PERSONAL INFORMATION:

Name: Emanuele Di Sotto

Nationality: Italian

Year of birth: 1972

Position: Flight Segment Products Manager

Company: GMV Aerospace and Defence

CONTACT DETAILS:

Email: emanuele.disotto@unibo.it

PROFESSIONAL EXPERIENCE:

2018-2023 **Universidad Carlos III de Madrid, Adjunct Professor in the Aerospace Engineering Department (Part-Time Position).**

Working part time at University Carlos III of Madrid (UC3M)

Coordinator of the courses on Launchers and Re-Entry Systems (18079) and Orbital Dynamics (18096) in the Master In Space Engineering (MISE).

A grade greater the 4/5 has been obtained in the vast majority of the given courses under the students evaluation process. Congratulations letters have been received from the university rector every year.

2008 -2023 **GMV Aerospace and Defence**

Flight Segment Products Manager

Responsible for the commercialization and industrialization of flight segment products.

Subcontractor Programme Manager for the Galileo Ground Control Segment

Manager responsible for Subcontractor Programs contractually, programmatically and technically, in the frame of the Galileo Ground Control Segment (GCS) Maintenance and Evolution Contract (FOC2 phase), awarded by the European Space Agency, with GMV in the Prime Contractor role.

Head of Launchers and Entry Systems Division. In charge of managing the assigned resources and projects with direct responsibility on division revenue and profitability.

Section Head (EDL and Launcher systems) within the GNC Systems & Technology division. Main duties concern with leading complex international projects (e.g VEGA-FPSA, SPARTAN), section activities management including projects monitoring, personnel allocation and commercial activities.

Project Manager.

Responsible for several activities in the SPace Segment and Robotics business unit (now Flight Segment and Robotics BU).

- **AVIOAR: Avionics for Miura (PLD) Launchers.** Project manager responsible for the development, integration and validation of the overall avionics system for Miura-1 micro launcher, integrated and operated by PLD space.
- **Space-Rider:** Responsible for the phase A/B1 of the GMV activities related with RendezVous GNC, Re-Entry Navigation and the supporting Mission Analysis.
- **NGTATB: Next Generation Transportation Avionics Test bed** This project (under ESA/ESTEC contract) aims at instantiating at ESTEC avionics lab two scenarios: Micro Launcher Ascent phase and Active Debris Removal. The project envisages the fully chain for Flight Software Verification and Validation starting with the Functional Engineering Simulator (FES) up to Hardware in the Loop (HWIL) validation.
- **MSRN: Multispectral Sensor for Relative Navigation.** This project (under ESA/ESTEC contract) is fully devoted to analysis the performance of a Multispectral sensor for relative navigation. This sensor shall be able to de-

tect and process several spectra signals: Visible Thermal Infrared and Near Infrared.

- **MVFLAU: Feasibility Study of In-Flight Model Validation and Performance Analysis of Launchers GNC.** This project (under ESA/ESTEC contract) aims at developing a post flight analysis tool to determine several VEGA uncertainty parameters related to different launcher subsystems: Propulsion, Structural Flexible modes, Aerodynamics load, GNC parameters.
- **VEMIPRO: Missionization Process for Multi-mission Vehicles.** This project (under ESA/ESTEC contract) is dedicated to define the missionization process of a launcher to avoid complex qualification activities at each launch. Guidelines for Flight Software Architecture and Mission Repository database prototyping are the main objectives of this contract
- **SPARTAN-FP7. Space Exploration Research For Throatable Advanced Engine.** Responsible for the GMV's team working on GNC subsystem design, HW procurement, breadboarding and testing. Responsible for the navigation algorithms design and mechanization. Support to the G&C algorithms definition and mechanization**.**
- **VEGA Program: FPSA.** Flight Program Software For Vega Launcher (2nd Source Development). Responsible for the whole GMV collocated team at ELV premises. Also responsible of several technical activities mainly related with Guidance and Navigation, FDIR, and Flight Manager.
- **AIE4T: Autonomous Inertia Estimation For Transportation.** This project transfers to the automotive sector the space technology related with Mass, Inertia and CoG identification based on inertial sensor.
- **ROBEDL**. Robust Entry, Descent and Landing Guidance and Control Techniques. This project aims at designing and implementing a whole GNC system for Entry Descent and Landing. Two different scenarios are considered for precise landing: Moon (Lunar Lander) and Mars (Mars Sample Return mission). GMV is responsible for the design implementation and validation of the navigation function.
- **VVAF**. Worst Case and Safety Analysis Tools for Autonomous Rendezvous System. Four different verification and validation frameworks are designed and implemented within this project. They make use of several advanced concept in robust control (mu-analysis and LFT) and hybrid optimisation techniques for the identification of a worst case scenario
- **HIGHLIFT**. Prototyping and validation of Guidance and Control re-entry algorithms for an high Lift-Over-Drag vehicle. The analysis of re-entry from lunar return trajectories (supercircular re-entry) represents a key feature

