

# **John D. Williams**

**ADDRESS** Department of Mechanical Engineering      **PHONE** 970-988-8384  
Colorado State University  
1320 Campus Delivery  
Fort Collins, CO 80523-1374

## **EDUCATION**

1991 Ph.D., Mechanical Engineering, Colorado State University, Fort Collins, CO, USA  
Thesis: An Experimental Investigation of Hollow Cathode-Based Plasma Contactors  
Advisor: Paul J. Wilbur  
1986 B.S., Mechanical Engineering, Colorado State University, Fort Collins, CO, USA

## **ACADEMIC POSITIONS**

2019-present Professor, Mechanical Engineering, Colorado State University  
2012-2019 Associate Professor, Mechanical Engineering, Colorado State University  
2006-2012 Assistant Professor, Mechanical Engineering, Colorado State University  
2002-present Director, Center for Electric Propulsion and Plasma Engineering (CEPPE), Colorado State University, <http://www.engr.colostate.edu/ionstand/index.php>  
2002-2006 Senior RS/Scholar II, Mechanical Engineering, Colorado State University

## **OTHER POSITIONS**

2014-present Technical Director, Sapient, LLC  
2008-present Technical Director, Plasma Controls, LLC  
1998-2002 Senior Engineer / Principal Investigator, Electric Propulsion Laboratory (EPL) Inc.  
1991-1998 Senior Member of the Technical Staff, Hughes Research Laboratories and Hughes Electron Dynamics Division, Malibu, CA and Torrance, CA

## **CURRENT JOB DESCRIPTION**

40% Teaching    50% Research/Creative Activity    10% Service/Outreach    0% Admin

## **HONORS AND AWARDS**

2018, George T. Abell Innovation and Entrepreneurship Award, Walter J. Scott College of Engineering, CSU  
2015, Nominated for Best Teacher Award, Engineering College Council of ASCSU, College of Engineering, CSU  
2014, Funniest Professor Award, Engineering College Council of ASCSU, College of Engineering, CSU  
2011, Jack E. Cermak Undergraduate Advising Award, Colorado State University  
2011, Nominated for Best Teacher Award, CSU Alumni Association and Student Alumni Connection, CSU  
2009, Most Helpful Engineering Professor, Engineering College Council of ASCSU, College of Engineering, CSU  
2008, Most Helpful Engineering Professor, Engineering College Council of ASCSU, College of Engineering, CSU

## **PUBLISHED WORKS**

### **Refereed Journal Articles – In Press:**

#### **Refereed Journal Articles:**

- 42) J.A. Gottfried, S. Antozzi, J. Stienike, S.J. Thompson, J. D. Williams, A.P. Yalin 2024 “Temporally resolved relative krypton neutral density during breathing mode of a Hall effect thruster recorded by TALIF” *Journal of Electric Propulsion* (2024) 3:9, <https://doi.org/10.1007/s44205-024-00070-5>
- 41) Thompson, Seth J., Shawn C. Farnell, Casey C. Farnell, Cody C. Farnell, Thomas M. Andreano, and John D. Williams. "Combined electrostatic analyzer—Wien filter probe for characterization of species distributions in Hall thrusters." *Journal of Applied Physics* 130, no. 23 (2021): 233302.
- 40) Maldonado, Carlos A., Andrew D. Ketsdever, and John D. Williams. "A Magnetically Filtered Atomic Oxygen Plasma Source for Low-Earth-Orbit Simulation." *Journal of Spacecraft and Rockets* 58, no. 5 (2021): 1406-1415.
- 39) McTernan, Jesse K., Omar J. Leon, Sven G. Bilén, John D. Williams, Jason A. Vaughn, Todd A. Schneider, and Linda Habash Krause. "Real-time density control of a plasma source used for simulating low-earth-orbit plasma environment." *IEEE Transactions on Plasma Science* 47, no. 8 (2019): 3891-3897.
- 38) McTernan, Jesse K., Omar J. Leon, Sven G. Bilén, John D. Williams, Jason A. Vaughn, Todd A. Schneider, and Linda Habash Krause. "Real-Time Density Control of a Plasma Source Used for Simulating Low-Earth-Orbit Plasma Environment." *IEEE Transactions on Plasma Science*, V. 47, No. 8, (2019)
- 37) Tucker J. Hensen; Trevor G. Aguirre; Corson L. Cramer; Austin S. Wand; Kaka Ma; David A. Prawel; John D. Williams; Troy B. Holland, “Additive Manufacturing of Ceramic Nanopowder by Direct Coagulation Printing.” *Additive Manufacturing*, ISSN: 2214-8604, Vol: 23, Page: 140-150, (2018).
- 36) Cramer, C. L., Farnell, Casey C., Farnell, Cody C., Geiss, R. H., Williams, J. D., “Thermoelectric Properties and Morphology of Si/SiC Thin-Film Multilayers Grown by Ion Beam Sputtering.” *Coatings*, V. 8, Issue 3, (2018).
- (35) Moritz, J. A., Turk, P. J., Williams, J. D., Stone-Roy, L. “Perceived Intensity and Discrimination Ability for Lingual Electrotactile Stimulation Depends on Location and Orientation of Electrodes.” *Frontiers in Human Neuroscience*, 11, 1-14 (2017).
- (34) Carl R. Mullins, Casey C. Farnell, Cody C. Farnell, Rafael A. Martinez, David Liu, Richard D. Branam, and John D. Williams. “Non-invasive Hall current distribution measurement in a Hall effect thruster.” *Review of Scientific Instruments* 88, 013507 (2017).
- (33) Movafaghi, Sanli, Wei Wang, Ari Metzger, Desiree D. Williams, John D. Williams, and Arun Kumar Kota. "Tunable superomniphobic surfaces for sorting droplets by surface tension." *Lab on a Chip* 16, no. 17 (2016).
- (32) Farnell, Casey C., Cody C. Farnell, Shawn C. Farnell, and John D. Williams. "Recommended Practice for Use of Electrostatic Analyzers in Electric Propulsion Testing." *Journal of Propulsion and Power* (2016): 1-21.
- (31) Rand, Lauren P., and John D. Williams. "A calcium aluminate electride hollow cathode." *IEEE Transactions on Plasma Science* 43, no. 1 (2015): 190-194.
- (30) Drayton, Jennifer A., Desiree D. Williams, Russell M. Geisthardt, Corson L. Cramer, John D. Williams, and James R. Sites. "Molybdenum oxide and molybdenum oxide-nitride back contacts for CdTe solar cells." *Journal of Vacuum Science and Technology A: Vacuum, Surfaces, and Films* 33, no. 4 (2015): 041201.
- (29) Xie, Kan, Qimeng Xia, John D. Williams, Rafael A. Martinez, and Casey C. Farnell. "Extracted Current, Bias Voltage, and Ion Production of Cathodic Hollow-Cathode-Driven Plasma Contactors." *Journal of Spacecraft and Rockets* 52, no. 4 (2015): 1181-1192.

