
Curriculum Vitae

Joaquim R. R. A. Martins

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1 Contact Information

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2 Education

Ph.D. Aeronautics and Astronautics, Stanford University, 2002

Thesis: “A Coupled-Adjoint Method for High-Fidelity Aero-Structural Optimization”

Advisors: Prof. Juan J. Alonso and Prof. Ilan M. Kroo

M.Sc. Aeronautics and Astronautics, Stanford University, 1997

Project: “Drag Reduction of Staggered Supersonic Wings” Advisor: Prof. Ilan M. Kroo

M.Eng. Aeronautics, Imperial College, London, UK, 1995

Thesis: “Self-Similar Solutions for the Plane Turbulent Jet”. Research performed in the Faculty of Aerospace Engineering at Technion — Israel Institute of Technology, Haifa, Israel

Advisors: Prof. Micha Wolfshtein and Prof. Richard Hillier

3 Professional Experience

Professor, University of Michigan, Department of Aerospace Engineering, Ann Arbor, MI, Sep 2016–present

Visiting Professor, ISAE–SUPAERO Institut Supérieur de l’Aéronautique et de l’Espace, Toulouse, France, 2015–2016.

Associate Professor, University of Michigan, Department of Aerospace Engineering, Ann Arbor, MI, Sep 2009–Aug 2016

Associate Professor, University of Toronto Institute for Aerospace Studies, Toronto, ON, Canada, Jul 2008–Aug 2009

Assistant Professor, University of Toronto Institute for Aerospace Studies, Toronto, ON, Canada, Nov 2002–Jun 2008

Teaching Assistant, Stanford University, Jan–Apr 2001

CAD Specialist, Serviços de Engenharia S.A., Macau, China, Jun–Sep 1993

Assistant Engineer, Union Bay Shipbuilding Corporation, Seattle, WA, Jun–Sep 1992

4 Academic Awards and Distinctions

- Marie Skłodowska-Curie Fellow, 2015–2016.
- Best Paper Award, *15th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Sep 2014.
- Best Paper Award, *14th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Sep 2012.
- Canada Research Chair in Multidisciplinary Design Optimization (Tier II), 2003–2009.
- Best Paper Award, *11th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Sep 2006.
- Ballhaus Prize for Best Thesis in the Department of Aeronautics, Stanford University, Jun 2003.
- Best Paper Award, *9th AIAA/ISSMO Symposium on Multidisciplinary Analysis and Optimization*, Sep 2002.
- Praxis XXI Scholarship, Sep 1997.
- US–Norway Fulbright Foundation Stipend, Sep 1996.
- British Aerospace Award, May 1995.

5 Keynote Lectures

- Keynote lecture, *Congress on Numerical Methods in Engineering*, Lisbon, Portugal, Jun 2015.
- Plenary speaker at the SIAM Conference on Optimization, San Diego, May 2014.
- Keynote address at the Aircraft Structural Design Conference, Royal Aeronautical Society, London, UK, Oct 2010.
- Plenary speaker at the *International Forum on Aeroelasticity and Structural Dynamics*, Stockholm, Jun 2007.

6 Technical Committees

- Co-organizer of the NSF Workshop: “The Future of Multidisciplinary Design Optimization: Advancing the Design of Complex Systems”, Fort Worth, TX, Sep 2010.
- Technical Co-Chair for the *12th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, Victoria, BC, Sep 2008.
- Co-organizer of the *UTIAS–MITACS International Workshop on Aviation and Climate Change*, Toronto, May 2008, May 2010, and May 2012
- Co-organizer of the *Fields Industrial Optimization Seminars*, 2008–2009.
- AIAA Multidisciplinary Design Optimization TC, 2006–present.
- Canadian Aeronautics and Space Institute Aircraft Design and Development TC, 2005–2009.

7 Editorial Boards and Reviewing Activities

- Member of the Portuguese Foundation for Science and Technology review panel, Nov 2017.
- Associate editor for the *Journal of Aircraft*, 2016–present.
- Review editor for *Structural and Multidisciplinary Optimization*, 2014–present.
- Associate editor for *Optimization and Engineering*, 2008–present.
- Associate editor for the *AIAA Journal*, 2011–2015.
- Member of the Portuguese Foundation for Science and Technology review panel for Mechanical Engineering, Mar 2008.
- Member of the National Science Foundation review panel, August 2007, and Dec 2010.
- Guest editor for a special issue of *Optimization and Engineering*, 2007.
- Associate editor for the *Canadian Aeronautics and Space Journal*, 2006–2008.
- Delegate in the Partnership Group for Science and Engineering (PAGSE) Symposium, Ottawa, Mar 2006.
- Reviewer for the Netherlands Organization for Scientific Research
- Reviewer in four NSF review panels.
- Regular reviewer for the *AIAA Journal*, *Journal of Aircraft*, *Optimization and Engineering*, and *Structural and Multidisciplinary Optimization*. Reviewed manuscripts for the following journals: *ACM Transactions on Mathematical Software*, *Automatica*, *Aerospace Science and Technology*, *Computers and Geosciences*, *International Journal of Computational Fluid Dynamics*, *Journal of Mechanical Design*, *Journal of Fluids and Structures*, *Journal of Spacecraft and Rockets*, and *SIAM Journal of Scientific Computing*.
- Regular session chair at the *AIAA Multidisciplinary Analysis and Optimization Conference*, the *World Congress on Structural and Multidisciplinary Optimization*, and the *AIAA Multidisciplinary Design Optimization Specialist Conference*. Also served as a session chair at the *International Council of the Aeronautical Sciences Congress* and the *International Forum on Aeroelasticity and Structural Dynamics*.

