will detect and track debris which orbit is in the detection zone (between 600 and 1100 km high) and send this data to the missions' command centres so that they can take any action needed in order to avoid this harm.

Thus, DebrEyes requires mainly a research in detection methods, the CubeSat design and the relationship between different CubeSats in terms of networking so this will be the final outcome. Once the full CubeSat is designed and the interactions are studied, the assembly of a prototype and its testing will be done to ensure a good performance before launching it to space.

1.3 High-Level Requirements

- CubeSats will orbit in a sun-synchronous orbit because of energy benefits and because it means an improvement in the accuracy of debris detection.

- The infrared cameras on board the CubeSats will be able to detect debris of 1 mm from a distance of 200 m and with a vision angle of 180º.

- More than two CubeSats will track an object once it has been detected

- The images captured by the satellites will be downlinked in HF/VHF band via the SatNOGS ground stations network.

- The position and velocity of the new debris must be determined with the images downloaded, and also their future trajectories.

- The EOL (End Of Life) of the CubeSats must not be less than 5 years.

- After the EOL, the CubeSats must be able to deorbit and self-destroy to avoid having new uncontrolled satellites.

1.4 Acceptance Criteria

The following criteria are needed to be achieved before the final deliberation in order to fulfill the scope and objectives of the project.

Table 1. Acceptance Criteria

Acceptance Criterion	Acceptance Condition
Quality and Presentation	All the documents must organized and clear information must be developed. The presentation must be clean. All the documents must be printable.
Research and Innovation	The project must use research and innovation to fulfill requirements which cannot be determined with the current technology.
Sustainability and Reliability	The materials used in this project and also the energy must be as much environmentally friendly as possible if technology permitted. The components' life must 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 interested information must be distributed to universities and costumers.
Gender equality	The recruitment must be fair and professional skills must be taken into account to not have gender discrimination.
Performance Requirements	The performance of all the systems and devices include in the CubeSats must accomplish their mission and work properly.
Technical Documents	The documents must include all the technical details needed to develop the project in order to be improved in the future. A manual must be performed in order to know how software and hardware work.
Tests and Validations	The tests and validations must be successful taking into account the regulations in order to prove new technology and innovation. The results of each one must be recorded and also the improvements to achieve the final device or system.

1.5 High-Level Risks

The main risks that would come out in this project are identified and explained in the Table 2.

Table 2. High-level risks

Risk	Description
Communication	A lack or poor communication between departments.
Component Failure	Failure of any component in the prototyping process.
Commercial Dependence	Failure of parts developed by collaborator companies.
Environmental Impact	If the CubeSats experiment critical failures when they are already launched they would become debris itself.
Human Errors	That kind of errors may occur in all the processes.
Information	Problems related with the availability of the information needed in the development of the project.
Innovation	Lack of approach to the innovation required in this project.
Legacy	The project must comply the related legal basis.
Merchandising Delay	Delaying in receiving components would affect the imposed deadlines.
Competitors	The future conjecture of other competitors companies with the same purpose.
Software Bug	Problems in the software, for instance in the communication between the ground station and the CubeSats.
Stakeholders Desertion	Loss of interest and support from stakeholders would be a huge difficulty.
Financial	Problems in obtaining the needed financial support.
Marketing	Lack of interest of potential users due to inappropriate or ineffective marketing.