- (28) Xie, Kan, Rafael A. Martinez, and John D. Williams. "Current-voltage characteristics of a cathodic plasma contactor with discharge chamber for application in electrodynamic tether propulsion." *Journal of Physics D: Applied Physics* 47, no. 15 (2014): 155501.
- (27) Metz, Garrett E., Leonard Mahoney, Nicholas A. Riedel, and John D. Williams. "Characterization of a hollow cathode styled plasma reactor for photovoltaic applications." *Plasma Sources Science and Technology* 24, no. 1 (2014): 015008.
- (26) Xie, Kan, Casey C. Farnell, and John D. Williams. "The plasma properties and electron emission characteristics of near-zero differential resistance of hollow cathode-based plasma contactors with a discharge chamber." *Physics of Plasmas* 21, no. 8 (2014): 083506.
- (25) Swanson, Drew E., Russell M. Geisthardt, J. Tyler McGoffin, John D. Williams, and James R. Sites. "Improved CdTe solar-cell performance by plasma cleaning the TCO layer." *IEEE Journal of Photovoltaics* 3, no. 2 (2013): 838-842.
- (24) N.A. Riedel, B.S. Smith, J.D. Williams, and K.C. Popat, "Improved thrombogenicity on oxygen etched Ti6Al4V surfaces," *Materials Science and Engineering C - Materials for Biological Applications*, V. 32, Issue 5, 2012, pp. 1196-1203.
- (23) N.A. Riedel, T.B. Cote, S.L. Bechara, K.C. Popat, and J.D. Williams, "Low energy helium ion texturization of titanium and relevance to biomedical applications," *Surface and Coatings Technology*, V. 206, Issue 23, 2012, pp. 4750-4755.
- (22) N.A. Riedel, S.L. Bechara, K.C. Popat, and J.D. Williams, "Ion Etching for Sharp Tip Features on Titanium and the Response of Cells to these Surfaces," *Materials Letters*, V. 81, 2012, pp. 158-161.
- (21) J.D. Williams, J. Sanmartin, and L.P. Rand, "Low Work Function Coating for an Entirely Propellant-less Bare Electrodynamic Tether," *IEEE Transactions of Plasma Science*, V. 40, No. 5, 2012, pp. 1441-1445.
- (20) N.A. Riedel, J.D. Williams, and K.C. Popat, "Ion beam etching titanium for enhanced osteoblast response," *J. of Materials Science*, V. 46, 2011, pp. 6087-6095.
- (19) Casey C. Farnell, J.D. Williams, and Cody C. Farnell, "Comparison of Hollow Cathode Discharge Plasma Configurations," *Plasma Sources Sci. and Tech.*, V. 20, No. 2, Article #- 025006, 2011
- (18) J.D. Williams and R. Corey, "Influence of Residual Gases on Witness Plate Measurements during Hall-effect Thruster Testing," *Plasma Sources Sci. and Tech.*, V. 19, N. 2, Article #- 025020, 2010.
- (17) Cody C. Farnell and J.D. Williams, "Ion Thruster Grid Design Using an Evolutionary Algorithm," *J. of Prop. and Power*, V. 26, N. 1, 2010, pp. 125-129.
- (16) N. Yamamoto, L. Tao, B. Rubin, J.D. Williams, and A.P. Yalin, "Sputter Erosion Sensor for Anode Layer-Type Hall Thrusters Using Cavity Ring-Down Spectroscopy," *J. of Prop. and Power*, V. 26, N. 1, 2010, pp. 142-148.
- (15) B. Rubin, Casey C. Farnell, J.D. Williams, J.A. Vaughn, T. Schneider, and D. Ferguson, "Magnetic filter type plasma source for ground-based simulation of low earth orbit environment," *Plasma Sources Sci. and Technol.*, V. 18, N. 2, Article #- 025015, 2009.
- (14) J. Wang, Y. Caoy, R. Kafafy, R.A. Martinez, and J.D. Williams, "Numerical and Experimental Investigations of Cross-Over Ion Impingement for Sub-Scale Ion Optics," *J. Propulsion and Power*, V. 24, No. 3, 2008, pp. 562-570.
- (13) B. Rubin and J.D. Williams, "Hollow Cathode Conditioning and Discharge Initiation," *J. of Applied Physics*, V. 104, No. 5, Article Number: 053302, 2008.
- (12) H.A. Fujii, T. Watanabe, , H. Kojima, K.I. Oyama, T. Kusagayac, Y. Yamagiwa, H. Ohtsu, M. Cho, S. Sasaki, K. Tanaka, J.D. Williams, et al, "Sounding Rocket Experiment of Bare Electrodynamic Tether System," *Acta Astronautica*, online July 6, 2008, doi:10.1016/j.actaastro. 2008.07.006.

