

Curriculum vitae - Chiara Bisagni

Primary ERC sector: *PE8_1 Aerospace engineering*

Family name, First name: Bisagni, Chiara

Researcher unique identifier: ORCID 0000-0002-8713-9763

• Education and key qualifications

PhD-degree in Aerospace Engineering

Department of Aerospace Engineering, Politecnico di Milano, Italy

Master-degree in Aeronautical Engineering (cum Laude)

Department of Aerospace Engineering, Politecnico di Milano, Italy

• Current position

2023 - present Full Professor

Department of Aerospace Science and Technology, Politecnico di Milano, Italy

• Previous positions

2015 - 2023 Full Professor (permanent position)

Faculty of Aerospace Engineering, Delft University of Technology (TU Delft), Netherlands

2012 - 2015 Full Professor (tenured position)

Department of Structural Engineering, University of California San Diego (UCSD), USA

2006 - 2012 Associate Professor

Department of Aerospace Science and Technology, Politecnico di Milano, Italy

2010 Visiting Associate Professor, 2 months sabbatical

School of Aerospace Engineering & Applied Mechanics, Tongji University, Shanghai, China

2006 - 2007 Visiting Associate Professor, 6 months sabbatical

Department of Mechanical Engineering, Massachusetts Institute of Technology (MIT), USA

1999 - 2006 Assistant Professor

Department of Aerospace Engineering, Politecnico di Milano, Italy

1998 EU Research Assistant

German Aerospace Center (DLR), Braunschweig, Germany

RESEARCH ACHIEVEMENTS AND PEER RECOGNITION

1. Parkinson B., Caniato M., Greenwood T.E., Pal R., Frecker M.I. and Bisagni C., “Compressive stiffness behavior of magneto-active beams and plates”, accepted on *Journal of Intelligent Material Systems and Structures*.

This work is the first result of the funded collaboration between my ERC Advanced Grant “NABUCCO - New Adaptive and BUCKling-driven Composite aerospace structures” and the NSF grant “LEAP HI: GOALI: Accelerating Design for Additive Manufacturing of Smart Multimaterial Devices” of Professor Mary Frecker of the Penn State University.

2. Fina M. and Bisagni C., “Buckling design optimization of tow-steered composite panels and cylindrical shells considering aleatory and epistemic uncertainties”, *Computational Mechanics*, 2025, 76: 59-92.

<https://doi.org/10.1007/s00466-024-02589-8>

The paper focuses on the design and optimization of variable angle tow composites considering uncertainty quantification. Different uncertainty models are introduced to quantify both natural variability (aleatory uncertainty) and lack of knowledge (epistemic uncertainty).

3. Kralovec C., Dengg A., Schagerl M., Schiller A., Bisagni C., Loebbecke M., Haubrich J. and Hanelt R., “Static strength and fatigue life of pinned hybrid titanium-composite single-lap-shear joints”, *Composite Structures*, 2025, 354: 118765.

<https://doi.org/10.1016/j.compstruct.2024.118765>

This work was conducted in collaboration with Johannes Kepler University Linz, Delft University of Technology, the German Aerospace Center and INVENT GmbH as part of the European project SUSTAINair under grant agreement 101006952. The project focused on developing circular economy principles for the aerospace industry, specifically in design, manufacturing, operations and end-of-life phases. In this paper, we studied a pinned hybrid titanium-composite joint. Our findings demonstrated a high load factor between failure and damage initiation under static and fatigue loads thanks to the crack-stopping effect of the interlocking pin array.

4. Rudd M.T., Schultz M.R., Gardner N.W., Kosztowny C.J.R. and Bisagni C., “Experimental validation of the buckling behavior of unreinforced and reinforced composite conical-cylindrical shells for launch-vehicles”, *Composite Structures*, 2024, 349-350: 118493.

<https://doi.org/10.1016/j.compstruct.2024.118493>

This paper is part of a research activity on launch-vehicle structures conducted in collaboration with NASA Marshall Space Flight Center and NASA Langley Research Center. The structure being investigated is a scaled component of the Space Launch System (SLS), the launch vehicle used by NASA for the Artemis program.