Project Consultant

- **HARVD**. Support for the GNC validation for an integrated multirange rendezvous system.
- **GNCDERIS3**. Responsible for the identification and definition of the guidance algorithms for RendezVous into elliptical orbit. Algorithms have been implemented into the Guidance Analysis TOol (GATO)

Supervisor of internal funded projects and co-tutor of MD thesis:

- REACTIVE. A simulation tool for analysis and design of different guidance and control techniques applied to different typologies of (re-)entry controlled vehicles.
- MCI for Spacecraft System Identification. MCI algorithms making use of S-estimation techniques have been analysed and prototyped in a Real Time, Hardware in the loop facility.

2004-2008 **Deimos Engenharia (Portugal)**

Head of the Guidance Navigation and Control (GNC) section in Advanced Projects Division. Responsible for the technical coordination and project management of the activities under the GNC section.

Project Manager in the Advanced Project division responsible for:

- **MOONLIB**: Analysis of Lagrangian Trajectories in the Earth-Moon System. Responsible for the analysis and definition of transfer strategy to the Earth Moon lagrangian points orbits (Lissajous and Halo).

- **GNCO**: Development of GNC algorithms for Rendezvous and Formation Flying in Non-Circular orbits. In charge of the scenario definition and guidance algorithms development for Rendezvous in Mars elliptical orbit and Formation Flying in Earth high elliptical orbit (Proba-3 mission).
- **AASTR**: Analysis of Transportation Architecture for European Space Exploration. Responsible for the Mission Analysis concerning transfer trajectories from LEO to Lagrangian Orbit in the Earth-Moon (EML) system and back and EML to Lunar Low Orbit and back
- **HARVD**: Integrated Multi-Range RendezVous Control System. In charge of the definition, design and implementation of the "Guidance Expert" within the vehicle GNC system
- **MOONTWINS**: Vision Based Hazard Avoidance Experiment, within MSR Additional Pre-Cursor Mission Pre-Phase A. Providing support to the prime contractor for the Hazard Avoidance function definition for the Moon landing scenario.

Senior Project Engineer responsible for:

- **FLPP**: Future Launcher Preparatory Programme. In charge of developing a tool for the generation of guess values for the Hopper vehicle ascent trajectory optimization.
- **VBRNAV**: Visual Based Navigation Techniques Framework. Responsible for the guidance algorithms trade-off, testing and implementation for the Rendezvous and Hazard Avoidance mission scenarios. Responsible for the whole integration of the Rendezvous Tool (RVDT)

Supervisor of internal founded projects and co-tutor of MD thesis:

- **ARPA**: Autonomous Rendezvous PlAnner. In charge of the study definition and algorithms design. Within this study Branch and Bound algorithms are investigated for an Autonomous RendezVous Mission Planner

2000-2004 **GMV Aerospace and Defence, SA**

Project Manager in Mission Analysis and Advanced System Engineering Division responsible for:

- **ATV Evolution**. Responsible for the assessment of the ascent trajectory of a composite vehicle based on Ariane5 and a CTV (Crew Transportation Vehicle) derived by the ATV (Automated Transfer Vehicle). In charge of both technical and management aspects.
- **WALES** Mission Analysis and Operations. Responsible for the mission analysis and operations assessment for WALES earth observation mission. Managerial and technical issues have been covered.

