Alexandre **Martin**, PhD, PE

Assistant Professor

Selected Publications

Publications in Refereed Journals

— In Print —

[16] Martin, A. and Boyd, I. D., "Strongly coupled computation of material response and nonequilibrium flow for hypersonic ablation," *Journal of Spacecraft and Rockets*, vol. 52, no. 1, 2015. DOI: 10.2514/1.A32847.

[15] Martin, A., Boyd, I. D., Cozmuta, I., and Wright, M. J., "Kinetic rates for gas phase chemistry of phenolic based carbon ablator decomposition in atmospheric air," *Journal of Thermophysics and Heat Transfer*, 2015. DOI: 10.2514/1.T4184.

[14] Nouri, N. and Martin, A., "Three-dimensional radiation heat transfer model for carbon fiber preforms," *International Journal of Heat and Mass Transfer*, vol. 83, pp. 629–635, 2015. DOI: 10.1016/j.ijheatmasstransfer.2014.12.041.

[13] Weng, H., Bailey, S. C. C., and Martin, A., "Numerical study of geometrical effects on charring ablative arc-jet samples," *International Journal of Heat and Mass Transfer*, vol. 80, pp. 570–596, 2015. DOI: 10.1016/j.ijheatmasstransfer.2014.09.040.

[12] Alkandry, H., Boyd, I. D., and Martin, A., "Comparison of models for mixture transport properties for flow field simulations of ablative heat-shields," *Journal of Thermophysics and Heat Transfer*, vol. 28, no. 4, pp. 569–582, 2014. DOI: 10.2514/1.T4233.

[11] Miller, M. A., Martin, A., and Bailey, S. C. C., "Investigation of the scaling of roughness and blowing effects on turbulent channel flow.," *Experiments in Fluids*, vol. 55, no. 2, pp. 1–11, 2014, Article: 1675. DOI: 10.1007/s00348-014-1675-y.

[10] Panerai, F., Martin, A., Mansour, N. N., Sepka, S. A., and Lachaud, J., "Flow-tube oxidation experiments on the carbon preform of PICA," *Journal of Thermophysics and Heat Transfer*, vol. 27, no. 2, pp. 181–190, 2014. DOI: 10.2514/1.T4265.

[9] Weng, H. and Martin, A., "Multidimensional modeling of pyrolysis gas transport inside charring ablative materials," *Journal of Thermophysics and Heat Transfer*, vol. 28, no. 4, pp. 583–597, 2014. DOI: 10.2514/1.T4434.

[8] Boyd, I. D., Martin, A., Wiebenga, J. E., and Jenniskens, P., "Hypersonic flow and radiation analysis of the Automated Transfer Vehicle "Jules Verne"," *Journal of Spacecraft and Rockets*, vol. 50, no. 1, pp. 124–136, 2013. DOI: 10.2514/1.A32208.

[7] Farbar, E. D., Boyd, I. D., and Martin, A., "Numerical prediction of hypersonic flow fields including effects of electron translational nonequilibrium," *Journal of Thermophysics and Heat Transfer*, vol. 27, no. 4, pp. 593–606, 2013. DOI: 10.2514/1.T3963.

[6] Martin, A., Scalabrin, L. C., and Boyd, I. D., "High performance modeling of an atmospheric re-entry vehicles," *Journal of Physics: Conference Series*, vol. 341, no. 1, 2012, Article 012002. DOI: 10.1088/1742-6596/341/1/012002.

[5] Martin, A. and Boyd, I. D., "Non-Darcian behavior of pyrolysis gas in a thermal protection system," *Journal of Thermophysics and Heat Transfer*, vol. 24, no. 1, pp. 60–68, 2010. DOI: 10.2514/1.44103.

[4] Martin, A. and Boyd, I. D., "Variant of the Thomas algorithm for opposed-border tridiagonal systems of linear equations," *International Journal for Numerical Methods in Biomedical Engineering*, vol. 26, no. 6, pp. 752–759, 2008. DOI: 10.1002/cnm.1172.

[3] Martin, A., Reggio, M., and Trépanier, J.-Y., "Numerical solution of axisymmetric multi-species compressible gas flow: towards improved circuit breaker simulation," *International Journal of Computational Fluid Dynamics*, vol. 22, no. 4, pp. 259–271, 2008. DOI: 10. 1080/10618560701868503.