5. van Dooren K., Waleson J., Chapman M. and Bisagni C., “Buckling and failure assessment of curved butt-joint stiffened thermoplastic composite panels with roller boundary conditions”, *Composites Science and Technology*, 2024, 254: 110667.

<https://doi.org/10.1016/j.compscitech.2024.110667>

This research, conducted in collaboration with industrial partners GKN Fokker Aerospace in the Netherlands and Gulfstream Aerospace Corporation in the United States, demonstrates the excellent capabilities of thermoplastic composites for primary aerospace structures. This study investigated the possibility of safely flying in post-buckling conditions in the future. It included an experimental campaign using advanced test technologies and instrumentation that allowed to validate the developed numerical model.

6. Tijs B.H.A.H., Turon A. and Bisagni C., “Characterization and analysis of conduction welded thermoplastic composite joints considering the influence of manufacturing”, *Composite Structures*, 2024, 348: 118505.

<https://doi.org/10.1016/j.compstruct.2024.118505>

Thermoplastic composite welding is a key technology that can help in making the aviation industry more sustainable, while at the same time enable high-volume production and cost-efficient manufacturing. This work involved the characterization, testing and analysis of thermoplastic composite conduction welded joints, taking into account the influence of the manufacturing process.

7. van Dooren K. and Bisagni C., “Design, analysis and testing of thermoplastic welded stiffened panels to investigate skin-stringer separation in post-buckling”, *Composites Part B: Engineering*, 2023, 267: 111033.

<https://doi.org/10.1016/j.compositesb.2023.111033>

This research was part of the Clean Sky 2 project STUNNING, project number 945583, whose consortium received a JEC Composites Innovation Award in January 2024 for the Multifunctional Fuselage Demonstrator. While many papers on thermoplastic composites are reported in the literature at the coupon level, this paper represents one of the first studies of thermoplastic composite full-scale structures.

8. Gavioli M. and Bisagni C., “Teaching buckling of cylindrical shells through an effective laboratory demonstration”, *Mechanics of Advanced Materials and Structures*, 2022, 29(25): 3911-3923.

<https://doi.org/10.1080/15376494.2021.1913269>

This paper presents a laboratory demonstration for a Stability of Structures course. The activity followed the Interactive Lecture Demonstration approach during the tests of two cylindrical shells: a 3 D-printed and a composite cylinder. The learning outcomes have been formulated by comparing what can be learned from theoretical lessons and buckling tests. The results showed that the activity helped students understand of shell buckling and increased their enthusiasm for the topic.

9. Zhang J. and Bisagni C. “Buckling-driven mechanisms for twisting control in adaptive composite wings”, *Aerospace Science and Technology*, 2021, 118: 107006.

<https://doi.org/10.1016/j.ast.2021.107006>

This paper was a feasibility study for my ERC proposal, which was successfully funded: ERC Advanced Grant, NABUCCO, project number 101053309.

10. Kootte L.J. and Bisagni C., “A methodology to investigate skin-stringer separation in postbuckled composite stiffened panels”, *Proceedings of AIAA SciTech 2020 Forum*, Orlando, Florida, USA, 6-10 January 2020, paper AIAA 2020-0477.

<https://doi.org/10.2514/6.2020-0477>

This paper presents a methodology to investigate and improve the strength and damage tolerance of stiffened composite panels used in aerospace structures subjected to post-buckling deformation. With this paper, my PhD student Luc Kootte won the “Lockheed Martin Student Paper Award in Structures”.

11. Raimondo A. and Bisagni C., “Fatigue analysis of a post-buckled composite single-stringer specimen taking into account the local stress ratio”, *Composites Part B: Engineering*, 2020, 193: 108000.
<https://doi.org/10.1016/j.compositesb.2020.108000>

This study presents the methodology developed for fatigue analysis of composite structures in the non-linear field. This research was sponsored by the Office of Naval Research (ONR), under grant award number N62909-17-1-2129.