1.6 Project deliverables

Table 3. List of deliverables

Deliverable Name	Description	Estimated due date
Project Management Plan	Detailed planning of the project including a Project Charter, a stakeholder register and a scope, time, cost, procurement, quality, risk and communication management.	t_0 + 1 month
Preliminary Design Review	Document containing the basic technical specifications of the system and the CubeSats, as a start point of the detailed design.	t_0 + 7 months
Website and Social Media	Document explaining the spreading strategy, specifying the methods used for the divulgation of the space debris issue as well as the proposed solution.	t_0 + 8 months
Study of the Interaction between 3 Satellites and Data Transmission	Report about the performance of each network of three CubeSats. Interactions between CubeSats and transmission of the data to the ground station through the use of Galileo project.	t_0 + 9 months
Infrared Camera Specifications	Document containing the basic technical specifications of the infrared camera that must be carried by the CubeSats.	t_0 + 10 months
Software for the Monitoring Specifications	Report containing the characteristics of the developed software as well as a user's guide.	t_0 + 13 months
Software for the Monitoring	Software for the monitoring of the data (sent to the ground station by the constellations of CubeSats) and the obtaining of a near field space debris mapping.	t_0 + 13 months
CubeSat Specifications	Report containing the characteristics of the final design of the CubeSat. Drawings, set of elements, technical specifications of the components.	t_0 + 15 months
Certification and Legal Requirements	Document with the certifications of the different components and the ones that will be followed during the production process of the prototypes and the testing.	t_0 + 16 months
Critical Design Review	Document for demonstrating that the maturity of the project and the available production techniques allow the production of a prototype of CubeSat.	t_0 + 18 months
Validation	Document for the validation of the CubeSats and the developed software, containing the characteristics of	t_0 + 23 months

	the testing, which will consist on the launch of a constellation of three satellites and the processing of the data received, and the obtained results.	
Final Report	Final document with all the information related to the project.	t_0 + 24 months

1.7 Project milestones

Table 4. List of milestones

Milestone Name	Description	Estimated due date
Kick-Off Meeting	First meeting for the kick-off of the project. Consolidation of the organization of the DebrEyes team, revision of the planning with the research and development stakeholders.	t_0
Project Management Plan	Detailed planning of the project including a Project Charter, a stakeholder register and a scope, time, cost, procurement, quality, risk and communication management.	t_0 + 1 month
Preliminary Design	Initial design of the system and the CubeSats as a start point of the technical part of the project, starting from an evaluation of the requirements.	t_0 + 7 months
Website and Social Media	Design of a website and beginning of the DebrEyes project dissemination strategy through social media.	t_0 + 8 months
Study of the Interaction between 3 Satellites and Data Transmission	Design of the communication between CubeSats in order to obtain the necessary data for the mapping of the debris as well as the system for the transmission to the data to the ground station.	t_0 + 9 months
Midterm Review Meeting	Meeting for the evaluation of the different ongoing activities together with the research and development stakeholders.	t_0 + 9 months
Software Design	Final design of the software for the monitoring of the data (sent to the ground station by each network of three CubeSats) and the obtaining of a near field space debris mapping.	t_0 + 13 months
CubeSat Design	Final configuration of the CubeSat.	t_0 + 15 months
CubeSat Prototype	Assembly of one prototype of CubeSat.	t_0 + 22 months
Testing Results	Analysis of the individual performance of the produced prototype and the validity of the results.	t_0 + 23 months
Final Meeting	Delivery of the Final Report of the DebrEyes project.	t_0 + 24 months

1.8 Project objectives

Table 5. Project objectives, success criteria and approval

Project Objectives	Success Criteria	Approval Responsible
Scope:		
Infrared camera and CubeSat design, software development, prototype, testing, positioning, ground communication.	The system is able to track and generate a map of the near field space debris.	Project Manager
Time:		
2 years	The project must be validated before the estimated time.	Project Manager
Cost:		
2.5 Million Euro	A suitable distribution of the budget according to the available funding.	Financial Manager
Quality:		
Products Assembly of the prototypes Documentation and results	The characteristics correspond to those specified in the acceptance criteria, the legal requirements are accomplished and the project has been properly certified.	Quality Manager

1.9 Estimated Budget

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, as shown in Table 6. The reimaging part of the project will be contributed by the European Regional Development Fund, the European Space Agency and Airbus Defence, as both are interested in the project.

Table 6. Incomes of the project

European Commission Fund	1.950.000 €
European Regional Development Fund	300.000 €
European Space Agency	300.000 €
Airbus Defence	450.000 €
Total Income	3.000.000 €

The expenses of the project are disaggregated in Table 7. Expenses of the projectTable 7. Most of them are related to engineering cost, which represents more than half of the budget of the project, and is shown below in the document.

