



D5.3 Data Management Plan

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PU	Public	Х			

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'As open as possible, as closed as necessary'

To maximise the dissemination and impact of the project and to embed the results into the aviation industry the FLIPASED consortium plans to make most of the flight test data and the developed mathematical models available open to the research community in accordance with the H2020 initiative on FAIR (Findable, Accessible, Interoperable and Reusable) Open Research Data Pilot. However, part of the flight test data together with design tools and embedded hardware and software components will be shared among project partners only. The purpose of the Data Management Plan (DMP) is to provide an analysis of the main elements of the data management policy that will be used by the partners with regard to all the datasets that will be generated by the project. It defines also the sets of data which will be published according to the Grant Agreement [3] considering confidentiality issues and proprietary rights as well.

The DMP addresses the points below on a dataset by dataset basis and reflects the current state of view within the consortium about the data that will be produced.

- Data set reference and name
- Data set description
- Standards and metadata
- Data sharing
- Archiving and preservation (including storage and backup)

Legal aspects with regard to all data handled in the project will be summarized in a separate chapter. The DMP provides guidelines for the project partners with regard to all the datasets that will be generated within the project. The DMP addresses the naming conventions, description of datasets, standards and metadata, and data sharing properties on a dataset by dataset basis. The DMP will be updated reflecting the current status of view on the data that will be produced, evolving during the lifespan of the project. The DMP also gives a clear description of the processes, roles and responsabilities concerning the handling and publication of data.

The next chapter gives an overview about the possible datasets generated during the project and the general rules of data handling. The forthcoming chapters explain the above listed bullet points in detail on a dataset by dataset basis.

The chapter about legal aspects closes the DMP.



2 Definition of datasets in FLIPASED project

The Guidelines on FAIR Open Access in Horizon 2020 [1] well summarizes the possible process of data handling in H2020 projects illustrated by the following graph:



The Dissemination Plan will complement this DMP and when handling data tha consortium should follow the recommendations of both documents. The following types of datasets will be made during the project:

- 1. Documentations and publications describing the work performed, new scientific findings and future directions of research including media files
- 2. Time series data from simulation and real flight tests
- 3. Software source code developed within the framework of the project or hardware design (including blueprints)

Besides setting up the decision process of data handling it is also important to define the data owner.

Data Owner (DO): is the partner institution who first processed the data in a distributable format (binary files, other electronic file formats or paper copy). The ownership of the data is decoupled from the ownership of the results, which is common for the whole consortium.

2.1 Scheme of the process of data handling

After generating, storing and processing the data the DO can decide about its publication for the wider public. This free decision possibility is restricted in case of data generated directly for public dissemination and publications which should comply with Green Open Access (see GA [3] page 47). To authorise data publication the consortium shall follow the process defined in the Project Handbook for authorizing publications:

To authorise a publication the author/DO should request the approval of all consortium members regarding content to be disseminated. The Principal Investigators (PI) of each member will receive an email about the details of the planned publication with the final version of the text/data attached or with link referring to the text/data at least 45 days before dissemination (GA Part B page 47)



- 1. Each PI should acknowledge receipt of this notification by a simple return email within 48 hrs.
- 2. All partners have 30 days to review the material attached and raise any objections by email to the Coordinator and the Partner launching the request.
- 3. If no formal objection is received from any partner within 30 days (Date of the deadline), permission for dissemination will be automatically granted.

For a partner to object, it must be able to prove the protection of [its] own legitimate interests could be affected by the disclosure/publication.

Acknowledgment from all partners will be required, but nothing else unless the partner has a disagreement with the proposed publication.

In case of a positive decision data and description (if required) will be sent to the Coordinator who places it into the Open Access Repository.

2.2 Mandatory publicly available datasets

According to the plan the following set of data, code and simulation files will be available publicly and fall under the procedure described above:

According to the GA [3] Part B page 23 and additionally:

- 1. Time series data which is associated with conducting software or hardware simulations and capturing the resulting input-output behaviour parameterized over time
 - a. High-fidelity flexible aircraft simulation results
 - b. Reduced order flexible aircraft simulation results
 - c. Hardware-in-the-loop simulation (HIL) results of the aircraft open-loop behaviour and of the behaviour with feedback control
 - d. Ground vibration test results of the instrumented airframe
 - e. Flight test data of the airplane with various wing configurations
- 2. System models
 - a. Associated with flexible aircraft development / simulation
 - b. Associated with software/hardware-in-the-loop testing
- 3. Parametric data to capture physical or other characteristics of models
 - a. Data associated with parameterizing the high-fidelity flexible aircraft simulation model
 - b. Data associated with parameterizing the reduced order flexible aircraft simulation model
 - c. Data associated with parameterizing the HIL
 - d. Data associated with parameterizing the flight control algorithms both in HIL test and in flight tests
- 4. Specifications regarding the design objectives, tool interfaces and modelling fidelity

The next chapters will describe possible datasets and their handling in detail.