8 Publications

8.1 Refereed Journal Publications

- [J64] G. K. W. Kenway and J. R. R. A. Martins. Buffet Onset Constraint Formulation for Aerodynamic Shape Optimization. *AIAA Journal*, 2017. (In press).
- [J63] R. P. Liem, J. R. R. A. Martins, and G. K. Kenway. Expected Drag Minimization for Aerodynamic Design Optimization Based on Aircraft Operational Data. *Aerospace Science and Technology*, 63:344–362, April 2017. doi:10.1016/j.ast.2017.01.006.
- [J62] S. Arreckx, A. B. Lambe, J. R. R. A. Martins, and D. Orban. A Matrix-Free Augmented Lagrangian Algorithm with Application to Large-Scale Structural Design Optimization. *Optimization and Engineering*, 17(2):359–384, 2016. doi:10.1007/s11081-015-9287-9.
- [J61] T. Ashuri, J. R. R. A. Martins, M. B. Zaaijer, G. A. van Kuik, and G. J. van Bussel. Aeroservoelastic Design Definition of a 20 MW Common Research Wind Turbine Model. *Wind Energy*, 19(11), 2016. doi:10.1002/we.1970.

- [J60] T. Ashuri, M. B. Zaaijer, J. R. R. A. Martins, and J. Zhang. Multidisciplinary Design Optimization of Large Wind Turbines—Technical, Economic, and Design Challenges. *Energy Conversion and Management*, 123:56–70, September 2016. doi:10.1016/j.enconman.2016.06.004.
- [J59] S. Chen, Z. Lyu, G. K. W. Kenway, and J. R. R. A. Martins. Aerodynamic Shape Optimization of the Common Research Model Wing-Body-Tail Configuration. *Journal of Aircraft*, 53(1):276–293, January 2016. doi:10.2514/1.C033328.
- [J58] T. Dhert, T. Ashuri, and J. R. R. A. Martins. Aerodynamic Shape Optimization of Wind Turbine Blades Using a Reynolds-Averaged Navier–Stokes Model and an Adjoint Method. *Wind Energy*, 2016. doi:10.1002/we.2070.
- [J57] J. T. Hwang and J. R. R. A. Martins. An unstructured quadrilateral mesh generation algorithm for aircraft structures. *Aerospace Science and Technology*, 59:172–182, 2016. doi:10.1016/j.ast.2016.10.010.
- [J56] G. K. W. Kenway and J. R. R. A. Martins. Multipoint Aerodynamic Shape Optimization Investigations of the Common Research Model Wing. *AIAA Journal*, 54(1):113–128, January 2016. doi:10.2514/1.J054154.
- [J55] A. B. Lambe and J. R. R. A. Martins. Matrix-free aerostructural optimization of aircraft wings. *Structural and Multidisciplinary Optimization*, 53(3):589–603, March 2016. doi:10.1007/s00158-015-1349-2.
- [J54] A. B. Lambe, J. R. R. A. Martins, and G. J. Kennedy. An Evaluation of Constraint Aggregation Strategies for Wing Box Mass Minimization. *Structural and Multidisciplinary Optimization*, 2016. doi:10.1007/s00158-016-1495-1, (In press).
- [J53] N. Garg, G. K. W. Kenway, Z. Lyu, J. R. R. A. Martins, and Y. L. Young. High-fidelity Hydrodynamic Shape Optimization of a 3-D Hydrofoil. *Journal of Ship Research*, 59(4):209–226, December 2015. doi:10.5957/JOSR.59.4.150046.
- [J52] R. P. Liem, C. A. Mader, and J. R. R. A. Martins. Surrogate Models and Mixtures of Experts in Aerodynamic Performance Prediction for Aircraft Mission Analysis. *Aerospace Science and Technology*, 43:126–151, June 2015. doi:10.1016/j.ast.2015.02.019.
- [J51] R. Liem, G. K. W. Kenway, and J. R. R. A. Martins. Multimission Aircraft Fuel Burn Minimization via Multipoint Aerostructural Optimization. *AIAA Journal*, 53(1):104–122, January 2015. doi:10.2514/1.J052940.
- [J50] Z. Lyu and J. R. R. A. Martins. Aerodynamic Shape Optimization of an Adaptive Morphing Trailing Edge Wing. *Journal of Aircraft*, 52(6):1951–1970, November 2015. doi:10.2514/1.C033116.
- [J49] Z. Lyu, G. K. Kenway, and J. R. R. A. Martins. Aerodynamic Shape Optimization Investigations of the Common Research Model Wing Benchmark. *AIAA Journal*, 53(4):968–985, April 2015. doi:10.2514/1.J053318.
- [J48] T. Ashuri, M. B. Zaaijer, J. R. R. A. Martins, G. J. W. van Bussel, and G. A. M. van Kuik. Multidisciplinary Design Optimization of Offshore Wind Turbines for Minimum Levelized Cost of Energy. *Renewable Energy*, 68:893–905, August 2014. doi:10.1016/j.renene.2014.02.045.
- [J47] W. Du, N. Xue, W. Shyy, and J. R. Martins. A Surrogate-Based Multi-Scale Model for Mass Transport and Electrochemical Kinetics in Lithium-Ion Battery Electrodes. *Journal of the Electrochemical Society*, 161(8):E3086–E3096, April 2014. doi:10.1149/2.013408jes.
- [J46] A. Gogulapati, P. P. Friedmann, and J. R. R. A. Martins. Optimization of the Kinematics of a Flapping Wing MAV in Hover for Enhanced Performance. *AIAA Journal*, 52(10):2342–2354,