- (11) P.J. Wilbur, M. Wilson, K. Hutchings, and J.D. Williams, "Emissive Membrane Ion Thruster Concept," *J. of Propulsion and Power*, V. 23, No. 5, 2007, pp. 1049-1054.
- (10) A.P. Yalin, J.D. Williams, V. Surla, and K.A. Zoerb, "Differential sputter yield profiles of molybdenum due to (10) bombardment by low energy xenon ions at normal and oblique incidence," *J of Physics D- Applied Physics*, V. 40, No. 10, 2007, pp. 3194-3202.
- (9) S.P. Rawal, A.R. Perry, J.D. Williams, P.J. Wilbur, D.M. Laufer, W. Shih, J. Polaha, and W.A. Hoskins, "Performance Evaluation of 8-cm Diameter Ion Optics Assemblies Fabricated from Carbon-Carbon Composites," *J. of Propulsion and Power*, V. 22, No. 3, 2006, pp. 604-610.
- (8) A.P. Yalin, V. Surla, M. Butweiller, and J.D. Williams, "Detection of Sputtered Metals using Cavity Ring-Down Spectroscopy", *Applied Optics*, V. 44, No. 30, 2005, pp. 6496-6505.
- (7) V. Surla, P.J. Wilbur, M.L. Johnson, J.D. Williams, and A.P. Yalin, "Sputter Erosion Measurements of Titanium and Molybdenum by Cavity Ring-Down Spectroscopy", *Review of Sci. Instr.*, V. 75, No. 9, 2004, pp. 3025-3030.
- (6) Z. Yu, K. Hoshimiya, J.D. Williams, S.F. Polvinen, and G.J. Collins, "Radio-Frequency-Driven Near Atmospheric Pressure Microplasma in a Hollow Slot Electrode Configuration," *Applied Physics Letters*, V. 83, No. 5, 2003, pp. 854-856.
- (5) J.N. Matossian, R. Wei, and J.D. Williams, "Plasma-Based Ion Implantation and Electron-Bombardment for Large-Scale Surface Modification of Materials," *Surface and Coatings Technology*, V. 96, No. 1, 1997, pp.58-67.
- (4) J.J. Vajo, J.D. Williams, R. Wei, R.G. Wilson, and J.N. Matossian, "Plasma Ion Implantation of Nitrogen into Silicon: Characterization of the Depth Profiles of Implanted Ions," *J. of Applied Physics*, Vol. 76, No. 10, Pt. 1, 1994, pp. 5666-5675.
- (3) C.J. Gaeta, J.N. Matossian, R.S. Turley, J.R. Beattie, J.D. Williams, and W.S. Williamson, "Erosion Rate Diagnostics in Ion Thrusters Using Laser-Induced Fluorescence," *J. of Propulsion and Power*, Vol. 9, No. 3, 1993, pp. 369-376.
- (2) J.D. Williams and P.J. Wilbur, "Electron Emission from a Hollow Cathode-Based Plasma Contactor," *J. of Spacecraft and Rockets*, Vol. 29, No. 6, 1992, pp. 820-829.
- (1) J.D. Williams and P.J. Wilbur, "Experimental Study of Plasma Contactor Phenomena," *J. of Spacecraft and Rockets*, Vol. 27, No. 6, pp. 634-641, Nov.-Dec. 1990. (See also J.D. Williams and P.J. Wilbur, Russian Translation in *Aero/Cosmosheskaya Tekhnika*, No. 11, 1991, pp. 3-10.)

#### **Refereed Conference Proceedings/Transactions and Edited Major Project Final Reports:**

- (121) Robertson, Zachary K., J.D. Williams, S.J. Thompson, S.C. Farnell, Casey C. Farnell, Cody C. Farnell, O. Duchemin, S. Ward, and J. Pawelski, "Single Power Supply Operation of a Hall Thruster, IEPC-2024-xxx, International Electric Propulsion Conference, Toulouse, France 2024.
- (120) Thompson, Seth J, Z.K. Robertson, S.C. Farnell, Casey C. Farnell, Cody C. Farnell, J.D. Williams, "Time-Resolved Ion Measurement in the Beam Plasma of a Hall Thruster," IEPC-2024-818, International Electric Propulsion Conference, Toulouse, France 2024.
- (119) Antozzi, Seth, J. Gottfried, J. Williams, J. Polk, A. Yalin 2024 "Cavity Ring-Down Spectroscopy Measurements of Barium Density in a Hollow Cathode," IEPC-2024-400, International Electric Propulsion Conference, Toulouse, France, 2024
- (118) J. Stienike, S. Antozzi, E. Ku, S. Thompson, J. Williams, A. Yalin 2024 "Spatially and Temporally Resolved Neutral Density Measurements in Plume of a Hollow Cathode by Two-Photon Absorption Laser Induced Fluorescence (TALIF)," IEPC-2024-401, International Electric Propulsion Conference, Toulouse, France, 2024
- (117) Ku, Emily X., and John D. Williams. "Testing and Evaluation of a Standalone Hollow Cathode Test Setup with a

Magnetic Field." In AIAA SCITECH 2024 Forum, p. 0486. 2024.

(116) Thompson, Seth J., Jack Garman, Zach C. Robertson, John D. Williams, William Hurley, Tate Gill, Collin B. Whittaker, and Benjamin Jorns. "Methods for Mitigating Backsputter in Electric Propulsion Test Facilities I: Beam Halter Concept and Design." In AIAA SCITECH 2024 Forum, p. 2367. 2024.

(115) Antozzi, Seth, Jacob Gottfried, John Williams, and Azer P. Yalin. "Cavity Ring-Down Spectroscopy (CRDS) Measurements of Barium Emitted from a Hollow Cathode." In AIAA SCITECH 2024 Forum, p. 0922. 2024.

