Project ID:	**Fly-Radar**
Project Title:	***"Low-frequency multi-mode (SAR and penetrating) radar onboard light-weight UAV for Earth and Planetary exploration"***
Call:	**H2020-MSCA-RISE-2020**
G.A. Number:	**101007973**

WP8 : Communication, Dissemination and Exploitation

D8.2: EXPLOITATION PLAN

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List of Abbreviations

Abbreviation	Description
EP	Exploitation Plan
FAIR	Findable, Accessible, Interoperable and Re-usable
H2020	Horizon 2020 Programme
ORDP	Open Research Data Pilot
OpenAIRE	Open Access Infrastructure for Research in Europe
CERN	The European Organization for Nuclear Research
IPRs	Intellectual Property Rights
WP	Work Package

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1. EXECUTIVE SUMMARY

The FlyRadar project deals with the production of a dual-mode, low-frequency, radar installed on board of a light-weight UAV. The radar will operate into two modes: as Synthetic Aperture Radar (SAR) and as ground penetrating radar. Both instruments provide extremely interesting images that are extensively used in Earth and planetary observations.

However, these airborne systems are bulky and can be operated only from manned aircraft both planes and helicopters. On the other hand, the few drones that can sustain such a equipment are large and heavy. In both cases, the operations are expensive and has a complicate logistic. The quantum leap of FlyRadar consists of installing this radar system onboard small and light electric octocopter, providing low-cost utilisation and easy operations. This affordable system will enlarge the user communities generating the possibility for an extensive use of FlyRadar taking advantage of the potentiality of this long-lasting innovation.

The current FlyRadar Exploitation Plan (EP) summarises the beneficiary's strategy and concrete actions related to the exploitation of the project results. Horizon 2020 is a Research and Innovation programme aiming at fostering competitiveness and growth and increasing benefits to the European Union economy and citizens. Public investment in projects is to be converted into socio-economic benefits for the society, as clearly indicated in the Horizon 2020 Rules for Participation (see Article 43 Horizon 2020 Rules for Participation http://ec.europa.eu/research/participants/data/ref/h2020/legal_basis/rules_participation/h2020-rulesparticipation_en.pdf), with a clear accent to the beneficiaries' obligations to exploit the outcomes of the funded activities.

The Horizon 2020 work programme explicitly specifies that project proposals shall include a draft Plan for the Exploitation of Results. This Plan is a strategic document indicating how the partnership establishes the basis for the intellectual property strategy and exploitation activities and summarises the beneficiaries' strategy and concrete actions related to the protection, dissemination and exploitation of the project results.

2. INTRODUCTION

2.1 Objectives and scope of the document

The EP describes the impact of the results of the FlyRadar project on science, industry, society and governments mostly after its end, as a Horizon 2020 project. Results are any tangible or intangible output of the project, such as data, knowledge and information whatever their form or nature, whether they can be protected. The EP aims at defining the management strategy of data generated during the project with the purpose to making research data findable, accessible, interoperable and re-usable (FAIR).

Stakeholders have been targeted with specific results according to the desired impact the project aims to have.

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2.2 Work carried out

WP8 is focused on proactive dissemination, communication, inter-sectorial collaboration and exploitation of the FlyRadar project results. WP8 provides communication and dissemination through press releases and outreach events, while special attention will be put on commercial exploitation of the results of the project (at industry portals, industry days, targeted emails) by actively involving relevant stakeholders and end-users.

In these first months of the project, we have set up a management system, agreed on a common terminology among the partners in the consortium, and set up a system for tracking dissemination and exploitation activities implemented by the partners.

The consortium has agreed on so far on the following:

- ➔ Definition of the project website, its implementation and compilation with content (images, videos, interviews, reports, articles and other media) provided by all partners. (Deliverables D8.1 Website Framework and Social Tools https://www.flyradarproject.eu/wp-content/uploads/2021/09/D81_Fly-Radar.pdf).
- ➔ Facebook (https://www.facebook.com/flyradarproject) and Twitter (https://twitter.com/FlyRadar1) pages were created and continuously updated for dissemination activities. Both documents set out how we plan to disseminate the results of our project. (D8.1).
- ➔ The FlyRadar's leaflet available in the about us section of the website (https://www.flyradarproject.eu/wp-content/uploads/2023/01/FlyRadar_Leaflet.pdf).

As part of dissemination, a requirement engineering analysis task was performed to key end-user to assemble the FlyRadar products to match the market needs.

Additionally, this document (D8.2) indicates how we will be addressing the exploitation activities.

Exploitation will be addressed by the related posters and oral presentations, research seminars and attendance at workshops and conferences the whole European community could benefit from the project.