- October 2014. doi:10.2514/1.J053083.
- [J45] J. T. Hwang, D. Y. Lee, J. W. Cutler, and J. R. R. A. Martins. Large-Scale Multidisciplinary Optimization of a Small Satellite's Design and Operation. *Journal of Spacecraft and Rockets*, 51(5):1648–1663, September 2014. doi:10.2514/1.A32751.
- [J44] K. A. James, G. J. Kennedy, and J. R. R. A. Martins. Concurrent Aerostructural Topology Optimization of a Wing Box. *Computers and Structures*, 134:1–17, April 2014. doi:10.1016/j.compstruc.2013.12.007.
- [J43] G. J. Kennedy and J. R. R. A. Martins. A parallel aerostructural optimization framework for aircraft design studies. *Structural and Multidisciplinary Optimization*, 50(6):1079–1101, December 2014. doi:10.1007/s00158-014-1108-9.
- [J42] G. J. Kennedy and J. R. R. A. Martins. A Parallel Finite-Element Framework for Large-Scale Gradient-Based Design Optimization of High-Performance Structures. *Finite Elements in Analysis and Design*, 87:56–73, September 2014. doi:10.1016/j.finel.2014.04.011.
- [J41] G. K. W. Kenway, G. J. Kennedy, and J. R. R. A. Martins. Scalable Parallel Approach for High-Fidelity Steady-State Aeroelastic Analysis and Derivative Computations. *AIAA Journal*, 52(5):935–951, May 2014. doi:10.2514/1.J052255.
- [J40] G. K. W. Kenway and J. R. R. A. Martins. Multipoint High-Fidelity Aerostructural Optimization of a Transport Aircraft Configuration. *Journal of Aircraft*, 51(1):144–160, January 2014. doi:10.2514/1.C032150.
- [J39] Z. Lyu and J. R. R. A. Martins. Aerodynamic Design Optimization Studies of a Blended-Wing-Body Aircraft. *Journal of Aircraft*, 51(5):1604–1617, September 2014. doi:10.2514/1.C032491.
- [J38] C. A. Mader and J. R. R. A. Martins. Computing Stability Derivatives and their Gradients for Aerodynamic Shape Optimization. *AIAA Journal*, 52(11):2533–2546, November 2014. doi:10.2514/1.J052922.
- [J37] N. Xue, W. Du, T. A. Greszler, W. Shyy, and J. R. R. A. Martins. Design of a Lithium-ion Battery Pack for PHEV Using Multiple Optimization Methods. *Applied Energy*, 115:591–602, February 2014. doi:10.1016/j.apenergy.2013.10.044.
- [J36] W. Du, N. Xue, A. M. Sastry, J. R. R. A. Martins, and W. Shyy. Energy Density Comparison of Li-ion Cathode Materials using Dimensional Analysis. *Journal of The Electrochemical Society*, 160(8):A1187–A1193, May 2013. doi:10.1149/2.069308jes.
- [J35] W. Du, N. Xue, A. Gupta, A. M. Sastry, J. R. R. A. Martins, and W. Shyy. Optimization of LiMn2O4 Electrode Properties in a Gradient- and Surrogate-Based Framework. *Acta Mechanica Sinica*, 29(3):335–347, June 2013. doi:10.1007_s10409-013-0039-x.
- [J34] G. J. Kennedy and J. R. R. A. Martins. A Laminate Parametrization Technique for Discrete Ply Angle Problems with Manufacturing Constraints. *Structural and Multidisciplinary Optimization*, 48(2):379–393, August 2013. doi:10.1007/s00158-013-0906-9.
- [J33] C. A. Mader and J. R. R. A. Martins. Stability-Constrained Aerodynamic Shape Optimization of Flying Wings. *Journal of Aircraft*, 50(5):1431–1449, September 2013. doi:10.2514/1.C031956.
- [J32] J. R. R. A. Martins and A. B. Lambe. Multidisciplinary Design Optimization: A Survey of Architectures. *AIAA Journal*, 51(9):2049–2075, September 2013. doi:10.2514/1.J051895.
- [J31] J. R. R. A. Martins and J. T. Hwang. Review and Unification of Methods for Computing Derivatives of Multidisciplinary Computational Models. *AIAA Journal*, 51(11):2582–2599, November 2013. doi:10.2514/1.J052184.

