

CURRICULUM VITAE ABREVIADO (CVA)

IMPORTANT – The Curriculum Vitae cannot exceed 4 pages. Instructions to fill this document are available in the website.

Part A. PERSONAL INFORMATION

First name	Rafael		
Family name	Vázquez Valenzuela		
Gender (*)	Male	Birth date (dd/mm/yyyy)	07/04/1975
Social Security, Passport, ID number	28739184-V		
e-mail	rvazquez1@us.es	URL Web	http://aero.us.es/rvazquez
Open Research and Contributor ID (ORCID)(*)	0000-0001-6904-2055		

(*) Mandatory

A.1. Current position

Position	Catedrático de Universidad		
Initial date	13/03/2023		
Institution	Universidad de Sevilla		
Department/Center	Dpto. de Ingeniería Aeroespacial y Mecánica de Fluidos / Escuela Técnica Superior de Ingeniería		
Country	Spain	Teleph. number	954488148
Key words	Aerospace Engineering, Control Theory		

A.2. Previous positions (research activity interruptions, indicate total months)

Period	Position/Institution/Country/Interruption cause
2000-2001	Systems Engineer at Telvent Interactiva - Spain
2002-2006	Researcher at University of California, San Diego – USA
2007-2008	Profesor Ayudante Doctor – Univ. de Sevilla, España
2008-2010	Profesor Contratado Doctor – Univ. de Sevilla, España
2010-2023	Profesor Titular de Universidad – Univ. De Sevilla, España

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
Ingeniero Industrial	Universidad de Sevilla	1999
Licenciado en Matemáticas	Universidad de Sevilla	2003
Master in Aerospace Engineering	University of California San Diego	2004
PhD in Aerospace Engineering	University of California San Diego	2006

Part B. CV SUMMARY (max. 5000 characters, including spaces)

3 Sexenios (2003-2008, 2009-2014, 2015-2020); 2 supervised PhD (2012, **2021**), 3 ongoing PhDs and 1 MCSA Postdoc; Total citations: 2052 (Researcher ID), 4003 (Google Scholar, see <https://scholar.google.com/citations?user=OZwv3iMAAAAJ>); Citations per year (2018-2022): 430 (Google Scholar); Total Q1 journal papers: 28 (JCR); H index: 24 (Researcher ID), 32 (Google Scholar). **Full professor (catedrático) accreditation (18/5/22)**.

Rafael Vazquez received the M.S. and Ph.D. degrees in aerospace engineering from the University of California, San Diego (USA) in the years 2004 and 2006, respectively, and BS



degrees in electrical engineering (Ingeniero Industrial) and mathematics (Licenciado en Matemáticas) from the University of Seville (Spain), in the years 1999 and 2003.

Since 2023, he is a **Full Professor** (Catedrático) in the Aerospace Engineering and Fluid Mechanics Department at the University of Seville, where he started as Assistant Professor in 2007. He has been **Chair of the Department** from 2016 to 2020. He has been **Academic Coordinator for the Master's Degree in Aeronautical Engineering and the Bs. Degree in Aerospace Engineering** from 2016 to 2019. He has taught courses in Orbital Mechanics and Space Vehicle Dynamics for more that 15 years.

Educational Experience

He has supervised **two PhD theses** and is supervising **one MCSA postdoc** and **three other PhD students**, as well as having supervised or co-supervised **13 Diploma thesis (PFC)**, **9 Master thesis (TFM)**, **21 Degree thesis (TFG)**, and **8 scholarships** (4 “beca de colaboración” and 4 “beca de iniciación a la investigación” from Univ. Sevilla) as well as 2 visiting Chinese PhD students with a 1-year CSC scholarship.

Research Experience

His research interests include control theory, distributed parameter systems, and optimization, with applications to flow control, ATM, UAVs, and orbital mechanics. He is coauthor of the book *Control of Turbulent and Magnetohydrodynamic Channel Flows* (Birkhauser, 2007). He currently serves as **Associate Editor** for the journals *Automatica* (Q1 in the JCR category Automation and Control Systems) and *IEEE Control and Systems Letter* (Q1, SJR Control and Optimization). Among other merits, he has published **43 journal papers** (JCR-indexed journals), **102 conference proceedings** (most of them peer reviewed), and **7 book chapters**.

His main research work has been on control of distributed parameter systems; besides he has worked as a researcher in numerous research projects and contracts with companies in topics related to Air Traffic Control, Applied Mathematics, Guidance and Control of Autonomous Air Vehicles, Control Theory, and Scheduling of Ground Station Antennas. In particular, he has past expertise on the rendezvous problem and in Model Predictive Control techniques. He was the IP of a national project on advanced rendezvous algorithms and has been the IP of a project for ESA in cooperation with INDRA which dealt with uncertainty modelling and quantification to detect maneuvers in LEO. He also belongs to international committees on both Control theory and Aerospace applications, being a regular attendee in conferences on both topics.

His research career is markedly international, with short and long research stays in United States, France, Germany and Brazil (**more than 6 months of postdoctoral stays, plus his full doctoral career in United States with long predoctoral stays in France and Germany**). He has published papers with co-authors from U.S.A., France, Brazil, China, Germany and Greece.

