CV Manuel Soler Arnedo

B.S. Aerospace Engineering
M.S. Aerospace Science
Ph.D. Aerospace Engineering

Bioengineering and Aerospace Engineering Department
Aerospace Engineering Area
Assistant Professor

Education

2013 **Ph. D**, *Doctor of Philoshopy in Aerospace Engineering.*
Universidad Rey Juan Carlos
Dissertation: Commercial Aircraft Trajectory Planning based on Multiphase Mixed-Integer Optimal Control.

- August 2012-December 2102. PhD visiting scholar in NEXTOR (National Center of Excellence for Aviation Operations Research) at the University of California at Berkeley (UCB).
- May 2010- August 2010. PhD visiting scholar in the automatic control laboratory at the Swiss Federal Institut of Technologie (ETH).

2011 **M. Sc**, *Master of Science in Aerospace Science and Technology.*
School of Aerospace Engineering at Polytechnic University of Madrid.
Dissertation: *trajectory planning via hybrid optimal control.*

2007 **B. Sc**, *5 year's Bachelor of Science in Aeronautics & Aerospace Engineering*, Minor in Airport Design and Planning.
School of Aerospace Engineering at Polytechnic University of Madrid.

- March 2007-October 2007; exchange at TU Berlin. Master's Final Project Work. Institut fuer Luft und Raumfahrt at the Technischen Universitaet Berlin. Dissertation: *Managing Airports: an application to Berlin Brandenburg International airport.*

– **BSc**, *Bachelor in Business & Management.*
Faculty of Economics at UNED.
Currently studying third year

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Job experience

2014- **Universidad Carlos III**, *Assistant Professor.*

2008-2013 **Rey Juan Carlos University**, *PhD student, teaching assistant, and researcher.*

2007-2008 **INECO: General Direction of Airports and Air transportation**, *technical consultant in airport design and planning.*

2006 **AENA (Spanish Airports and Air Navigation): Business & Management Direction**, *internship.*

Faculty certificates (valid in Spain)

2013 **ANECA certificates**, *Profesor Contratado Doctor.*

Publications

Books

2014 **M. Soler**, *Fundamentals of Aerospace Engineering. An Introductory course to aeronautical engineering*, M. Soler [Ed], 2014, ISBN 978-14-937277-5-9. Open access at http://aerospaceengineering.es .

2013 **M. Soler**, *Commercial Aircraft Trajectory Planning based on Multiphase Mixed-Integer Optimal Control*, OMM Editorial, ISBN 978-84-941248-1-5.

Journal papers

2016 **J. García-Heras, M. Soler, F. J. Sáez Nieto**, *Comparative Analysis of Direct Collocation Methods to Aircraft Minimum Fuel Trajectory Problems with Required Time of Arrival*, Journal of Aerospace Information Systems, Vol. 13, No. 7 (2016), pp. 243-265. DOI: 10.2514/1.I010401.

2016 **M. Soler, M. Kamgarpour, J. Lloret, and J. Lygeros**, *A hybrid optimal control approach to aircraft conflict avoidance*, In preparation, IEEE Transactions on Intelligent Transportation Systems.
Vol. 17. No. 7. pp. 1826-1838, July 2016. DOI: 10.1109/TITS.2015.2510824

2015 **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. DOI: 10.2514/1.C032697.

2014 **M. Soler, B. Zou, and M. Hansen**, *Contrail sensitive vertical trajectory planning using multiphase mixed-integer optimal control*, Submitted to Transportation Research Part C: Emerging Technologies, Volume 48, November 2014, Pages 172-194 DOI 10.1016/j.trc.2014.08.009.

2013 **P. Bonami, A. Olivares, M. Soler, and E. Staffetti**, *Multiphase Mixed-Integer Optimal Control Approach to Aircraft Trajectory Optimization*, Journal of Guidance, Control, and Dynamics, Vol. 36, No. 5 : pp. 1267-1277; September 2013. DOI 10.2514/1.60492.

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2012 **M. Soler, A. Olivares, E. Staffetti, and D. Zapata**, *Framework for Aircraft 4D Trajectory Planning Towards an Efficient Air Traffic Management*, Journal of Aircraft, Vol. 49, No. 1, January-February 2012. DOI: 10.2514/1.C031490.

