Tânia Sofia Cação Ferreira

taniafer@stanford.edu — (650) 609-8920 — ORCID — LinkedIn

EDUCATION AND TRAINING

Stanford University, California Aug 2022–Present
Center for Turbulence Research Postdoctoral Fellow, prev. TomKat Postdoctoral Fellow in Sustainable Energy
Advisors: Prof. Parviz Moin (CTR), Prof. Catherine Gorlé (CEE), Prof. Juan Alonso (AA)
Research project: *"Quantifying and reducing the climate impact of contrails from hydrogen-powered aircraft"*

Université Catholique de Louvain (UCLouvain), Belgium Aug 2016–Apr 2021
PhD, Science & Technology, Mechanical Engineering
Collaborative research with the von Karman Institute (VKI) and the Centre de recherche en aéronautique (Cenaero)
Advisors: Prof. Tony Arts (VKI, UCLouvain), Prof. Vincent Legat (UCLouvain)
Dissertation: *"Boundary layer transition and convective heat transfer of the high-pressure turbine vane LS89"*

von Karman Institute for Fluid Dynamics, Belgium Sep 2015–Jul 2016
Research Master (MS), Fluid Dynamics, Turbomachinery & Propulsion, *Honor grade for project*
Advisor: Prof. Tony Arts
Thesis: *"Investigation of gas-to-wall temperature ratio effect on bypass transition"*

Universidade de Beira Interior (UBI), Portugal Sep 2010–Nov 2015
BS & MS, Aeronautical Engineering, *Top 15% of my class*
Advisors: Prof. Francisco Brójo (UBI), Prof. Lavagnoli (VKI), Prof Tony Arts (VKI, UCLouvain)
Thesis: *"Calibration and sensitivity analysis of fast-response virtual three-holes probes"*
Mobility programs: IAESTE (summer internship), Erasmus+ Internships (master thesis)

WORK EXPERIENCE

von Karman Institute for Fluid Dynamics, Belgium Apr 2021 – Jul 2022
Research Engineer, Aeronautics & Aerospace

RESEARCH

Climate impact of contrails from Jet A, SAF, and H_2 fueled aircraft Aug 2022 – Present
Postdoctoral Fellow *Stanford University*

- High-fidelity simulations of early contrail stage with microphysics models and radiative forcing calculations.
- Collaborations on vortex dynamics and instabilities, contrail observations, extending study to dissipation stage of contrails, code transition to GPU, detailed microphysics, uncertainty quantification and multi-fidelity simulations.

State-of-the-art of clean aircraft propulsion fuels and technologies Apr 2021 – Jul 2022
Research Engineer *von Karman Institute*

- Technical leader of research project on alternative fuels and technologies for climate-neutral aircraft propulsion (hydrogen combustion, hydrogen fuel cells, (hybrid-)electric, sustainable aviation fuels, and innovative engine cycles).

High-fidelity simulation of an academic testcase of LS89 turbine Set 2019 – Present
PhD Researcher, now Collaborative Postdoctoral Researcher *von Karman Institute, Cenaero*

- Numerical investigation of flowfield and boundary layer of a complex high-pressure turbine test case with bypass transition, relaminarization, and shock-induced transition. Observed a high sensitivity to a numerical parameter, AV.

Experimental boundary layer studies on high-pressure turbines Aug 2016 – Mar 2021
PhD Researcher *von Karman Institute, UCLouvain*

- Lab research on the physics of boundary layer transition on high-pressure turbines through heat flux measurements.
- Extensive testing to enlarge the LS89 turbine database to engine-representative turbulence and temperature ratios.