Project Engineer in Mission Analysis and Advanced System Engineering Division responsible for:

- **GNCDERIS-2** GNC Development Environment and Rendezvous with Incapacitated Spacecraft. Responsible for the design, development and testing of a Guidance Analysis Tool (GATO)
- **SMART-II** Mission Definition Study. Responsible for the overall orbital/transfer analysis. In charge of developing dedicated software programs for the transfer trajectories computation to both Lissajous-Halo orbits and Heliocentric Earth Trailing orbits.
- **GNCDERIS-1** GNC Development Environment and Rendezvous with Incapacitated Spacecraft In charge of the mission definition related to the launchers ascent scenario. Software requirements/specifications were also derived from the previous activity.
- **ARIESC-B**: Ariane5 System Study: 3DoF Trajectory and Eclipse Study. Responsible for the ascent trajectory optimization of the new Ariane5-ESCB version. SARATO, a dedicated trajectory optimization tool, was developed during this study
- **SOGAGE**: Study on GPS at GTO Experiment. Responsible for the visibility analysis of the GPS constellation from a spacecraft into a GTO orbit

Supervisor of internal founded projects and co-tutor of MD thesis:

- **INILOW**: Low-Thrust Optimal Trajectories Computation. Responsible for the software development and algorithms verification. New concepts have been investigated and implemented in this area

- **GOPIM:** Genetic Optimization of Interplanetary Missions. Responsible for the tool development and algorithms verification. A relevant experience has been earned in using Genetic Algorithms for trajectory optimization purposes. This tool has been presented during the 13th AAS Spaceflight Mechanics conference
- **Manoeuvres Optimization at a Massive Body Arrival**. GMV founded study/SW prototype for the application of optimal control theory for long manoeuvres optimisation. Results derived from this software have been presented during the 5th International Conference on Space Launchers Technology

1999-2000 **Research Assistant** in the **Astrodynamics Group at University of Rome (GAUSS)**

Project Consultant for the Design and manufacturing of the UNISAT-1 microsatellite (UNIROMA/ASI project). This satellite was successfully launched on 26th of September 2000 by DNEPR launcher.

Teaching Assistant for the course of Astrodynamics of Aerospace System at University of Rome "La Sapienza

EDUCATION:

1991-1998 **MSc in Aerospace Engineering** from **University of Rome, "La Sapienza", Italy**. Specialisation in Aerospace System, Thesis: "Analytical Methods and Experimental Techniques for a Magnetic Attitude Control System", Grade 105/110

1999-2000 **Post-graduate courses attended at University of Rome.**

- Astrodynamics of Aerospace System, at Graduated School of Aerospace Engineering at University of Rome, Rome, Italy
- Launchers GN&C system and Trajectory Optimisation, at Graduated School of Aerospace Engineering at University of Rome, Rome, Italy
- Space environment, at Graduated School of Aerospace Engineering at University of Rome, Rome, Italy

LANGUAGES:

Italian, Spanish, English, Portuguese, French

PUBLICATIONS:

Journals, reports and magazines

- P.Colmenarejo et Al "Active debris removal GNC challenges over design and required ground validation", CEAS Space Journal, June 2015, Volume 7, Issue 2, pp 187-201, DOI DOI10.1007/s12567-015-0088-y
- Wenfei Wang, et Al. ," Verification and Validation Framework for Autonomous Rendezvous Systems in Terminal Phase", Journal of Spacecraft and Rocket, accepted for publication with DOI: 10.2514/1.A32531
- T. Milhano, J. Sequeira and E. Di Sotto, "Using S-estimators in Parameter Identification", in Procs. 16th International Conference on Information Fusion (FUSION 2013), Istanbul, July, 2013.
- E. Di Sotto. "Un simulatore magnetico per l'analisi del dipolo di bordo di un veicolo spaziale", published in Italian in Quaderni di Astrodinamica, Vol. 4, Rome May 2010
- P. Rogata, E. Di Sotto et Al, "Design and performance assessment of hazard avoidance techniques for vision-based landing", published in Acta Astronautica Volume 61, Issues 1-6, June-August 2007
- P. Colmenarejo, E. Di Sotto, V.Barrena, "Low-cost relative navigation sensing: GNSS-like devices hosted on deployed tethers", published in Acta Astronautica Volume 59, Issues 8-11, October-December 2006
- E. Di Sotto, L.Tarabini et el. "Heliocentric Earth Trailing Orbit Design for a Small Probe Concept", published in Advances in the Astronautical Sciences, Vol. 114
- P. Rogata, E. Di Sotto et al. "Guess Values for Interplanetary Transfer through Genetic Algorithms", published in Advances in the Astronautical Sciences, Vol. 114
- E. Di Sotto, P. Teofilatto, "A Semi-analytical Evaluation Of Launcher Performances", published in Journal of Guidance and Control and Dynamics, Vol. 25 & No. 3, El Segundo-Ca, May-June 2002
- E. Di Sotto, "La coppia magnetica e la deriva dell'asse di spin di un satellite", published in Quaderni di Astrodinamica, Vol. 3, Rome, September 1999
- E. Di Sotto, "Enrico Fermi ed il Gravity Assist", published in Quaderni di Astrodinamica, Vol. 3, Rome, September 1999

