


Name:	Filippo Cichocki	
Date of Birth:	March 6, 1984	
Nationality:	Italian	
Residence:	Madrid, Spain	
Contact:	filippo.cichocki@uc3m.es Tel. +34 666173066	

CAREER OVERVIEW

Academic Career:

- Since October 2017: Post-doctoral researcher of the **EP2** group (<http://ep2.uc3m.es>), at the **Bio-Engineering and Aerospace Engineering** department of the university **Carlos III de Madrid**.
- Oct 2013 – Sep 2017: **PhD degree** with grade **Excellent cum laude** and with **International Mention**, in the **Plasma Physics and Nuclear Fusion** programme of the university **Carlos III de Madrid**. The thesis title is **Analysis of the Expansion of a Plasma Thruster Plume into Vacuum**, and its defence took place on September 26, 2017. As a member of the **EP2** group and of the **Bio-Engineering and Aerospace Engineering** department, I was directly involved in:
 - **LEOSWEEP** (<https://leosweep.upm.es/en/>): European Commission project devoted to the design of an ion beam shepherd (IBS) mission for space debris removal. Main contribution: development of numerical codes for the simulation of a plasma plume expansion into vacuum, and its interaction with both the S/C and the space debris. Both simplified axisymmetric fluid codes, and a complex 3D hybrid-PIC code have been developed. The core of my PhD thesis is the presentation of these codes.
 - **IBS-IOD (Ion Beam Shepherd In-Orbit Demonstration)**: ESA feasibility study of the IBS technique for a space debris removal mission. Main contribution: electric thrusters trade-off analysis.
 - **Didactic activities**: more than 100 lecture hours (at MSc level), and preparation of audio-visual material for an online course (more details under teaching skills).
- Jul 2009 – Sep 2013: **Junior Project Engineer** at **ELECNOR DEIMOS-Space S.L.U.** in the **Mission Analysis and Navigation** competence centre of the **Aerospace Engineering Business Unit**. Directly involved in the following space projects:
 - **EXOMARS PHASES B2 & C**: ESA exploration mission to Mars. Main contributions: analysis of ground station coverage, Earth occultation and solar eclipse, design of Mars orbiter relay orbits, aerobraking phase design, simulation and results cross-check.
 - **RAAS (Robust and Autonomous Aerobraking Strategies)**: main technical responsible of this ESA funded project, aiming at investigating and developing GNC architectures for autonomous and robust aerobraking. Main contributions: coding of mission operations algorithms and of an Aerobraking Mission Analysis Tool (ABMAT) for preliminary mission analysis and performance assessment.
 - **MSRAB**: ESA study of the aerobraking phase of a Mars Sample Return Orbiter. Main contributions: simulation and design of the aerobraking phase.
 - **PERIGEO**: Spanish project on R&D of unmanned aerial vehicles. Main contributions: definition of 2 exploration missions: (a) a Titan airplane exploration mission and (b) a precision landing mission on Mars with a parafoil.
 - **MARCOPOLO-R**: ESA sample return mission to a Near Earth Asteroid. Main contributions: optimization of interplanetary trajectories, and design of innovative guidance algorithms for the asteroid proximity phase.

	<ul style="list-style-type: none"> • SEALS (Sustainable Near-Earth Access and Life Support): ESA announcement of opportunity (AO), concerning technology studies on asteroid deflection missions. Main contribution: mission analysis support for the definition of 2 asteroid deflection missions. • LUNAR-GNSS: ESA project with the main goal of defining navigation and communication requirements for Lunar Exploration missions, which could benefit from the use of GNSS signals. Main contribution: definition of the Earth-Moon transfer trajectory and of the Low Lunar Orbit. • SSA-SN-VII: ESA project dedicated to the study of the feasibility of different asteroid deflection techniques. Main contributions: review and quantitative assessment of the efficacy of the kinetic impactor deflection technique. • NEOSHIELD: ESA project dedicated to R&D of asteroid deflection techniques. Main contributions: selection of the best asteroid candidate for a kinetic impactor mission, design of the asteroid approach guidance for the explorer S/C, integration and testing of a navigation filter based on optical measurements, simulation of the explorer S/C approach phase with a functional engineering simulator (Simulink). <ul style="list-style-type: none"> ○ Sep 2006 – Mar 2009: MSc degree in Space Engineering at the University of Rome Sapienza. Final grades: 110/110 cum laude. ○ Sep 2003 – Sep 2006: Bachelor degree in Aerospace Engineering at the University of Rome Sapienza with grades 110/110 cum laude.
SKILLS	
Language skills:	<ul style="list-style-type: none"> ○ Italian: native speaker. ○ English: proficient user (CFOE grade A, TOEFL total score 111/120). ○ Spanish: proficient user (I have been living in Spain since July 2009). ○ French: independent user (I lived in Paris between Nov 2015 and Feb 2016).
Relational and Organizational Skills	<ul style="list-style-type: none"> ○ Team Working: working experience in international teams (most projects I have been involved in, were international consortium projects). ○ Project Planning: planning and technical execution of many work packages of different projects.
Teaching skills	<ul style="list-style-type: none"> ○ Very keen on teaching, with more than 100 lecture hours at MSc level, for the courses of Astrodynamics and Atmospheric Flight and Space Systems of the MSc degree in Ingeniería Aeronáutica of the university Carlos III de Madrid. ○ Supervisor of 1 bachelor thesis. ○ Preparation of audio-visual contents for the online EdX course The Conquest of Space, including 3 videos on relativity in space: https://www.edx.org/course/conquest-space-space-exploration-rocket-uc3mx-bia-1x-0.
Technical Skills:	<ul style="list-style-type: none"> ○ Areas of Expertise: electric propulsion, plasma physics, plasma plumes, hybrid particle codes, PIC (Particle-In-Cell) simulations, DSMC and MCC collisions modeling, Monte Carlo studies, mission analysis, interplanetary transfer optimization, genetic algorithms, in-orbit rendezvous, aerobraking, asteroid approach and proximity GNC, interplanetary navigation, space debris removal, asteroid deflection techniques, ion beam shepherd, kinetic impactor. ○ Computer Skills: <ul style="list-style-type: none"> • Fortran: very good knowledge. • Matlab: very good knowledge.