AWARDS AND FELLOWSHIPS

Center for Turbulence Research Postdoctoral Fellowship	2023
TomKat Postdoctoral Fellowship in Sustainable Energy (2 years)	2021
2x Student Advisory Committee Travel Award, ASME	2020, 2021
2x Young Engineer Turbo Expo Participation Award, ASME	2018, 2019
Student Scholarship, ASME IGTI Honors and Awards	2018
Best Turbomachinery Poster, VKI	2017
VKI fellowship (4.7 years)	2016
NATO fellowship (1 year)	2015

PUBLICATIONS

Peer-reviewed journal articles

Cação Ferreira, T. S., Arts, T., Croner, E., "On the influence of high turbulence on the convective heat flux on the high-pressure turbine vane LS89", *Int. J. of Turbomach., Propulsion and Power* 4(4) 37, 2019.

Cação Ferreira, T. S., Vasilakopoulos, N., Arts, T., "Investigation of thermal effect on bypass transition on a high-pressure turbine guide vane", *J. of Turbomach.* 141 (5), 2018.

Peer-reviewed conference proceedings

Yazdani, M., **Ferreira, T.**, Lele, S., "The role of particulate morphology and chemistry on the nucleation and growth of water and ice in the exhaust plume", *In Proc. of the Summer Program*, Center for Turbulence Research, Stanford, Jun 24–Jul 19, 2024.

Ferreira, T., Caprace, D.-G., Paoli, R., Shariff, K., "Can inducing the Crow instability reduce contrail radiative forcing?", *In Proc. of the Summer Program*, Center for Turbulence Research, Stanford, California, Jun 24–Jul 19, 2024.

Formisano, P., **Cação Ferreira, T. S.**, Arts, T., "Influence of the gas-to-wall temperature ratio on the boundary layer transition: investigation of the wake in a nozzle guide vane", *In Proc. ASME Turbo Expo*, AZ, USA, Jun 17-21, 2019.

Cação Ferreira, T. S., Vasilokopoulos, N., Arts, T., "Investigation of thermal effect on bypass transition on a high-pressure turbine guide vane", *In Proc. ASME Turbo Expo 2018*, Olso, Norway, Jun 11-15, 2018.

Cação Ferreira, T. S., Arts, T., "Influence of gas-to-wall temperature ratio on bypass transition", *In Proc. ASME Turbo Expo 2017*, Charlotte, North Carolina, Jun 26-30, 2017.

Conference proceedings (non-peer-reviewed)

Ferreira, T., Alonso, J. J., Gorlé, C., "Developing a numerical framework for high-fidelity simulation of contrails: sensitivity analysis for conventional contrails", AIAA Aviation Forum and Ascend, Las Vegas, Nevada, 29 Jul - 2 Aug, 2024.

Cação Ferreira, T. S., Arts, T., Legat, V., Toulorge, T., and Rasquin, M., "Implicit Large Eddy Simulation of the high-pressure turbine vane LS89", *11th VKI PhD Symposium, Rhode-Saint-Genése*, Belgium, May 18-20, 2020.

Cação Ferreira, T. S., Arts, T., Croner, E., "On the influence of high turbulence on the convective heat flux on the high-pressure turbine vane LS89", In *Proc. of the 14th ISAIF*, Gdansk, Poland, 8-11 Jul, 2019.

Cação Ferreira, T. S., Arts, T., and Legat, V. "On the influence of high turbulence on the convective heat flux on the high-pressure turbine vane LS89", *10th VKI PhD Symposium*, Rhode-Saint-Genése, Belgium, Mar 11-13, 2019.

Cação Ferreira, T. S., Arts, T., "Investigation of temperature influence in the production of higher turbulence", *In Proc. Turbulence, Heat, and Mass Transfer 9*, Brazil, Jul 10-13, 2018.

Cação Ferreira, T. S., Arts, T., and Legat, V., "Influence of gas-to-wall temperature on bypass transition", *9th VKI PhD Symposium*, Rhode-Saint-Genése, Belgium, Mar 5-7, 2018.

Popular press

Published three opinion articles about oil exploration on a National Portuguese online newspaper, P3 (Público), 2018.

Reports

Ferreira, T., Gorlé, C., "LES of contrails from H_2 aircraft", CTR Annual Research Brief, 2024.