Part C. RELEVANT MERITS (*sorted by typology*)

C.1. Publications (*see instructions*) – 10 more relevant publications

1. J.M. Montilla, J.C. Sanchez, R. Vazquez, J. Galan-Vioque, J. Rey Benayas, J. Siminski, "Manoeuvre detection in Low Earth Orbit with Radar Data," in Press, *Advances in Space Research*, 2022.
2. J. C. Sanchez, J.D. Biggs, F. Bernelli-Zazzera, R. Vazquez, "Asteroid station-keeping predictive control with autonomous navigation and in-situ gravity estimation," vol. 45, pp. 262-279, *Journal of Guidance, Control and Dynamics*, 2022.
3. J. C. Sanchez, C. Louembet, F. Gavilan, R. Vazquez, "Event-based Impulsive Control for Spacecraft Rendezvous Hovering Phases," vol. 44 (10), pp. 1794-1810, *Journal of Guidance, Control and Dynamics*, 2021.

4. J. C. Sanchez, F. Gavilan, R. Vazquez, "Chance-constrained Model Predictive Control for Near Rectilinear Halo Orbit spacecraft rendezvous," *Aerospace Science and Technology* Vol. 100, 105827, 2020.
5. J. C. Sanchez, F. Gavilan, R. Vazquez, C. Louembet, "A Flatness-Based Predictive Controller for Six-Degrees of Freedom Spacecraft Rendezvous," *Acta Astronautica*, vol. 167, 391-403, 2020.
6. R. Vazquez, D. Rivas, A. Franco, "Stochastic Analysis of Fuel Consumption in Aircraft Cruise Subject to Wind Uncertainty," *Aerospace Science and Technology*, Vol. 66, 304-314, 2017.]
7. F. Gavilan, R. Vazquez, E. F. Camacho, "Pulse-Width Predictive Control for LTV Systems with Application to Spacecraft Rendezvous," *Control Engineering Practice*, Vol. 60, pp. 199-210, 2017.
8. F. Gavilan, R. Vazquez, E. F. Camacho, "An Iterative Model Predictive Control Algorithm for UAV Guidance," *IEEE Transactions on Aerospace and Electronic Systems*, vol. 51, No. 3, pp. 2406 - 2419, 2015.
9. R. Vazquez, F. Perea, J. Galan-Vioque, "Resolution of an Antenna-Satellite assignment problem by means of Integer Linear Programming," *Aerospace Science and Technology*, vol. 39, pp. 567-574, 2014.
10. F. Gavilan, R. Vazquez and E. F. Camacho, "Chance-constrained Model Predictive Control for Spacecraft Rendezvous with Disturbance Estimation", *Control Engineering Practice*, vol 20 (2), 111-122, 2012.

C.2. Congress, indicating the modality of their participation (invited conference, oral presentation, poster) – last 5 years conference work related to project

1. J. C. Sanchez, F. Gavilan, R. Vazquez, "A Predictive Guidance Algorithm for Autonomous Asteroid Soft Landing," *IFAC Workshop Networked & Autonomous Air & Space Systems (NAAS)*, 2018
2. J. C. Sanchez, F. Gavilan, R. Vazquez, C. Louembet, "A Flatness-Based Trajectory Planning Algorithm for Rendezvous of Single-Thruster Spacecraft," *IFAC Workshop Networked & Autonomous Air & Space Systems (NAAS)*, 2018
3. J. C. Sanchez, C. Louembet, F. Gavilan, R. Vazquez, "An Event-Triggered Predictive Controller for Spacecraft Rendezvous Hovering Phases," *ACA* 2019
4. J.C. Sanchez, J. D. Biggs, F. Bernelli-Zazzera, and R. Vazquez "Guidance, Navigation and Control for Asteroid Orbit Station-Keeping with In-Situ Gravity Estimation," *ESA GNC 2020* (postponed to 2021)
5. R. Vazquez, J.C. Sanchez, J.M. Montilla, J. Galan-Vioque, F. Gavilan, F. Soler Lanagran, J. Rey Benayas, F.A. Rodriguez Lopez, J. Siminski, C. Perez Hernandez, "Manoeuvre detection for near-orbiting objects," *8th European Conference on Space Debris*, 2021.
6. R. Vazquez, J.C. Sanchez, J.M. Montilla, J. Galan-Vioque, F. Gavilan, P. Mora Cubero, J. Rey Benayas, S. Rodriguez Rodriguez, J. Siminski, C. Perez Hernandez, "Two Manoeuvre Detection Probability Metrics Based on Radar Measurements and Validated with S3TSR Data," *Stardust Global Virtual Workshop*, 2021.
7. J.C. Sanchez, F. Gavilan, R. Vazquez, C. Louembet, "Spacecraft Rendezvous Hovering Predictive Control around a Near-Rectilinear Halo Orbit," *CEAS EuroGNC 2022*.
8. J.M. Montilla, J.C. Sanchez, R. Vazquez, J. Galan-Vioque, J. Rey Benayas, J. Siminski, "Manoeuvre detection based on S3TSR data," *KEPASSA 2022*.
9. A.S. Rivero, C. Bombardelli, and R. Vazquez, "Fast Orbit Propagation for Conjunction Screening," *KEPASSA 2022*.
10. J. Galan-Vioque, J.M. Montilla, R. Vazquez and C. Bombardelli, "Continuation and Bifurcations of Quasi Satellite Orbits in the Mars Phobos RTBP problem," *CELMEC VIII*, 2022.
11. J.M. Montilla, R. Vazquez and P. Di Lizia, "Mixture-Based Cost Metrics for Maneuver Detection Using Radar Track Data," accepted, *33rd AIAA/AAS Space Flight Mechanics Meeting*, 2023.
12. A.S. Rivero, C. Bombardelli, and R. Vazquez "Space-Occupancy Conjunction Filter," accepted, *33rd AIAA/AAS Space Flight Mechanics Meeting*, 20

