# ICARUS –

# D2.4 Data Management Plan

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| 00.00.01 | 17/11/2020 | Draft | Cristina Terpessi | New document |
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## Copyright Statement

# ICARUS

INTEGRATED COMMON ALTITUDE REFERENCE SYSTEM FOR U-SPACE

This "Data Management Plan" deliverable is part of a project that has received funding from the SESAR Joint Undertaking under grant agreement No 894593 under European Union's Horizon 2020 research and innovation programme.

## Abstract

The present document describes the Data Management Plan (DMP) of ICARUS project.

The structure of the document follows the "Guidelines on FAIR Data Management in Horizon 2020", provided by the Directorate-General for Research & Innovation of the European Commission

https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-data-management/data-management_en.htm

and related template

(https://ec.europa.eu/research/participants/data/ref/h2020/gm/reporting/h2020-tpl-oa-data-mgt-plan_en.docx)

The ICARUS DMP addresses the following issues:

- Data Summary
- FAIR data
  - Making data findable, including provisions for metadata
  - Making data openly accessible
  - Making data interoperable
  - Increase data re-use
- Allocation of resources

- Data security
- Ethical aspects
- Other issues

In particular, the deliverable is structured in the following chapters

- Chapter 1 includes a description of the methodology used
- Chapter 2 includes the description of the DMP components; the information related to the Data Summary and to the Fair Data are divided into the WPs involving the collection or production of data.

# Table of Contents



# List of Tables

*No table of figures entries found.*

# List of Figures

*No table of figures entries found.*

# 1 Introduction

The main goal of this document is to show how the research data of the project are **findable, accessible, interoperable and reusable** (FAIR).

This deliverable describes the data management life cycle for the data to be collected, processed and/or generated by the project. It includes information on:

- the handling of research data during and after the end of the project
- what type of data will be collected, processed and/or generated
- which methodology and standards will be applied
- whether data will be shared/made open access
- how data will be curated and preserved (including after the end of the project)
- ethical aspects related to data protection issues are highlighted, providing links to the relevant deliverables for more information, as necessary
- how data security issues will be assessed and minimized
- what are the costs related to data management

Although ICARUS is not a data-intensive project significant attention has been given to this task. The DMP aims to be the document where all the details regarding data management are easily accessible to all the members of the consortium to ensure the FAIR principles.

The DMP is intended to be a living document and it will be updated over the course of the project whenever significant changes arise.

## 1.1 Acronyms

| Acronym | Meaning |
|---|---|
| ICARUS | INTEGRATED COMMON ALTITUDE REFERENCE SYSTEM FOR U-SPACE |
| IAB | International Advisory Board |
| SESAR | Single European Sky ATM Research |
| STELLAR | SESAR Tool Enabling coLLaborative ATM Research |
| SJU | SESAR Joint Undertaking |
| UAS | Unmanned Aircraft Systems |
| WP | Work Package |

# 2 Methodology

The methodological approach used to compile the D2.4 Data Management Plan was based on the updated version of the "Guidelines on FAIR Data Management in Horizon 2020" by the European Commission Directorate – General for Research & Innovation.

ICARUS is an innovative U-space service aiming to provide its users accurate height estimation and altitude translation (from geodetic to barometric and viceversa).

In this contest the data that will be used by ICARUS are mainly the aims to calibrate the translation algorithms, to estimate the total error budget and to validate the ICARUS service.

At this stage of the project, ICARUS it is foreseen to manage the following Data:

- Drone Flight data logs

Flights will be conducted in the calibration and service validation phases. The complete logs with all the telemetry information of these flights will be recorded and used.

- GNSS-related data

Collection of GNSS related Data will be done in order to generate the drone's position estimates and the related integrity parameters (protection levels). both in the ICARUS service prototyping phase and in the ICARUS service validation phase

- ICARUS online survey results

An online survey to capture feedback from the users who are most involved in the ICARUS service, as Drone operators and pilots and Manned aviation professionals will be organized. The answers to the survey will be analysed, used in the design phase and published in aggregate form.

- Data related to the members of the Advisory Board

Name and contact details of the members of the Advisory Board members will be stored in a database in order to contact and invite them to the ICARUS events, surveys and workshops that will be organized, to distribute documentation generated during the project activities and receive feedback from them.

The present deliverable will be updated if new data sets not foreseen are required or if the processing of the data involves substantial changes from the guidelines contained in the present deliverable.

All research data will be stored and shared among the partners of the ICARUS Consortium, using an online collaborative tool (Sharepoint). The platform enables full access to registered users (who are employees of the partners of the Consortium).