Table 7. Expenses of the project

Administrative Services	519.060 €
Communication	129.765 €
Partnership and Networks	519.060 €
Engineering	1.702.350 €
Casualties	129.765 €
Total Expenses	3.000.000 €

The engineering cost is estimated as a forecast of the workload for each task in the scope, considering the required manpower and time, as shown in Table 8. A critical part of the project is the development of the technology for the IR camera. This is also one of the most expensive concept in the engineering process. The design of the CubeSat is also an important part of the total cost of the project, being required to design and implement all the different systems in the vehicle. Prototyping is usually one of the larger expenses of the projects, however, the raise of popularity of CubeSats in universities and the technology of the satellites have made them affordable for projects of this size.

Table 8. Engineering expenses

IR Camera Dev.	1.080.000 €
Design	360.000 €
Maneuver and orbit dynamics study	48.000 €
Ground segment	96.000 €
Prototyping	70.350 €
Constellation study	48.000 €
Total Engineering expenses	1.702.350 €

The project incomes may be increased if any problem arose with any of the investors by selling the technologies developed during the project. Space companies will be interested in the IR camera technology for there is not such device with the specifications at the moment. Studies on satellite constellations and manoeuvring would be also interesting for companies operating observation CubeSats

1.10 Project organization

1.10.1 Customers

The following customers are defined for this project:

Table 9. List of customers groups

Customer group	Customer representative
European Commission	Pierre Huguenet
European Space Agency	Fréderic Le Gall
Airbus Defense and Space	Marwan Lahound

1.10.2 Stakeholders

The following groups and organization are the key stakeholders in this project:

Table 10. List of stakeholders, roles and responsibilities

Stakeholder Name	Roles/Responsibilities
Pierre Huguenet (European Commission)	Main Investor
Fréderic Le Gall (European Space Agency)	Investor
Marwan Lahound (Airbus Defense and Space)	Investor
Christopher Hurst (European Investment Bank, EIB)	Funder
Alex Saz Carranza (Institut Català de Finances)	Funder Intermediary
Manuel Espiau (Caixa d'Enginyers)	Funder Intermediary
David S. Weaver (National Aeronautics and Space Administration, NASA)	Potential Customer
Marie-Hélène Harvard (Télédiffusion de France)	Potential Customer
Jon Talbot (Deutsche Telekom)	Potential Customer
Peter Crafter (NSSL Global LTD)	Potential Customer
Martin Bauer (European Council)	Regulators
Enrique Hernández Bento	Regulators

(Spanish Government)	
Jian Guo (Technical University of Delft)	Research collaborator
Ioannis Charitopoulos (SatNOGS)	Research collaborator
Stakeholder Name	**Roles/Responsibilities**
Mogens Blanke (Technical University of Denmark)	Research collaborator
Elena Fantino (Aerospace and Research Center, Universitat Politècnica de Catalunya)	Research collaborator
Divya Krishnamoorthy (Advanced Research in Telecommunications Systems, ESA ARTES)	Development collaborator
Michiel van Bolhuis (Innovative solutions in Space, ISIS)	Development collaborator
Maik Hartmann (Astro- und Feinwerktechnik Adlershof GmbH)	Development collaborator
Joan Martorell (Gutmar, S.A)	Machining process
Ramon Calvet (Sener)	Facilities Rental

Table 11. List of stakeholders, roles and responsibilities

1.10.3 Roles and responsibilities

The following key roles have been defined for this project:

Table 12. Roles and responsibles

Role	**Resource Name**	**Organization**	**Responsibilities**
Project Sponsor	Pierre Huguenet	European Comission	Project's business case. Oversight the project management.
Project Managers	S. Pallejà, M. Sans	DebrEyes	Plan, execute and close the project.
Technical Managers	I. Jiménez, O. Jiménez, E. Mirambell	DebrEyes	Lead technological development activities.
Quality Managers	A. Amorós, P.A. Martorell, C. Molins	DebrEyes	Ensure the quality of any delivered material.
Marketing Managers	O. Casamor, G. Benosa	DebrEyes	Attract attention and create interest.
Research collaborator	Jian Guo	Technical University of Delft	Obtain expertise and funds.