- [J30] M. Nelson, D. Temple, J. T. Hwang, Y. L. Young, J. R. R. A. Martins, and M. Collette. Simultaneous Optimization of Propeller-Hull Systems to Minimize Lifetime Fuel Consumption. *Applied Ocean Research*, 43:46–52, October 2013. doi:10.1016/j.apor.2013.07.004.
- [J29] N. Xue, W. Du, A. Gupta, W. Shyy, A. M. Sastry, and J. R. R. A. Martins. Optimization of a Single Lithium-ion Battery Cell with a Gradient-based Algorithm. *Journal of the Electrochemical Society*, 160(8):A1071–A1078, May 2013. doi:10.1149/2.036308jes.
- [J28] S. Haghghat, H. H. T. Liu, and J. R. R. A. Martins. A Model-Predictive Gust Load Alleviation Controller for a Highly Flexible Aircraft. *Journal of Guidance, Control and Dynamics*, 35(6):1751–1766, November 2012. doi:10.2514/1.57013.
- [J27] S. Haghghat, J. R. R. A. Martins, and H. H. T. Liu. Aeroservoelastic Design Optimization of a Flexible Wing. *Journal of Aircraft*, 49(2):432–443, March 2012. doi:10.2514/1.C031344.
- [J26] R. P. Henderson, J. R. R. A. Martins, and R. E. Perez. Aircraft Conceptual Design for Optimal Environmental Performance. *The Aeronautical Journal*, 116(1175):1–22, Jan. 2012.
- [J25] K. A. James and J. R. R. A. Martins. An Isoparametric Approach to Level Set Topology Optimization Using a Body-Fitted Finite Element Mesh. *Computers and Structures*, 90–91:97–106, January 2012. doi:10.1016/j.compstruc.2011.10.004.
- [J24] K. A. James, E. Lee, and J. R. R. A. Martins. Stress-Based Topology Optimization Using an Isoparametric Level Set Method. *Finite Elements in Analysis and Design*, 58:20–30, October 2012. doi:10.1016/j.finel.2012.03.012.
- [J23] G. J. Kennedy and J. R. R. A. Martins. A homogenization-based theory for anisotropic beams with accurate through-section stress and strain prediction. *International Journal of Solids and Structures*, 49(1):54–72, Jan. 2012. doi:10.1016/j.ijsolstr.2011.09.012.
- [J22] A. B. Lambe and J. R. R. A. Martins. Extensions to the Design Structure Matrix for the Description of Multidisciplinary Design, Analysis, and Optimization Processes. *Structural and Multidisciplinary Optimization*, 46:273–284, August 2012. doi:10.1007/s00158-012-0763-y.
- [J21] E. Lee, K. A. James, and J. R. R. A. Martins. Stress-Constrained Topology Optimization with Design-Dependent Loading. *Structural and Multidisciplinary Optimization*, 46:647–661, November 2012. doi:10.1007/s00158-012-0780-x.
- [J20] E. Lee and J. R. R. A. Martins. Structural Topology Optimization with Design-Dependent Pressure Loads. *Computer Methods in Applied Mechanics and Engineering*, 233–236:40–48, August 2012. doi:10.1016/j.cma.2012.04.007.
- [J19] C. A. Mader and J. R. R. A. Martins. Derivatives for Time-Spectral Computational Fluid Dynamics Using an Automatic Differentiation Adjoint. *AIAA Journal*, 50(12):2809–2819, December 2012. doi:10.2514/1.J051658.
- [J18] R. E. Perez, P. W. Jansen, and J. R. R. A. Martins. pyOpt: A Python-Based Object-Oriented Framework for Nonlinear Constrained Optimization. *Structural and Multidisciplinary Optimization*, 45(1):101–118, January 2012. doi:10.1007/s00158-011-0666-3.
- [J17] G. J. Kennedy, J. S. Hansen, and J. R. R. A. Martins. A Timoshenko beam theory with pressure corrections for layered orthotropic beams. *International Journal of Solids and Structures*, 48(16-17):2373–2382, 2011. doi:10.1016/j.ijsolstr.2011.04.009.
- [J16] C. A. Mader and J. R. R. A. Martins. Computation of Aircraft Stability Derivatives Using an Automatic Differentiation Adjoint Approach. *AIAA Journal*, 49(12):2737–2750, December 2011. doi:10.2514/1.J051147.
- [J15] T. W. Simpson and J. R. R. A. Martins. Multidisciplinary Design Optimization for Complex Engineered Systems Design: Report from an NSF Workshop. *Journal of Mechanical Design*,

- 133(10):101002, Oct. 2011. doi:10.1115/1.4004465.
- [J14] Q. Thomson and J. R. R. A. Martins. Adaptive Accuracy Trust Region: Using Cross-Validation in the Optimization Process. *Engineering Optimization*, 43(6):615–633, June 2011. doi:10.1080/0305215X.2010.508521.
- [J13] P. Jansen, R. E. Perez, and J. R. R. A. Martins. Aerostructural Optimization of Nonplanar Lifting Surfaces. *Journal of Aircraft*, 47(5):1491–1503, September 2010. doi:10.2514/1.44727.
- [J12] N. P. Tedford and J. R. R. A. Martins. Benchmarking Multidisciplinary Design Optimization Algorithms. *Optimization and Engineering*, 11(1):159–183, Feb. 2010. doi:10.1007/s11081-009-9082-6.
- [J11] I. R. Chittick and J. R. R. A. Martins. An Asymmetric Suboptimization Approach to Aerostructural Optimization. *Optimization and Engineering*, 10(1):133–152, Mar. 2009. doi:10.1007/s11081-008-9046-2.
- [J10] K. James, J. S. Hansen, and J. R. R. A. Martins. Structural Topology Optimization for Multiple Load Cases Using a Dynamic Aggregation Technique. *Engineering Optimization*, 41(12):1103–1118, Dec. 2009. doi:10.1080/03052150902926827.
- [J9] J. R. R. A. Martins, C. Marriage, and N. P. Tedford. pyMDO: An Object-Oriented Framework for Multidisciplinary Design Optimization. *ACM Transactions on Mathematical Software*, 36(4):20:1–20:25, Aug. 2009. doi:10.1145/1555386.1555389.
- [J8] I. R. Chittick and J. R. R. A. Martins. Aero-Structural Optimization Using Adjoint Coupled Post-Optimality Sensitivities. *Structural and Multidisciplinary Optimization*, 36(1):59–77, July 2008. doi:10.1007/s00158-007-0200-9.
- [J7] C. A. Mader, J. R. R. A. Martins, J. J. Alonso, and E. van der Weide. ADjoint: An Approach for the Rapid Development of Discrete Adjoint Solvers. *AIAA Journal*, 46(4):863–873, Apr. 2008. doi:10.2514/1.29123.
- [J6] A. C. Marta, C. A. Mader, J. R. R. A. Martins, E. van der Weide, and J. J. Alonso. A methodology for the development of discrete adjoint solvers using automatic differentiation tools. *International Journal of Computational Fluid Dynamics*, 21(9):307–327, 2007. doi:10.1080/10618560701678647.
- [J5] N. M. K. Poon and J. R. R. A. Martins. An Adaptive Approach to Constraint Aggregation Using Adjoint Sensitivity Analysis. *Structural and Multidisciplinary Optimization*, 34(1):61–73, July 2007. doi:10.1007/s00158-006-0061-7.
- [J4] P. Thokala and J. R. R. A. Martins. Variable-complexity optimization applied to airfoil design. *Engineering Optimization*, 39(3):271–286, Apr. 2006. doi:10.1080/03052150601107976.
- [J3] J. R. R. A. Martins, J. J. Alonso, and J. J. Reuther. A Coupled-Adjoint Sensitivity Analysis Method for High-Fidelity Aero-Structural Design. *Optimization and Engineering*, 6(1):33–62, Mar. 2005. doi:10.1023/B:OPTE.0000048536.47956.62.
- [J2] J. R. R. A. Martins, J. J. Alonso, and J. J. Reuther. High-Fidelity Aerostructural Design Optimization of a Supersonic Business Jet. *Journal of Aircraft*, 41(3):523–530, May 2004. doi:10.2514/1.11478.
- [J1] J. R. R. A. Martins, P. Sturdza, and J. J. Alonso. The Complex-Step Derivative Approximation. *ACM Transactions on Mathematical Software*, 29(3):245–262, September 2003. doi:10.1145/838250.838251.