2010 **M. Soler, A. Olivares, and E. Staffetti**, *Hybrid Optimal Control Approach to Commercial Aircraft Trajectory Planning*, Journal of Guidance, Control, and Dynamics, Vol. 33, No. 3, May-June 2010. DOI: 10.2514/1.47458.

Peer-reviewed conference papers

2016 **D. González-Arribas, Manuel Soler, Manuel Sanjurjo**, *Wind-Based Robust Aircraft Route Optimization using Meteorological Ensemble Prediction Systems.*, SESAR Innovation Days 2016 (SIDs'16)., pp. 1-8..

2016 **D. Morante, Manuel Soler, Manuel Sanjurjo**, *SEQUENTIAL METHOD TO COMPUTE MULTIOBJECTIVE OPTIMAL LOW-THRUST EARTH ORBIT TRANSFERS.*, ICATT'16 (6th International Conference on Astrodynamics Tools and techniques).

2016 **Guillermo Orenga and Manuel Soler**, *ATM performance analysis in Madrid ACC sectors considering optimal aircraft trajectories.*, 6th International Conference on Research in Air Transportation 2016, ICRAT'16.

2015 **D. González-Arribas, M. Soler, and M. Sanjurjo**, *Wind-optimal cruise trajectories using pseudospectral methods and ensemble probabilistic forecasts.*, Proceedings of ATACCS'15. - 5th International Conference on Application and Theory of Automation in Command and Control Systems, pp. 160-167.

2015 **David Morante Gonzz, Manuel Sanjurjo, and Manuel Soler**, *Low-Thrust Earth-orbit transfer optimization using analytical averaging within a sequential method.*, 2015 AAS/AIAA Astrodynamics Specialist Conference.

2015 **Sergio Ruiz and Manuel Soler.**, *Conflict pattern analysis under the consideration of optimal trajectories in the European ATM.*, Proceedings of the 11th USA/Europe Air Traffic Management Research and Development Seminar, ATM Seminar 2015..

2015 **Daniel González-Arribas, Manuel Sanjurjo, and Manuel Soler**, *Optimization of path-Constrained Systems using Pseudospectral Methods applied to Aircraft Trajectory Planning.*, 2015 IFAC Workshop on Advanced Control and Navigation for Autonomous Aerospace Vehicles. IFAC Proceedings Volumes (IFAC-PapersOnline), Volume 48, Issue 9, 1 July 2015, Pages 192-197.

2014 **M. Soler, M. Kamgarpour, and J. Lygeros**, *A Numerical Framework and Benchmark Case study for Muti-modal Fuel Efficient Aircraft Conflict Avoidance*, 6th the International Conference on Research in Air Transportation (ICRAT 2014). Instambul, 2014.

2013 **J. García-Heras, M. Soler, F. J. Sáez Nieto**, *A comparison of optimal control methods for minimum fuel cruise at constant altitude and course with fixed arrival time*, 3rd International Symposium on Aircraft Airworthiness, ISAA 2013. Toulouse, 2013.

2013 **M. Soler, B. Zou, and M. Hansen**, *Contrail Sensitive 4D Trajectory Planning with Flight Level Allocation using Multiphase Mixed-Integer Optimal Control* , Proceedings of the AIAA Guidance, Navigation, and Control Conference, August 19-22, 2013. Boston, USA. Paper AIAA 2013-5179..

2013 **A. Olivares, M. Soler, and E. Staffetti**, *Multiphase Mixed-Integer Optimal Control applied to 4D Trajectory Planning in Air Traffic Management*, Proceedings of ATACCS'13, HALA research network conference, May 28-30, 2013. Npoles, Italy. ISBN: 978-2-917490-24-2, pp 104-114. **Best Research Paper Award**.

2012 **M. Soler, M. Kamgarpour, C. J. Tomlin, and E. Staffetti.**, *Multiphase Mixed-Integer Optimal Control Framework for Aircraft Conflict Avoidance.*, 51st IEEE Conference on Decision and Control (CDC 2012), December 8-11 2012, Maui, Hawaii, USA. pp 1740-1745.

2011 **M. Kamgarpour, M. Soler, C. J. Tomlin, A. Olivares, and J. Lygeros.**, *Hybrid Optimal Control for Aircraft Trajectory Design with a Variable Sequence of Modes* , Proceedings of the 18th IFAC World Congress, Vol 18, part I, August 29-31 2011. Milan, Italy. ISBN: 978-3-902661-93-7.