(114) Antozzi, Seth, Jacob Gottfried, John D. Williams, and Azer P. Yalin. "Spatially Resolved Measurements of Krypton by Two-photon Absorption Laser Induced Fluorescence (TALIF) in a Barium Oxide Hollow Cathode Plasma." In AIAA AVIATION 2023 Forum, p. 4269. 2023.

(113) Gottfried, Jacob, Seth Antozzi, Jon Stienike, Seth Thompson, John Williams, and Azer P. Yalin. "Temporally Resolved Neutral Density Measurements of Hall Effect Thruster Breathing Mode by Two-Photon Absorption Laser Induced Fluorescence (TALIF)." In AIAA SCITECH 2024 Forum, p. 0802. 2024.

(112) Mitchell L. R. Walker, Dan Lev, Maryam Saeedifard, Benjamin Jorns, John Foster, Alec D. Gallimore, Alex Gorodetsky, Joshua L. Rovey, Huck Beng Chew, Deborah Levin, John D. Williams, Azer Yalin, Richard E. Wirz, Jaime Marian, Iain Boyd, Kentaro Hara, Kristina Lemmer, "Overview of the Joint Advanced Propulsion Institute (JANUS)" IEPC-2022-156, Presented at the 37th International Electric Propulsion Conference, Massachusetts Institute of Technology, Cambridge, MA USA, June 19-23, 2022.

(111) Seth J. Thompson, Casey C. Farnell, John D. Williams, and Matthew G. McHarg, "Combined Energy and Velocity Analyzer Measurements of a Low-Power Hall Thruster, IEPC-2022-404, Presented at the 37th International Electric Propulsion Conference, Massachusetts Institute of Technology, Cambridge, MA USA, June 19-23, 2022

(110) Cody C. Farnell, Seth J. Thompson, John D. Williams, "Additive Manufacturing for Ion Optics," IEPC-2022-277, Presented at the 37th International Electric Propulsion Conference, Massachusetts Institute of Technology, Cambridge, MA USA, June 19-23, 2022.

(109) Laity, George R., Robinson, Allen C., Cuneo, Michael E., Alam, Mary Kathleen, Beckwith, Kristian R., Bennett, Nichelle L., Bettencourt, Matthew T., Bond, Stephen D., Cochrane, Kyle, Criscenti, Louise, Cyr, Eric C., De Zetter, Karen, Drake, Richard R., Evstatiev, Evstati G., Fierro, Andrew S., Gardiner, Thomas A., Glines, Forrest W., Goeke, Ronald S., Hamlin, Nathaniel D., Hooper, Russell, Koski, Jason, Lane, James Matthew, Larson, Steven R., Leung, Kevin, McGregor, Duncan A., Miller, Philip R., Miller, Sean M., Ossareh, Susan J., Phillips, Edward G., Roberds, Nicholas A., Rose, Charles E., Shadid, John N., Shields, Sidney, Simpson, Sean C., Sirajuddin, David, Smith, Thomas M., Swan, Matthew Scot, Thompson, Aidan P., Tranchida, Julien G., Welch, Dale R., Genoni, Thomas C., Thomas, Carsten, Russell, Alex, Watson, Eric D., Rose, David V., Williams, John, Yalin, Azer, McBride, Ryan D., and Smith, Trevor J., "Towards Predictive Plasma Science and Engineering through Revolutionary Multi-Scale Algorithms and Models (Final Report)". United States. <https://doi.org/10.2172/1813907>. <https://www.osti.gov/servlets/purl/1813907>. (2021).

(108) Ham, Ryan, John Williams, Seth J. Thompson, and Shawn Farnell. "A low erosion instant start ignition process for heaterless hollow cathodes." In AIAA Propulsion and Energy 2021 Forum, p. 3377. 2021.

(107) Wegner, Tad, Seth J. Thompson, John Williams, and Azer P. Yalin. "Two-Photon Absorption Laser Induced Fluorescence (TALIF) Of Neutral Xenon In A Hall Effect Thruster Plasma." In AIAA Propulsion and Energy 2021 Forum, p. 3391. 2021.

(106) Thompson, Seth, Susan J. Ossareh, C. C. Farnell, John D. Williams, Vladimir Gorokhovskiy, Grant Miars, Omar Leon, and Brian E. Gilchrist. "Hidden Anode Plasma Contactor System for Spacecraft Neutralization." In AGU Fall Meeting 2021. AGU, 2021.

(105) VanWoerkom, Michael, Vladimir Gorokhovskiy, Gerardo Pulido, Alex Seidcheck, John Williams, and Casey Farnell. "Test results of Exoterra's halo micro electric propulsion system for microsatellites." In AIAA Propulsion and Energy 2019 Forum, p. 4163. 2019.