Currently, the FlyRadar project has been presented at the following events and conferences:

- ➔ 53rd Lunar and Planetary Science Conference (March, 2022)

  (Abstract: https://www.hou.usra.edu/meetings/lpsc2022/pdf/1536.pdf);
- ➔ EGU2022 (May, 2022)

  (Abstracts: https://meetingorganizer.copernicus.org/EGU22/EGU22-1798.html , https://meetingorganizer.copernicus.org/EGU22/EGU22-1915.html)
- ➔ EPSC2022 (September, 2022)

  (Abstract: https://meetingorganizer.copernicus.org/EPSC2022/EPSC2022-983.html)
- ➔ Multiplier Event - Planet Earth Week in Pescara, Italy (October, 2022)
- ➔ XVIII Congresso Nazionale Perugia 2023 (Febraury, 2023)

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(Abstract: https://www.flyradarproject.eu/wp-content/uploads/2023/03/ElettraMariani_Abstract_CongressoNazionaleScienzePlanetariePerugia_2023.pdf)

➔ EGU2023 Splinter Meeting: "FlyRadar: training for drone based GPR usage in future Mars missions" (Figure 1)

(April, 2023 https://meetingorganizer.copernicus.org/EGU23/session/47612)

(Abstracts: https://www.flyradarproject.eu/wp-content/uploads/2023/04/EGU23-7284-print.pdf , https://www.flyradarproject.eu/wp-content/uploads/2023/04/EGU23-8449-print.pdf).

***Figure 1**: During the Splinter Meeting at the EGU General Assembly 2023*

2.3 Key Term

Communication, Dissemination and Exploitation are three key concepts for H2020 projects. Some of the key terms used in this document are defined as following:

- ➔ Exploitation “means the use of results in further research activities other than those covered by the action concerned, or in developing, creating and marketing a product or process, or in reusing the acquired know-how for given business purposes, or in creating and providing a service, or in standardization activities”.
- ➔ Dissemination “means the public disclosure of the results by any appropriate means (other than resulting from protecting or exploiting the results), including by scientific publications in any medium”. Description of FAIR DATA characteristics including DMP Review Process.
- ➔ Communication activities are complementary to dissemination and exploitation ones, calling attention of multiple audiences about the research undertaken (in a way that they can be understood by non-specialists) and address the public policy perspective of EU research and innovation funding. Data Security

The efforts of dissemination and exploitation can further be segmented into intra-partner, inter-partner and external:

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- ➔ Intra-partner efforts: These activities take place among the different departments of each partner so that project developments become part of the product/service portfolio.
- ➔ Inter-partner efforts: These activities are being carried out among consortium partners. This dissemination is playing a key role in smoother project execution, exploitation of potential synergy and ensuring building on complementary strengths of the consortium.
- ➔ External efforts: External dissemination efforts take different forms based on the content being transmitted and the audience being addressed. The consortium has segmented the public according to the goals and objectives while keeping in mind the potential relationship to be sought with the stakeholders.

2.4 Structure of the deliverable

The document is structured with the following information:

- ➔ Exploitation Plan (EP) guiding principles and strategy
- ➔ Description of FlyRadar Exploitation strategy and expected impact
- ➔ Description of FlyRadar type of data
- ➔ Description of FAIR DATA characteristics
- ➔ Allocation of resources
- ➔ Data Security
- ➔ Ethical Aspects
- ➔ Conclusions

3. EXPLOITATION PLAN

3.1 The Exploitation Plan (EP) guiding principles

The Exploitation Plan of FlyRadar is realized within the Work Package 8. WP8 provides communication and dissemination through press releases and outreach events, while special attention is put on commercial exploitation of the results of the project (at industry portals, industry days, targeted emails) by actively involving relevant stakeholders and end-users.

The Fly-Radar project EP follows the principle of Open Access according to the Horizon 2020 guideline summarized in the diagram below (Figure 2).

The others main principles for the Fly-Radar project EP are the following:

- ➔ This Exploitation Plan (EP) has been prepared by taking into account the “Guidelines For Your Dissemination and Exploitation Activities” (https://ec.europa.eu/research/participants/docs/h2020-funding-guide/grants/grant-management/dissemination-of-results_en.htm)
- ➔ The EP is an official public project Deliverable (D8.2) due in Month 36 (January 2024), but it will be updated throughout the project, whether necessary. The first initial version will evolve depending on significant changes arising and periodic reviews at relevant reporting stages of the project.

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➔ The consortium complies with the requirements of Regulation (EU) 2016/679 and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation). Guidance on how these regulations interact with open-access data policy can be found here: https://www.openaire.eu/ordp/

➔ Type of data, storage, confidentiality, ownership, management of intellectual property and access: procedures implemented for data collection, storage, access, sharing policies, protection, retention and destruction are in line with EU standards as described in the Grant Agreement and the Consortium Agreement.