3 Documentations and publications

3.1 Data set reference and name

Deliverables should be named considering the conventions laid down in Project Handbook:

FLIPASED_deliverable_No_DeliverableName_version_No_date

(in case of this document it is *FLIPASED_D503_DataManagementPlan_V01_y2020m03d24*) Deliverable_No format: **DPNr** where:

D = deliverable

P = WP number

Nr = 2 character document number with leading zero in case of one digit number DeliverableName should be written capitalized without spacers

Version_No format: **VNr** where:

V = version

Nr = 2 character version number with leading zero in case of one digit number Date format.

Either **yYYYmMMdDD** (for example y2020m03d24)

Or **YYYYyMMmDDd** (for example 2020y03m24d)

The main point is to show which numbers are year, month and day.

Other documentation should be named according to the following convention:

FLIPASED_DOC_DocumentationName_version_No_date

DocumentationName should be written capitalized without spacers

Version_No format: VNr where:

V = version

Nr = 2 character version number with leading zero in case of one digit number

Date format.

Either **yYYYmMMdDD** (for example y2020m03d24)

Or **YYYYyMMmDDd** (for example 2020y03m24d)

The main point is to show which numbers are year, month and day.

Meeting documents should be named according to the following convention:

FLIPASED_Type_Name/Place of meeting_version_No_date

Type can be:

AGD agenda

DIS dissemination document

REP report

MOM minutes of meeting

SLD overhead slides

OTH others

Name/Place of meeting should be written capitalized without spacers

Version_No format: VNr where:



V = version

Nr = 2 character version number with leading zero in case of one digit number

Date format.

Either **yYYYmMMdDD** (for example y2020m03d24)

Or YYYYMMmDDd (for example 2020y03m24d)

The main point is to show which numbers are year, month and day.

Media files should be named according to the following convention:

FLIPASED_TYPE_EventName_date

TYPE can be:

VIDEO

AUDIO

EventName should be written capitalized without spacers

Date format.

Either yYYYmMMdDD (for example y2020m03d24)

Or YYYYMMmDDd (for example 2020y03m24d)

The main point is to show which numbers are year, month and day.

Publications should be named according to the general community rules and/or requirements of the conference / journal. Their identification can best be provided through their DOI and/or ISBN number.

3.2 Data set description

This category (Documentation and publication) includes any written document or media file which contains summary or detailed description of any theoretical, software or hardware developments (Deliverable 1.1 [5] is a good example). This can be mainly useful for project partners, but part of this can be also useful for a wider audience.

3.3 Standards and metadata

Any work in this category should comply with publication ethics correctly referencing any third party sources. Regarding the format of the documents the guidelines of the Project Handbook [2] should be considered. SI units should be used in all of the documents as a common standard.

Related metadata is the name of the document as described above, in case of deliverables the deliverable number also identifies the work. Publications can be accurately identified by their DOI and/or ISBN number. According to GA [3] page 47 publication metadata should also include all of the following:

- terms "European Union (EU)" & "Horizon 2020"
- name of the action, acronym and grant number
- publication date, the length of the embargo period (if applicable) and a persistent identifier.

Metadata should also include the name of the Data Owner if applicable.

3.4 Data sharing

Rules of data sharing are described in detail in 2.1. Publications shall meet the requirements of Green Open Access as described in the GA [3] page 47:



Each beneficiary must ensure open access (free of charge online access for any user) to **all peerreviewed** scientific publications relating to its results.