- (104) Andreano, T.M.; Morfei, D.; Williams, J.D.; and Farnell, C.C., "Updated Performance Comparison of a 1.5 kW Hall Thruster with Center-Mounted and Outer-Pole-Mounted Heaterless Cathodes," 39th International Electric Propulsion Conference, IEPC-2019-791, Vienna, Austria, 2019.
- (103) Andreano, T.M., Williams, J.D., Clement, M., and Farnell, C.C., "Performance Comparison of a 1.5 kW Hall Thruster with Center-Mounted and Outer-Pole-Mounted Heaterless Cathodes," *In AIAA Propulsion and Energy 2019 Forum*, Indianapolis, IN, August 2019.
- (102) Thompson, S.J., VanGemert, J.J., Farnell, C.C., Farnell, C.C., Farnell, S.C., Hensen, T.J., Ham, R.K., Williams, D.D., Chandler, J.P., Williams, J.D., "Development of an Iodine Compatible Hollow Cathode," *In AIAA Propulsion and Energy 2019 Forum*, Indianapolis, IN, August 2019.
- (101) Thompson, S.J., VanGemert, J.J., Farnell, C.C. Farnell, C.C., Farnell, S.C., Hensen, T.J., Ham, R.K., Williams, D.D. Chandler, J.P., Williams, J.D., "Evaluation of Iodine Compatible Hollow Cathode Configurations," 36th International Electric Propulsion Conference, IEPC-2019-768, Vienna, Austria, 2019.
- (100) Ham, R. K., Williams, J. D., Hall, S. J., Benavides, G. F., and Verhey, T. R., "Characterization of Propellant Flow and Bias Required to Initiate an Arc Discharge in a Heaterless Hollow Cathode," *In AIAA Propulsion and Energy 2019 Forum*, Indianapolis, IN, August 2019.
- (99) Ham, R. K., Williams, J. D., Hall, S. J., Benavides, G. F., and Verhey, T. R., "Characterization of a Fixed-Volume Release System for Initiating an Arc Discharge in a Heaterless Hollow Cathode," 36th International Electric Propulsion Conference, IEPC-2019-890, Vienna, Austria, Sept. 2019.
- (98) VanWoerkom, Michael, Vladimir Gorokhovskiy, Gerardo Pulido, Alex Seidcheck, John D. Williams, and Casey Farnell. "Test Results of ExoTerra's Halo Micro Electric Propulsion System for Microsatellites." *In AIAA Propulsion and Energy 2019 Forum*, Indianapolis, IN, August 2019.
- (97) Casey C. Farnell, Seth J. Thompson, Jesse McTernan, Carlos Maldonado, Sven G. Bilén, Andrew Ketsdever, Julie Xie, Phuc D. Hoang, Philippe Lorain, Christopher Capon, and John D. Williams. "Magnetic-Filter-Equipped Plasma Sources for Creating Low-Earth-Orbit Plasma Environments," *Applied Space Environments Conference*, Los Angeles, CA, May 2019.
- (96) McTernan, Jesse K., Sven G. Bilén, and John D. Williams. "Real-time plasma density control via a modified hollow-cathode plasma source with a variable aperture." *In Proc. 14th Spacecraft Charging Technol. Conf.(ESA/ESTEC)*, pp. 1-6. 2016.
- (95) David A. Cunningham, David Liu, Carl Hartsfield, Carl Mullins, Casey Farnell, John D. Williams, and William A. Hargus. "Synchronized Measurement of Plasma Characteristics In a Hall Effect Thruster." 54th AIAA Aerospace Sciences Meeting, AIAA SciTech Forum, (AIAA 2016-1943).
- (94) James T. Duvall Casey C. Farnell and Cody C. Farnell, Desiree D. Williams and John D. Williams. "Instant-Start Hollow Cathodes for Electrodynamic Tether Applications." 5th International Conference on Tethers in Space, Ann Arbor, MI, May 24-26, 2016.
- (93) Cramer, C., C. Farnell, R. Geiss, and J. D. Williams. "Thermoelectric Properties and Film Morphology of Si/SiC Thin-Film Amorphous Multilayers Grown By Ion Beam Sputtering." 58th Annual Technical Conference Proceedings, Society of Vacuum Coaters, Santa Clara, CA April 25–30, 2015.
- (92) Carl R. Mullins, Rafael Martinez, John D. Williams, Casey Farnell, Cody C. Farnell, David Liu, and Richard D. Branam. "Non-Invasive Hall Current Distribution Measurement in a Hall Effect Thruster", 51st AIAA/SAE/ASEE Joint Propulsion Conference, AIAA Propulsion and Energy Forum, AIAA 2015-4005, Orlando, FL, July 2015.
- (91) R. A. Martinez, C. R. Mullins, J. Moritz, J. D. Williams, and C. C. Farnell, "Performance evaluation of a 1.5 kW Hall effect thruster with a center mounted heaterless hollow cathode using xenon and krypton propellant," 62nd JANNAF Propulsion Meeting, Nashville, TN, 2015.