[2] Martin, A., Reggio, M., Trepanier, J.-Y., and Guo, X., "Transient ablation regime in circuit breakers," *Plasma Science and Technology*, vol. 9, no. 6, pp. 653–656, 2007. DOI: 10.1088/1009−0630/9/6/02.

[1] Maruzewski, P., Martin, A., Reggio, M., and Trépanier, J.-Y., "Simulation of arc-electrode interaction using sheath modeling in SF_6 circuit-breakers," *Journal of Physics D: Applied Physics*, vol. 35, no. 9, pp. 891–899, 2002. DOI: 10.1088/0022−3727/35/9/309.

— In Press —

[1] Weng, H. and Martin, A., "Numerical investigation of pyrolysis gas blowing pattern and thermal response using orthotropic charring ablative material," *Journal of Thermophysics and Heat Transfer*, 2015, In Press (Manuscript ID 2014-09-T4576). DOI: 10.2514/1. T4576.

— In Revision —

[2] Davuluri, R., Zhang, H., and Martin, A., "Numerical study of spallation phenomenon in an arc-jet environment," *Journal of Thermophysics and Heat Transfer*, 2014, In Revision (Manuscript ID 2014-09-T4586). DOI: 10.2514/1.T4586.

[1] Martin, A. and Boyd, I. D., "Modeling of heat transfer attenuation by ablative gases during the stardust re-entry," *Journal of Thermophysics and Heat Transfer*, 2014, In Revision (Manuscript ID 2013-06-T4202). DOI: 10.2514/3.T4202.

Full Length Articles in Refereed Conference Proceedings

[36] Omidy, A. D., Smith, D. L., Panerai, F., Lachaud, J. R., White, T. R., Mansour, N. N., and Martin, A., "In-depth thermal conductivity effect due to water containment within charring ablators," in *45th AIAA Thermophysics Conference*, AIAA Paper 2015-xxx, Submitted (Manuscript ID 2147147), Dallas, TX, 2015.

[35] Smith, D. L., Omidy, A. D., White, T. R., and Martin, A., "Effects of water presence on low temperature phenomenon in pica," in *45th AIAA Thermophysics Conference*, AIAA Paper 2015-xxx, Submitted (Manuscript ID 2150042), Dallas, TX, 2015.

[34] Smith, D. L., White, T. R., and Martin, A., "Statistics on fiat conduction modeling for medli arc jet testing," in *45th AIAA Thermophysics Conference*, AIAA Paper 2015-xxx, Submitted (Manuscript ID 2149970), Dallas, TX, 2015.

[33] Weng, H. and Martin, A., "Numerical investigation of geometric effects of stardust return capsule heat shield," in *53rd AIAA Aerospace Sciences Meeting*, AIAA Paper 2015-0211, Kissimmee, FL, 2015. DOI: 10.2514/6.2015−0211.

[32] Davuluri, R. and Martin, A., "Numerical study of spallation phenomenon in an arc-jet environment," in *11th AIAA/ASME Joint Thermophysics and Heat Transfer Conference*, AIAA Paper 2014-2249, Atlanta, GA, 2014. DOI: 10.2514/6.2014−2249.

[31] Panerai, F., Lachaud, J., Mansour, N., and Martin, A., "Numerical and experimental study of carbon fiber oxidation," in *52nd AIAA Aerospace Sciences Meeting*, AIAA Paper 2014-1208, National Harbor, MD, 2014. DOI: 10.2514/6.2014−1208.

[30] Weng, H. and Martin, A., "Numerical investigation of pyrolysis gas blowing pattern and thermal response using orthotropic charring ablative material," in *11th AIAA/ASME Joint Thermophysics and Heat Transfer Conference*, AIAA Paper 2014-2121, Atlanta, GA, 2014. DOI: 10.2514/6.2014-2121.

[29] Zhang, H., Weng, H., and Martin, A., "Simulation of flow-tube oxidation on the carbon preform of pica," in *52nd AIAA Aerospace Sciences Meeting*, AIAA Paper 2014-1209, National Harbor, MD, 2014. DOI: 10.2514/6.2014-1209.