In particular, it must:

- As soon as possible and at the latest on publication, deposit a machine-readable electronic copy of the **published version or final peer-reviewed manuscript** accepted for publication in a repository for scientific publications;
- 2. Moreover, the beneficiary must aim to **deposit** at the same time **the research data** needed to validate the results presented in the deposited scientific publications.
- 3. Ensure open access to the deposited publication via the repository at the latest:
 - (i) on publication, if an electronic version is available for free via the publisher, or
 - (ii) within six months of publication (twelve months for publications in the social sciences and humanities) in any other case.
- 4. Ensure open access via the repository to the bibliographic metadata that identify the deposited publication and is listed above

3.5 Archiving and preservation (including storage and backup)

All data generated within the project and relevant for the project results will be uploaded to the project's online management tool and will be available for download for all project participants. The web administrator (responsibility within SZTAKI) will archive the data on external drives every 6 months and will preserve each archive for 12 months. The research data generated during the project will be archived in one volume at the end of the project and each consortium partner will obtain an identical copy, containing all data generated during the entire length of the project. The coordinator will make a master volume for long term preservation which will be available for 5 more years after the conclusion of FLIPASED.

Open Access data will be placed into the Open Access Repository usable with internet browser without any special software need which will be handled by the Coordinator. Its content will also be available for 5 more years after the conclusion of FLIPASED.



4 Time series data from simulation and real flight tests

4.1 Data set reference and name

Such data should be identified through the following naming convention:

FLIPASED_TSTTT_DDD_date_time_set_test(P)

(for example: in case of processed flight test data recorded by TUM with FCC on 8th of February 2016 at 10:05 the name of the dataset is: FLIPASED_TSFLT_FCC_ y2016m02d08_h10m05_V01P)

Notes covering related metadata should be named as:

FLIPASED_TSTTT_DDD_NOTE_date_time_set_test(P)

Files including related parametric data should be named as:

FLIPASED_TSTTT_DDD_PD_date_time_ set_test(P)

In all of the cases the fields are defined as:

TSTTT means TimeSeries data from TTT test type

TTT test type can cover:

FLT- Flight Test

SYS- System tests (includes EMC, range, etc.)

GVT-Ground vibration testing (Pre-GVT as well)

STT - Static tests

HIL- Hardware-in-the-loop tests

SIM – Simulation tests

DDD means device type which can be:

FCC flight control computer

GAT gator interrogator

XXX to be defined if required

 $TSTT_DDD = TS_DataName$ can be used if the data can not fit any above category with capitaliesd data name without spaces

Date format.

Either **yYYYmMMdDD** (for example y2020m03d24)

Or **YYYYyMMmDDd** (for example 2020y03m24d)

The main point is to show which numbers are year, month and day.

Time format:

Either hHHmMM (for example h13m42)

Or **HHhMMm** (for example 13h42m)

The main point is to show which numbers are hour and minute.

Set_test(P) format.

Set = two digit number of test data set

Test = test number (e. g. flight test campaign number)

P = Processed data flag if applicable



4.2 Data set description

This data sets could include time series data from simulations, ground tests or real flight tests. Simulations can include data from FEM and CFD calculations also. According to the GA [3] (Part B page 24)

"The project plans to use the NASTRAN and Matlab/Simulink software environment for simulation, control design and data analysis, hence all research data will be compatible with these platforms, moreover all raw data gathered by embedded platforms will have the corresponding data conversion tool. The standard data format for processes and parameter data will be stored in Matlab's ".mat" format, while raw data logged in embedded devices will be in binary ".bin" format.

The project will also use Python based data science software, including numpy, scipy, pandas, scikitlearn, Tensorflow, Keras, matplotlib and many more, in Jupyter notebooks, as the emerging de facto standard sharing and collaboration tool for data scientists."

so data formats should be set accordingly if possible.

According to the GA [3] Part B page 23. Time series data - which is associated with conducting software or hardware simulations and capturing the resulting input-output behaviour parameterized over time can be :

- High-fidelity flexible aircraft simulation results
- Reduced order flexible aircraft simulation results
- Hardware-in-the-loop simulation results of the aircraft open-loop behaviour and of the behaviour with feedback control
- Ground vibration test results of the instrumented airframe
- Flight test data of the airplane with various wing configurations

4.3 Standards and metadata

Any time series data should include exclusively SI units as a common standard.

Related metadata should be the type and version of software application used to create the time series data, in addition to a short description of purpose and circumstances creating the data. This will be described in a note file bound to the data itself (see 4.1). Common, widely compatible data formats are preferred to software version specific ones.