2011 **M. Soler, A. Olivares, E. Staffetti, and P. Bonami**, *En-Route Optimal Flight Planning Constrained to Pass Through Waypoints using MINLP*, Proceedings of the 9th ATM Seminar, June 14-17 2011. Berlin, Germany.

2011 **M. Soler, A. Olivares, E. Staffetti, and J.Cegarra**, *Optimal 4D Strategic Trajectory Planning in ATM*, Proceedings of ATACCS'11, HALA research network conference, May 26-27, 2011. Barcelona, Spain. ISBN: 978-2-917490-14-3.

2010 **M. Soler, A. Olivares, E. Staffetti, D. Zapata and J. Cegarra**, *Comparative Analysis of Commercial Aircraft Trajectory Performance.*, Proceedings of the 2nd International Conference on Engineering Optimization (EngOpt), September 6-9 2011. Lisbon, Portugal. ISBN: 978-989-96264-3-0.

2010 **M. Soler, A. Olivares and E. Staffetti**, *Hybrid Optimal Control Approach to Commercial Aircraft 3D Multiphase Trajectory Optimization*, Proceedings of the AIAA Guidance, Navigation, and Control Conference, August 2-5, 2010. Toronto, Canada. AIAA-2010-8453.

Seminars and invited talks

2014 **SESAR: A young Scientist's perspective**, *World ATM Congress*, SESAR internal meeting, March, 3, 2014. Madrid.

2014 **Applications of Optimal Control towards Trajectory Based Operation Operational Concept in the Future Air Traffic Management System**, *Wed. Feb. 12th, 2014. Polytechnic University of Catalonia.*

2012 **Contrail Sensitive 4D Trajectory Planning with Flight Level Allocation using Multiphase Mixed-Integer Optimal Control**, *NASA AMES Research Center. December the 3rd 2012, Moffett Field, CA, USA.*

2010 **Hybrid Optimal Control Approach to Commercial Aircraft Trajectory Planning.**, *Swiss Federal Institute of Technology Zurich (ETH)*, March, 24th, 2010, Zurich..

Research

Competitive projects

2016-2018 **TBO-MET: Meteorological Uncertainty Management for Trajectory Based Operations.**, *Funded by the European Commission under call H2020-SESAR-2015-1.*, Contract (GA) number 699294, Principal Investigator.

2015-2017 **OPTMET: ANALYSIS AND OPTIMIZATION OF AIRCRAFT TRAJECTORIES UNDER THE EFFECTS OF METEOROLOGICAL UNCERTAINTIES.**, *Ref.: TRA2014-58413-C2-2-R. Funded by: Plan Nacional de I+D+I 2013-2016. Spanish Ministry of Economy and Competitiveness, General Direction of Science and Innovation.*, Principal Investigator.

2014-2016 **Stochastic Optimal Control towards Enhanced Predictability of four-dimensional Trajectories using of Weather Ensemble Prediction Forecasts.**, *Financed by Eurocontrol through HALA! Research Network.*, Principal Investigator.

2011-2012 **Parametric Optimization software package for TRAjectory shaping under constraints, POTRA**, *Clean Sky Joint Technology Initiative project*, financed by the European Union's Seventh Framework Program (FP7/2007-2013), Researcher.

2008-2011 **Application of Leading Technologies to Unmanned Arial Vehicles for Research and Development in ATM, ATLANTIDA**, *CENIT project*, financed by the spanish government and leaded by Boeing R&D, Researcher.

2009-2010 **Optimization models in Air Traffic Management: Strategic Planning**, *Consolider project Ingenio Mathematica*, financed by the spanish government.

Contracts

2016 **Senasa**, *Principal Investigator.*

2014-2016 **Boeing Research and Technology Europe**, *Principal Investigator.*

2015 **En-Aire & CRIDA**, *Principal Investigator.*

2014-2016 **Fundación Innaxis**, *Principal Investigator.*

Research networks

- **HALA! (Higher Automation Levels in ATM)**. HALA! is a Research Network established within the framework of SESAR WP-E to spearhead long term and innovative research in automation in ATM in pursuit of the SESAR 2020 vision and beyond
- **ComplexWorld** is a Research Network established within the framework of SESAR WP-E, bringing together researchers from academia, research establishments and industry that share common interests and expertise in the field of ATM Complexity Management.