- (90) Maldonado, C., L. Rand, K. Xie, C. Farnell, A. Ketsdever, and J.D. Williams. "Development of a magnetically filtered atomic oxygen plasma source: LEO drag applications." 13th Spacecraft Charging Technology Conference. Pasadena, CA, 23-27 June 2014.
- (89) Derek M. Blash and John D. Williams, "Determination of Hollow Cathode Plasma Contactor System Requirements using an Electrodynamic Tether System Simulation Tool," 13th International Spacecraft Charging Technology Conference, Pasadena, California, 23-27 June 2014.
- (88) Casey C. Farnell, Cody C. Farnell, Shawn C. Farnell, and John D. Williams, "Electrostatic Analyzers with Application to Electric Propulsion Testing," IEPC-2013-300, 33rd International Electric Propulsion Conference, George Washington University, Washington D.C., 2013
- (87) L.P. Rand and J.D. Williams, "Instant Start Electride Hollow Cathode," 33rd International Electric Propulsion Conference, IEPC-2013-305, George Washington University, October 6 - 10, 2013.
- (86) Carlos A. Maldonado, Andrew D. Ketsdever, and Taylor C. Lilly, Lauren P. Rand, Kan Xie, Casey C. Farnell, and John D. Williams, "Source Characterization for a Combined Effects Space Simulation Facility," AIAA Aerospace Sciences Meeting, Grapevine, Texas, 7-10 January 2013.
- (85) Garrett Metz, Len Mahoney, John D. Williams, Drew Swanson, Walajabad S. Sampath, "A plasma-enhanced close-spacing sublimation (PECSS) device for photovoltaic thin-film modification," 65th Gaseous Electronics Conference, Austin, Texas, Oct. 22-26, 2012.
- (84) Drew E. Swanson, Ryan M. Lutze, Walajabad S. Sampath, and John D. Williams, "Plasma Cleaning of TCO Surfaces Prior to CdS/CdTe Deposition," 38th IEEE Photovoltaic Specialists Conference, Austin, Texas, July 2012, pp. 859-863.
- (83) S.G. Biedron, ..., Lauren P. Rand, John D. Williams, et al., "The CSU Accelerator and FEL Facility," 34th International Free Electron Laser Conference, Nara, Japan, August 26-31, 2012.
- (82) Carlos A. Maldonado, Andrew D. Ketsdever, Lauren Rand, Kan Xie, Casey Farnell, and John Williams, "Development of a Ground-Based Facility to Study Combined Effects," 27th Space Simulation Conference, Annapolis, Maryland, Nov. 5-8, 2012.
- (81) Juan R. Sanmartin, Enrico C. Lorenzini, John D. Williams, Francisco García-de-Quirós, Tim van Zoest, and Jesús Marcos, "Propellantless deorbiting of space debris by bare electrodynamic tethers," International Astronautical Congress, IAC-11-A6, Cape Town, South Africa, Oct. 2011.
- (80) L.P. Rand and J.D. Williams, "Hollow Cathode with Low Work Function Electride Insert," Proceedings of ASME 2011 International Mechanical Engineering Congress & Exposition, IMECE 2011, Denver, CO, Nov. 11-17, 2011.
- (79) L.P. Rand, R.L. Hoyt, and J.D. Williams, "Hollow Cathode with Electride Insert," AIAA-2011-5992, Joint Propulsion Conference, San Diego, CA, July 31-Aug. 3, 2011.
- (78) A.L. Jurgensmeyer, J.D. Williams, et al, "Superlattice-based Thermoelectric Materials Fabricated using Ion Beam Deposition," AIAA-2011-5980, Int'l Energy Conversion and Engineering Conference, San Diego, CA, July 31-Aug. 3, 2011.
- (77) S. Mahalingam, Y. Choi, P. Stoltz, L.P. Rand, and J.D. Williams, "Particle-in-Cell (PIC) Tools for Simulation of Electrodynamic Bare Tether Plasma Interactions," ICOPS 2011, Topic- Computational Plasma Physics I # IP2B-14, Chicago, IL, June 28, 2011.
- (76) L.P. Rand and J.D. Williams, "Ultra Low Work Function, Non-Consumable Insert for Hollow Cathodes Formed From C12A7 Electride," 57th JANNAF Propulsion Meeting, Colorado Springs, CO, May 3-7, 2010.
- (75) L.P. Rand, S. Mahalingam, J. Sanmartin, and J.D. Williams, "Ultra Low Work Function Coating for Combined Passive Electron Emission and Collection for Spacecraft Charging Neutralization and Electrodynamic Tether Applications," 11th

Spacecraft Charging Technology Conference, Albuquerque, NM, Sept. 20-24, 2010.

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#### **Patents:**

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## **CONTRACTS AND GRANTS:**

### **Externally-funded Projects pending as PI at CSU as of 10/2019**

Sponsor, Title, End Date, Overhead Rate, Amount

### **Externally-funded Projects as PI at CSU as of 10/2019**

Sponsor, Title, End Date, Overhead Rate, Amount

Boeing Electron Dynamic Devices Inc., Twenty-five (25) cm XIPS Ion Optics Modeling, 10/28/2003, 30.5%, \$25,000

Calif. Inst. of Tech/Jet Propulsion Lab, Ion Thruster Hollow Cathode & High Specific Impulse Gridlet Research, 11/4/2003, 45%, \$64,000

DoD-NAVY, Wear Testing of Metal Matrix Composites 1, 12/30/2003, 30.5%, \$23,000

DOD-NAVY, Wear Testing of Metal Matrix Composites 2, 12/30/2003, 30.5%, \$18,000

Lockheed Martin Corp, Carbon-Carbon Characterization Tests 1, 12/31/2003, 30.5%, \$10,000

Lockheed Martin Corp, Carbon-Carbon Characterization Tests 2, 12/31/2003, 30.5%, \$15,000

Calif. Inst. of Tech/Jet Propulsion Lab, NEXIS Gridlet Research 1, 2/25/2004, 45%, \$8,000

Boeing Electron Dynamic Devices Inc., In-Vacuum ExB Probe Actuator System 1, 2/28/2004, 30.5%, \$72,000

Boeing Electron Dynamic Devices Inc., In-Vacuum ExB Probe Actuator System 2, 2/28/2004, 30.5%, \$1,300

Boeing Electron Dynamic Devices Inc., Boeing EDD Sputter Measurement Effort 1, 4/16/2004, 30.5%, \$50,000

Boeing Electron Dynamic Devices Inc., Boeing EDD Sputter Measurement Effort 2, 4/16/2004, 30.5%, \$12,000

University of Alabama, Eight (8) cm Ion Thruster System 1, 9/30/2004, 30.5%, \$65,000

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NASA - Natl Aeronautics & Space Admin., Numerical Simulation of Ion Thruster Optics, 11/17/2004, 45%, \$21,072

Calif. Inst. of Tech/Jet Propulsion Lab, NEXIS Gridlet Research 2, 2/15/2005, 45%, \$147,074

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Boeing Electron Dynamic Devices Inc., In-Vacuum ExB Probe Actuator System 3, 4/28/2005, 30.5%, \$10,000

Boeing Electron Dynamic Devices Inc., In-Vacuum ExB Probe Actuator System 4, 4/28/2005, 30.5%, \$2,500

Boeing Electron Dynamic Devices Inc., In-Vacuum ExB Probe Actuator System 5, 4/28/2005, 30.5%, \$1,500

Boeing Electron Dynamic Devices Inc., In-Vacuum ExB Probe Actuator System 6, 6/30/2005, 30.5%, \$20,564

University of Alabama, Eight (8) cm Ion Thruster System 2, 7/31/2005, 30.5%, \$825

DOD-USAF-Air Force Academy, Magnetic Field Hollow Cathode Plasma Source, 11/18/2005, 46%, \$15,000 NASA

- Natl Aeronautics & Space Admin., Numerical Simulation of Ion Thruster Optics, 12/14/2005, 45%, \$16,001