[28] Alkandry, H., Boyd, I. D., and Martin, A., "Comparison of models for mixture transport properties for numerical simulations of ablative heat-shields," in *51st AIAA Aerospace Sciences Meeting*, AIAA Paper 2013-0303, Grapevine, TX, 2013. DOI: 10.2514/6.2013-303.

[27] Alkandry, H., Boyd, I. D., and Martin, A., "Coupled flow field simulations of charring ablators with nonequilibrium surface chemistry," in *44th AIAA Thermophysics Conference*, AIAA Paper 2013-2634, San Diego, CA, 2013. DOI: 10.2514/6.2013-2634.

[26] Mansour, N. N., Panerai, F., Martin, A., Parkinson, D. Y., MacDowell, A., Haboub, A., Sandstrom, T. A., Fast, T., Vignoles, G. L., and Lachaud, J., "A new approach to light-weight ablators analysis: from micro-tomography measurements to statical analysis and modeling," in *44th AIAA Thermophysics Conference*, AIAA Paper 2013-2768, San Diego, CA, 2013, pp. 1–11. DOI: 10.2514/6.2013-2768.

[25] Martin, A., "Modeling of chemical non equilibrium effects in a charring ablator," in *51st AIAA Aerospace Sciences Meeting*, AIAA Paper 2013-0301, Grapevine, TX, 2013. DOI: 10.2514/6.2013-301.

[24] Martin, A., "Volume averaged modeling of the oxidation of porous carbon fiber material," in *44th AIAA Thermophysics Conference*, AIAA Paper 2013-2636, San Diego, CA, 2013. DOI: 10.2514/6.2013-2636.

[23] Miller, M. A., Bailey, S. C. C., and Martin, A., "Investigation of turbulent structure modification by momentum injection into turbulent flow over a rough surface," in *51st AIAA Aerospace Sciences Meeting*, AIAA Paper 2013-534, Grapevine, TX, 2013. DOI: 10.2514/6.2013-534.

[22] Miller, M. A., Martin, A., and Bailey, S. C. C., "Experimental investigation of blowing effects on turbulent flow over a rough surface," in *8th International Symposium on Turbulence and Shear Flow Phenomena*, Poitiers, France, 2013.

[21] Panerai, F., Martin, A., Mansour, N. N., Sepka, S. A., and Lachaud, J., "Flow-tube oxidation experiments on the carbon preform of pica," in *44th AIAA Thermophysics Conference*, AIAA Paper 2013-2769, San Diego, CA, 2013. DOI: 10.2514/6.2013-2769.

[20] Weng, H. and Martin, A., "Multi-dimensional modeling pyrolysis gas flow inside charring ablators," in *44th AIAA Thermophysics Conference*, AIAA Paper 2013-2635, San Diego, CA, 2013. DOI: 10.2514/6.2013-2635.

[19] Farbar, E. D., Boyd, I. D., and Martin, A., "Modeling ablation of charring heat shield materials for non-continuum hypersonic flow," in *50th AIAA Aerospace Sciences Meeting and Exhibit*, AIAA Paper 2012-0532, Nashville, TN, 2012. DOI: 10.2514/6.2012-532.

[18] Khan, O. U. and Martin, A., "Effect of applied magnetic field on shock boundary layer interaction," in *50th AIAA Aerospace Sciences Meeting*, AIAA Paper 2012-0355, Nashville, TN, 2012. DOI: 10.2514/6.2012-355.

[17] Martin, A. and Boyd, I. D., "Modeling of heat transfer attenuation by ablative gases during stardust re-entry," in *50th AIAA Aerospace Sciences Meeting*, AIAA Paper 2012-0814, Nashville, TN, 2012. DOI: 10.2514/6.2012-814.

[16] Weng, H., Martin, A., Khan, O. U., and Zhang, H., "Multi-dimensional modeling of charring ablators," in *43rd AIAA Thermophysics Conference*, AIAA Paper 2012-2748, New Orleans, LA, 2012. DOI: 10.2514/6.2012-2748.

[15] Farbar, E. D., Boyd, I. D., Kim, M., and Martin, A., "Investigation of the effects of electronic-electron translational nonequilibrium on numerical predictions of hypersonic flowfields," in *42nd AIAA Thermophysics Conference*, AIAA Paper 2011-3136, Honolulu, HI, 2011. DOI: 10.2514/6.2011-3136.

