

**Grant Agreement No.:** 760941

**Project acronym:** ReSiSTant

**Project title:** Large riblet surface with super hardness, mechanical and temperature resistance by nano functionalization

**Call (part) identifier:** H2020-NMBP-PILOTS-2017

**Topic:** PILOTS-03-2017 Pilot lines for manufacturing of nanotextured surfaces with mechanically enhanced properties

**Starting date of project:** 1<sup>st</sup> of January, 2018

**Duration:** 48 months

## **WP 1 – Project Management Deliverable D1.3 – Data Management Plan**

Due date of deliverable: **30<sup>th</sup> June 2018**

Actual submission date: **29<sup>th</sup> June 2018**

**Organisation name of lead contractor for this deliverable: RINA-C**

<b>Dissemination Level</b>		
<b>CO</b>	Confidential, only for members of the consortium (including the Commission Services)	
<b>PU</b>	Public	<b>X</b>

## Executive Summary

The present document represents the Deliverable D1.3: Data Management Plan of the ReSiSTant project, co-funded by the European Commission within the Horizon 2020 programme - Grant Agreement n° 760941.

**The Data Management Plan described in this document follows the template proposed by the European Commission for Open Research Data Pilot projects within the H2020 program.**

In particular the present DMP describes the data management life cycle for the data to be collected, processed and/or generated by the project. As part of making research data findable, accessible, interoperable and re-usable (FAIR) the present public document includes information on: i) the handling of research data during and after the end of the project, ii) what data will be collected, processed and/or generated, iii) which methodology and standards will be applied, iv) whether data will be shared/made open access and how data will be curated and preserved (including after the end of the project).

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## List of abbreviations / Nomenclature

<b>Abbreviation</b>	<b>Definition</b>
WP	Work package
GA	Grant Agreement
DMP	Data Management Plan
CA	Consortium Agreement
WBS	Work Breakdown Structure
FAIR	findable, accessible, interoperable and re-usable

# 1 Introduction

The present document has been prepared in agreement with the FAIR template as such the following Chapters are presented:

- Chapter 2: Data Summary
- Chapter 3: FAIR Data comprehending the subchapters:
  - 3.1. Making data findable, including provisions for metadata
  - 3.2. Making data openly accessible
  - 3.3 Making data interoperable
  - 3.4. Increase data re-use
- Chapter 4: Allocation of resources
- Chapter 5: Data security
- Chapter 6: Ethical aspects
- Chapter 7: Other issues
- Chapter 8: Conclusions

Since some information is considered Confidential from partners this report discloses only the information has been considered might be for public dissemination by the Consortium. This document presents the Data Management Plan for the Consortium at M6 and it will be revised along with the course of the project at least every 6 months.

## 2 Data Summary

The present chapter intends to provide and answer to a number of questions as:

- What is the purpose of the data collection/generation and its relation to the objectives of the project?
- What types and formats of data will the project generate/collect?
- Will you re-use any existing data and how?
- What is the origin of the data? What is the expected size of the data? To whom might it be useful ('data utility')?

RESISTANT is a project aimed at optimizing two industrial pilot lines by using micro and nano-structured surfaces for drag reduction. The main objective is to implement the new surfaces into aircraft turbofan engines and industrial compressors. The demonstration at the two dedicated pilot lines will occur at TRL7 level, this implies that the solutions must be tested and monitored in order to be analysed. In addition, some techno-economic analysis must be done for each demonstrator, facts that will produce a big number of data sets that must be handled properly.

RESISTANT data differentiates between two classes of datasets:

- Data generated during research activities. These data come from the activities developed within each work package. This document serves to define which dissemination level they will have
- Project deliverables generated within the 10 project workpackages. These are the datasets that will be based on the aforementioned results. Their dissemination level is already defined within the Grant Agreement and reported in the following table.

Table 1. Project deliverables.