Boeing Electron Dynamic Devices Inc., In-Vacuum ExB Probe Actuator System 7, 12/31/2005, 30.5%, \$1,900

Calif. Inst. of Tech/Jet Propulsion Lab, NEXIS Gridlet Research 3, 4/24/2006, 45%, \$100,000

L-3 Communications Electron Technologies Inc, In-Vacuum ExB Probe Actuator System Upgrade, 12/31/2006, 46%, \$18,000

NASA - Natl Aeronautics & Space Admin., Magnetic Plasma Source and Retarding Potential Analyzer (RPA) System, 2/14/2007, 47%, \$40,181

DOD-NAVY, Tribological Testing of NSWC Samples, 4/30/2007, 46%, \$20,000

NASA - Natl Aeronautics & Space Admin., Monoenergetic Monodirectional Ion Source, 2/7/2008, 47%, \$50,000

Colorado Power Electronics Inc., High Voltage Test Console Modeling, Design, and Testing, 2/28/2008, 47%, \$56,000

ECI-Engineered Coatings Inc., Analysis and Modeling of Low Sputter Yield Coatings 1, 4/17/2008, 47%, \$8,000

ECI-Engineered Coatings Inc., Analysis and Modeling of Low Sputter Yield Coatings 2, 4/17/2008, 47%, \$44,000

NASA - Natl Aeronautics & Space Admin., Hollow Cathode Electron Emission Research 1, 7/19/2008, 46%, \$25,000

NASA - Natl Aeronautics & Space Admin., Hollow Cathode Electron Emission Research 2, 7/19/2008, 46%, \$84,793

Spectral Energies LLC, Services to Spectral Energies to Develop Plasma Diagnostics Systems for AFIT, 9/30/2008, 47%, \$79,600

Colorado Power Electronics Inc., Standard Architecture Ion Thruster PPU Analysis and Testing, 12/1/2008, 47%, \$123,500

Colorado Power Electronics Inc., Thermal and Dynamic Modeling and Testing of a Wide Ranging Power Supply for Electric Propulsion Engines, 1/31/2009, 47%, \$93,139

ECI-Engineered Coatings Inc., Analysis and Modeling of Low Sputter Yield Coatings 3, 8/1/2009, 47%, \$16,000

NASA - Natl Aeronautics & Space Admin., Initial Part of the Second Phase of Research and Testing of a Prototype 1 eV-40keV Ion Source Power Controller, 8/26/2009, 47%, \$57,600

NASA - Natl Aeronautics & Space Admin., Third Phase of Ion Source Development-Manufacture, Integration, and Testing of an Ion Source Power Controller 1, 12/31/2011, 47%, \$112,400

ERC Inc. for the Air Force Research Laboratory- Edwards AFB, Electride Hollow Cathode, 9/30/2010, 47.5%, \$20,000

ESLI-Energy Science Laboratories, Inc., Coating of ESLI components with Electride, 11/15/2010, 47.5%, \$1,000

NASA - Natl Aeronautics & Space Admin., Third Phase of Ion Source Development-Manufacture, Integration, and Testing of an Ion Source Power Controller 2, 12/31/2010, 47%, \$2,796

CSURF-CSU Research Foundation, Evaluation of Hydroxyapatite Coatings Deposited using Novel Plasma Based Ion Implantation and Deposition Techniques, 4/30/2011, 8%, \$27,700

University of Colorado-Colorado Springs, Magnetic Plasma Source System, 6/1/2011, 47.5%, \$27,000

Tethers Unlimited Inc., Terminator Tape Tether with Enhanced Performance, 8/8/2011, 47.5%, \$15,000

Pennsylvania State University, LEO Plasma Source, 10/15/2011, 47.5%, \$9,995

Tech-X Corporation, Advanced Particle-in-Cell Tools for Simulation of Electrodynamic Tether Plasma Interactions STTR award from NASA - Natl Aeronautics & Space Admin., 2/17/2012, 48%, \$30,000

ERC Inc., Electride Hollow Cathode Testing, End date: 3/31/2012, 47%, \$5,560

ERC Inc., Electride Hollow Cathode Prototypes, End date: 4/30/2013, 48%, \$27,815

Universidad Politecnica de Madrid: European Commission FP7 project, Hollow Cathode Plasma Contactor for an Electrodynamic Tether System to Remove Debris from Low Earth Orbits, 7/31/2013, 47%, \$330,000

Universidad Politecnica de Madrid: European Commission FP7 project, Hollow Cathode Plasma Contactor for an Electrodynamic Tether System to Remove Debris from Low Earth Orbits, End date: 7/31/2013, 47%, \$145,407

Universidad Politecnica de Madrid: European Commission FP7 project, Hollow Cathode Plasma Contactor for an Electrodynamic Tether System to Remove Debris from Low Earth Orbits, End date: 10/31/2013, 47%, \$59,896

NASA, Third Phase of Ion Source Development-Manufacture, Integration, & Testing of an Ion Source Power Controller, End date: 12/31/2013, 47%, \$2,500

Universidad Politecnica de Madrid: European Commission FP7 project, Hollow Cathode Plasma Contactor for an Electrodynamic Tether System to Remove Debris from Low Earth Orbits, End date: 1/31/2014, 47%, \$43,226

NASA, Third Phase of Ion Source Development-Manufacture, Integration, & Testing of an Ion Source Power Controller, End date: 7/31/2014, 47%, \$30,000

Universidad Politecnica de Madrid: European Commission FP7 project, Hollow Cathode Plasma Contactor for an Electrodynamic Tether System to Remove Debris from Low Earth Orbits, End date: 6/30/2015, 47%, \$39,601.10