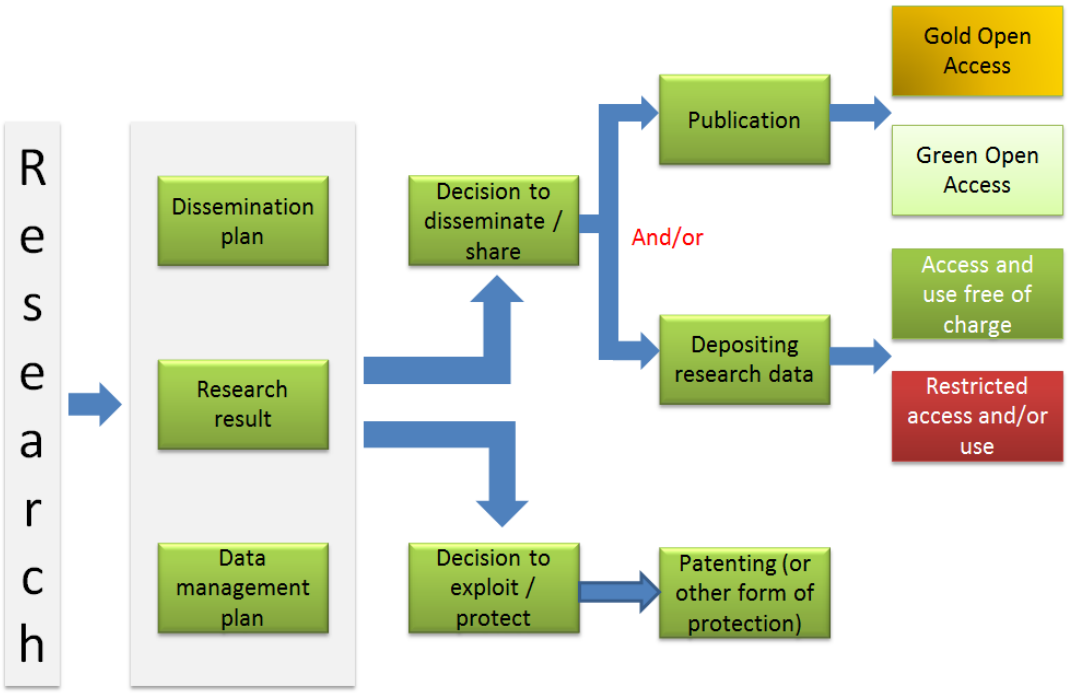

***Figure 2**: Open access to research data and publication decision diagram (from Guidelines to the Rules on Open Access to Scientific publications and Open Access to Research Data in Horizon 2020)*

3.2 Fly-Radar Exploitation strategy

As a project participating in the Open Research Data Pilot (ORDP) in Horizon 2020, the Exploitation strategy of the FlyRadar project is focused on the observation of FAIR (Findable, Accessible Interoperable and Reusable) Data Management Protocols. This document addresses for each data set collected, processed and/or generated in the project the following elements:

➔ **Dataset reference and name:** Internal project Identifier for the dataset to be produced with the format:

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PName_PartnerName_DatasetName_Version__DateOfStorage, where the project name is FlyRadar, the Partner Name represents the name of the data custodian (WP Lead/ Task Leader).

- ➔ **Dataset description:** description of the data generated or collected, including its origin (in cases where data is collected), nature and scale, to whom it could be useful, the potential for reuse.
- ➔ **Standards and metadata:** reference to existing suitable standards. If these do not exist, an outline on how and what metadata will be created.
- ➔ **Data sharing:** description of how data will be shared, including access procedures, embargo periods (if any), outlines of technical mechanisms for dissemination and necessary software and other tools for enabling reuse, and definition of whether access will be open or restricted to specific groups. Identification of the repository where data will be stored, if already existing and identified, indicating the type of repository (institutional, standard repository for the discipline, etc.). In cases where the dataset cannot be shared, the reasons for this will be stated (e.g. ethical, rules of personal data, intellectual property, commercial, privacy-related, security-related).
- ➔ **Archiving and preservation** (including storage and backup): description of the procedures to be put in place for long-term preservation of the data, including an indication of how long the data should be preserved, the approximate end volume, associated costs, and how these are planned to be covered.

The EP is intended to be a 'living' document that will outline how the FlyRadar research data will be handled during and after the project, and so it will be reviewed and updated whether necessary. All European Union funded projects must try to disseminate as much information as possible and on top of that the FlyRadar project adhered to the "Open Research Data Pilot", committing to give open access to data generated during the project unless it goes against legitimate interests. In this regard, the EP guarantees the accessibility and intelligibility of the data generated during the FlyRadar project to comply with the Guidelines of the ORPD.

All the data sets, regardless of their categorization, are stored in each of the participant entities databases and in the FlyRadar Cloud folders created as internal database and communication tool for the partners. In addition, those categorized as open will be publicly shared (in the case of embargo, after the embargo period is over) through the public section of the project website (https://www.flyradarproject.eu/) and ZENODO (https://zenodo.org/). ZENODO is an open access repository for all fields of science that allows uploading any kind of data file formats, which is recommended by the Open Access Infrastructure for Research in Europe (OpenAIRE).

The following elements will guarantee the ideal exploitation activity during the progress of the project.

- ➔ Exploitation of complementary background experience of the participants through task sharing, brainstorming, feedback.
- ➔ Existing and known field sites, and existing laboratory facilities (including computer-based modelling environments).

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- ➔ Jointly compiled schedule and internal deadlines supporting the continuous project progress.
- ➔ Hierarchical project management and task sharing.
- ➔ Technology-science synergy by cross training of participants and harmonizing the methods to make compatible results.
- ➔ Interdisciplinary language learning among researchers and engineers to link scientific needs with technological constraints through joint group discussions, goal-oriented brainstorming, and definition and use of technical vocabulary.
- ➔ Searchable and easy access of online archive of descriptions, definitions, background literature, minutes of meetings, previous results etc.
- ➔ The overview of specific business opportunities through a market survey

Specific numerical measures of quality of the work exploitation: documents (number of publications (papers and conference presentations); number and size of produced radar based datasets; characterization of verified datasets during the improvement of radar); events (lectures and tutorials produced during the training events; participants at meetings, documentation of activities, discussions; realized field works, and documentation of field tests); discoveries, methodological improvements (identified subsurface features (locations, physical characteristics, description of regional context) at the field tests; calculations and definition of system capability and error levels); applied aspects, business relations.