Public data generated by ICARUS will be made available free of charge in the project website.

# 3 DMP Components in ICARUS

## 3.1 DMP Components in WP2 – Project Management

### 3.1.1 Data Summary

| | |
|---|---|
| **Data types, collection and generation** | |
| ▪ Purpose of the data collection/generation and its relation to the objectives of the project | The list of members of the Advisory Board is required to contact them to invite them to the various workshops that will be organized and to distribute documentation generated during the lifetime of the project. |
| ▪ Types and formats of data that the project will generate/collect | The data consist in records containing the following personal information:<br>• Name<br>• Email address<br>• Organisation they represent |
| ▪ Origin of the data | The members of the consortium and SJU have suggested the names of the participants in the AB |
| ▪ Expected size of the data | The size of the data will be in the range of a few kilobytes |
| **Existing data** | |
| ▪ Re-use of existing data and how | Data will be generated inside the project. |
| | |
| **Data utility** | |
| ▪ To whom it might be useful | The database will not be publicly available. |

### 3.1.2 FAIR data

N.A

## 3.2 DMP Components in WP3 – ICARUS Concept Outline Definition & state-of-the-art analysis

### 3.2.1 Data Summary

| **Data types, collection and generation** | |
|---|---|
| ▪ Purpose of the data collection/generation and its relation to the objectives of the project | A field test campaign has been conducted to better estimate the error budget related to barometric and to achieve the respective Work Packages objectives. The field survey was done using two different drones (one of witch with an external multi-band GNSS receiver with RTK technology), a RTK base station and a series of Ground Control Points (GCP). Multiple campaign might be needed to collect additional data, also in the verification and validation stage. |
| ▪ Types and formats of data that the project will generate/collect | Data collected during the field survey fall into one of the following categories:<br>• Drone flight logs;<br>• GNSS Raw observables<br>• Media files (RGB images) for 3D object reconstruction (no people)<br><br>Flight logs include both proprietary RAW data in .DAT format and the converted version in .CSV format. The GNSS Raw observables are in the form of RINEX files and the positions of the GCPs are in .CSV format. The media files acquired by the drone's camera are in .JPG format. |
| ▪ Origin of the data | The geo-location data and the media files will be collected during test activities. The origins are mainly:<br>- Drones;<br>- Geodectic grade GNSS receivers; |
| ▪ Expected size of the data | The size of the data collected depends on the considered data sources. The size of GNSS Raw observables is in the order of tens of MBs while both the flight logs and the media files varies from hundreds of MBs to some GBs. |
| **Existing data** | |
| ▪ Re-use of existing data and how | No existing data will be re-used in the project. |

| Data types, collection and generation | |
|---|---|
| | |
| **Data utility** | |
| ▪ To whom it might be useful | The collected data is used by the consortium in the evaluation of the proposed architecture and to evaluate the Total Error budget with the support of real data. The GNSS RAW measurement dataset has been identified as of potential benefit to further research exploitation opportunities in the European Community. |

### 3.2.2 FAIR data

#### 3.2.2.1 Making data findable, including provisions for metadata

N.A

The collected Data are Drone Flight data logs.

No Metadata is foreseen.

The project deliverables will contain analysis from that data.

#### 3.2.2.2 Making data openly accessible

In the preliminary phase the data that is produced during the field surveys will be stored in the consortium's repository.

#### 3.2.2.3 Making data interoperable

N.A.

#### 3.2.2.4 Increase data re-use (through clarifying licences)

N.A.

## 3.3 DMP Components in WP6 – Validation Activities

During the validation activities, in addition to the drones flight data logs, already described in the previous chapter 3.2 related to WP3, it is foreseen to collect data related to GNSS drone's position estimates.

### 3.3.1 Data Summary

| | |
|---|---|
| **Data types, collection and generation** | |
| ▪ Purpose of the data collection/generation and its relation to the objectives of the project | Collection of GNSS-related data in order to generate the drone's position estimates and the related integrity parameters (protection levels). |
| ▪ Types and formats of data that the project will generate/collect | The data will be collected in the form of real-time GNSS data streams originated from the drone(s) under test (binary proprietary format) and the reference fiduciary station network (format: RTCM over NTRIP); moreover, the real-time EDAS data stream will be collected (format: EDAS proprietary).<br>The data generated will be a real-time data stream containing drone's position estimates and the related integrity parameters (protection levels), in binary proprietary format. Moreover, the GNSS data collected and the solution computed will be stored in files (RINEX for the collected GNSS data; EMS for the EGNOS/EDAS messages; ASCII proprietary format for position and integrity). |
| ▪ Origin of the data | IGS/EUREF network; EDAS data center; drone under test. |
| ▪ Expected size of the data | The size of the data depends on the number and duration of the tests. Expected size should not exceed 10 GB globally. |
| **Existing data** | |
| ▪ Re-use of existing data and how | No re-use of existing data foreseen |
| **Data utility** | |
| ▪ To whom it might be useful | Other research projects |