Role	Resource Name	Organization	Responsibilities
Research collaborator	Ioannis Charitopoulos	SatNOGS	Obtain expertise and funds
Research collaborator	Mogens Blanke	Technical University of Denmark	Obtain expertise
Research collaborator	Elena Fantino	Aerospace and Research Center, Universitat Politècnica de Catalunya	Obtain expertise
Development collaborator	Divya Krishnamoorthy	Advanced Research in Telecommunications Systems, ESA ARTES	Obtain expertise and funds
Development collaborator	Michiel van Bolhuis	Innovative solutions in Space, ISIS	Obtain expertise and funds
Development collaborator	Maik Hartmann	Astro- und Feinwerktechnik Adlershof GmbH	Obtain expertise and funds
Machining process	Joan Martorell	Gutmar, S.A	Obtain necessary structural components
Facilities Rental	Ramon Calvet	Sener	Assembly of the prototype

Approvals:

Signature,

Signature,

Project Management Name

Project Sponsor Name

Date:

Date:

2 Stakeholder identification

2.1 Stakeholder analysis matrix

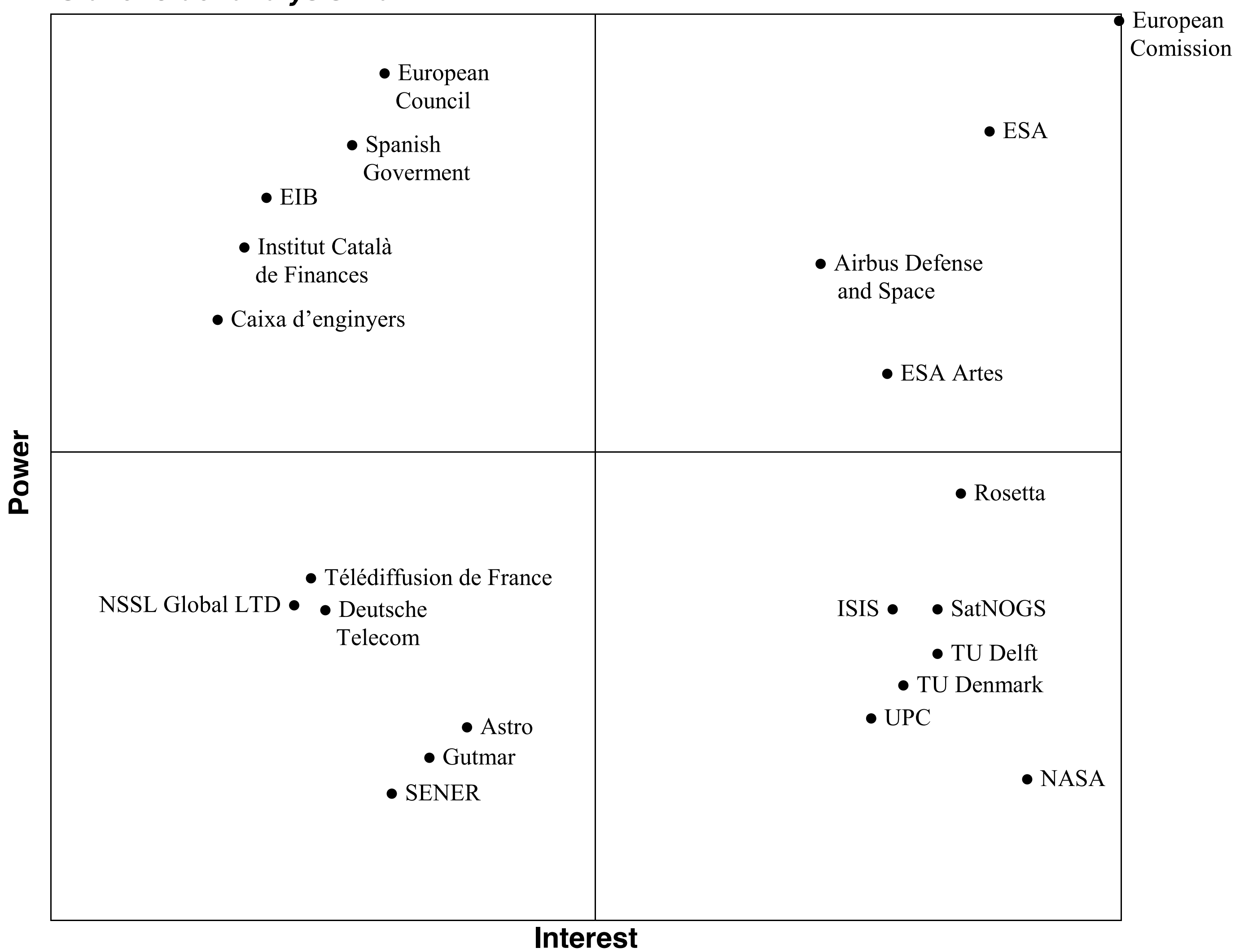

Figure 4. Stakeholder analysis matrix

2.2 Stakeholder register

Table 13. Stakeholder register

Name	Position	Role	Contact Information	Requirements	Expectations	Influence	Classification
Pierre Huguenet (European Commission)	National Contact Point	Main Investor	E-mail: pierre.huguenet@sener.es	Investment of 1.95 M€ for research, assuming part of the risk of the project.	That the project accomplishes the objectives stipulated at H2020 and the deliverables to keep track of the progress of the project.	Manage closely	Supporter
Fréderic Le Gall (European Space Agency)	Distribution and Infrastructures	Investor	Tel: (+33) 1 53 69 76 54	Investment of 300,000€ for research.	Obtention of useful information in order to prevent future accidents concerning space debris.	Manage closely	Influencer
Marwan Lahound (Airbus Defense and Space)	Marketing and strategy director	Investor	Tel: (+33) 01 39 06 12 34	Investment of 450,000€ for research.	Obtention useful information in order to prevent future accidents concerning space debris.	Manage closely	Influencer
Christopher Hurst (European Investment Bank, EIB)	Projects Manager	Investor	Tel: (+352) 43 79 1	Funding of 300,000€ to the project through the European Regional Development Funding (ERDF) program	Obtention of benefits from the devolution of the credit.	Keep satisfied	Supporter