Exploitation activities in different countries provide the opportunity for short periods of secondment with the exchange of seconded personnel. The hosting institutions within a specific work package, exchange the engaged personnel in different phases of the development of the WP by performing different activities (e.g. requirement definition, analysis, adaptation and development, integration and testing, validation and exploitation).

The FlyRadar consortium aims to define and develop a functional prototype that is a challenge for all researchers involved in the project. This can be further exploited after the end of the project for industry, including writing future proposals. Potential customers certainly include space agencies for Earth and planetary exploration, research institutes, companies, investment groups and academic institutions active in the specific field. This motivates the consortium to continue research and innovation activities to expand the applicability of the methods beyond the European level. In this regard, there is growing international attention and interest (individual countries, international organizations such as NASA) for technology in planetary exploration. The innovative use of the tool developed by FlyRadar is expected to have a significant impact on both the industrial sector and the user community. The FlyRadar project targets a targeted group of research institutions and cross-sector professionals across Europe. The specific skill of the three SMEs in the FlyRadar consortium is complementary in terms of both market area and geography, so the network does not present internal competition but rather enhances the future commercial perspectives. In this regard the network is well balanced and provides real perspective to build-up a long-lasting relationship well beyond the limited horizon of the project period. The mechanism of secondment is also well suited to FlyRadar consortium, not only to improve the career perspective of researchers coming from Academia, but also providing a

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unique and valuable training to engineers and technicians employed at the SMEs, as deeply exploited collaboration.

3.3 Expected impact

To translate the knowledge resulting from publicly funded EU research activities into tangible products with significant economic and social impacts, FlyRadar is set to explore various avenues of exploitation, including the commercialization of products and services. The motivation behind the commercialization process lies in the diverse benefits that can be derived from it, extending beyond the evident revenue generation. These advantages encompass the expansion of the job market for researchers, enhancement of career perspectives, promotion of innovation in Europe, and the visibility of SMEs and academia.

Currently, the utilization of Synthetic Aperture Radar (SAR) data is widespread but is predominantly confined to orbital missions (such as Radarsat, Cosmo-SkyMed, Alos) and certain airborne instruments. However, SAR data remains relatively expensive and is not widely employed, except for low-resolution orbital data. Furthermore, radar systems with sub-surface penetration capabilities pose additional challenges. To date, only radar systems around Mars exhibit penetrating capabilities (using a pulse-mode) on orbiting platforms.

While some commercial radar systems mounted on drones are now available, they still tend to be bulky and expensive. However, the potential advent of low-cost systems may revolutionize the market, rendering them more affordable for a broad range of activities, spanning from surveying and surveillance to Search & Rescue operations, agriculture, and water exploration. This prospect could significantly broaden the accessibility and applicability of radar technology across various sectors.

FlyRadar is taking the following actions:

- ➔ Investigation of the integration of technologies developed in FlyRadar with existing systems, models, and methods.
- ➔ Identification of the appropriate market for the developed technologies, these target companies will receive direct emails and will be invited to personal meetings of demonstration events.
- ➔ Protection of the resulting intellectual property and knowledge.
- ➔ Enhancement of synergies with European and national Space Agencies and European Union funded projects, by personal discussions with mission experts and managers, industry policy makers, including national delegates of the participating countries.
- ➔ Exploitation will be addressed by conferences, questionnaires and interviews to stakeholders and relevant end users.
- ➔ Get the academia, industry and end-users to understand the possibilities of commercial exploitation of the developed technologies as long as in Mars and Titan exploration and Earth based applied aspects.

The FlyRadar project will be disseminated with a poster (in preparation) at the "Space BR Show" (https://spacebrshow.com/en/ - Brasil, 21st - 23rd 2024); the event will show the

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potential for new business generated by space exploration for the Latin American community.

The exploitation plan's main scope is to analyse the market, gather feedback from the stakeholders, and develop strategic commercial plans and alliances to contribute to the reinforcement of European industrial leadership in the specific market. With this perspective, we plan to take specific measures to support the exploitation of the project's outcomes at the end of the project.

FlyRadar exploitation plan is summarized hereafter:

- ➔ Market analysis surveying oversees competitors.
- ➔ Patent exploration and actions for protecting IPR, data and knowledge.
- ➔ Establishing presence in appropriate end-user communities and build direct links toward leaders there.
- ➔ Evaluation over competing technologies.
- ➔ Financial and marketing planning.

The analysis of the markets for the next two decades is reported in the following table.

	SEGMENTS	TARGET
Planetary Science and Exploration	NASA	Mars and Moon missions including robotic precursors and possible the first human, subsoil analysis to build foundations, identify the presence of water or other resources
	ESA, ASI	
Earth Science and Exploration	Radar Drone SME	Surveillance, search and rescue
	Geology analysis	Shallow surface analysis, surveillance
	Archaelogy site excavation campaign	Survey, metal object recovery, Identify devices, bombs, mines, tunnels, pipelines
	Search and Rescue	Response to natural and human-driven disasters, people in distress
	Resources and climate	Companies working on the climate change driven sea level change produced subsurface water level change at European seaside areas

A low-frequency dual mode radar, SAR and ground penetrating, can be proficiently adopted either on board of a rover or on a drone for airborne surveys. The demonstrator drone carried onbord of the Mars2020 rover will mark a turning point in the operations for the in-situ martian exploration. Future missions will extensively use drones for several tasks. It will be important for the analysis of the subsurface for scientific purposes but also for technical reasons (identify subsurface water or ice, 3D mapping of geological features, support infrastructure deployment on the surface by subsurface knowledge, identification of resources, etc.). Although drones are going to be applied, however there is a business gap in producing low weight, low energy consumption, robust SAR systems that is exploited by this project.