12. Gutierrez Alvarez J. and Bisagni C., “Closed-form solutions for thermomechanical buckling of orthotropic composite plates”, *Composite Structures*, 2020, 233: 111622.
<https://doi.org/10.1016/j.compstruct.2019.111622>

The paper presents the derivation of an analytical formulation that relates critical temperatures to applied plate displacements. This formulation can be used during initial design, for sensitivity analysis and for obtaining desired buckling shapes. It is of significant relevance for hypersonic aircraft.

13. Labans E., Bisagni C., Celebi M., Tatting B., Gürdal Z., Blom-Schieber A., Rassaian M. and Wanthal S., “Bending of composite cylindrical shells with circular cutouts: experimental validation”, *Journal of Aircraft*, 2019, 56 (4): 1534-1550.
<https://doi.org/10.2514/1.C035247>

The innovative fiber steering technology for composites has been successfully employed in this study, in collaboration with Boeing.

14. Dávila C.G. and Bisagni C. “Fatigue life and damage tolerance of postbuckled composite stiffened structures with initial delamination”, *Composite Structures*, 2017, 161: 73-84.
<https://doi.org/10.1016/j.compstruct.2016.11.033>

This research, conducted in collaboration with NASA Langley Research Center, focused on fatigue and damage tolerance analyses of structures that exhibit large nonlinear deformation. An extensive test campaign was conducted in the Structures and Materials Research Laboratories of NASA Langley Research Center using digital image correlation to obtain full-field displacement measurements, as well as in-situ passive thermography and ultrasonic scans to track damage evolution.

15. Bisagni C., “Overview of the DAEDALOS project”, *Progress in Aerospace Sciences*, 2015, 78: 1-7.
<https://doi.org/10.1016/j.paerosci.2015.05.007>

This paper presents the main ideas of the European project DAEDALOS that I coordinated. The project involved 13 European partners (4 industries, 2 research centers, 5 universities and 2 SMEs) from 8 European countries.

16. Vescovini R. and Bisagni C., “Two-step procedure for fast post-buckling analysis of composite stiffened panels”, *Computers and Structures*, 2013, 128: 38-47.
<https://doi.org/10.1016/j.compstruc.2013.06.002>

This research was conducted as part of the European project MAAXIMUS, under grant agreement No. 213371. It developed a rapid method for analysing composite stiffened panels that could be utilized by industries during the preliminary design phase.

17. Greve L., Bisagni C. and Walters C., “Biaxial experimental determination of in-plane matrix fracture envelope of unidirectional composite”, *Composites Part A: Applied Science and Manufacturing*, 2010, 41(6): 750-758.
<https://doi.org/10.1016/j.compositesa.2010.02.007>

This research was conducted in collaboration with Volkswagen Group Research and the Impact and Crashworthiness Laboratory at the Massachusetts Institute of Technology. The study presents a test procedure for determining the in-plane fracture envelope of unidirectional fiber reinforced polymers. The proposed test procedure allows the manufacture of specimens for material fracture characterization in the same way that real composite structures are usually produced for the automotive industry.

18. Bisagni C., Di Pietro G., Fraschini L. and Terletti D., “Progressive crushing of fiber-reinforced composite structural components of a Formula One racing car”, *Composite Structures*, 2005, 68(4): 491-503.
<https://doi.org/10.1016/j.compstruct.2004.04.015>

The paper describes an experimental and numerical investigation on energy absorbers for Formula One side impact and steering column impact. It was an interesting collaboration with Ferrari Formula One, working on their design challenges. The composite components had to be simultaneously extremely light, exceptionally stiff, crashworthy, manufacturable, and aerodynamically integrated.

19. Bisagni C. and Lanzi L., “Post-buckling optimisation of composite stiffened panels using neural networks”, *Composite Structures*, 2002, 58(2): 237-247.