Cação Ferreira, T. S., Arts, T., "Aero-thermal investigation of a highly loaded transonic linear turbine guide vane cascade: effects of turbulence intensity and gas-to-wall temperature ratio", VKI TN222, von Karman Institute, 2021.

Cação Ferreira, T. S., Scelzo, M. T., "Alternative aircraft propulsion for sustainable aviation", VKI TN227, 2023.

In progress

Ferreira, T., Alonso, J. J., Gorlé, C., "Large eddy simulations of jet-vortex interaction phase of contrail formation behind conventional aircraft: sensitivity to modeling and initial conditions", *In preparation*, 2024.

Ferreira, T., Gorlé, C., "Large eddy simulations of contrail formation from H_2 aircraft", *In preparation*, 2025.

Yazdani, M., **Ferreira, T.**, "The role of particulate morphology and chemistry on the nucleation and growth of water and ice in the exhaust plume", *In preparation*, 2025.

Ferreira, T., Caprace, D.-G., Paoli, R., Shariff, K., "Can inducing the Crow instability reduce contrail radiative forcing?", *In preparation*, 2025.

Cação Ferreira, T. S., Rasquin, M., T. Toulorge, T., Hillewaert, K., Arts, T., "Implicit Large Eddy Simulation of the high-pressure turbine vane LS89", *In preparation*, 2025.

PRESENTATIONS

Oral presentations *(excluding conference proceedings)*

Ferreira, T., Alonso, J. J., Gorlé, C., "Developing a numerical framework for high-fidelity simulation of contrails: sensitivity analysis for hydrogen contrails", *APS-77th Annual Meeting of the Division of Fluid Dynamics*, Selected for the DFD-Interact Session, Salt Lake City, Utah, Nov 24-26, 2024.

Ferreira, T., Caprace, D.-G., Shariff, K., Paoli, R., "The effect of artificially induced Crow instability on contrail radiative forcing", *APS 77th Annual Meeting of the Division of Fluid Dynamics*, Salt Lake City, Utah, Nov 24-26, 2024.

Poster presentations

Ferreira, T., Gorlé, C., "High-fidelity simulations of Jet A and H_2 contrails", *2024 C3E Women in clean energy symposium and awards*, Stanford, California, Nov 12-13, 2024.

Cação Ferreira, T. S., Arts, T., "Investigation of thermal effects on boundary layer transition under high levels of turbulence intensity", *ASME Turbo Expo 2019*, Phoenix, Arizona, Jun 17-21, 2019.

Cação Ferreira, T. S., Arts, T., "Influence of gas-to-wall temperature on bypass transition", *8th VKI PhD Symposium*, Rhode-Saint-Genése, Belgium, Mar 1-3, 2017.

Invited lecture

Ferreira, T., "Research in conventional and alternative aircraft propulsion: flow in a high-pressure turbine, and contrail formation", *CTR Tea Seminar*, Stanford University, Nov 1, 2024.

Cação Ferreira, T. S., "On the influence of high turbulence on the convective heat flux on the high-pressure turbine vane LS89", *ERCOFTAC Spring Festival 2019*, von Karman Institute, Rhode-Saint-Genése, Belgium, Apr 15-16, 2019.

TEACHING

Guest lecturing, Stanford University 2023

- Double lecture entitled *"What about contrails? Uncertainties for HC fuels and unknowns for H_2 fuels. Part I and II"* taught at the AA260 Sustainable Aviation course, included class activities and assessments, and instructor evaluation.

Teaching Certification, Stanford University 2023-Present

- Engaged in Stanford's Postdoc and CIRTL Teaching Certificate: 30h training and 3h practice (15+ evaluations) to date.

Experimental demonstrations lecturer, von Karman Institute 2017 – 2022

· Lectured Measurement Techniques & Instrumentation laboratory demonstrations to VKI Lectures Series attendees.

Private tutor in STEM, Brussels 2018 – 2021

· Tutored middle-school and high-school students in mathematics, physics, chemistry, and biology courses.