Being FlyRadar a development project, the simple knowledge management strategy relevant to the knowledge captured and shared during the project evolution is based on the following points:

- ➔ Knowledge accessibility (e.g. web site, databases, documentation repository, glossaries, disclaimers, IPR lists and references, etc.) in which the knowledge is stored (including digital backup) in a form common and available to all participants

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and extensible to all entities and communities of interest having interest in this knowledge.

- ➔ Transformation, the flow of knowledge from one place to another and from one form to another is based on design and implementation of documentation, workshops and meetings.

The project policy is compliant with the open access procces as common in the scientific environment and in line with the H2020 open access policy. The exploitation of the project outcomes will be based on the commercialisation of the radar systems and on the scientific dissemination. These two actions are granted by the presence in the project of both Companies and strong scientific partners.

The market of space exploration is experiencing an outstanding interest, and more and more missions are expected in the next 20 years involving robots and eventually humans. Airborn surveys will be essential in both robotic and human explorations as the capability increases, the used information should be also improved, what serves as pathfinder and planner of for mineral prospecting, quest for ice/water, geological target selection – Europe might gain a good position in this market gap. The Martian subsurface analysis is of paramount central importance for Mars Human Exploration and science. In fact, high-resolution knowledge about the uppermost subsurface allows the hazard evaluation for locations/ areas, which is essential for future deployments and resources exploitation. Nevertheless, available data are at low vertical resolution and able to find deep aquifers that are useless for human exploration and exploitation, for paleoclimatic reconstruction also shallow water ice is useful. NASA (occasionally jointly with ESA) will run missions every two years, plans support drone-carried radar for next missions. The joint planned NASA-ESA Mars Sample Return initiative could heavily use the radar system improved by this project. A drone supported survey could cover substantial area for grid-based investigation, ideal input for GIS analysis. This leading-edge technology of innovative instrument will compete with American counterpart; NASA and ESA have interests in similar instruments to be shared within the existing collaboration in planetary exploration, just like it has already happened in the case of Cassini-Huygens mission (Italian antenna and radar), MarsExpress mission (Italian MARSIS radar); COSMO-SkyMed (Italian satellite radar system). The FlyRadar consortium's scientific team is also currently involved in some recent space exploration missions such as MARS EXPLORATION ICE MAPPER (radar based on RADARSAT technology), ARTEMIS (Moon exploration program) and ARGONAUT (European lunar lander).

Due to fewer constraints in Earth application, a miniaturized light-weighted SAR and penetrating radar fit the geologists and archaeologists needs for a highly portable, easily deployable instrument to address their science questions (hazards, shallow subsurface analysis, object detection etc.). The opportunity of the use of such dual-mode radar will be crucial in providing airborne radar exploration at a fraction of the current cost involving planes or helicopters or even off-the self-drones. Radars with these characteristics are, currently laboratory sized and requires large aircraft or heavy and bulky drones. Thus, the innovative optimization in this project passes through the reduction of size, weight, power consumption, operational time of data assessment and improvement of instruments performances. The adoption of the suggested methodologies will signify a significant advancement for both Planetary Exploration and Earth Science.

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3.4 Fly-Radar type of data

Among project datasets and deliverables, the following categories of outputs are declared "public" and will be made "Open Access" (to be provided free of charge for public sharing). These will be included in the Open Research Data Pilot and thus be managed according to the present EP:

- ➔ Project deliverables, except deliverables D3.2, D3.3, D4.2, D4.3, D9.1, D9.3, D9.4, D9.5, which are confidential
- ➔ Articles published in Open Access scientific journal
- ➔ Conference and Workshop abstracts/articles/minutes
- ➔ Summer schools reports/documents/minutes
- ➔ Research data:
  - ✓ Mars surface and terrestrial analogues dataset (WP1)
  - ✓ System requirements dataset (WP2)
  - ✓ Design and manufacturing radar (WP3)
  - ✓ Design and manufacturing drone dataset (WP4)
  - ✓ Model qualification campaign dataset (WP5)
  - ✓ Validation and test field campaign (WP6)

3.5 Data Summary

Research data summary tables are available in Annex 1.

4. FAIR DATA

The following rules and principles, as identified and described in the present section 4, apply to all datasets identified in Annex 1 of this EP.

4.1 Making data findable, including provisions for metadata

Metadata is data on the research data themselves. It enables other researchers to find data in an online repository and is, as such, essential for the reusability of the dataset. By adding rich and detailed metadata, other researchers, can better determine whether the dataset is relevant and useful for their own research. Metadata (type of data, location, etc.) will be uploaded in a standardized form. This metadata will be kept separate from the original raw research data.

