



Exploitation Plan

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TBO-Met

METEOROLOGICAL UNCERTAINTY MANAGEMENT FOR TRAJECTORY BASED OPERATIONS

This project has received funding from the SESAR Joint Undertaking under grant agreement No 699294 under European Union's Horizon 2020 research and innovation programme.



Abstract

The TBO-Met project corresponds to the research topic “Environment & Meteorology for ATM”, which is part of the research area “ATM Excellent Science & Outreach” of the SESAR 2020 Exploratory Research programme (call H2020-SESAR-2015-1). TBO-Met is coordinated by the University of Seville (Spain) and the rest of the consortium is formed by the following members: University Carlos III of Madrid (Spain), University of Salzburg (Austria), MeteoSolutions GmbH (Darmstadt, Germany) and the Spanish meteorological agency AEMET (Agencia Estatal de Meteorología).

In this project we address the problem of analysing and quantifying the effects of meteorological uncertainties in Trajectory Based Operations. In particular, two problems are considered: 1) trajectory planning under meteorological uncertainties and 2) sector demand analysis under meteorological uncertainties, which correspond to two different scales: trajectory (micro) scale and sector (meso) scale. In each problem two types of meteorological uncertainties are considered: wind uncertainty and convective zones (including individual storm cells). Weather predictions will be based on Ensemble Probabilistic Forecasts and Nowcasts.

At the trajectory scale, the main objective is to assess and improve the predictability of efficient 4D trajectories when weather uncertainty is taken into account, both at the pre-tactical level (mid-term planning) and at the tactical level (short-term planning and execution). To reach this goal, a methodology based on the use of stochastic trajectory optimization will be used.

At the sector scale, the main objective is to analyse the impact of trajectory planning under weather uncertainty (as performed at the trajectory scale) on sector demand. To achieve this objective, a methodology will be developed to measure the uncertainty of sector demand (probabilistic sector loading), based on the uncertainty of the individual trajectories. This analysis will also provide an understanding of how weather uncertainty is propagated from the trajectory scale to the sector scale (this problem of uncertainty propagation between different scales of the system is one of the main research challenges in the understanding of the effects of meteorological uncertainty in the ATM system).

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The expected outcome of the project is two-fold: 1) to enhance our understanding of the impact of meteorological uncertainty in TBO, and 2) to develop methodologies to quantify the impact of meteorological uncertainty in TBO. The methodologies will be evaluated and assessed using advanced air traffic simulation facilities.

To help in achieving the project objectives, a survey among the stakeholders involved (airlines, ANSPs and Network Manager) is to be performed. The main result of the survey will be a first-hand expert description of current practice and future expectations, which will serve as a valuable reference for the project activities.

This project is fully aligned with the objectives of the SESAR 2020 Exploratory Research programme, in particular the following ones related to the “Meteorology” topic: “to enhance meteorological capabilities and their integration into ATM planning processes for improving ATM efficiency” and “to develop 4D trajectories that are optimised to take account of all environmental considerations”, and where the following impact is expected: “to enhance ATM efficiency by integrating meteorological information”.



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1 Executive Summary

The Exploitation Plan (EP) of the project TBO-Met is presented in this document. Its target audience is the SESAR Joint Undertaking and the consortium members: Agencia Estatal de Meteorología (Spain), MeteoSolutions GmbH (Germany), University of Salzburg (Austria), University Carlos III of Madrid (Spain), and University of Seville (Spain, consortium coordinator).

TBO-Met addresses the topic Sesar-04-2015 - Environment and Meteorology in ATM, of the call H2020-SESAR-2015-1; in particular Meteorology. The overall objective of the project is threefold: 1) to advance in the understanding of the effects of meteorological uncertainty in TBO; 2) to develop methodologies to quantify and reduce the effects of meteorological uncertainty in TBO; and 3) to pave the road for a future integration of the management of meteorological uncertainty into the air traffic management system.

This plan is intended to summarize the consortium strategy and concrete actions related to the exploitation of the project results. It defines how research results will be implemented and how they will impact on the market and on future research.