- E. Di Sotto, "Analytical Methods and Experimental Techniques for a Magnetic Attitude Control System", MSc. Graduation report presented at the University board in April 1999.

Conferences Papers

- 2019," Low Cost Avionics for a European Micro Launcher", 70th International Astronautical Congress (IAC), Washington D.C., United States, 21-25 October 2019
- 2017, " Avionics and Launch Opportunities for an European Micro-Launcher", IAA-AAS-CU-17-01-01, 4th IAA Conference on University Satellite Missions & CubeSat Workshop
- 2015, "GNC and Avionics Assembly Integration and Validation for SPARTAN Technology Demonstrator", 6th European Conference for Aerospace Sciences (EUCASS), June 29th – July 2nd Krakow (Poland).
- 2015, "Ascent Trajectory Optimisation for Hybrid Propulsion Micro Launcher", 6th European Conference for Aerospace Sciences (EUCASS), June 29th – July 2nd Krakow (Poland).
- 2012, "Drag Derived Altitude for Improved Navigation Accuracy in Mars Entry Descent and Landing System", 1st IAA Conference on Dynamics and Control of Space Systems Porto, Portugal 19-21 March 2012
- 2011, "Throttleable hybrid engine for planetary soft landing", presented at 4th European Conference for Aerospace Sciences (EUCASS), July 4-8 St Petersburg, Russia.
- 2011, "Reactive Design Tool for Entry Vehicles Guidance and Control System", presented at 4th European Conference for Aerospace Sciences (EUCASS), July 4-8 St Petersburg, Russia.
- 2011, "Implementation of Navigation System for Entry Descent and Landing Missions", presented at 62nd International Astronautical Congress, Cape Town, SA.
- 2010, "VVAF- Worst Case & Safety Analysis Tools For Autonomous Rendezvous System", presented at AIAA Guidance, Navigation, and Control 2-5 August 2010 in Toronto, Ontario, Canada
- 2010, "Multimission GNC Design and Performances for a High Lift over Drag Re-Entry vehicle", presented at 4th International Conference on Astrodynamics Tools and Techniques, 4th –ICATT 2010, (ESA/ESAC), Madrid Spain, 3 – 6 May 2010
- 2009 "PHOEBUS: GNC Design and Performance Assessment for super orbital Re-Entry", presented at 16th AIAA/DLR/DGLR International Space Planes and Hypersonic Systems and Technologies Conference, Bremen, 10 October 2009.
- 2009 "PHOEBUS: A High Lift-over-Drag Vehicle for Earth Re-entry" presented at 60th International Astronautical Congress Daejeon, Republic of Korea 12 – 16 October, 2009
- 2008, "LFT modelling for the analysis of relative motion controllers in eccentric orbits" presented at Computer-Aided Control Systems, 2008. CACSD 2008. IEEE International Conference on 03/10/2008, DOI: 10.1109/CACSD.2008.4627369
- 2008"FF Analysis and GNC Concept for a FF Mission in Higly Eccentric Orbit", presented at 3rd International Symposium on Formation Flying, Missions and Technologies, 23 - 25 April 2008, ESA/ESTEC, Noordwijk, The Netherlands
- 2008"Vision Based GNC For Autonomous RVD in Circular and Elliptical Orbit", presented at 7th International ESA Conference on Guidance, Navigation & Control Systems, June 2nd-5th 2008, Tralee, Ireland
- 2008"Hazard Avoidance for Planetary Landing: GNC Design and Performance Assessment" presented at 7th International ESA Conference on Guidance, Navigation & Control Systems, June 2nd-5th 2008, Tralee, Ireland
- 2007"GNC concept definition for RendezVous Mission in Mars Elliptical Orbit", presented at the 58th International Astronautical Congress in Hyderabad, India, September 2007, IAC-07-C1.6.03
- 2007"Guidance Algorithms for Non-Drifting Trajectory Generation and Control in RendezVous Missions into Elliptical orbits", presented at 20th International Symposium on Space Flight Dynamics (ISSFD), Annapolis, Maryland, September 2007
- 2007"Consolidated Performance Assessment of Hazard Avoidance Techniques for Vision Based Landing", presented at the AIAA Guidance, Navigation and Control Conference and Exhibit, Hilton Head Island, South Carolina, August 2007, AIAA-2007-6854
- 2007"System and GNC concept for RendezVous into elliptical Orbit for Mars Sample Return mission", presented at the AIAA Guidance, Navigation and Control Conference and Exhibit, Hilton Head Island, South Carolina, August 2007, AIAA-2007-6852
- 2007"Formation Flight Control in Highly Elliptical Orbit", presented at the AIAA Guidance, Navigation and Control Conference and Exhibit, Hilton Head Island, South Carolina, August 2007, AIAA-2007-6542
- 2006"Mars Ascent Trajectory for Rendezvous Operations into Elliptical Orbit", presented at the 57th International Astronautical Congress in Valencia, Spain, October 2006, IAC-06-C1.P.4.04
- 2006"Design and Performance Assessment of GNC Algorithms for Vision Based Rendezvous Mars Orbit" presented at the 57th International Astronautical Congress in Valencia, Spain, October 2006, IAC-06-C1.7.06
- 2006"Design and Performance Assessment of Hazard Avoidance Techniques for Vision Based Landing, presented at the AIAA Guidance, Navigation and Control Conference and Exhibit, Keystone, Colorado, August