	<ul style="list-style-type: none"> • Python: very good knowledge. • Microsoft Office: very good knowledge. • Simulink: good knowledge. • C: fair knowledge (attendance to an advanced C programming course in 2010). • Parallel computing with Open MP and fair knowledge of MPI. • Operative systems: Windows and Linux.
Experimental Skills:	<ul style="list-style-type: none"> ○ Laboratory experiences: <ul style="list-style-type: none"> • Testing of the DS4G thruster (Dual Stage 4 Gridded Ion Thruster) at the University of Southampton, during my MSc thesis activities (October 2008 – March 2009). • Experimental characterization of the PEGASES thruster plume at the Laboratoire de Physique des Plasmas (LPP), Paris, during a PhD collaboration (November 2015 – February 2016). • Preparation of the laboratory demonstration sessions of the Space Systems course, dealing with the subsystems of the didactic purpose EyasSat satellite. ○ Laboratory know-how: vacuum chambers, ion thrusters, vacuum pumps, RF generators, matching boxes and antennas, high voltage supplies, fuel tanks, mass flow controllers, propellant feed lines and valves, and plasma diagnostics (Langmuir probes, Faraday cups, Retarding Potential Analysers). Moreover, I built and tested an innovative plasma potential sensor to measure the oscillating potential in the plasma plume of the PEGASES thruster (which emits alternatively positive and negative ions).
OTHER INTERESTS	
Hobbies:	<ul style="list-style-type: none"> ○ Playing sports (beach volley, tennis), travelling, cinema, going out with friends
Volunteering activities:	<ul style="list-style-type: none"> ○ Volunteer at the 2011 World Youth Day, in Madrid
PRIZES AND AWARDS	
Dec 2017	<ul style="list-style-type: none"> ○ 2016-2017 Extraordinary PhD Award, in the PhD programme Plasmas and Nuclear Fusion of the university Carlos III de Madrid: https://www.uc3m.es/ss/Satellite/Doctorado/es/TextoDosColumnas/1371242620131/

JOURNAL PUBLICATIONS	
Dec 2017	F. Cichocki, A. Domínguez, M. Merino and E. Ahedo, Hybrid 3D model for the interaction of plasma thruster plumes with nearby objects , Plasma Sources Sciences and Technologies, Vol. 26, N. 12, pages 125008, 2017
Mar 2017	F. Cichocki, M. Merino, E. Ahedo, A. Mingo, M. Smirnova and M. Dobkevicius, Electric propulsion subsystem optimization for "ion beam shepherd" missions , Journal of Propulsion and Power, Vol. 33, N. 2, pages 370-378, 2017
Mar 2016	A. Alpatov, F. Cichocki, A. Fokov, S. Khoroshylov, M. Merino, and A. Zakrzhevskii, Determination of the force transmitted by an ion thruster plasma plume to an orbital object , Acta Astronautica, Vol. 119, pages 241–251, 2016