Alex Saz Carranza (Institut Català de Finances)	Treasury and Money Market Manager	Investor Intermediary	Tel: (+34) 933 42 84 10	Act as local intermediary between the project and the EIB and ERDF assuming part of the risk of the project	Obtain benefits from the devolution of the credit	Keep satisfied	Supporter

Name	Position	Role	Contact Information	Requirements	Expectations	Influence	Classification
Manuel Espiau (Caixa d'Enginyers)	Secretary	Investor Intermediary	Tel: (+34) 933 102 626	Commercialization and distribution of the investments	Obtain benefits from the devolution of the credit	Keep satisfied	Supporter
David S. Weaver (National Aeronautics and Space Administra-tion, NASA)	Associate Administrator for the Office of Communications	Potential Customer	Tel: (202) 358-0001	To be interested in our product	Obtain useful information in order to prevent future accidents concerning space debris	Keep informed	Influencer
Marie-Hélène Harvard (Télédiffusion de France)	External Relations Responsible	Potential Customer	E-mail: marie-helene.harvard@tdf.fr	To be interested in our product	Obtain useful information in order to prevent future accidents concerning space debris	Monitor	Influencer
Jon Talbot (Deutsche Telekom)	Purchasing Department	Potential Customer	Tel: 0080 330 1080	To be interested in our product	Obtain useful information in order to prevent future accidents concerning space debris	Monitor	Influencer
Peter Crafter (NSSL Global LTD)	Purchasing Department Director	Potential Customer	Tel: +44 (0) 1737 648 800	To be interested in our product	Obtain useful information in order to prevent future accidents concerning space debris	Monitor	Influencer
Martin Bauer (European Council)	Senior Legal Counsellor – Legal Service	Regulators	Tel: (+32) 2281-6111	Provide the legal framework to develop the project	Fulfil the regulations and laws	Keep satisfied	Resistor
Enrique Hernández Bento (Spanish Government)	Undersecretary of Industry, Energy and Tourism	Regulators	Tel: (+34) 91 349 46 40	Provide the legal framework to develop the project	Fulfil the regulations and laws	Keep satisfied	Resistor
Jian Guo (Technical University of Delft)	Project Manager, TU Delft Staff Member	Research collaborator	Tel: (+31) 15 2784615	Co-development of the infrared camera.	Obtain expertise and funds to expand their research about the working area	Keep informed	Supporter