The exploitation strategy for the TBO-Met project is based on 2 main threads:

1. Exploitation of knowledge that will be gained during the course of the project to produce new products and services, e.g. MetSol (meteorological services), PLUS (simulation facilities) and AEMET (new meteorological products). It can be considered as a direct commercialization/industrialization channel.
2. Protection of certain research results that could be considered key for further research. This will be the primary thread for the academic institutions in TBO-Met, i.e., USE and UC3M.

2 Introduction¹

Exploitation and dissemination are integral part of the European research and innovation funding. In this document, the Exploitation Plan (EP) of the project entitled ‘Meteorological Uncertainty Management for Trajectory Based Operations — TBO-Met’ is presented. This plan elaborates further the information provided in the Project Management Plan [1], and addresses the requirements defined in Section 4.2 of the Exploratory Research Project Execution Guidelines document [2] and articles 27 and 28 of the Grant Agreement [3]. The EP is primarily intended for the SESAR Joint Undertaking and the consortium members participating in the project (AEMET, MetSol, PLUS, UC3M, USE).

This document is organized as follows. Next in this section, a list of acronyms is given. In Section 3, after addressing some generalities, the strategy proposed for the exploitation of research results is defined. Finally, references are listed in Section 4.

2.1 Acronyms and Terminology

Term	Definition
ANSP	Air Navigation Service Provider
ATM	Air Traffic Management
EP	Exploitation Plan
IPR	Intellectual Property Rights
MET	Meteorology
SB	Steering Board
SESAR	Single European Sky ATM Research Programme
SJU	SESAR Joint Undertaking
TBO	Trajectory-Based Operations

¹ The opinions expressed herein reflect the author’s view only. Under no circumstances shall the SESAR Joint Undertaking be responsible for any use that may be made of the information contained herein.

TBO-Met Consortium

AEMET	Agencia Estatal de Meteorología
MetSol	MeteoSolutions GmbH
PLUS	University of Salzburg
UC3M	University Carlos III of Madrid
USE	University of Seville

3 Exploitation of Research Results

The expected results of TBO-Met project will go through the decision process recommended by H2020 as illustrated in Figure 3.1, complying with, the dissemination plan, the data management plan, and the exploitation plan.

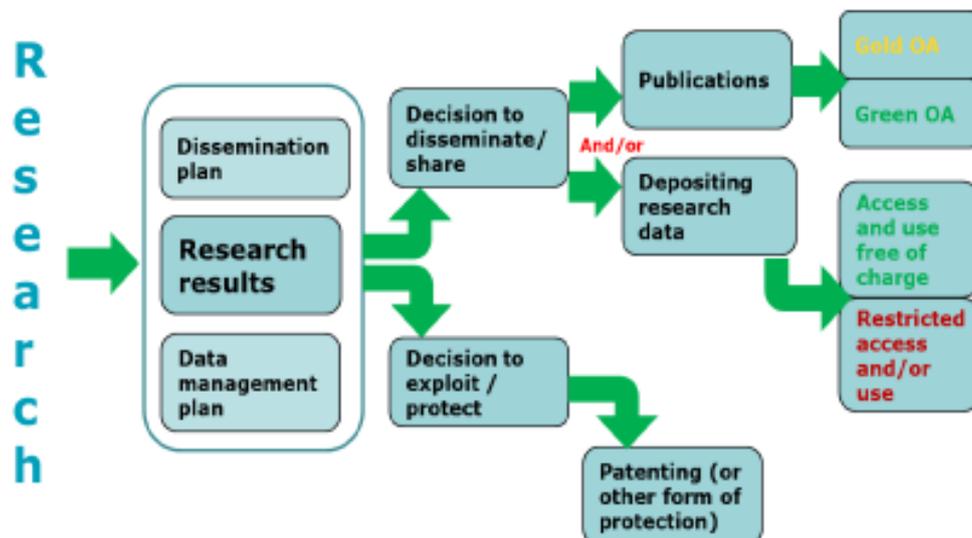


Figure 3.1. Dissemination and exploitation decision process [3]

Exploitation of the project outcomes can be seen as the process of converting the knowledge acquired thanks to publicly funded research activities into socio-economic benefits. Indeed, the participants in a project funded by Horizon 2020 research and innovation programme have to turn science into business, because they have the obligation to exploit and protect the research results in accordance with articles 27 and 28 of the Grant Agreement [5], and article 43 of the Horizon 2020 Rules for Participation [6].