Aug 2015	S. Ettl, D. Hestroffer, W. Thuillot, D. Bancelin, J.L. Cano and F. Cichocki, Post mitigation impact risk analysis for asteroid deflection demonstration missions , Advances in Space Research, Vol. 56, N. 3, pages 528–548, 2015
May 2015	M. Merino, F. Cichocki and E. Ahedo, A collisionless plasma thruster plume expansion model , Plasma Sources Sciences and Technologies, Vol. 24, N. 3, pages 035006, 2015
CONTRIBUTIONS TO CONFERENCES AND WORKSHOPS	
Oct 2017	F. Cichocki, M. Merino and E. Ahedo, EP2PLUS: a hybrid plasma plume/spacecraft interaction code , invited talk at the 24 th SPINE meeting, ESTEC, Noordwijk, The Netherlands, October 23, 2017
Sep 2017	A. Domínguez, F. Cichocki, M. Merino, P. Fajardo and E. Ahedo, 2D and 3D hybrid PIC-fluid modeling of electric thruster plumes , 35 th International Electric Propulsion Conference, Atlanta, Georgia, October 8-12, 2017
Sep 2017	D. Kahnfeld, R. Schneider, F. Cichocki, M. Merino and E. Ahedo, HEMPT thruster discharge and plume simulation with a 2D3v-PIC-MCC and a 3D hybrid fluid-PIC code , 35 th International Electric Propulsion Conference, Atlanta, Georgia, October 8-12, 2017
May 2016	F. Cichocki, D. Rafalskyi, A. Aanesland and M. Merino, The plume neutralization process of the PEGASES thruster , 6 th Space Propulsion Conference, Rome, Italy, May 2–6, 2016
May 2016	F. Cichocki, A. Dominguez, M. Merino and E. Ahedo, A 3D hybrid code to study electric thruster plumes , 6th Space Propulsion Conference, Rome, Italy, May 2–6, 2016
Apr 2016	F. Cichocki, A. Domínguez, D. Pérez-Grande, M. Merino, E. Ahedo, P. Fajardo, Hybrid particle codes for electric propulsion , poster presentation at the 14 th Spacecraft Charging and Technology Conference, ESTEC, Noordwijk, The Netherlands, April 4–8, 2016
Jul 2015	F. Cichocki, M. Merino, E. Ahedo, D. Feili and M. Ruiz, Electric propulsion subsystem optimization for "ion beam shepherd" missions , 34 th International Electric Propulsion Conference, Kobe, Japan, July 4–10, 2015
Jul 2015	F. Cichocki, M. Merino and E. Ahedo, Fluid vs PIC modeling of a plasma plume expansion , 34th International Electric Propulsion Conference, Kobe, Japan, July 4–10, 2015
Jul 2014	F. Cichocki, M. Merino and E. Ahedo, Modeling and simulation of EP plasma plume expansion into vacuum , 50 th Joint Propulsion Conference, Cleveland, Ohio, USA, July 28–30, 2014
Jun 2014	M. Merino, F. Cichocki and E. Ahedo, Plasma thruster beam expansion and impingement in space debris , 13 th Spacecraft Charging and Technologies Conference, Pasadena, California, June 23–27, 2014
May 2014	Mercedes Ruiz et al., The FP7 LEOSWEEP project: improving Low Earth Orbit security with enhanced electric propulsion , 5 th Space Propulsion Conference, Cologne, Germany, May 19–22, 2014
Sep 2013	F. Cacciatore, F. Cichocki, Marcopolo-R proximity trajectory analysis and design for binary asteroid 1996 FG3 , 64 th International Astronautical Congress, Beijing, China, September 23–27, 2013
Sep 2013	P. Silva, H. Lopes, T. Peres, J. Silva, J. Ospina, F. Cichocki, F. DAVIS, L. Musumeci, D. Serant, T. Calmettes et al, Weak GNSS signal navigation to the Moon , 2013 ION GNSS conference, Nashville, USA, September 16–20, 2013
May 2013	F. Cichocki, Kinetic impactor challenge , invited talk at the ESA workshop NEO impact effects and threat mitigation measures , Tres Cantos, Madrid, Spain, May 7–8, 2013
June 2012	F. Cichocki, M. Sanchez, C. Bakouche, S. Clerc and T. Voirin, Robust and autonomous aerobraking strategies , 9 th International Planetary Probe Workshop, Toulouse, France, June 18–22, 2012
June 2012	F. Cichocki and M. Sanchez, ABMAT: mission design and analysis tool for aerobraking scenarios and operations strategies , 5 th International Conference on Astrodynamics Tools and Techniques, ESTEC, Noordwijk, The Netherlands, May 29–June 1, 2012

June 2011	F. Cichocki, M. Sanchez, S. Clerc and T. Voirin, Aerobraking pericentre control strategies , 8 th International Planetary Probe Workshop, Portsmouth, Virginia, June 6–10, 2011
June 2010	F. Cichocki, S. Cornara, M. Sanchez and J.L. Cano, Aerobraking mission analysis tool for Mars exploration missions , 7 th International Planetary Probe Workshop, Barcelona, Spain, June 12–18, 2010
May 2010	P. Baltazar, M. Pizzighella et al., Mission profile design tool for intermediate and final rendezvous in circular and elliptic reference orbits , 4 th International Conference on Astrodynamics Tools and Techniques, Madrid, Spain, May 3–6, 2010
<i>ACADEMIC THESES</i>	
Sep 2017	F. Cichocki, defense of the PhD thesis, titled Analysis of the Expansion of a Plasma Thruster Plume into Vacuum . Director: Eduardo Ahedo, co-director: Mario Merino.
Mar 2009	F. Cichocki, dissertation of the MSc thesis, titled Experimental Analysis of the RF Discharge in a DS4G Ion Thruster . The work consisted in setting up a Dual Stage 4-Gridded Ion Thruster in a vacuum chamber in order to analyse the physical properties of the radio-frequency discharge exploited to create the plasma. The experimental activities took place at the Astronautics Laboratory of the University of Southampton , between September 2008 and March 2009
Sep 2006	F. Cichocki, dissertation of the Bachelor degree thesis, titled Mission Analysis for AGILE