8.2 Book Chapters

- [B3] J. R. R. A. Martins. *Encyclopedia of Aerospace Engineering*, volume Green Aviation, chapter Fuel burn reduction through wing morphing, pages 1–7. Wiley, May 2016.
- [B2] J. R. R. A. Martins. *Advances and Trends in Optimization with Engineering Applications*, chapter Multidisciplinary Design Optimization of Aerospace Systems. SIAM, 2016. (In press).
- [B1] N. Xue, W. Du, J. R. R. A. Martins, and W. Shyy. *Handbook of Clean Energy Systems*, volume 5 : Energy Storage, chapter 26: Lithium-Ion Batteries: Thermo-Mechanics, Performance, and Design Optimization, pages 2849–2864. John Wiley & Sons, Ltd, 2015.

8.3 Papers in Conference Proceedings

- [C108] J. M. C. N. Bartoli, T. Lefebvre, S. Dubreuil, J. R. R. A. Martins, E. Benard, and J. Morlier. Similarity Maximization of a Scaled Aeroelastic Flight Demonstrator via Multidisciplinary Optimization. In *Proceedings of the AIAA SciTech Conference*, Grapevine, TX, January 2017. AIAA 2017-0573.
- [C107] T. R. Brooks, G. J. Kennedy, and J. R. R. A. Martins. High-fidelity Multipoint Aerostructural Optimization of a High Aspect Ratio Tow-steered Composite Wing. In *Proceedings of the 58th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, AIAA SciTech Forum*, Grapevine, TX, January 2017.
- [C106] J. Gray, C. A. Mader, G. K. W. Kenway, , and J. R. R. A. Martins. Approach to Modeling Boundary Layer Ingestion using a Fully Coupled Propulsion-RANS Model. In *55th AIAA Aerospace Sciences Meeting (SciTech)*, Grapevine, TX, January 2017.
- [C105] G. K. W. Kenway, N. Secco, J. R. R. A. Martins, A. Mishra, and K. Duraisamy. An Efficient Parallel Overset Method for Aerodynamic Shape Optimization. In *Proceedings of the 58th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, AIAA SciTech Forum*, Grapevine, TX, January 2017.
- [C104] S. Roy, K. Moore, J. T. Hwang, J. S. Gray, W. A. Crossley, and J. R. R. A. Martins. A Mixed Integer Efficient Global Optimization Algorithm for the Simultaneous Aircraft Allocation-Mission-Design Problem. In *Proceedings of the AIAA Science and Technology Forum and Exposition (SciTech)*, Grapevine, TX, January 2017. AIAA 2017-1305.
- [C103] T. R. Brooks, G. J. Kennedy, and J. R. R. A. Martins. High-fidelity Aerostructural Optimization of a High Aspect Ratio Tow-steered Wing. In *57th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference*. American Institute of Aeronautics and Astronautics, January 2016.
- [C102] D. A. Burdette, G. K. Kenway, and J. R. R. A. Martins. Performance Evaluation of a Morphing Trailing Edge Using Multipoint Aerostructural Design Optimization. In *57th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference*. American Institute of Aeronautics and Astronautics, January 2016.
- [C101] D. A. Burdette, G. K. W. Kenway, and J. R. R. A. Martins. Aerostructural design optimization of a continuous morphing trailing edge aircraft for improved mission performance. In *17th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference*, June 2016.
- [C100] N. Garg, G. K. W. Kenway, J. R. R. A. Martins, and Y. L. Young. High-fidelity Coupled Hydrostructural Optimization of a 3-D Hydrofoil. *International Symposium on Transport Phenomena and Dynamics of Rotating Machinery*, April 2016.
- [C99] J. S. Gray, J. Chin, T. Hearn, E. S. Hendricks, T. M. Lavelle, and J. R. R. A. Martins.

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- [R12] G. K. W. Kenway and J. R. R. A. Martins. AIAA ADODG Case 5: CRM Wing-Body-Tail Optimization at Flight Reynolds Number. Technical report, AIAA, May 2015.
- [R11] G. K. W. Kenway and J. R. R. A. Martins. Aerostructural Analysis of the Airbus XRF1 Aircraft Configuration. Technical report, Multidisciplinary Design Optimization Laboratory, University of Michigan, May 2015.
- [R10] G. J. Kennedy, G. K. Kenway, and J. R. R. A. Martins. A Comparison of Metallic, Composite and Nanocomposite Optimal Transonic Transport Wings. Technical report, NASA, March 2014. CR-2014-218185.
- [R9] T. Simpson and J. R. R. A. Martins. The Future of Multidisciplinary Design Optimization: Advancing the Design of Complex Engineered Systems. NSF workshop report, NSF, September 2010.
- [R8] G. K. W. Kenway and J. R. R. A. Martins. Aerodynamic Design of a 10 kW Vertical Axis Wind Turbine. Technical report, University of Toronto Institute for Aerospace Studies, January 2009.
- [R7] P. Jansen and J. R. R. A. Martins. Vale Experimental Towed Platform—Aerodynamic Shell Design. Technical report, Vale Exploration Canada, May 2008.
- [R6] J. R. R. A. Martins. A Review of a Wind Tunnel Test Report. Technical report, Ontario Human Rights Commission, August 2007.
- [R5] J. R. R. A. Martins. C-Class Airfoil Analysis, Part 1. Technical report, University of Toronto Institute for Aerospace Studies, February 2005.
- [R4] J. R. R. A. Martins. C-Class Airfoil Analysis, Part 2. Technical report, University of Toronto Institute for Aerospace Studies, March 2005.