As described in the project Grant Agreement (Article 29.2), the bibliographic metadata that identify the deposited publication must include all the following:

- ➔ the terms "Marie Sklodowska-Curie Actions";
- ➔ the project name, acronym and grant number;

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- ➔ the publication date and, if applicable, length of embargo period
- ➔ a persistent identifier

Fly-Radar open data are collected in an open online research data repository: ZENODO (https://zenodo.org/). Its repository structure, facilities and management are following FAIR data principles as it allows researchers to deposit both publications and data, providing tools to linking them to these through persistent identifiers and data citations. ZENODO is set up to facilitate the finding, accessing, re-using and interoperating of data sets, which are the basic principles that ORDP projects must comply with. Zenodo repository is provided by OpenAIRE (https://www.openaire.eu/) and hosted by CERN. Zenodo is a catch-all repository that enables researchers, scientists, EU projects and institutions to:

- ➔ Share research results in a wide variety of formats including text, spreadsheets, audio, video, and images across all fields of science.
- ➔ Display their research results and get credited by making the research results citable and integrating them into existing reporting lines to funding agencies like the European Commission.
- ➔ Easily access and reuse shared research results.
- ➔ Integrate their research outputs with the OpenAIRE portal (https://www.openaire.eu/).

Search keywords

Zenodo allows to perform simple and advanced search queries on Zenodo using the keywords. Zenodo also provides a user guide with easy-to-understand examples.

Naming conventions

Files and folders at data repositories will be versioned and structured by using a name convention consisting as follow: Fly-radar_Dx.y_YYYYMMDD_Vzz.doc

Version numbers

Individual file names will contain version numbers that will be incremented at each revision (Vzz).

4.2 Making data openly accessible & data sharing

To boost the impact of Fly-Radar research data, the results are shared within and beyond the consortium. Selected data and results will be shared with the scientific community and other stakeholders through publications in scientific journals and presentations at conferences, as well as through open access data repositories.

The Fly-Radar project datasets are first stored and organized in a database by the data owners (personal computer, or on the institutional secure server) and on the project cloud (a restricted area of the project website). All data are made available for verification and re-use, unless the task leader declares that the data cannot be made openly accessible, for a specified reason (e.g., commercial use, patenting, other IPR protection).

To protect the copyright of the project knowledge, Creative Commons license will be used in some cases.

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The Fly-Radar deliverables with the dissemination level "public" (data access policy unrestricted) will be accessible through:

- ➔ Fly-Radar project web site
- ➔ Partners database
- ➔ OpenAIRE (https://www.openaire.eu/)
- ➔ ZENODO (https://zenodo.org) for ORDP data and datasets
- ➔ Open access journals

All data deposited on ZENODO are accessible without restrictions. For other data, potential users must contact the IPR team or the data owner to gain access. If necessary, proper IPR procedures (such as non- disclosure agreement) will be used.

4.3 Making data interoperable

Partners will observe OpenAIRE guidelines for online interoperability, including OpenAIRE Guidelines for Literature Repositories, OpenAIRE Guidelines for Data Archives, OpenAIRE Guidelines for CRIS Managers based on CERIF-XML. These guidelines can be found at: https://guidelines.openaire.eu/en/latest/.

Partners will also ensure that Fly-Radar data observes FAIR data principles under H2020 open-access policy:
http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-datamgt_en.pdf

To ensure the interoperability, all datasets will use the same standards for data and metadata capture/creation.

As the project progresses and data is more precisely identified and collected, further information on how data will be made interoperable may be further outlined in subsequent versions of the EP, whether necessary. Further information may be added on data and metadata vocabularies, standards or methodology to follow to facilitate interoperability and whether the project uses standard vocabulary for all data types to allow interdisciplinary interoperability.

4.4 Increase data re-use (through clarifying licences)

Each research institute is currently assessing how to license data to permit the widest reuse possible and clearly identify any requirements for data embargo and length of time for which the data will remain usable, if applicable.

All Fly-Radar project results that are open to use for any purpose are appropriately licensed using open licensing policy (see https://creativecommons.org/licenses/?lang=en).

All data products that will not be subject to IPR protection will be deposited on the public data repository ZENODO (https://zenodo.org/), where access is unlimited and data will be publicly available and re-usable in accordance with ZENODO terms and conditions for use.

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Restrictions on re-use policy are applied for all protected data (see Figure 1: Open access to research data and publication decision diagram), whose re-use will be limited to the project partners.

Other restrictions could include:

- ➔ the "embargo" period imposed by journals publication policy (Green Open access);
- ➔ some or all the following restrictions may be applied with Creative Commons licensing of the dataset:
  - ✓ Attribution: requires users of the dataset to give appropriate credit, provide a link to the license, and indicate if changes were made.
  - ✓ NonCommercial: prohibits the use of the dataset for commercial purposes by others.
  - ✓ ShareAlike: requires the others to use the same license as the original on all derivative works based on the original data.

5. ALLOCATION OF RESOURCES

Costs related to open-access to research data in Horizon 2020 are eligible for reimbursement under the conditions defined in the H2020 Grant Agreement, in particular Article 6 and Article 6.2.D.3, but also other articles relevant for the cost category chosen. Project beneficiaries will be responsible for applying for reimbursement for costs related to making data accessible to others beyond the consortium.

The costs for making data FAIR includes:

- ➔ Data set storage, management and maintenance costs: these costs will be considered as institutional costs and incurred by Coordinator's Project Office, who will be also responsible for it
- ➔ Fees associated with the publication of scientific articles containing project's research data in "Gold" or "Green" Open access journals:
  - ✓ Any fee incurred for Open Access through scientific publication of the data will be under the responsibility of the data owner (authors)-partner(s). The cost sharing will be applied in case of multiple authors.
- ➔ Project Website (https://www.flyradarproject.eu/)
- ➔ Data archiving at ZENODO (https://zenodo.org/) and on other on-line data base: free of charge
- ➔ Copyright licensing with Creative Commons: free of charge
- ➔ Patenting or other IP protection: this cost will be incurred by the author (s) applying for the IP protection.

