CV date	30/05/2022

Part A. PERSONAL INFORMATION

First name	MANUEL FERNANDO		
Family name	Soler Arnedo		
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(ORCID) (*)		0000-0002-4664-1693	

A.1. Current position

Position	Profesor Titular de Universidad /Associate Professor		
Initial date	25/02/2019		
Institution	UNIVERSIDAD CARLOS III DE MADRID		
Department/Center	DEPT. BIOINGENIERÍA E INGENIERÍA AEROESPACIAL		
Country	Spain		
Keywords	Climate Change, Artificial Intelligence, Machine Learning, Meteorology & Aviation, Optimal Control		

A.2. Previous positions (research activity interuptions, art. 14.2.b))

Period	Position/Institution/Country/Interruption cause
01/01/2014-24/02/2019	Profesor Visitante/Asisstant Professor at UC3M. 1 Sexenio (2011-2016)
23/08/2018 – 23/10/2018	Paternity Leave
06/07/2016 – 21/07/2016	Paternity Leave

A.3. Education

PhD	University	Year
Doctor	UNIVERSIDAD REY JUAN CARLOS	2013
Master en Ciencia y Tecnología Aeroespacial	UNIVERSIDAD POLITÉCNICA DE MADRID	2011
Ingeniero Aeronáutico	UNIVERSIDAD POLITÉCNICA DE MADRID	2007

Part B. CV SUMMARY

In my **Ph.D. thesis (2008-2013)**, I conceived a multiphase and mixed-integer optimization framework specifically tailored for the computation of deterministic, minimum fuel aircraft trajectories, including discrete events and decision-making. The **results of my Ph.D. thesis** were published in 3 WoS Journal papers and 5 Scopus papers. My Doctoral work was **recognized at the European level** with the **SESAR Young Scientist Award** 2013 *for its innovative modelling and interdisciplinary solution approach to the trajectory modelling problem, as well as strong engagement with European Research Centres and the USA.* This award provided me the opportunity to present my research within the SESAR Track at the World ATM Congress (~400 attendees to the talk; ~7000 to the event). Moreover, the last contribution of my Ph.D. Soler et al., (2015) was recognized with the **Luis Azcarraga award of the EnAire Foundation in 2016**, distinguishing yearly scientific studies with singular contributions to air transport. I was awarded two scholarships and enjoyed **research stays at ETH Zürich (3 months) and UC Berkeley (5 months)**, where I started to develop an **international and independent scientific career.** At UC Berkeley, hosted by Prof. Mark Hansen, we published (independently of my Ph.D. advisors) a joint WOS Journal paper, extending the theoretical contributions of my thesis to the consideration of contrails (see highlighted publication I). At ETH, I was hosted by Prof. Lygeros (ERC AGr in 2018) and started a fruitful collaboration with M. Kamgarpour (Assistant Prof. at ETH and ERC SGr in 2015) on optimal control under uncertainty. Together (and independently of my Ph.D. advisors) we have co-authored 3 WOS papers (see highlighted publications II and IV), 4 Scopus papers, and currently co-supervising a Ph.D. student (Eduardo Andrés).

In 2014 I joined UC3M as a **tenure track Assistant Professor (2014-2019)**, where I developed an **early independent research career, starting a research line on meteorological uncertainty and ATM**. I incorporated meteorological uncertainty (turning to be a very impactful

factor) into aircraft trajectory optimization problems. This independent research line provided me expertise in state-of-art and experimental meteorological products and stochastic optimization algorithms. I become one of the pioneers in Europe to use Ensemble Probabilistic Systems (EPS) weather forecasts in ATM-related problems. Within this research line: a) I got competitive grants (always as IP and independently of my Ph.D. advisors) that worth 500.000 €, (5 competitive project -3 European- and 14 R&D contracts -including Boeing R&T and Airbus R&D France-; b) I established a research group independently; c) I independently supervised 3 Ph.D. thesis; d) I published (always independently from my Ph.D. supervisors) 2 book chapters, 10 WoS papers, 8 Scopus papers; and more than 30 communications in conferences; e) I organized a "workshop on uncertainty and ATM"; e) I started to lead the Challenge "Efficient provision and use of meteorological information in ATM" of the network Engage http://www.engagektn.com/ within SESAR H2020; f) in co-work with a Ph.D. student under my supervision (see highlighted publication III), we were awarded the 2019 Luis Azcárraga Award (for the second time in my career).