ID #	Deliverable No.	Deliverable name	Type	Dissemination level
1	D1.1	Executive Action Plan	O	CO
2	D1.2	Project Quality Plan	R	CO
3	D1.3	Data Management Plan	ORDP	PU
4	D2.1	Adaption of mesh quality for numeric riblet simulation	R	CO
5	D2.2	Adjustment of numerical simulation with riblet mesh vs. normal mesh	R	CO
6	D2.3	Riblet simulation for industrial testing	R	CO
7	D2.4	Riblet numbers and positions DEM1	R	CO
8	D2.5	Riblet numbers and positions DEM2	R	CO
9	D2.6	Expected impact on performance	R	PU
10	D2.7	Riblet simulation evaluation	R	CO
11	D3.1	Design and construction test rig DEM2	R	CO
12	D3.2	Assembly and commissioning test rig DEM2	D	PU
13	D3.3	Aerodynamic design freeze of test rig	R	CO
14	D3.4	Structural mechanics and dynamics of test rig	R	CO
15	D3.5	Reference measurements test rig DEM2	R	CO
16	D3.6	Test rig assembly and commissioning DEM1	D	PU

<i>ID #</i>	<i>Deliverable No.</i>	<i>Deliverable name</i>	<i>Type</i>	<i>Dissemination level</i>
17	D4.1	Feasibility study material for DEM1 and DEM2	R	CO
18	D4.2	Master moulds manufactured and quality approved for DEM1 and DEM2	R	CO
19	D4.3	Coating material for DEM1	R	CO
20	D4.4	Coating material for DEM2	R	CO
21	D4.5	Application Riblets DEM2	D	CO
22	D4.6	Application Riblets DEM1	D	PU
23	D4.7	Preliminary Life Cycle Sustainability of the ReSiSTant Pilot lines	R	PU
24	D5.1	Design and development of functionalized nanoparticles with related nano-structuring process (stabilization, nano-structure)	D	CO
25	D5.2	Development of the optimized nanostructured coating material DEM1 and DEM2	D	CO
26	D5.3	Nanosafety test results	R	CO
27	D5.4	Upscaling of the nanostructured coating material production at industrial level	D	CO
28	D6.1	Demonstration KPI panel	R	CO
29	D6.2	Test report reference surface set up (without riblets) test rig DEM2	R	CO
30	D6.3	Test report test rig DEM1	R	CO
31	D6.4	Test report riblet surface set up test rig DEM2	D	CO
32	D6.5	Reference measurements test rig DEM1	R	CO
33	D7.1	Manufacturing and repair process evaluation	R	CO
34	D7.2	Test modified test engine CFM56-5C	D	PU
35	D7.3	Test and evaluation riblet test DEM1	D	PU
36	D7.4	Certification for flight test campaign	R	CO
37	D8.1	Design review compressor stage DEM2	R	CO
38	D8.2	Test design and assembly finished	D	CO
39	D8.3	Test and evaluation riblet tests DEM2	D	PU
40	D9.1	Business model to support the partners aiming at the commercial exploitation of the project results	R	PU
41	D9.2	ReSiSTant Commercialization technology roadmap	R	PU
42	D9.3	Plan for the upscale and optimization of ReSiSTant demonstrator pilot lines	R	PU
43	D9.4	ReSiSTant standardization document	R	PU
44	D9.5	ReSiSTant Stakeholders' vision document	R	CO
45	D9.6	Business plan for application of nanoriblet coatings in aircraft turbofans	R	CO
46	D9.7	Business plan for application of nanoriblet coatings in industrial compressors	R	CO
47	D10.1	Dissemination strategy	R	CO
48	D10.2	Public website online	O	PU
49	D10.3	Dissemination material: poster and flyer	O	PU
50	D10.4	Report on Dissemination and communication activities I	R	PU

ID #	Deliverable No.	Deliverable name	Type	Dissemination level
51	D10.5	Report on dissemination and communication activities II	R	PU
52	D10.6	Report on dissemination and communication activities III	R	PU
53	D10.7	Safe by design report	R	CO
54	D10.8	Report on dissemination and communication activities IV	R	PU
55	D10.9	Report on networking workshop	R	PU

At present the following data sets have been identified, specifying relevant aspects such as the origin, utility or format.

Table 2. Datasets from WP1.