Fixing commonly used simulation software versions is highly recommended during the project.

Usually time series data is strongly related to parametric data (including tuning parameters, flight conditions etc.) the joined parametric data file should be named as stated in 4.1 Examples for possible parametric data sets are:

- Data associated with parameterizing the high-fidelity flexible aircraft simulation model
- Data associated with parameterizing the reduced order flexible aircraft simulation model
- Data associated with parameterizing the hardware-in-the-loop simulation
- Data associated with parameterizing the ground vibration tests
- Data associated with parameterizing the flight control algorithms both in HIL test and in flight tests

Metadata should also include the name of the Data Owner if applicable.

4.4 Data sharing

Rules of data sharing are described in detail in 2.1.

4.5 Archiving and preservation (including storage and backup)

The archiving and preservation rules are the same as described in 3.5.



5 Software codes and hardware design files

5.1 Data set reference and name

Such data should be identified through the following naming convention (including documentation about the designs):

FLIPASED_SW_fwname_board_tag_N_gXXXXXXX

FLIPASED_HW_fwname_board_tag_N_gXXXXXXX

Notes covering related metadata should be named as:

FLIPASED_SW_NOTE_fwname_board_tag_N_gXXXXXXXX

FLIPASED_HW_NOTE_fwname_board_tag_N_gXXXXXXXX

Due to the fact that all the software and custom hardware is version tracked using GIT, a proper identification of a given version can be given by the XXXXXXX GIT tag only. To have more user friendly naming, the exact location in git is given with the following fields :

SW / HW means software or hardware

Fwname means name of the current firmware – RXMUX/FlightHAT/Autopilot/etc

board means in case if multiple board uses the same firmware with different configuration, identification number of the board itslef.

RXMUX: 1, 2, 3

IMU/SHM: Given ID of the board

if there is only one board 1 is used instead

tag-N means the last signed tag of the firmware. Should use the following convention **vX.Y-Z** or **fy.AB** where:

X indicates the current version of the hardware.

- Increased with every changes in the hardware.
- Increased with Every big conceptional changes in the Software. Different language, different software architecture

Y indicates the main version of the software

- Increased with every new function added.
- Tag commit message shall contain the new functions.

Z indicates the release number of the software

- Automatically increased by git toolchain
- Increased with every bug fix, and release/commit.
- If Y is increased, the value of Z get zero.
- Tag commit message shall contain the short description of the fixed bug.

A indicates the flight campaign

B indicates the flight itself



We put these version number to the software as a tag

In the commit message of each tag, important information about the version should be highlighted - like new feature, fixed bugs or usage of the firmware.

gXXXXXXXX: automatically generated by git.

The g stand for git

the eight character stands for the first 8 character of unique ID used by git to identify every commit.

In addition a readme.md file should be generated also – tool already exists – which contains the following data for each software/hardware:

- Creator of the package/firmware
- Date of creation
- tag commit message
- all the commit messages since the last tag

5.2 Data set description

This data set includes any kind of software code or hardware design and documentation developed in the frame of the project including Matlab scripts and simulations, autopilot codes, auxiliary hardware drivers, blueprints, gerber files etc.

5.3 Standards and metadata

Any software should use exclusively SI units as inputs / outputs as a common standard.

Related metadata should be the type and version of software application under which the code runs or design file opens. Software application types and versions freely available or already in use by partners are preferred to special licensed versions.

Metadata should also include the name of the Data Owner if applicable.

5.4 Data sharing

Rules of data sharing are described in detail in 2.1.

5.5 Archiving and preservation (including storage and backup)

The archiving and preservation rules are the same as described in 3.5.



6 Folder structure for test data

Main folder

TTT_date_time_set_test

TTT test type

FLT- Flight Test

SYS- System tests (includes EMC, range, etc.)

GVT-Ground vibration testing (Pre-GVT as well)

STT - Static tests

HIL- Hardware-in-the-loop tests

SIM - Simulation tests

Date format.

Either yYYYmMMdDD (for example y2020m03d24)

Or YYYYMMmDDd (for example 2020y03m24d)

The main point is to show which numbers are year, month and day.

Time format:

Either **hHHmMM** (for example h13m42)

Or HHhMMm (for example 13h42m)

The main point is to show which numbers are hour and minute.

Set_test format.