2006, AIAA-2006-6593

- 2006"Design and Performance Assessment of Guidance Algorithms for Vision Based Rendezvous" presented at the AIAA Guidance, Navigation and Control Conference and Exhibit, Keystone, Colorado, August 2006, AIAA-2006-6586.
- 2005"Hazard Avoidance Techniques for Vision based Landing", paper presented at 6th International ESA Conference on Guidance, Navigation and Control Systems, October 2005 Greece
- 2005"Design of Guidance and Control Algorithms for A Vision Based Navigation Rendezvous Mission on Mars Orbit" presented at the 56th International Astronautical Congress in Fukuoka, October 2005
- 2003"Genetic Algorithms in the generation of an initial guess for the optimisation of ascent trajectory with an hybrid method", presented at 5th International Conference on Space Launchers, Madrid, Spain, November 2003
- 2003"SCLATO Software for Ascent Trajectory Optimisation with Application to Conventional Launchers", presented at 5th International Conference on Space Launchers, Madrid, Spain, November 2003
- 2003"Optimisation of the Ariane5 ESC-B Multiboost Trajectory for Constellation Deployment", presented at 3rd International Workshop on Satellite Constellations and Formation Flying, Pisa, Italy, February, 2003
- 2003"Relative Navigation Determination in Formation Flying Through Tethered Deployed GNSS-Like Signal Devices", presented at 3rd International Workshop on Satellite Constellations and Formation Flying, Pisa, Italy, February, 2003
- 2001"A Semi-analytical Evaluation Of Launcher Performances", presented at 11th AAS/AIAA Spaceflight Mechanics Meeting, Santa Barbara, CA, USA, February, 2001
- 2001"Cryosat Collision Warning and Low Thrust Avoidance Manoeuvre Strategy", presented at 3rd European Conference on Space Debris, ESOC, Darmstadt, Germany, March, 2001
- 1999"Experimental and Analytical Methods to Evaluate the magnetic moments of the UNISAT microsatellite", presented at 50th International Astronautical Congress, Amsterdam, The Netherlands, October 1999

AFFILIATIONS and Honours

- Full Member of International Academy of Astronautics (IAA) in Engineering Sciences Section