In January 2019 **I became an Associate Professor at UC3M**. I opened new research lines on "Artificial intelligence with application to aviation" and "Aviation and Climate Impact"**.** Only in these two years and a half (2019-2021): 1) I have been awarded **5 H2020 European projects (in two of them I'm the Consortium Coordinator), 1 national project and 1 industrial project with Airbus Germany**, all of them are currently running (see Table 1), and **are worth nearly 1.1Mi € of funds attracted to UC3M;** 2) **I have consolidated my researcher group,** which is now formed by 2 PostDocs and 6 PhD Students I'm supervising (all of them covered with my own funds); 3) I have extended my network of international collaborators (see Figure 1) and I'm deeply involved in the definition of the SESAR research roadmap for Horizon Europe in topics related with Artificial Intelligence, meteorology and climatic impact of aviation; 4) I have published (among other things) 11 WoS papers (all of them Q1/Q2), see highlighted publication V as an illustration; 5) I have launched and I'm currently the Director of the PhD Program in Aerospace Engineering a UC3M (https://uc3m-phd-aerospace.es/).

My medium-term research goal is to establish a leading research group in Europe on meteorology and climatic change with application to aviation and using artificial intelligence. Indeed, I'm starting to prepare an ERC Consolidator Grant for 2022 call (I applied in the ERC SGr 2019 call and obtained a B, resulting in non-funded proposal)**. I will also continue to seek funding in the Horizon Europe calls related to SESAR, Clean-Sky, Clean Aviation, and Transport**. All in all, I would like to transform my scientific background acquired throughout these last years into ground-breaking, scientifically and socially meaningful research, transferring research on aviation and climate into tangible, operational solutions with multidisciplinary impacts, in particular towards a greener aviation using artificial intelligence techniques.

Part C. RELEVANT MERITS

C.1. Publications (including books)

I have a total of 67 **scientific publications (all of them since June 2010)**: 3 book chapters with Springer; 25 WoS publications (16 are in Q1 journals); 18 SCOPUS papers; 21 articles in international conference proceedings. I have co-authored papers with researchers of 20 institutions, including ETH, EPFL, UC Berkeley, U. Chicago, ENAC, U. Cranfield, U. Hannover, ESA. Boeing R&D, U. Salzsburg, DLR, TU Deflt. Figure 1 presents my citations of an accumulative basis for different sources, including h-index Up to date publication record can be consulted at http://www.aerospaceengineering.es/publications/ . I highlight here some publications and provide a list of the publications in 2020-2021:

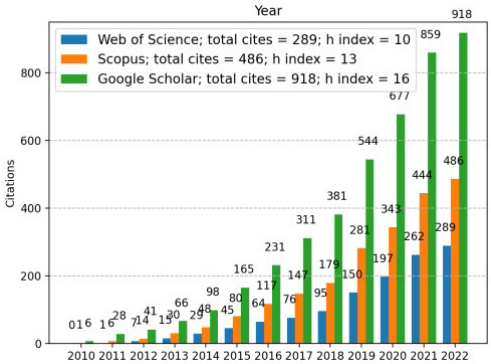

Figure 1: Citations (accumulative)

6 Highlighted WoS Journal Publications:

1. Valentin Courchelle, Manuel Soler, Daniel González-Arribas, and Daniel Delahaye. "Strategic Aircraft Deconfliction under Wind Uncertainties: A Simulated Annealing Metaheuristic Approach based on Speed Changes". *Transportation Research Part C: Emerging Technologies*. Volume 103, June 2019, Pages 194-210. [JCR 2018 Transp. Sci. & Tech.: IF 5.775; 3/37 Q1 Cites 18 (GS); 10

(Scop); 8 (WoS)]. **Corresponding author, independent research, international collaboration (ENAC)**.