Set = two digit number of test data set

Test = test number (e. g. flight test campaign number)

Possible subfolder names:

01_RawData

02_ProcessedData

03_Media

04_Metadata

05_Analysis



7 Legal aspects

This Data Management Plan and data handling shall be governed by and construed in accordance with the laws of Belgium and the relevant regulations defined in the Consortium Agreement.



8 Conclusion

This Data Management Plan summarizes the types of data which can be generated during the FLIPASED project together with the rules of data handling and publication.

Chapter 2 gives an overview of possible datasets and lays down the rules of data handling within the Consortium. The following chapters detail the content of possible datasets and summarize the special rules on a dataset to dataset basis. Considered datasets are:

- 1. Documentations and publications describing the work performed, new scientific findings and future directions of research including media files
- 2. Time series data from simulation and real flight tests
- 3. Software source code developed within the framework of the project or hardware design (including blueprints)

Finally, chapter 7 considers the legal aspects.

This document is foreseen to evolve during the lifespan of the project, reflecting the needs of all data generated by the partners.



9 Bibliography

A list of documents, publications and other key references relevant to the deliverable.

- [1] Guidelines to the Rules on Open Access to Scientific Publications and Open Access to Research Data in Horizon 2020, EUROPEAN COMMISSION Directorate-General for Research & Innovation, Version 3.2, 21 March 2017.
- [2] Project Handbook D5.1, FLIPASED / SZTAKI, 01. 02. 2020.
- [3] GRANT AGREEMENT, NUMBER 815058 FLIPASED, 2019.
- [4] Guidelines on FAIR Data Management in Horizon 2020, EUROPEAN COMMISSION Directorate-General for Research & Innovation, Version 3.0 26 July 2016.
- [5] Wing and demonstrator actuation and sensing conceptual design requirements, D1.1 FLIPASED / TUM, 29 02. 2020.



10Annexes with additional information

This part might remain confidential and thus not be delivered. The EC reviewer might ask for an insight – in this case a NDA is recommended.

ANNEX I – Declaration of Data Owner ANNEX II - Disclaimer



ANNEX I

DECLARATION

...... (registration number:, registered seat:, represented by:) as the member of the FLIPASED consortium and also as Data Owner (hereinafter referred to as **Data Owner**) hereby

declares as follows.

By signing this declaration, the Data Owner gives its consent to **Számítástechnikai és Automatizálási Kutató Intézet** (SZTAKI, registration number:, registered seat:, represented by:) as Data Manager (hereinafter referred to as **Data Manager**) to manage, use, store transfer, publish and do all the other activities and exercise all other rights, which are specified in the FLIPASED Consortium Agreement, the FLIPASED Grant Agreement, in the Data Management Plan of the FLIPASED project or in any enclosure of the before mentioned documents or the relevant Belgian legal regulations about data management (hereinafter collectively referred to as Data management), in case of all relevant data (hereinafter referred to as **Data) provided by Data Owner** in relation to the Project "FLIGHT PHASE ADAPTIVE AERO-SERVOELASTIC AIRCRAFT DESIGN METHODS" in a distributable format (binary files, other electronic file formats or paper copy).

By signing this declaration, the Data Owner declares that it gives consent to the Data management of the Data Manager according to this declaration, "The Data Management Plan" and the relevant Belgian legal regulations.

By signing this declaration, the Data Owner declares that the provided data do not contain such personal or non-personal information that is handled by the Data Manager without the voluntary consent of the affected single person or legal entity or otherwise in an unlawful way. The Data Owner declares that its data processing in connection with the provided data meets the requirements of the FLIPASED Consortium Agreement, the FLIPASED Grant Agreement, the Data Management Plan of the FLIPASED project, the other documents and regulations regarding the FLIPASED project, and the relevant Belgian laws and regulations. The Data Owner also states that it has the right to transfer the Data to the Data Manager and grant all the above mentioned rights without the infringement of the rights of any 3rd Party. Data Owner declares that he is going to indemnify Data Manager against all claims brought against it by 3rd parties due to infringement rights regarding the management of the Data provided by Data Owner who will also compensate Data Manager for all related costs regarding the claim.

Data management is based on the voluntary consent of the Data Owner. Data handling shall take place in the territory of the European Union.



- 3. Scope of managed data
- 4. Security and disclosure of the managed data
- 5. Duration of data management

.....

represented by:

Data Owner



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