[14] Martin, A. and Boyd, I. D., "CFD implementation of a novel carbon-phenolic-in-air chemistry model for atmospheric re-entry," in *49th AIAA Aerospace Sciences Meeting and Exhibit*, AIAA Paper 2011-143, Orlando, FL, 2011. DOI: 10.2514/6.2011-143.

[13] Martin, A., Farbar, E. D., and Boyd, I. D., "Numerical modeling of the CN spectral emission of the stardust re-entry vehicle," in *42nd AIAA Thermophysics Conference*, AIAA Paper 2011-3125, Honolulu, HI, 2011. DOI: 10.2514/6.2011-3125.

[12] Martin, A. and Boyd, I. D., "Assessment of carbon-phenolic-in-air chemistry models for atmospheric re-entry," in *10th AIAA/ASME Joint Thermophysics and Heat Transfer Conference*, AIAA Paper 2010-4656, Chicago, IL, 2010. DOI: 10.2514/6.2010-4656.

[11] Martin, A. and Boyd, I. D., "Mesh tailoring for strongly coupled computation of ablative material in nonequilibrium hypersonic flow," in *10th AIAA/ASME Joint Thermophysics and Heat Transfer Conference*, AIAA Paper 2010-5062, Chicago, IL, 2010. DOI: 10.2514/6.2010-5062.

[10] Martin, A., Boyd, I. D., Cozmuta, I., and Wright, M. J., "Chemistry model for ablating carbon-phenolic material during atmospheric re-entry," in *48th AIAA Aerospace Sciences Meeting and Exhibit*, AIAA Paper 2010-1175, Orlando, FL, 2010. DOI: 10.2514/6.2010-1175.

[9] Martin, A. and Boyd, I. D., "Implicit implementation of material response and moving meshes for hypersonic re-entry ablation," in *47th AIAA Aerospace Sciences Meeting and Exhibit*, AIAA Paper 2009-0670, Orlando, FL, 2009. DOI: 10.2514/6.2009-670.

[8] Martin, A. and Boyd, I. D., "Strongly coupled computation of material response and nonequilibrium flow for hypersonic ablation," in *41th AIAA Thermophysics Conference*, AIAA Paper 2009-3597, San Antonio, TX, 2009. DOI: 10.2514/6.2009-3597.

[7] Martin, A. and Boyd, I. D., "Simulation of pyrolysis gas within a thermal protection system," in *40th AIAA Thermophysics Conference*, AIAA Paper 2008-3805, Seattle, WA, 2008. DOI: 10.2514/6.2008-3805.

[6] Martin, A., Reggio, M., Trepanier, J.-Y., and Guo, X., "Transient ablation regime in circuit-breakers," in *XVI International Conference on Gas Discharges and their Applications*, Xi'an, People's Republic of China, 2006.

[5] Martin, A., Reggio, M., and Trépanier, J.-Y., "Solution of multi-species real gas flows with electric arc and wall ablation," in *12th Annual Conference of the CFD Society of Canada*, National Research Council Canada, Ottawa, Canada, 2004.

[4] Martin, A., Reggio, M., and Trepanier, J.-Y., "Simulation of multi-species gas flows in circuit-breakers with arc-wall interactions," in *XV International Conference on Gas Discharges and their Applications*, Toulouse, France, 2004, pp. 33–36.

[3] Martin, A., Reggio, M., and Trépanier, J.-Y., "Simulation of inviscid multi-species plasma flow," in *Computational Technologies for Fluid/Thermal/Structural/Chemical Systems with Industrial Applications, Volume 1*, Paper No. PVP2002-1546, Pressure Vessel and Piping Division, ASME, Vancouver, BC, 2002, pp. 147–154. DOI: 10.1115/PVP2002-1546.

[2] Martin, A., Reggio, M., and Trépanier, J.-Y., "Simulation of inviscid multi-species plasma flow," in *9th Annual Conference of the CFD Society of Canada*, vol. 1, Waterloo, Canada, 2001, pp. 459–464.

[1] Martin, A., Reggio, M., and Trépanier, J.-Y., "Neptune: un logiciel pour les écoulements de rivière," in *8th Annual Conference of the CFD Society of Canada*, vol. 1, Montréal, Canada, 2000, pp. 199–205.