2. Daniel Hentzen, Daniel González-Arribas, Maryam Kamgarpour, and Manuel Soler**. "On Maximizing Safety in Stochastic Aircraft Trajectory Planning with Uncertain Thunderstorm Development"**. *Aerospace Science and Technology*. Vol. 79, 2018, Pages 543-553. [JCR 2018 Eng. Aerospace: IF 2,829; 3/31 Q1, Cites 26 (GS); 20 (Scop); 16 (WoS)]. **Independent research, international collaboration (ETH)**.
3. D. González-Arribas, Manuel Soler, and Manuel Sanjrujo. "Robust Aircraft Trajectory Planning under Wind Uncertainty using Optimal Control". *Journal of Guidance, Control, and Dynamics*. Vol. 41, No. 3 (2018), pp. 673-688. [JCR 2018 Eng. Aerospace: IF 2.061; 8/31 Q2); Cites 47 (GS); 30 (Scop); 25 (WoS)]. **Independent research, main supervisor**. **Luis Azcárraga Award'19.**
4. M. Soler, B. Zou, M. Hansen "Flight Trajectory Design in the Presence of Contrails: Application of a Multiphase Mixed-Integer Optimal Control Approach". Transportation Research C: Emerging Tech. Vol. 48, 2014, pp 172–194. [JCR 2014 Transp. Sci. &Tech: IF 2.818; 5/33 Q1. Cites 46 (GS); 31 (Scop) 19 (WoS)]. **First author, independent research, international collaboration (UC Berkeley)**.
5. Soler, Manuel; Kamgarpour, Maryam; Lloret, Javier; Lygeros, John. "A Hybrid Optimal Control Approach to Fuel Efficient Aircraft Conflict Avoidance". *IEEE Transactions on Intelligent Transportation Systems*. Vol. 17. No. 7. pp. 1826-1838, July 2016. [JCR 2016 Transp. Sci. &Tech: IF 3.724; 7/34 Q1. Cites 32 (GS); 21 (Scop) 20 (WoS)]. **First author, independent research, International collaboration (ETH).**
6. M. Soler, A. Olivares and E. Staffetti. "Multiphase Optimal Control Framework for Commercial Aircraft 4D Flight Planning Problems". *Journal of Aircraft*. Vol. 52, No. 1, pp. 274-286 2015. [JCR 2015 Eng. Aerospace: IF 0.7, 15/30 Q2. Cites 53 (GS); 33 (Scop) 22 (WoS)]. **Luis Azcárraga Award'16.**

<u>Some additional WoS Journal Publications in 2021-2022</u>:

7. Abolfazl Simorgh *, Manuel Soler, Daniel González-Arribas, Sigrun Matthes, Volker Grewe, Simone Dietmüller, Sabine Baumann, Hiroshi Yamashita, Feijia Yin, Federica Castino, Florian Linke, Benjamin Lührs, Maximilian Meuser**. A Comprehensive Survey on Recent Climate Optimal Aircraft Trajectory Planning**. *Aerospace 2022, 9(3), 146.* [JCR 2020 Eng. Aerospace: IF 1.659; 13/34 Q2. Cites: -].
8. Aniel Jardines, Manuel Soler, Javier García-Heras. **Estimating Entry Counts and ATFM Regulations during Adverse Weather Conditions using Machine Learning**. *Journal of Air Transport Management, 2021.* [JCR 202o Transportation: IF 4.134; 13/37 Q2. Cites: -].
9. Aniel Jardines, Alejandro Cervantes, Manuel Soler, Javier García-Heras, and Juan Simarro. **Convection Indicator for Pre-Tactical Air Traffic Flow Management using Neural Network**. *Machine Learning with Applications.* 2021-06 | journal-article DOI: 10.1016/j.mlwa.2021.100053
10. Eduardo Andrés, Maryam Kamgarpour, Manuel Soler, Manuel Sanjurjo-Rivo and Daniel González-Arribas. **Informed Scenario-Based RRT for Aircraft Trajectory Planning under Ensemble Forecasting of Thunderstorms**. *Transportation Research Part C, 2021,* [JCR 2020 Transp. Sci. &Tech: IF 8.089; 3/37 Q1. Cites: -].