A goal of TBO-Met project is to ensure an effective exploitation of achieved results, including any action needed to protect certain results that could be considered strategic for further research and/or commercial uses. Each beneficiary will examine the possibility of protecting its results and will adequately protect them.

According to the European IPR Helpdesk [7], there are two mainstream tools to set a flow of knowledge and technology between the public research and business: Direct commercialization tools and other

knowledge transfer channels. From this point of view, one can rearrange the measures for the results exploitation, which are listed in the article 28 of the Grant Agreement [5], into two main groups:

- a) Direct commercialization/industrialization activities: Those activities in which the results are used in developing, creating and marketing a product or process, or in creating and providing a service.
- b) Other knowledge transfer activities: Further research activities (no covered by the action) or standardisation activities in which the results are used.

3.1 Exploitation Strategy

The exploitation strategy for the TBO-Met project is based on 2 main threads:

1. The 1st thread is through the exploitation of knowledge that will be gained during the course of the project to produce new products and services, e.g. MetSol (meteorological services), PLUS (simulation facilities) and AEMET (new meteorological products). It can be considered as a direct commercialization/industrialization channel. Overall, MetSol, PLUS, and AEMET partners in the project provide expertise in standardization, sophisticated tools, applications to describe use cases, and to perform simulation assessment, thus contributing to the expected impact of TBO-Met and potential exploitation of results.
2. The 2nd thread is through the protection of certain research results that could be considered key for further research. This will be the primary thread for the academic institutions in TBO-Met, i.e., USE and UC3M. Moreover, there will be significant spinoff advantages in terms of the direct and indirect involvement and skills development of MSc and PhD students in an area of key and increasing European interest, namely meteorological uncertainty in aviation studies. This meets urgent commercial needs for skilled specialists in this area, resulting in indirect exploitation.

For the first thread, according to the article 27 of the Grant Agreement [5], the research results must be adequately protected (through, for instance, a patent application), provided that protecting them is possible, reasonable and justified. In that case, any application for protection of results must include the following text:

“The project leading to this application has received funding from the SESAR Joint Undertaking under grant agreement No 699294 under European Union’s Horizon 2020 research and innovation programme”.

Finally, it should be remarked that the SB meetings will be the forum to discuss, with all the partners, those aspects related to intellectual property rights. As the project evolves, the particular exploitation interests of each of the partners (e.g., for further research, for the development of products, for the provision of services) will be identified, the IPRs will be managed to ensure the timely conduction of intended research activities, and the proper actions will be taken in order to protect and/or patent a particular research result.



The TBO-Met consortium will seek a fair equilibrium between disclosing information and products to the public and developing patents, in order to protect strategic ideas that might lead to future commercialisation. The dissemination activities shall be compatible with exploitation strategy and with the protection of IPR of the institutions involved.



4 References

- [1] *TBO-Met Deliverable 1.1, Project Management Plan*, Edition 00.01.02, November 2016.
- [2] A. Prister, «Project Execution Guidelines for SESAR 2020 Exploratory Research,» Edition 01.00.00, February 2016.
- [3] «Horizon 2020. AGA - Annotated Model Grant Agreement. Version 2.1.1,» 2016.
- [4] *H2020 Programme. Guidelines on Open Access to Scientific Publications and Research Data in Horizon 2020*, Version 3.1, 25 August 2016.
- [5] *Grant Agreement number: 699294 — TBO-MET — H2020-SESAR-2015-1*.
- [6] *Regulation 1290/2013 of the European Parliament and of the Council*, 2013.
- [7] European IPR Help Desk, «Exploitation channels for public research results,» [On line]. Available: <https://www.iprhelpdesk.eu/sites/default/files/newsdocuments/Fact-Sheet-Exploitation-Channels-for-Public-Research-Results.pdf>.