Each partner is responsible for the data they produce.

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6. DATA SECURITY

The following guidelines will be followed to ensure the security of the data:

- ➔ Store data in at least two separate locations to avoid loss of data;
- ➔ Encrypt data if it is deemed necessary by the participating researchers;
- ➔ Limit the use of USB flash drives.
- ➔ Label files in a systematically structured way to ensure the coherence of the final dataset.

All project deliverables and data are stored and shared in the project cloud set up on the project website, which is restricted to the project consortium. Following scientific publications and articles, the dataset deliverables and the final research results that do not hold a restrict access for commercial/patent/IP purposes will be shared through ZENODO (https://zenodo.org/) and other database to promote the making data FAIR.

7. ETHICAL ASPECTS

Data sets collected or generated in Fly-radar do not raise ethics concerns. No personal and sensitive information will be collected and/or generated in the frame of the Fly-Radar project. Data protection rules are therefore not applicable to the Fly-Radar project.

8. CONCLUSIONS

This document describes the man principles and guidelines for the Exploitation Plan for the Fly-Radar project. As living document, it will be updated throughout the project lifetime whether necessary.

The results of the validation campaign, the technology roadmap and the exploitation plan, output of WP8, will be used to draft the final project conclusion including recommendations, way forward and future area of exploitation of developed instrumentation.

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9. ANNEX 1: RESEARCH DATA SUMMARY TABLES

Dataset N.	**1** **WP1**
Dataset Name	**Fly-Radar_ UCBL_MarsSurface&TerrestrialAnalogues_v1_date**
Lead Beneficiary	**Partner 4: UCBL**
Open/ Restricted	**Open**
Purpose of data	Mars surface data will be collected/processed for the analysis of the major factors affecting the survey campaign of Mars. It will deal with modelling and simulation of the Mars environment, SAR images and subsurface data, this way unravelling possible impact of individual and combined parameters on the outcome of the measurement operation of the radar data. This multidisciplinary effort will deal with rock and soil composition, environment, geological setting, and regolith density. Terrestrial Analogue data will be collected for the definition of the test ranges, including the analysis of the test ranges in Morocco, Afar and Botswana. Data will be relative to sedimentary environments, volcanic edifices, stratigraphy, subsurface data, rock density, dielectric constants and other physical and petrophysical parameters.
Data Types: ➔ **text (e.g. reports)** ➔ **numeric (e.g. tables)** ➔ **audiovisual (e.g. image)** ➔ **simulated (e.g. model)**	Bibliography -> investigation of what has been already done Remote sensing Images -> to study the geology and geophysics of investigated areas Simulation of Radargramms-> to evaluate the potential of the FlyRadar system to investigate Martian and Erath subsurface
Data format:	Bibliography -> pdf Remote sensing data -> he5, tiff, shp, grd, pds, raw Simulation -> raw
New/ Existing data	Bibliographye -> yes

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	Remote sensing -> yes Simulation-> no
Size	Bibliography : 100 Mo Remote sensing 1 To Simulation 100Go
Data origin	Bibliography-> compiled by staff from web sources Remote sensing -> compiled from web sources managed by space agencies Simulation -> from numerical solvers of Maxwell equations
Reference of canonical (links)	http://global-data.mars.asu.edu/bin/ctx.pl https://land.copernicus.eu/imagery-in-situ http://global-data.mars.asu.edu/bin/hirise.pl https://urs.earthdata.nasa.gov
Dataset is	Growing and revisable
Data value	Researchers Simulation -> long term use (5 years)

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Dataset N.	2	WP2
Dataset Name	**Fly-Radar_UCBL_System requirements_v1_date**	
Lead Beneficiary	**Partner 4: UCBL**	
Open/ Restricted	**Open**	
Purpose of data	Data will be collected/processed for the definition of system requirements of the instrument suitable for planetary exploration, in term of mass budget, power budget (including TL assessment vs power consumption), thermal analysis, mechanical and data processing requirements.	
Data Types: ➔ **text (e.g. reports)** ➔ **numeric (e.g. tables)** ➔ **audiovisual (e.g. image)** ➔ **simulated (e.g. model)**	Bibliography -> investigation of what has been already done	
Data format:	pdf	
New/ Existing data	Existing data	
Size	100 Mo	
Data origin	Bibliography-> compiled by staff from web sources	
Reference of canonical (links)	isiwebofscience	
Dataset is	Growing and revisable	
Data Value	Staff only	

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Dataset N.	3 WP3
Dataset Name	**Fly-Radar_CORISTA_Design&ManufacturingRadar_v1_date**
Lead Beneficiary	**Partner 6: CO.RI.S.T.A.**
Open/ Restricted	**Restricted due to commercial use and possible patent application**
Purpose of data	Data will be processed/generated for building the multi-mode, low-frequency radar for drone installation. Data will be relative to the Radar design, focusing on system miniaturisation and radar data processing definition and development.
Data Types: ➔ **text (e.g. reports)** ➔ **numeric (e.g. tables)** ➔ **audiovisual (e.g. image)** ➔ **simulated (e.g. model)**	Text Numeric Simulated
Data format:	pdf, doc, txt Binary with internal format, Matlab
New/ Existing data	Existing data New for experimental data
Size	Various
Data origin	experimental simulation derived/compiled
Reference of canonical (links)	IEEE library
Dataset is	Growing: new data may be added, but the old data is never changed or deleted.
Data Value	Academic researchers and industry