C.2. Congress

I have authored more than 40 conference papers. See http://www.aerospaceengineering.es/publications/ for details.

C.3. Research projects and grants

A complete list of research projects can be consulted @ http://www.aerospaceengineering.es/projects/. I provide below information about on-going grants. In total, considering also contracts with the industry (see C.4), I have ~**1.5 Mi€ granted as independent PI**: 2 competitive projects as PI at national level (100k€); 8 competitive projects as PI at European level -6 H2020; 2 of them consortium coordinator- (1.2 Mi. €); 14 research contracts as PI with industry (180k€). Since 2014, I have been the PI in all projects I have been involved in.

On-Going research projects and grants

I'm **currently involved as PI at UC3M in 5 H2020 projects, in 2 of them acting as Consortium Coordinator**. They were all granted in 2020. Considering also an additional H2020 project granted in 2015 (TBO-Met), **which makes a total of 1Mi€ funds attracted to UC3M** in H2020 projects- In addition, I'm also involved in a National Project (Met-ATS) and a co-PhD fund grant.

Project Title and Logo.		*Funding source*	*Amount (€)/ Period*	*Role*
START "a Stable and resilienT ATM by integrAting Robust airline operations into the neTwork"	START	H2020-SESAR-RIA 893204	1.999.411,25 € (300.000 € UC3M) May'20-Nov'22	Consortium Coordinator
ALARM "multi-hAzard monitoring and earLy wARning systeM"	ALARM	H2020-SESAR-RIA 891467	991.268,75 € (150.000 € UC3M) June'20-Dec'22	Consortium Coordinator
FMP-Met "Meteorological uncertainty management for Flow Management Positions"	FMP-Met	H2020-SESAR-RIA 885919	849.000 € (98.000 € UC3M). May'20-Nov'22	PI at UC3M
ISOBAR "Artificial Intelligence Solutions to Meteo-Based DCB Imbalances for Network Operations Planning"		H2020-SESAR-RIA 891965	2.609.230 € (214.408 € UC3M) June'20-Dec'22	PI at UC3M
FlyATM4E "FLYING AIR TRAFFIC MANAGEMENT FOR THE ENVIRONMENT"	FlyATM4E	H2020-SESAR-RIA 891317	999.765 € (112.387,5 € UC3M) Nov'20-Dec'22	PI at UC3M
etATS "Managing meteorological uncertainty for a more efficient air traffic system."		Spanish Government -Retos	*44000 € Jan'19-Dic'21*	PI at UC3M
STORMY "A pilot support tool based on the enhanced provision of thunderstorm".		Funded by Engage, The SESAR H2020 Network. Eduardo Andres' PhD co-funding grant.	*65000 € Feb'19-Jan'22*	*PI at Uc3M*

Table 1: On-going grants

Completed research projects and grants

Competitive Projects as PI (grant total amount ~210.000€) include 1 national project (OptMet, finished in 2018), 1 European Project (TBO-Met, finished in 2018), and 1 co-PhD fund grant (finished in 2016). See details @ http://www.aerospaceengineering.es/projects/

C.4. Contracts

I have Been PI of 15 Projects/art. 83 worth ~180000 €. Companies include Boeing R&D, Airbus R&D, EnAire, among others.

C.5 Others (Research stays)

1. UC Berkeley (Host by Prof. Mark Hansen), Department of Transportation. Duration: 5 months, 01/08/2012 to 31/12/2012. JCR paper #8 was a result of this visit.
2. ETH Zürich (host by Prof. Lygeros), Institut für Automatic. Duration: 3 months, 01/05/2010 to 31/07/2010. JCR papers #2 and #5 are in collaboration with them.

C.6 Others (Awards)

2019- Luis Azcárraga Award. Fundación EnAire: National level,12.000 Euros.
2019- UC3M's entrepreneurship student competition (acting as mentor). 1st position 10.000 €.
2016- Luis Azcárraga Award. Fundación EnAire: National level,12.000 Euros.
2013- SESAR Young Scientist Award. SESAR JTU: European level, 5000 Euros.