[https://doi.org/10.1016/S0263-8223\(02\)00053-3](https://doi.org/10.1016/S0263-8223(02)00053-3)

This paper presents a study on the application of neural networks in optimizing composite structures. At the time, artificial intelligence was not widely utilized, especially in the aerospace field. The year before (2001), I proposed the idea of using neural networks to design helicopter subfloor components for crashworthiness requirements. That research earned me a Young Researcher Fellowship by Prof. K.-J. Bathe at the “First M.I.T. Conference on Computational Fluid and Solid Mechanics”.

20. Bisagni C., “Numerical analysis and experimental correlation of composite shell buckling and post-buckling”, *Composites Part B: Engineering*, 2000, 31(8): 655-667.

[https://doi.org/10.1016/S1359-8368\(00\)00031-7](https://doi.org/10.1016/S1359-8368(00)00031-7)

This paper is from my PhD study and presents research on composite structures. At the time, there were limited investigations in aerospace on composite structures in the literature.

Fellowship and Awards

- 2022 Cavaliere dell’Ordine della Stella d’Italia (Knight in the Order of the Star of Italy), Italy
- 2021 Fellow, American Institute of Aeronautics and Astronautics (AIAA), USA
- 2012 Associate Fellow, American Institute of Aeronautics and Astronautics (AIAA), USA
- 2006/07 Fulbright Grant in the category Research Scholar, USA
- 2007 Fellowship of the Occasional Lecturer Program, Department of State, USA
- 2003 Fellowship of Rotary International, Group Study Exchange to Melbourne, Australia
- 2001 Prize Arnaldo Rancati, Istituto Lombardo Accademia di Scienza e Lettere, Italy
- 2001 Young Researcher Fellowship, Massachusetts Institute of Technology (MIT), USA
- 1998 Marie Curie Research Training Grant, Training and Mobility of Researchers, EU
- 1997 Amelia Earhart Fellowship, Zonta International Foundation, USA
- 1993 Prize Gianfranco Rotondi, Politecnico di Milano, Italy

ERC Advanced Grant

- 2023-2028 New Adaptive and BUCKling-driven COMposite aerospace structures (NABUCCO), Call ERC-2021-ADG, Grant Agreement: 101053309

Main Invited Presentations

- Keynote Lecture at the 10th ECCOMAS Thematic Conference on the Mechanical Response of Composites (COMPOSITES 2025), Vienna, Austria, September 9-11, 2025.
- Keynote Lecture at the 21st Australian International Aerospace Congress (AIAC21), Melbourne, Australia, March 24-26, 2025.
- Semi-Plenary Lecture at the 16th World Congress on Computational Mechanics and 4th Pan American Congress on Computational Mechanics (WCCM-PANACM), Vancouver, Canada, July 21-26, 2024.
- Keynote Lecture at the American Society for Composites (ASC) 38th Annual Technical Conference, Greater Boston, USA, September 17-20, 2023.
- Plenary Lecture at the 1st International Conference on Mathematical Modelling in Mechanics and Engineering, Belgrade, Serbia, September 8-10, 2022, Online.
- Keynote Lecture at the American Society for Composites (ASC) 36th Annual Technical Virtual Conference, Composites Ingenuity Taking on Challenges in Environment-Energy-Economy, Texas A&M University, USA, September 19 - 23, 2021, Online.
- Keynote Lecture at the International Conference on Applications in Computational Engineering & Science (IConACES2020), Chennai, India, October 30-31, 2020, Online.
- Keynote Lecture at 22nd International Conference on Composites Materials (ICCM-22), Melbourne, Australia, August 11-16, 2019.
- Keynote Lecture at 2nd International Conference on Advances in Aerospace Structures, Systems & Technology (AASST), London, UK, May 8-9, 2019.
- Keynote Lecture at 33rd Annual Technical Conference of the American Society for Composites (ASC), Seattle, USA, September 24-26, 2018.
- Minisymposium Keynote at 13th World Congress in Computational Mechanics (WCCMXIII), New York, USA, July 22-27, 2018.
- Keynote Lecture at 21st International Conference on Composites Materials (ICCM-21), Xi'an, China, August 20-25, 2017.