Name	Position	Role	Contact Information	Requirements	Expectations	Influence	Classification
Ioannis Charitopoulos (SatNOGS)	Prediction & Tracking Software	Research collaborator	E-mail: info@satnogs.org	Development of the ground segment to receive the data from the CubeSats.	Obtain expertise and funds to expand their research about the working area.	Keep informed	Supporter
Mogens Blanke (Technical University of Denmark)	Collaboration responsible	Research collaborator	E-mail: mb@oersted.dtu.dk Tel: (+45) 45 25 35 65	Collaborate in the design of the attitude control, software, the structures and the propulsion systems.	Obtain expertise in the field of attitude control.	Keep informed	Supporter
Elena Fantino (Aerospace and Research Center, Universitat Politècnica de Catalunya)	Aerospace Engineering Department	Research collaborator	E-mail: elena.fantino@upc.edu Tel: (+34) 93 7398796	Collaborate in the study of orbital mechanics and maneuvers.	Obtain expertise in the field of astrodynamics.	Keep informed	Supporter
Divya Krishnamoorthy (Advanced Research in Telecommunications Systems, ESA ARTES)	Researcher in Satellite Communi-cation	Developer collaborator	E-mail: d.krishnamoorthy@esa.int	Get funding and knowledge for research.	Obtain expertise and funds to expand their research about the working area	Manage closely	Supporter
Michiel van Bolhuis (Innovative solutions in Space, ISIS)	Space Systems Engineer	Developer collaborator	E-mail: m.bolhuis@isispace.nl	Provide different kind of systems for our CubeSat, such as telecommunication, attitude and control…	Obtain expertise and funds to expand their research about the working area	Keep informed	Supporter
Maik Hartmann (Astro- und Feinwerktechnik Adlershof GmbH)	Power of Represen-tation	Developer collaborator	E-mail: m.hartmann@astrofein.com Tel: (+49) 30 6392-1000	Provide ESA certified test services like thermal-vacuum cycling, vibration and pyroshock tests.	Obtain expertise and funds to expand their research about the working area	Monitor	Supporter

Name	Position	Role	Contact Information	Requirements	Expectations	Influence	Classification
Joan Martorell (Gutmar, S.A)	Chief Executive	Machining process	E-mail: jmartorell@gutmar.es	Machining of the components of the structure.	Obtention of all the necessary components of the structure for a prototype of the CubeSat.	Monitor	Supporter
Ramon Calvet (Sener)	Clean Room Responsible	Facilities Rental	E-mail: r.calvet@sener.es	Rental of a clean room for the assembly of the prototype.	Proper assembly of the prototype of CubeSat.	Monitor	Supporter
Sylvain Lodiot (ESA)	Rosetta project	Developer collaborator	E-mail: slodiot@esa.int	Provide Rosetta's solar panels and energy saving system technology to adapt them to DebrEyes CubeSats	Obtain expertise and funds to expand their research about the working area.	Keep informed	Supporter