### 3.3.2 FAIR data

#### 3.3.2.1 Making data findable, including provisions for metadata

| Data "Findability" | |
|---|---|
| ▪ Are the data produced and/or used in the project discoverable with metadata, identifiable and locatable by means of a standard identification mechanism (e.g. persistent and unique identifiers such as Digital Object Identifiers)? | No metadata are provided. Information and identification are provided by means of the naming convention of the files. |
| ▪ What naming conventions do you follow? | The naming convention will follow the one established by IGS and EGNOS for their data publication. See also:<br>1. ftp://ftp.igs.org/pub/data/format/rinex304.pdf, §4<br>2. http://www.egnos-pro.esa.int/ems/EMS_UID_2_0.pdf, §3 |
| ▪ Will search keywords be provided that optimize possibilities for re-use? | No |
| ▪ Do you provide clear version numbers? | No |
| ▪ What metadata will be created? In case metadata standards do not exist in your discipline, please outline what type of metadata will be created and how | No metadata created |

#### 3.3.2.2 Making data openly accessible

| Data "Accessibility" | |
|---|---|
| ▪ Which data produced and/or used in the project will be made openly available as the default? If certain datasets cannot be shared (or need to be shared under restrictions), explain why, clearly separating | All data will be made openly available by default. |

| Data "Accessibility" | |
|---|---|
| legal and contractual reasons from voluntary restrictions (Note that in multi-beneficiary projects it is also possible for specific beneficiaries to keep their data closed if relevant provisions are made in the consortium agreement and are in line with the reasons for opting out) | |
| ▪ How will the data be made accessible (e.g. by deposition in a repository)? | By means of Icarus website. |
| ▪ What methods or software tools are needed to access the data? | To be defined. |
| ▪ Is documentation about the software needed to access the data included? | No. |
| ▪ Is it possible to include the relevant software (e.g. in open source code)? | No. |
| ▪ Where will the data and associated metadata, documentation and code be deposited? Preference should be given to certified repositories which support open access where possible. | To be defined. |
| ▪ Have you explored appropriate arrangements with the identified repository? | No. |
| ▪ If there are restrictions on use, how will access be provided? | No restrictions of use foreseen. |
| ▪ Is there a need for a data access committee? | No. |
| ▪ Are there well described conditions for access (i.e. a machine-readable license)? | No. |
| ▪ How will the identity of the person accessing the data be ascertained? | To be defined. |

### 3.3.2.3 Making data interoperable

| Data "Interoperability" | |
|---|---|
| ▪ Are the data produced in the project interoperable, that is allowing data exchange and re-use between researchers, institutions, organisations, countries, etc. (i.e. adhering to standards for formats, as much as possible compliant with available (open) software applications, and in particular facilitating re-combinations with different datasets from different origins)? | Yes. |
| ▪ What data and metadata vocabularies, standards or methodologies will you follow to make your data interoperable? | To be defined. |
| ▪ Will you be using standard vocabularies for all data types present in your data set, to allow inter-disciplinary interoperability? | No. |
| ▪ In case it is unavoidable that you use uncommon or generate project specific ontologies or vocabularies, will you provide mappings to more commonly used ontologies? | No. |

### 3.3.2.4 Increase data re-use (through clarifying licences)

| Data "Re-usability" | |
|---|---|
| ▪ How will the data be licensed to permit the widest re-use possible? | To be defined. |
| ▪ When will the data be made available for re-use? If an embargo is sought to give time to publish or seek patents, specify why and how long this will apply, bearing in mind | To be defined. |

| Data "Re-usability" | |
|---|---|
| that research data should be made available as soon as possible. | |
| ▪ Are the data produced and/or used in the project useable by third parties, in particular after the end of the project? If the re-use of some data is restricted, explain why | Yes. |
| ▪ How long is it intended that the data remains re-usable? | Permanently. |
| ▪ Are data quality assurance processes described? | No. |