International Technical Committees

- 2024 - present Working Group for European Space Agency (ESA) ECSS-E-HB-32-24A "Buckling of structures" Handbook.
- 2020 - present Member of the ASME VVUQ Standards Committee "ASME VVUQ 90 Airframe Structure Modeling & Simulation Credibility Assurance Framework", organized by Boeing, Airbus, EASA and FAA.
- 2019 - present Member of the International Activities Working Group, AIAA
- 2017 - present Chair of Diversity Working Group, ICCM
- 2016 Expert of the panel "Vehicle Design and Manufacturing" of the Strategic Transport Research and Innovation Agenda (STRIA), European Commission
- 2015 - present Executive Council Member, International Committee on Composite Materials (ICCM)
- 2014 - 2023 Member of the Composites Working Group, NAFEMS
- 2009 - present International Member of the Structures Technical Committee, AIAA

Editorial Boards of International Journals

- 2021 - present Editorial Board Member of Composites Part B: Engineering
- 2019 - present Editorial Board Member of Aerospace
- 2017 - present Contributing Editor of Mechanics of Advanced Materials and Structures
- 2015 - 2025 Editorial Board Member of Journal of Sandwich Structures and Materials
- 2015 - 2024 Associate Editor of American Institute of Aeronautics and Astronautics AIAA Journal
- 2021 - 2023 Member of TU Delft OPEN Publishing Board of Editors
- 2015 - 2023 Editorial Board Member of International Journal of Crashworthiness
- 2015 Special Guest Editor of Progress in Aerospace Sciences

Organisation of Scientific Meetings

- 2008 - 2026 Member of the Technical and Scientific Committee of more than 45 International Conferences. Some examples: International Conference on Composites Materials (ICCM); ECCOMAS Thematic Conference on the Mechanical Response of Composites; European Conference on Spacecraft Structures, Materials and Environmental Testing; Aircraft Structural Design Conference, organized by UK Royal Aeronautical Society; Aerospace Structural Impact Dynamics International Conference.
- 2014 Conference Co-Chair, American Society for Composites (ASC) & US-Japan Conference on Composite Materials, San Diego, USA, September 8-10, 2014.
- 2012 Conference Co-Chair and Conference General Manager, International Crashworthiness Conference, Milan, Italy, July 18-20, 2012.

Reviewing Activities

- 2023 - present Member of the Advisory Board of the Department of Aerospace Engineering of the Universidad Carlos III de Madrid, Spain
- 2022 - 2025 Member of the Scientific and Innovation Advisory Board of the Center for Technological Innovation in Building and Civil Engineering (CITEEC) of the University of A Coruña, Spain
- 2019 - present Assessor of EPSRC-funded Centre for Doctoral Training in Composites Science, Engineering and Manufacturing of the University of Bristol, UK
- 2019 - 2025 Member of the Independent Advisory Board of the EPSRC-funded research project, University of Bristol, University of Bath, University of Exeter and University of Southampton, UK
- 2019 - 2023 External Examiner, Aeronautical Program, University of Limerick, Ireland
- 2014 - 2020 Monitor, European Commission, three FP7 projects (2014-2017) and two H2020 project (2016-2018 and 2016-2020)
- 2010 - 2026 Evaluator for various scientific proposals: Horizon Europe (EU); H2020 (EU); Clean Sky 2 (EU); FP7 Program (EU); Dutch Research Council - NWO (NL); La Caixa Foundation (Spain); Danish Council for Independent Research, Technology and Production Sciences (Denmark); Ministry of Education, Youth and Sports (Czech Republic); ETH Zurich (Switzerland); Helmholtz Association (Germany); Singapore's Research, Innovation and Enterprise (Singapore); Fulbright Commission (US-Italy); National Science Foundation (US)

ADDITIONAL INFORMATION

- 2019 - 2023 Member of the Scientific Committee, Italian Embassy in the Netherlands