- [R3] J. R. R. A. Martins. Drag Reduction of Staggered Supersonic Wings. Technical report, Stanford University, June 1997.
- [R2] J. R. R. A. Martins. Self-Similar Solutions for the Plane Turbulent Jet. TAE no. 750, Faculty of Aerospace Engineering, Technion – Israel Institute of Technology, Haifa, Israel, June 1995.
- [R1] J. R. R. A. Martins. Front Fuselage Structure of an Advanced Air Superiority Fighter. Technical report, Department of Aeronautics, Imperial College, London, UK, May 1994.

9 Invited Presentations

- [I87] *Multidisciplinary Design Optimization of Aircraft Configurations. Part 1: A modular coupled adjoint approach*, von Karman Institute Lecture Series, Brussels, Belgium, May 2016.
- [I86] *Multidisciplinary Design Optimization of Aircraft Configurations. Part 2: High-fidelity aerostuructural optimization*, von Karman Institute Lecture Series, Brussels, Belgium, May 2016.
- [I85] *Optimisation numérique de la conception d'une aile d'avion: Rêve ou réalité?*, ENSEEIHT, Toulouse, France, May 2016.
- [I84] *Optimisation numérique de la conception d'une aile d'avion: Rêve ou réalité?*, ONERA Fluid Mechanics and Energetics Branch, Paris, France, Mar 2016.
- [I83] *Multidisciplinary design optimization (MDO): Theory and applications*, Red Cedar Workshop, East Lansing, MI, Feb 2016
- [I82] *Multidisciplinary design optimization (MDO): A new scalable and modular approach*, ROMA Seminar, ISAE, Toulouse, France, Jan 2016.
- [I81] *A Very Short Course on Multidisciplinary Design Optimization*, ISAE, Toulouse, France, Mar 2016.
- [I80] *High-Fidelity Multidisciplinary Design Optimization*, Airbus Technical Workshop, Airbus, Filton, UK, Dec 2015.
- [I79] *Practical wing design via numerical optimization: Are we there yet?*, University of Bristol, UK, Dec 2015.
- [I78] *Optimisation numérique de la conception d'une aile d'avion: Rêve ou réalité?*, Institut Clément Ader, Toulouse, France, Nov 2015.
- [I77] *Wing design via numerical optimization: Are we there yet?*, ONERA AGILE Workshop, Toulouse, Dec 2015.
- [I76] *Optimisation numérique de la conception d'une aile d'avion: Rêve ou réalité?*, Dassault Aviation, Paris, France, Oct 2015.
- [I75] *Optimisation numérique de la conception d'une aile d'avion: Rêve ou réalité?*, École Polytechnique, Paliseau, France, Oct 2015.
- [I74] *Optimisation numérique de la conception d'une aile d'avion: Rêve ou réalité?*, Séminaire DAEP, ISAE, Toulouse, France, Oct 2015.
- [I73] *High-Fidelity Multidisciplinary Design Optimization for the Next-Generation of Commercial Transport Aircraft*, AMEDEO ESR Training Course, ONERA, Paris, France, Oct 2015.
- [I72] *High-Fidelity Multidisciplinary Design Optimization for the Next Generation of Aircraft*, Congress on Numerical Methods in Engineering, Lisbon, Portugal, Jul 2015.

- [I71] *Wing Design via Numerical Optimization—Are we there yet?*, Lehigh University, May 2015.
- [I70] *High-Fidelity Multidisciplinary Design Optimization*, Boeing, Huntington Beach, May 2015.
- [I69] *High-Fidelity Aerostructural Optimization for the Next Generation of Aircraft*, Altair Symposium, Ann Arbor, MI, Apr 2015.
- [I68] *Wing Design via Numerical Optimization—Are we there yet?*, Politecnico di Torino, Turin, Italy, Mar 2015.
- [I67] *Aerodynamic and Aerostructural Wing Design Optimization*, AIAA Aerodynamic Technical Working Group, Kissimmee, FL, Jan 2015.
- [I66] *Next-generation computational tools for airframe analysis and design*, Boeing, Huntington Beach, Dec 2014.
- [I65] *Wing Design via Numerical Optimization: Are we there yet?*, Bombardier Aerospace, Montreal, Canada, Oct 2014.
- [I64] *Wing Design via Numerical Optimization: Are we there yet?*, McGill University, Montreal, Canada, Oct 2014.
- [I63] *CFD-Based Aerodynamic Shape Optimization for Aircraft Design*, CFD Summer School, Tsinghua University, Beijing, China, Jul 2014.
- [I62] *Large-Scale Optimization of Multidisciplinary Engineering Systems*, SIAM Conference on Optimization, San Diego, May 2014.
- [I61] *High-Fidelity Multidisciplinary Design Optimization for Aerospace Systems*, ATA Engineering, Poway, CA, May 2014.
- [I60] *Wing Design via Numerical Optimization: Are We There Yet?*, Massachusetts Institute of Technology, Boston, MA, Apr 2014.
- [I59] *Multidisciplinary Design Optimization of Aircraft Configurations*, Massachusetts Institute of Technology, Invited lecture for 16.888/ESD.77 Multidisciplinary System Design Optimization, Department of Aeronautics and Astronautics, Apr 2014, Boston, MA.
- [I58] *High-Fidelity Wing Design Optimization*, Aurora Flight Sciences, Cambridge, MA, Apr 2014.
- [I57] *Design Optimization of the CADRE CubeSat using OpenMDAO*, NASA Glenn Research Center, OH, Apr 2014.
- [I56] *High-Fidelity Aerostructural Design Optimization of High Aspect Ratio Wings*, NASA Langley Research Center, VA, Apr 2014.
- [I55] *Design Optimization of the CADRE CubeSat using OpenMDAO*, NASA Glenn Research Center, OH, Apr 2014.
- [I54] *Aerodynamic Shape Optimization of a Morphing Wing*, NASA Langley Research Center, VA, Apr 2014.
- [I53] *Towards Optimal Aeroelastic Tailoring of Wind Turbine Blades*, NTNU, Trondheim, Norway, Oct 2013.
- [I52] *Optimal Aeroelastic Tailoring of Composite Wings*, Composites 2013, IV ECCOMAS Conference on the Mechanical Response of Composites, Ponta Delgada, Portugal, Sep 2013.
- [I51] *A Matrix-Free Approach to Large-Scale Nonlinear Constrained Optimization*, 4th International Conference on Continuous Optimization, Caparica, Portugal, Jul 2013.