## 3.4 DMP Components in WP7 – Exploitation and Dissemination

### 3.4.1 Data Summary

| Data types, collection and generation | |
|---|---|
| ▪ Purpose of the data collection/generation and its relation to the objectives of the project | An online survey has been organized to capture important feedback from the two user groups more likely to be affected by the ICARUS service:<br>• Drone operators and pilots<br>• Manned aviation professionals<br>Results of the survey will be used to understand user's needs, limitations of the existing systems and other information relevant to the design of the service. |
| ▪ Types and formats of data that the project will generate/collect | The data consists of records containing the answers to the questions presented on the survey.<br>No personal data has been collected. |
| ▪ Origin of the data | The data is created by the participants on the survey. |
| ▪ Expected size of the data | The size of the data will be in the range of a few kilobytes |

| Data types, collection and generation | |
|---|---|
| **Existing data** | |
| ▪ Re-use of existing data and how | Data will be generated inside the project. |
| | |
| **Data utility** | |
| ▪ To whom it might be useful | The raw database containing individual answers will not be made public but a comprehensive report analysing the results will be created and accessible on the project website.<br>Also, selected results relevant to design decisions will be presented and discussed in the appropriate deliverables: [complete] |

## 3.4.2 FAIR data

### 3.4.2.1 Making data findable, including provisions for metadata

| Data "Findability" | |
|---|---|
| ▪ Are the data produced and/or used in the project discoverable with metadata, identifiable and locatable by means of a standard identification mechanism (e.g. persistent and unique identifiers such as Digital Object Identifiers)? | The report will be discoverable and accessible to the public once it is delivered to the EU. It will be uploaded to the project website and promoted through the project social channels. |

### 3.4.2.2 Making data openly accessible

| Data "Accessibility" | |
|---|---|
| ▪ Which data produced and/or used in the project will be made openly available as the default? If certain datasets cannot be shared (or need to be shared under restrictions), explain why, clearly separating legal and contractual reasons from | The raw data will not be accessible outside the project. |

| Data "Accessibility" | |
|---|---|
| voluntary restrictions (Note that in multi-beneficiary projects it is also possible for specific beneficiaries to keep their data closed if relevant provisions are made in the consortium agreement and are in line with the reasons for opting out) | |

#### 3.4.2.3 Making data interoperable

| Data "Interoperability" | |
|---|---|
| ▪ Are the data produced in the project interoperable, that is allowing data exchange and re-use between researchers, institutions, organisations, countries, etc. (i.e. adhering to standards for formats, as much as possible compliant with available (open) software applications, and in particular facilitating re-combinations with different datasets from different origins)? | N/A |

#### 3.4.2.4 Increase data re-use (through clarifying licences)

| Data "Re-usability" | |
|---|---|
| ▪ How will the data be licensed to permit the widest re-use possible? | N/A |

## 3.5 Allocation of resources

| Costs related to data management | |
|---|---|
| ▪ What are the costs for making data FAIR in your project? | Most of the FAIR Data Principles are already taken into account. Further evaluation will be made on the basis of the final data ensemble. |

| Costs related to data management | |
|---|---|
| ▪ How will these be covered? Note that costs related to open access to research data are eligible as part of the Horizon 2020 grant (if compliant with the Grant Agreement conditions) | Data will be stored in a collaborative platform for Consortium use and re-use and on the Icarus website, for public data. Cost for storage and management are included in the project budget to cover the period of usage within the project lifecycle. |
| ▪ Are the resources for long term preservation discussed (costs and potential value, who decides and how what data will be kept and for how long)? | The amount of data stored is in the order of 15-20 of MB.<br>Given that, no rolling archive policies have been put in place. Nevertheless, it is allowed the administrator to backup and put offline old data in any moment, if needed. |
| **Data management responsible** | |
| ▪ Who will be responsible for data management in your project? | The Project Coordinator |

## 3.6 Data security

| Data security | |
|---|---|
| ▪ What provisions are in place for data security (including data recovery as well as secure storage and transfer of sensitive data)? | The Database will be stored in a collaborative platform made available by e-GEOS and on the Icarus website both ensure high data security and reliability |
| ▪ Is the data safely stored in certified repositories for long term preservation and curation? | No.<br><br>See also **Error! Reference source not found.** |

## 3.7 Ethical aspects

The only data set that has a potential ethical aspect to consider is the database of the members of the advisory board used in activities related to WP2.

| Ethical aspects | |
|---|---|
| ▪ Are there any ethical or legal issues that can have an impact on data sharing? These can | Only personal data protection issues covered in D1.2 POPD |

| Ethical aspects | |
|---|---|
| also be discussed in the context of the ethics review. If relevant, include references to ethics deliverables and ethics chapter in the Description of the Action (DoA). | |
| ▪ Is informed consent for data sharing and long term preservation included in questionnaires dealing with personal data? | Yes. The informed consent form described in D1.1 is signed by each participant of the AB |


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