WP1	Project Management
<b>Dataset 1.1</b>	
<i>Related project task</i>	T1.3: Monitoring and reporting Task 1.4: Financial administration and maintenance of legal documents
<i>Description</i>	Technical and economic reporting data will be reported to the EU
<i>Origin and reuse of data</i>	Partners and participant portal
<i>Data Utility</i>	Consortium and the EU
<i>Type and Format</i>	Report (.doc/.pdf)
<i>Expected Size</i>	-
<i>Keywords</i>	Technical, financial, report
<i>Open to the public or confidential</i>	Confidential
<i>In case of confidential: why? (separate legal and contractual reasons from voluntary restrictions).</i>	The technical and economical progression of the project is not of public interest

Table 3. Datasets from WP2.

WP2	Simulation
<b>Dataset 2.1</b>	
<i>Related project task</i>	T2.1: Adaption of mesh quality for numeric riblet simulation T2.2: Adjustment of numerical simulation with riblet mesh vs. normal mesh. T2.3: Riblet simulation for industrial testing T2.7: Riblet simulation evaluation
<i>Description</i>	Mesh adaption and simulations



<i>Origin and reuse of data</i>	Partners participants and BST
<i>Data Utility</i>	Validation and baseline for future work
<i>Type and Format</i>	Geometry (.stp), Mesh (.msh), Simulation (.cas,.dat (Fluent); .def, .cfx, .res (CFX))
<i>Expected Size</i>	Order of magnitude: 100 GB
<i>Keywords</i>	Mesh, Simulation, Riblets, Performance
<i>Open to the public or confidential</i>	Confidential
<i>In case of confidential: why? (separate legal and contractual reasons from voluntary restrictions).</i>	Due to the privacy of the internal BST riblet algorithm.
<b>Dataset 2.2</b>	
<i>Related project task</i>	T2.4, T2.5: Riblet numbers and positions DEM1 and DEM2 T2.6: Expected impact on performance
<i>Description</i>	Detailed riblet geometries and the expected performance
<i>Origin and reuse of data</i>	Data produced before by BST
<i>Data Utility</i>	Based on this data, the topography of the master moulds will be manufactured and the utility of riblets will be exploited.
<i>Type and Format</i>	Report (.doc/.pdf)
<i>Expected Size</i>	Order of magnitude: 10 MB
<i>Keywords</i>	Master mould, Riblet spacing, Riblet height, Coating Scenario, Performance
<i>Open to the public or confidential</i>	T2.4, T2.6: Confidential T2.6 Public
<i>In case of confidential: why? (separate legal and contractual reasons from voluntary restrictions).</i>	Due to the privacy of the internal BST riblet algorithm.

Table 4. Datasets from WP3.

<b>WP3</b>	<b>Rig design manufacturing and commissioning</b>
<b>Dataset 3.1</b>	
<i>Related project task</i>	T3.1, T3.5
<i>Description</i>	DEM 1 & DEM2 Aerodynamic design and CAD
<i>Origin and reuse of data</i>	Partners participants and TUG/RWTH
<i>Data Utility</i>	Based on this data the manufacturing, rig assembly will be done
<i>Type and Format</i>	Dwg,...
<i>Expected Size</i>	-

<i>Keywords</i>	CAD, DEM1,DEM2
<i>Open to the public or confidential</i>	Confidential
<i>In case of confidential: why? (separate legal and contractual reasons from voluntary restrictions).</i>	Data are protected according to partners policy
<b>Dataset 3.2</b>	
<i>Related project task</i>	T3.8
<i>Description</i>	Data related to the upgrade of the measurement system
<i>Origin and reuse of data</i>	DEM2 testing
<i>Data Utility</i>	These data allow to investigate the influence of flow phenomena on the compressor performance experimentally
<i>Type and Format</i>	-
<i>Expected Size</i>	-
<i>Keywords</i>	Flow field, boundary layer, performance measurement
<i>Open to the public or confidential</i>	Public
<i>In case of confidential: why? (separate legal and contractual reasons from voluntary restrictions).</i>	Data will be made available in conjunction, for example, of papers publication

Table 5. Datasets from WP4.