MENTORING

High-school students mentor, Stanford University 2023

· Mentored female-identifying high school students in the Bay Area during the program for Outreach for Students in Engineering and Science (OASES) of the Society for Women Engineers (SWE).

Undergraduate research mentor, Stanford University 2023

· Interviewed and mentored for the Sustainability Undergraduate Research in Geoscience and Engineering (SURGE) program for non-Stanford undergraduates from underrepresented backgrounds.

Graduate research mentor, von Karman Institute 2016 – 2022

· Mentored a total of seven graduate students on master's thesis and internships research projects (3 to 9 months).
· Designed three research projects on hydrogen engine analysis, innovative engine cycles, and sustainable aviation fuels.

SERVICE

To the community

Co-founded and led the *VKI Green Office*, Est. 2018. Lobby and implementation of sustainability initiatives to reduce environmental impact, disseminate ecological education, improve mobility, among others, VKI, Belgium, 2018-2022.

Guest observer and host to Mentoring Sessions for start-ups in sustainable aviation by the *Sustainable Aero Lab*, at Stanford Session Apr 24, and Online Session Jun 26, 2024.

To the profession

Reviewed conference papers & acted as student technical liaison at ASME Turbo Expo conferences, 2018-2021.

Hosted two teams and guided their proceedings on the topic of contrails during the Summer Program of the Center for Turbulence Research at Stanford University, Jun 24 - Oct 7, 2024.

Co-convener to the session "Advances in modelling contrails and aircraft-cirrus interactions" for European Geosciences Union (EGU) General Assembly 2025, Vienna, Austria & Online, Apr 27–May 2, 2025.

Steering committee member for organizing the 2nd Sustainable Aviation workshop at the American Institute of Aeronautics and Astronautics (AIAA) Aviation Forum, Las Vegas, Nevada, Jul 21–25, 2025.

To the institution

Volunteered and helped organizing VKI events: Saint Eloi Challenge, Graduation & Open Days, VKI, 2017-2022.

ADDITIONAL EXPERIENCE

Team-developed an electric vehicle for Shell Eco-Marathon (Prototype class, 330.8 km/kWh), Rotterdam, 2014, 2015.

SKILLS

Languages	Portuguese (native), English (fluent), French (advanced), Spanish (intermediate)
Programming	C++, Python, MATLAB, LaTeX
Operating systems	Linux, Windows, macOS
Software	EcosimPro, GasTurb, Catia, FreeCad, SolidWorks, Paraview, charLES (cadence), gmsh
Laboratory	wind tunnel (short-duration compression tube) and subsonic nozzle jet operation; calibration & measurements: pressure transducers, thermocouples, hot-wires, thin films

REFERENCES

Associate Professor Catherine Gorlé — *PostDoc advisor*
Department of Civil & Environmental Engineering
Stanford University, California
gorle@stanford.edu

Professor Parviz Moin — *CTR Director, PostDoc advisor*
Center for Turbulence Research
Stanford University, California
moin@stanford.edu

Professor Tony Arts — *PhD advisor*
Department of Turbomachinery & Propulsion
von Karman Institute, Belgium
tony.arts@vki.ac.be

Dr. Miad Yazdani — *Collaborator*
Senior Fellow
RTX Technology Research Center, Connecticut
miad.yazdani@rtx.com

Professor & Chair Juan J. Alonso — *PostDoc co-advisor*
Department of Astronautics & Aeronautics
Stanford University, California
jjalonso@stanford.edu

Professor Beverley McKeon — *CTR Program Director*
Center for Turbulence Research
Stanford University, California
bjmckeon@stanford.edu

Professor & Head Frank Eulitz — *Research mentor*
Department of Turbomachinery & Propulsion
von Karman Institute, Belgium
frank.eulitz@vki.ac.be

Professor Roberto Paoli — *Collaborator*
Department of Mechanical Engineering
Polytechnique Montréal, Canada
roberto.paoli@polymtl.ca