- [I50] *Towards Practical High-Fidelity Aerostructural Optimization*, Research Consortium for Multidisciplinary System Design Workshop, Stanford University, Department of Aeronautics and Astronautics, Jul 2013.
- [I49] *High-Fidelity Multidisciplinary Design Optimization for the Next Generation of Aircraft*, Airbus, Toulouse, France, Jun 2013.
- [I48] *High-Fidelity Multidisciplinary Design Optimization for the Next Generation of Aircraft*, University of São Paulo, Brazil, Apr 2013.
- [I47] *High-Fidelity Aerostructural Design Optimization of Commercial Transport Aircraft*, Boeing Tech Splash (remote presentation), Apr 2013.
- [I46] *An Overview of MDO for Aircraft Configurations*, MSTC/AFOSR Multi-Fidelity Analysis for Aerospace Vehicle Design TIM Dayton, OH, Feb 2013
- [I45] *Towards Optimal Aeroelastic Tailoring of Wind Turbine Blades*, 2nd NREL Systems Engineering Workshop, Boulder, CO, Jan 2013
- [I44] *A Comparison of Metallic versus Composite Wings using Aerostructural Design Optimization*, Carbon Fiber Conference, La Jolla, CA, Dec 2012
- [I43] *An Overview of Tools and Methods for the MDO of Aircraft Configurations*, NASA Langley Research Center, Hampton, VA, Nov 2012
- [I42] *High-Fidelity Multidisciplinary Design Optimization for the Next Generation of Aircraft*, University of Illinois Urbana-Champaign, IL, Oct 2012
- [I41] *High-Fidelity Multidisciplinary Design Optimization of Aircraft Configurations*, University of Michigan AE585 Seminar, Sep 2012
- [I40] *Optimal Aeroelastic Tailoring of Aircraft Wings Using a Coupled Adjoint Method*, ANSYS Inc., Lebanon, NH, Aug 2012
- [I39] *High-Fidelity Multidisciplinary Design Optimization of Aircraft Configurations*, Lockheed Martin, Palmdale, CA, Aug 2012
- [I38] *High-Fidelity Optimal Aeroelastic Tailoring of Highly Flexible Wings... and some other stuff*, MDO Consortium Workshop, Purdue University, Jul 2012
- [I37] *High-Fidelity Optimal Aeroelastic Tailoring of Highly Flexible Wings*, Boeing Development Center, Tukwila, WA, Jul 2012
- [I36] *Geometry-Centric MDAO of Aircraft Configurations with High-Fidelity*, NASA Glenn Research Center, Cleveland, OH, Jul 2012
- [I35] *High-Fidelity Optimal Aeroelastic Tailoring of Highly Flexible Wings*, Embraer, São José dos Campos, Brazil, Jul 2012
- [I34] *A Short Course on Multidisciplinary Design Optimization*, Embraer, São José dos Campos, Brazil, Jul 2012 (3 day course)
- [I33] *High-Fidelity Optimal Aeroelastic Tailoring of Highly Flexible Wings*, FlexSys Inc, Ann Arbor, MI, Jul 2012
- [I32] *High-Fidelity Aerostructural Optimization Tools for Future Aircraft Design*, 3rd International Workshop on Aviation and Climate Change, University of Toronto, Canada, May 2012
- [I31] *Multidisciplinary Design Optimization: An Introduction for Applied Mathematicians*, École Polytechnique de Montréal, Nov 2011.