<b>WP4</b>	<b>Material and application</b>
<b>Dataset 4.1</b>	
<i>Related project task</i>	T 4.1. Screening of raw material and coatings for high temperature riblet coatings
<i>Description</i>	Screening for 2K-silicones and compatible co-binders e.g. polyurethanes fulfilling the requirements for the application cases.
<i>Origin and reuse of data</i>	Project partners, raw material manufactures und first own material developments
<i>Data Utility</i>	Consortium and the EU
<i>Type and Format</i>	Report Deliverable D4.1
<i>Expected Size</i>	-
<i>Keywords</i>	Screening raw material coatings
<i>Open to the public or confidential</i>	Confidential
<i>In case of confidential: why? (separate legal and contractual reasons from voluntary restrictions).</i>	The technical progression of the project is not of public interest

Table 6. Datasets from WP5.

WP5	Nanofunctionalization
<b>Dataset 5.1</b>	
<i>Related project task</i>	T5.1
<i>Description</i>	Development of material nanostructure material
<i>Origin and reuse of data</i>	Lab data
<i>Data Utility</i>	Demonstrators development
<i>Type and Format</i>	Table / .xlsx, .csv
<i>Expected Size</i>	Not known
<i>Keywords</i>	Nanomaterial, functionalization, validation
<i>Open to the public or confidential</i>	Confidential
<i>In case of confidential: why? (separate legal and contractual reasons from voluntary restrictions).</i>	Data for Demonstrators

Table 7. Datasets from WP6.

WP6	Industrial testing
<b>Dataset 6.1</b>	
<i>Related project task</i>	Tasks 6.1-6.5
<i>Description</i>	Demonstrator characterization and monitoring
<i>Origin and reuse of data</i>	Data acquisition through monitoring system at test rigs
<i>Data utility*</i>	Validation of numerical results
<i>Type and Format</i>	Table / .xlsx, .csv
<i>Expected size</i>	Not known
<i>Keywords</i>	Demonstrators, validation
<i>Open to the public or confidential</i>	Confidential
<i>In case of confidential: Why? (Separate legal and contractual reasons from voluntary restrictions).</i>	Data from Demonstrators

Table 8. Datasets from WP7.

WP7	Demonstrator 1: aircraft turbofan
<b>Dataset 7.1</b>	
<i>Related project task</i>	Task 8.1-8.2
<i>Description</i>	Raw data from demo cases
<i>Origin and reuse of data</i>	Monitoring
<i>Data Utility</i>	Demo sites evaluation
<i>Type and Format</i>	.csv, .xlsx
<i>Expected Size</i>	Not known
<i>Keywords</i>	Monitoring, data acquisition
<i>Open to the public or confidential</i>	Confidential
<i>In case of confidential: why? (separate legal and contractual reasons from voluntary restrictions).</i>	Data from demos

Table 9. Datasets from WP8.

WP8	Demonstrator 2: Industrial compressor
<b>Dataset 8.1</b>	
<i>Related project task</i>	Task 8.1-8.2
<i>Description</i>	Raw data from demo cases
<i>Origin and reuse of data</i>	Monitoring
<i>Data utility*</i>	Demo sites evaluation
<i>Type and Format</i>	.csv, .xlsx
<i>Expected size</i>	Not known
<i>Keywords</i>	Monitoring, data acquisition
<i>Open to the public or confidential</i>	Confidential
<i>In case of confidential: Why? (Separate legal and contractual reasons from voluntary restrictions).</i>	Data from demos

Table 10. Datasets from WP9.

WP9	Upscaling and exploitation
<b>Dataset 9.1</b>	
<i>Related project task</i>	Task 9.4
<i>Description</i>	Data to develop techno-economic analysis for demo partners
<i>Origin and reuse of data</i>	W8, WP7,Wp6
<i>Data utility*</i>	Replication of ReSiStant Demonstrators
<i>Type and Format</i>	.xlsx, .docx
<i>Expected size</i>	-
<i>Keywords</i>	investments
<i>Open to the public or confidential</i>	Confidential
<i>In case of confidential: Why? (Separate legal and contractual reasons from voluntary restrictions).</i>	The techno-economic analyses of the demonstrators contain information that is important to safeguard for the demo partners competitiveness

Table 11. Datasets from WP10.