13. J.A. Rebollo, R. Vazquez, F. Gavilan, J. Cordero, J. Jimenez, "A Symmetry-Based Unscented Particle Filter for State Estimation of a Ballistic Vehicle," submitted to IFAC WC 2023.

C.3. Research projects, indicating your personal contribution. In the case of young researchers, indicate lines of research for which they have been responsible.

1. "Estrategias Seguras De Rendezvous Para Eliminacion Activa De Basura Espacial Mediante Control Predictivo Basado En Modelo Con Cuantificacion De Incertidumbre." Funding from: Ministerio de Ciencia e Innovación (Proyecto de Transición Ecológica y Digital TED2021-132099B-C33), IP: Rafael Vazquez and Daniel Limón, 2022-2024. Amount: 96.200€.
2. "Towards Higher Levels of Autonomy and Robustness in Space Operations through Uncertainty Management and Quantification—THOR." Funding from: European Commission (Horizonte 2020). IP: Rafael Vazquez 2021-2024. Amount: 204.415,68€.
3. "Diseño de Algoritmos de Guiado y Control Innovadores para Aplicaciones Avanzadas de Rendezvous: Órbitas Halo y Exploración de Asteroides." Funding from: Ministerio de Ciencia. IP: Rafael Vazquez. 2019-2021. Amount: 39.930€.
4. "AIRPORTS MPC". Funding from: CDTI - Boeing Research and Technology Institute Europe S.L. (Proyecto CIEN). IP: Eduardo Fernández Camacho (Univ. de Sevilla). 2015-2017. Amount: 200.000€. Role: researcher.
5. "Análisis de Bifurcaciones en Sistemas Dinámicos: Aplicación". Funding from: Ministerio de Economía y Competitividad. IP: Jorge Galán Vioque (Univ. de Sevilla). 2016-2018. Amount: 51.300€. Role: researcher (50%).
6. "Análisis Y Optimización De Trayectorias De Avion Bajo Los Efectos De Incertidumbre Meteorológica". Funding from: Ministerio de Economía y Competitividad. IP: Damián Rivas Rivas (Univ. de Sevilla). 2015-2017. Amount: 80.000 €. Role: researcher (50%).
7. "SINTONIA: Sistemas No Tripulados Orientados al Nulo Impacto Ambiental". Funding: CDTI - AERTEC Ingeniería y Desarrollos S.L.U. (Proyecto CENIT). IP: Damián Rivas Rivas. 2009-2012. Amount: 126.000 €. Role: researcher.
8. "Control y optimización de sistemas híbridos de energías renovable". Funding: Junta de Andalucía (Proyecto de Excelencia). IP: Eduardo Fernández Camacho. 2008-2012. Amount: 375.000 €. Role: researcher (desde 2009).

C.4. Contracts, technological or transfer merits, Include patents and other industrial or intellectual property activities (contracts, licenses, agreements, etc.) in which you have collaborated. Indicate: a) the order of signature of authors; b) reference; c) title; d) priority countries; e) date; f) Entity and companies that exploit the patent or similar information, if any

1. "Manoeuvre detection for near-orbiting objects". Funding: Indra (subcontrato para la Agencia Espacial Europea). IP: Rafael Vázquez. 2020. Amount: 40.000€. Role:IP
2. "BASGE: diseño de Bomba Aire-Superficie Guiada para Entrenamiento". Funding: Aertec Solutions S.L. (programa COINCIDENTE del Ministerio de Defensa). IP: Francisco Gavilán Jiménez. 2020. Amount: 27.500€. Role:researcher
3. "CEFIRO-3". Funding: Aertec Ingeniería y Desarrollos S.L.. IP: Damián Rivas Rivas. 2014-2015. Amount: 100.000 €. Role: researcher.
4. "SESAR WP-E ComplexWorld Network - Mastering Complex Systems Safely". Funding: Eurocontrol - SESAR WP-E (red europea). IP: Damián Rivas Rivas. 2010-2014. Amount: 198.000 €. Role: researcher.
5. "Diseño, desarrollo, Integración y test de un algoritmo de planificación optimizada de las operaciones de antenas de recepción y transmisión con satélites de observación de la tierra". Funding: Taitus Software Italia. IP: Jorge Galán Vioque. 2012-2013. Role: researcher. Amount: 20.000 €.