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Dataset N.	4	WP4
Dataset Name	**Fly_Radar_HYPERION_Design&ManufacturingDrone_v1_ date**	
Lead Beneficiary	**Partner 5: HYPERION SEVEN**	
Open/ Restricted	**Restricted due to commercial use and possible patent application**	
Purpose of data	Data will be processed/generated for dimensioning and building of the drone system. In particular data will be relative to dimensioning the 3 segments (Aerial, Cable segment, Ground segment) and to the final test of the system, including different component e.g. Aerial segment, Ground/air link control of radar and data drone (by the fiber optic), and ground station.	
Data Types: ➔ **text (e.g. reports)** ➔ **numeric (e.g. tables)** ➔ **audiovisual (e.g. image)** ➔ **simulated (e.g. model)**	Text: report /manual Numeric: flight data Audio-visual: image /video	
Data format:	PDF/ TXT/CSV/JPG/ TIFF/MP4/MOV/AVI/ KML/SHP	
New/ Existing data	New	
Size	TBD	
Data origin	User and maintenance manual of the drone System operating procedures manual (Standard Operational Procedure)	
Reference of canonical (links)	N/A	

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Dataset is	GROWING
Data value	Project partners Not known yet the potential value of long-term reuse of the data

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Dataset N.	5	WP5
Dataset Name	**Fly-Radar_CBKPAN_ModelQualificationCampaign_v1_date**	
Lead Beneficiary	**Partner 2: CBK PAN**	
Open/ Restricted	**Open**	
Purpose of data	Data will be processed for the identification of a technology development roadmap for planetary exploration and Earth Science. Data will be relative to: • radar calibration and instruments performance • software update to acquire and analyse the data	
Data Types: ➔ **text (e.g. reports)** ➔ **numeric (e.g. tables)** ➔ **audiovisual (e.g. image)** ➔ **simulated (e.g. model)**	**- Data generated by WPs 3 and 4** **- New data collected during the campaign**	
Data format:	**Anticipated to be similar to the data generated during WPs 3 and 4D**	
New/ Existing data	**New**	
Size	**TBD**	
Data origin	**FlyRadar technical measurements**	
Reference of canonical (links)	**Not identified to date**	

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Dataset is	**Fixed**
Data Value	**- Primarily, internal use for the project.** **- Might be of use for other projects, such as application to an equivalent instrument onboard a planetary lander.**

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Dataset N.	6	WP6
Dataset Name	**Fly-Radar_IRSPS_Validation&TestFieldCampaign_v1_date**	
Lead Beneficiary	**Partner 1: IRSPS srl**	
Open/ Restricted	**Open**	
Purpose of data	Data will generated to test the performance, operations and scientific results of the Fly-Radar system. This verification process will be composed of a large number of end-to-end tests, as well as of subsystem checks. The test ranges will be located in dry desert environments in order to take advantage of a stronger penetration of the radar signal. The field test will also test the scientific results comparing other data sets with the data obtained during the FlyRadar operations. The latter will be also analysed. Both the radar performance and the operational procedures will be tested and evaluated.	
Data Types: ➔ **text (e.g. reports)** ➔ **numeric (e.g. tables)** ➔ **audiovisual (e.g. image)** ➔ **simulated (e.g. model)**	Bibliography and Technical Manuals: Collection of previous investigations and state of the art. The data will be stored mainly in PDF format (Portable Document Format). Technical reports about operations: Textual and numerical reports. The data will be stored as PDF, DOC or XLS depending to the data type. Remote sensing data: Resulting from geological and geophysical investigations. The files will be stored in GeoTiff, HDF HE5, SHP, PDS, GRD, RAW, JPG, PNG, DAT, SDAT formats. Point Cloud Data: Resulting from photogrammetric surveys to support investigrations. The file format will be XYZ and LAS. Dissemination media: Audiovisual contents for the dissemination and promotion of the project, both in image and video format.	
Data format:	Text files: TXT, PDF, DOC. Spreadsheet: XLS, CSV. Raster Data: GeoTiff, HDF HE5, PDS, GRD, RAW, JPG, PNG,	

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	DAT, SDAT. Vector data: SHP. Point cloud data: XYZ, LAS. Video format: MP4, AVI. Audio format: MP3, WAVE.
New/ Existing data	Everything new except for data templates and pre-existing bibliography data.
Size	Bibliography, Manual, Reports: 1-200 MB Remote sensing and Photogrammetry data: 1-1000 GB Media: 1MB - 1GB
Data origin	Experimental: Radargramms, Point Cloud Observational: Remote sensing data, satellite sensor readings, drone images Derived/Compiled: Vector data, table contents, reports
Reference of canonical (links)	N/A
Dataset is	Growing
Data value	Researchers in Remote Sensing and Radar ambit, Industry with interests in Radar uses, Earth Observing educational institutions, Space Agencies (Payload Planning and development).

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END OF DOCUMENT

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