WP10	Dissemination
<b>Dataset 10.1</b>	
<i>Related project task</i>	T10.1
<i>Description</i>	Project identity toolkit
<i>Origin and reuse of data</i>	Own development
<i>Data utility*</i>	Public reports and presentations of the Project
<i>Type and Format</i>	.docx, .png, .ppt
<i>Expected size</i>	Not known
<i>Keywords</i>	Identity toolkit
<i>Open to the public or confidential</i>	Public
<i>In case of confidential: why? (separate legal and contractual reasons from voluntary restrictions).</i>	-

## 3 FAIR Data

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

The present chapter intends to provide and answer to a number of questions as:

- 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)?
- What naming conventions do you follow?
- Will search keywords be provided that optimize possibilities for re-use?
- Do you provide clear version numbers?
- 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.)

In this framework Metadata identity providing info as Description, Reference, Creator is prepared. Besides the metadata described above, ReSiSTant will include version of the document in order to make data discoverable and identifiable, and Zenodo, an open access repository will be investigated to be used to publish the results. Finally, identification of data produced within the project will be also supported by a common naming convention. Example: *ReSiSTant \_WPx - Dx.y\_Title\_Rev.1.0.pdf*

### 3.2 Making data openly accessible

The present chapter intends to provide and answer to a number of questions as:

- Which data produced and/or used in the project will be made openly available as the default?
- How will the data be made accessible (e.g. by deposition in a repository)?
- Where will the data and associated metadata, documentation and code be deposited?
- Have you explored appropriate arrangements with the identified repository?

In this framework there are limitations that will be followed by partners for publishing results, and they already reported in the project Grant Agreement. The main project communication channel will be the official website of ReSiSTant which was on air in April 2018. Other repositories like Zenodo, an open access repository created by OpenAIRE, will be also considered for being used for depositing the publications.

### 3.3 Making data interoperable

The present chapter intends to provide and answer to a number of questions as:

- 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)?

- What data and metadata vocabularies, standards or methodologies will you follow to make your data interoperable?
- Will you be using standard vocabularies for all data types present in your data set, to allow inter-disciplinary interoperability?
- 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?

As presented above the aforementioned standardized metadata is defined and it will be included by default in the official template for deliverables, .ppts, etc. Moreover in case of executable files, an additional .txt file with metadata content will be provided.

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

The present chapter intends to provide and answer to a number of questions as:

- How will the data be licensed to permit the widest re-use possible?
- 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 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.
- How long is it intended that the data remains re-usable?
- Are data quality assurance processes described?

As anticipated in order to ensure the reuse of the generated results as much as possible Zenodo repository will be considered. Moreover public data could be stored on the project website.

## 4 Allocation of resources

The present chapter intends to provide and answer to a number of questions as:

- What are the costs for making data FAIR in your project?
- 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). Who will be responsible for data management in your project?
- 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)?

Each partner will be responsible for their own confidential data management and conveniently and clearly inform their WP leader about confidentiality requirements of each produced dataset.

Each WP leader will be responsible for providing open results from their work packages to the WP10 leader, who will be in charge of uploading them to the Zenodo repository.

The WP10 (Communication and dissemination) leader will also take charge of publishing results in the official website.

## 5 Data security

The present chapter intends to provide and answer to a number of questions as:

- What provisions are in place for data security (including data recovery as well as secure storage and transfer of sensitive data)?
- Is the data safely stored in certified repositories for long term preservation and curation?
- Are your data stored in a secure way? Where are you storing it? Is that server certified or not?

**In this framework each partner is going to follow its internal data security procedure whose details are not herein presented for confidentiality reasons.**

## 6 Ethical aspects

The present chapter intends to provide and answer to a number of questions as:

- Are there any ethical or legal issues that can have an impact on data sharing? These can 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?

In this framework there is not any ethical issue but informed consent for data sharing will be collected if personal data will be needed from stakeholders feedback/info collection.

## 7 Other issues

Details in relation to other national/funder/sectorial/departmental procedures for data management used by each partner are not herein presented as this is a public DMP release.



## 8 Conclusions

The present DMP constitutes the first release of the ReSiSTant DMP. The DMP foresees that each task leader and WP leader is responsible for defining the data generated within his/her task and the level of confidentiality and agree with partners the path for disclosing it. The present DMP is planned to be updated the project whenever significant changes arise and in any case the document planned revision will occur on a yearly based timeframe and uploaded on the project website private area.