- [I30] *High-Fidelity Multidisciplinary Design Optimization for the Next Generation of Aircraft*, TU Delft, Netherlands, Oct 2011.
- [I29] *Multidisciplinary Design Optimization*, Forum and Symposium on Digital Fabrication (remote presentation), Lima, Peru, Aug 18, 2011.
- [I28] *Aircraft Design Optimization for Minimum Environmental Impact*, Upper Michigan Green A Coalition Conference, Escanaba, MI, Jun 2011.
- [I27] *Multidisciplinary Design Optimization: Theory and Applications*, tutorial for the Optimization Days conference, Montréal, Canada, May 2011.
- [I26] *High-Fidelity Multidisciplinary Design Optimization of Aircraft Configurations*, Bombardier Aerospace, Dorval, QC, Canada, March 2011.
- [I25] *High-Fidelity Multidisciplinary Design Optimization for the Next Generation of Aircraft*, *Aircraft Structural Design Conference*, Royal Aeronautical Society, London, UK, October 2010 (Keynote address).
- [I24] *Multidisciplinary Design Optimization of Aircraft Configurations*, Deutsches Zentrum für Luft- und Raumfahrt (DLR), Braunschweig, Germany, August 2010.
- [I23] *ADjoint: An Approach for the Rapid Development of Discrete Adjoint Solvers*, Deutsches Zentrum für Luft- und Raumfahrt (DLR), Braunschweig, Germany, August 2010.
- [I22] *High-Fidelity MDO for Aircraft Design*, Research Consortium for Multidisciplinary System Design Workshop, Massachusetts Institute of Technology, Department of Aeronautics and Astronautics, July, 2010.
- [I21] *A Short Course on Multidisciplinary Design Optimization*, Portuguese Air Force Academy, Sintra, Portugal, May 2010 (2 day short course).
- [I20] *Multidisciplinary Design Optimization of Aircraft Configurations*, NASA Glenn Research Center, March 2010.
- [I19] *Architectures for Multidisciplinary Design Optimization*, Research Consortium for Multidisciplinary System Design Workshop, Stanford University, Department of Aeronautics and Astronautics, June 2009.
- [I18] *Aerostructural Shape Optimization of Wind Turbine Blades Considering Site-Specific Winds*, The New Zealand Institute of Mathematics and its Applications, New Zealand, February 2009.
- [I17] *High-Fidelity MDO of Aircraft Configurations*, TU Delft, Netherlands, August 2008.
- [I16] *Adjoint Methods for High-Fidelity Aerostructural Design Optimization*, Imperial College, London, UK, August 2008.
- [I15] *MDO Approaches and Frameworks*, Research Consortium for Multidisciplinary System Design Workshop, Massachusetts Institute of Technology, Department of Aeronautics and Astronautics, July, 2008.
- [I14] *On Multidisciplinary Design Optimization: Theory and Algorithms*, Massachusetts Institute of Technology, Department of Aeronautics and Astronautics, April, 2008.
- [I13] *A Framework for Automatic Implementation of MDO Architectures*, 6th International Congress on Industrial and Applied Mathematics, Zürich, July 2007.
- [I12] *An Object-Oriented Framework for Multidisciplinary Design Optimization*, Sandia National Laboratories, Albuquerque, NM, July 2007.

- [I11] *Methods for High-Fidelity Multidisciplinary Design Optimization*, Research Consortium for Multidisciplinary System Design Workshop, Stanford University, CA, July 2007.
- [I10] *Multidisciplinary Methods for High-Fidelity Aero-Structural Optimization*, International Forum on Aeroelasticity and Structural Dynamics, Stockholm, June 2007 (Plenary session).
- [I9] *A Short Course on Multidisciplinary Optimization*, 5th Annual Conference of the CFD Society of Canada, Toronto, May 2007 (1 day course).
- [I8] *Multidisciplinary Optimization: Current Status and Future Directions*, Optimization in Engineering Workshop, Banff International Research Station, November 2006.
- [I7] *High-Fidelity MDO of Aircraft Configurations*, Airbus, Toulouse, December 2006.
- [I6] *High-Fidelity MDO of Aircraft Configurations*, Bombardier Aerospace, Montréal, March 2006.
- [I5] *Aero-Structural Wing Design Using Coupled Sensitivity Analysis*, The Fields Institute, Toronto, December 2004.
- [I4] *High-Fidelity Aero-Structural Design Optimization of Aircraft Configurations*, University of Minnesota, Aerospace Engineering and Mechanics Department, May 2004.
- [I3] *High-Fidelity Aero-Structural Optimization of Aircraft Configurations*, Massachusetts Institute of Technology, Department of Aeronautics and Astronautics, April 2004.
- [I2] *The Complex-Step Derivative Approximation*, Lawrence Livermore National Laboratory, Livermore, CA, August 2001.
- [I1] *The Complex-Step Derivative Approximation*, Sandia National Laboratories, Albuquerque, NM, March 2001.

10 Teaching Experience

10.1 AER501: Advanced Mechanics of Structures

Description: This is a 4th year undergraduate course that is also open to graduate students. I completely redesigned this course when I started teaching it. It was part of a plan to modernize the 3rd and 4th year structural mechanics curriculum by introducing the finite-element method and structural optimization.

Terms taught: Winter 2003, Fall 2003, Fall 2004, Fall 2005, Fall 2006, Fall 2007, Fall 2008

10.2 AER406: Aircraft Design

Description: This is a senior year undergraduate class whose material is geared towards designing, building and flying electric UAVs. The final evaluation of the projects is based on presentations, a report, and a flight test. The course material consists on a review of aerodynamics, structures, propulsion, and stability and control, in a design oriented context.

Terms Taught: Winter 2008, Winter 2009

10.3 AER1415: Optimization Concepts and Applications

Description: This is a graduate course that I developed. The course covers a broad range optimization algorithms that includes not only gradient-based algorithms, but also genetic algorithms and other gradient-free methods. Sensitivity analysis methods are also taught.

Multidisciplinary optimization (MDO) is taught towards the end of the course, which incorporates my latest research and culminates with an assignment involving a simplified aircraft MDO problem.

Terms Taught: Winter 2004, Fall 2004, Fall 2005, Fall 2006, Winter 2008, Fall 2008

10.4 AE588: Multidisciplinary Design Optimization

Description: This is a graduate course based on the AER1415 described above. The computational assignments were modified to include an aircraft design problem that illustrates the material in the various chapters.

Terms Taught: Winter 2010, Winter 2011, Winter 2012, Winter 2014, Winter 2017

10.5 AE481: Aircraft Design

Description: This is an undergraduate capstone course that consists in performing a design project. In the two years that I have taught this course, I have focused on environmentally friendly airliner projects.

Terms Taught: Fall 2009, Fall 2010, Fall 2011, Fall 2012, Fall 2013, Fall 2014, Fall 2016

10.6 AE510: Finite Elements I

Description: This is a graduate course on structural finite elements.

Terms Taught: Winter 2013, Winter 2015

11 Memberships in Professional Societies

- AIAA Lifetime Associate Fellow
- Royal Aeronautical Society
- Society for Industrial and Applied Mathematics