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Courses

2012 **HALA! Summer school at La Granja**, *Research in decision support systems for future Air Traffic Management.*

2013 **HALA! Summer school at La Granja**, *Designing the future Air Traffic Management system.*

Awards

2016 **EnAire's Luis Azcaga Award**.

2013 **SESAR Young Scientist Award**.

2013 **Best Research paper ATACCS 2013**.

Teaching Activity

Courses

2014-2015 **Air Navigation Systems**, *Master in Aeronautical Engineering*, Universidad
2015-2016 Carlos III de Madrid, Coordinator (English).
2016-2017 First year, first semester

2015-2016 **Air Transport**, *Master in Aeronautical Engineering*, Universidad Carlos III
2016-2017 de Madrid, Coordinator (English).
Second year, first semester

2015-2016 **Aerospace Autonomous Systems**, *Master in Aeronautical Engineering*, Uni-
2016-2017 versidad Carlos III de Madrid, Coordinator (English).
Second year, first semester

2014-2015 **Airports**, *Master in Aeronautical Engineering*, Universidad Carlos III de Madrid, Coordinator (English).
First year, first semester

2014-2015 **Advanced Flight Mechanics**, *Degree in Aerospace Engineering*, Universidad Carlos III de Madrid, Teacher (English).
Forth year, first semester

2014-2015 **On-board systems design**, *Degree in Aerospace Engineering*, Universidad Carlos III de Madrid, Teacher (English).
fourth year, first semester

2013-2014 **Aerial Navigation, Air Transport, and Airports**, *Degree in Aerospace*
2014-2015 *Engineering*, Universidad Carlos III de Madrid, Coordinator (English).
2015-2016 Third year, second semester
2016-2017

2012-2013 **Air Navigation**, *Degree in Aerospace Engineering in Air Navigation*, Universidad Rey Juan Carlos, Lecturer (English).
Second year, second semester

2012-2013 **Ingeniería Aeroespacial**, *Grado en Ingeniería Aeroespacial en Aeronavegación*, Universidad Rey Juan Carlos, Profesor responsable (Español).
Curso primero, segundo semestre

2011-2012 **Aerospace Engineering**, *Degree in Aerospace Engineering in Air Navigation*, Universidad Rey Juan Carlos, Lecturer (English).
First year, second semester

Published Material

2012-2013 **Course on Aerospace Engineering**, *Lecture Notes*, Digital Version. 2nd Edition.

2012-2013 **Course on Aerospace Engineering**, *Collection of exams with solutions*, Digital Version. 1st Edition.

2012-2013 **Air Navigation**, *Slides*, Digital Version. 1st Edition.

Other courses as assistant

2010-2011 **Estadística**, *Grado en ingeniería del software*, Universidad Rey Juan Carlos, Ayudante (Español). Curso primero, segundo semestre.

2010-2011 **Estadística**, *Licenciatura en periodismo*, Universidad Rey Juan Carlos, Ayudante (Español). Curso tercero, primer semestre.

2009-2010 **Estadística**, *Ingeniería informática*, Universidad Rey Juan Carlos, Ayudante (Español). Curso segundo, primer semestre.

2009-2010 **Estadística**, *Licenciatura en periodismo*, Universidad Rey Juan Carlos, Ayudante (Español). Curso tercero, primer semestre.

2008-2009 **Estadística**, *Ingeniería de Telecomunicaciones*, Universidad Rey Juan Carlos, Ayudante (Español). Curso primero, segundo semestre.

Languages

Spanish

- **Mother language.**

English

- **Highly skilled (Level C2).** Lived in USA for 10 months. Attended several courses. Título superior de la Escuela Oficial de Idiomas. 102 Toefl IBT. High proficiency in written and spoken english. Used to give oral presentations and write scientific documents.

German

- **Skilled (Level B2)** Lived in Germany for 7 months and Switzerland for 3 months. Attended level A1.1 to A2.2 courses at Göethe Institut Madrid. Attended level B1 to B2 courses at TU Berlin. 4th year in the Escuela Oficial de Idiomas.

Italian

- **Basic Knowledge (Level A2)** Attended courses A1 and A2 at TU Berlin.

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