NASA, 3D Printed Hall Thruster, End date: 9/30/2015, 48%, \$10,000

NASA, 3D Printed Hall Thruster, End date: 9/30/2015, 48%, \$5,200

CSURF-CSU Ventures, Audio-lingual Interface, End date: 5/30/2016, 8%, \$17,000

Larry Bell Studio Taos, Large-Scale Glass Coating System for Application of Artistic Titanium and Chromium Nitride Thin Films, End date: 9/15/2016, 51%, \$60,000

Lockheed Martin Space Systems Company, Tantalum Cathode Filament Lifetime Improvement, End date: 12/31/2016, 8%, \$20,000

Colorado Office of Economic Development and International Trade, Hollow Cathode Use for Improving E-Beam-based Additive Manufacturing Technology, End date: 7/17/2017, 8%, \$150,000

Colorado Office of Economic Development and International Trade, Tantalum Filament Lifetime Enhancement for 3D EBM Printing, End date: 11/12/2017, 8%, \$60,000

CSURF-CSU Ventures, Electron Hollow Cathode Use for Improving Electron-Beam-based Additive Manufacturing Technology, End date: 12/31/2017, 8%, \$12,500

NASA, Ryan Ham, NASA Space Technology Research Fellowships (NSTRF) – Fall 2018, End date: 7/31/2020, 0%, \$148.2k

ArianeGroup, Ion Optics Simulations, Dr. John D. Williams, PI, End date: 4/2022, 52%, \$114k

NASA STTR Phase 1 with QorTek, Inc., Propellant Storage and Distribution System Based on Textured Ceramic Valves for Xenon Electric Propulsion Systems, Dr. John D. Williams, PI; End date: 5/2020, 52%, \$42k

DOE-NTESS-Sandia National Laboratories; High Speed Mass Spectrometer; Williams, John D, PI; End date: 9/2022; 52%; \$25k

ArianeGroup; Ion Optics Simulations; Williams, John D, PI; End date: 4/2022, 52%, \$70k

DOE-NTESS-Sandia National Laboratories; High Speed Mass Spectrometer; Williams, John D, PI; End date: 9/2021, 52%; \$50k

DOE-NTESS-Sandia National Laboratories; Evaluation of a Compact Energy and Charge State Analyzer; Williams, John D, PI; End date: 9/2020; 52%; \$29k

SBIR Phase 2 QorTek, NASA-National Aeronautics and Space Administration; Development of Gas Feed System for Electric Propulsion Applications that Employ a High-Strain, Textured Piezoelectric Material; Williams, John D, PI; End date: 1/2023; 52%; \$165k

STTR Phase 1 Neutron Star Systems, DOD-USAF-Air Force; Hybrid Traditional Rocket and Applied Field Magneto-Plasma Dynamic Thruster Propulsion System Using the Same Mono-Propellant; Williams, John D, PI; End date: 1/2023; 53%; \$75k

University of Michigan, NASA-National Aeronautics and Space Administration; Hollow Cathode Plasma Contactor System for the BSPICE Mission; Williams, John D, PI; End date: 6/2025; 52%; \$667k

Georgia Institute of Technology, NASA-National Aeronautics and Space Administration; CSU Participation in the Joint Advanced Propulsion Institute (JANUS); Williams, John D, PI; End date: 9/2026; 52%; \$1.7M

### **Externally-funded Projects as Co-PI**

Funding Source, Title, PI, End Date, Overhead Rate, Award



University of Colorado, Solar Wind Simulator Ion Source, P. Wilbur, 8/26/2004, 0%, \$12,500

ERC Inc. for the Air Force Research Laboratory- Edwards AFB, Ion Sputtering of Advanced Materials for Electric Propulsion Equipped S/C 1, A. Yalin, 3/31/2006, 45%, \$129,500

ERC Inc. for the Air Force Research Laboratory- Edwards AFB, Ion Sputtering of Advanced Materials for Electric Propulsion Equipped S/C 2, A. Yalin, 9/30/2006, 45%, \$32,375

ERC Inc. for the Air Force Research Laboratory- Edwards AFB, Ion Sputtering of Advanced Materials for Electric Propulsion Equipped S/C 3, A. Yalin, 6/30/2007, 46%, \$48,562

ERC Inc. for the Air Force Research Laboratory- Edwards AFB, Ion Sputtering of Advanced Materials for Electric Propulsion Equipped S/C 4, A. Yalin, 9/30/2008, 47%, \$50,000

Plasma Controls LLC SBIR Grant from NSF, Deposition and Evaluation of Hydroxyapatite Biological Coatings, K. Popat, 12/31/2010, 8%, \$49,941 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls LLC SBIR Grant from NIH, Deposition and Evaluation of Hydroxyapatite Biological Coatings, K. Popat, 12/31/2010, 8%, \$31,999 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls LLC SBIR Grant from DoE, Task Order #1: Collaborative Research Project on Thin Film Superlattices for Use in a Thermoelectric Module for Waste Heat Recovery, S. James, 6/30/2011, 47.5%, \$16,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

DHS - US Department of Homeland Security, Development of an Integrated Super Critical Breathing Apparatus and Powered Air Purified Respirator 1, T. Bradley, 8/6/2011, 47%, \$4,000

DHS - US Department of Homeland Security, Development of an Integrated Super Critical Breathing Apparatus and Powered Air Purified Respirator 2, T. Bradley, 8/6/2011, 47%, \$912,923

NSF, I/U CRC Next Generation Photovoltaic Center, W. Sampath, 7/31/2012, 10%, \$265,000

Plasma Controls SBIR from DOD, Task Order #2: Collaborative Project on Thin Film Superlattices for Use in a Thermoelectric Module for Waste Heat ..., S. James, End date: 8/14/2012, 48%, \$65,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls Contract from Boeing, Task Order #3: Magnetic Filter Plasma Source, S. James, End date: 1/15/2013, 48%, \$28,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls Contract from AFRL Kirtland, Task Order #4: AFRL Kirtland LEO Plasma Source, S. James, End date: 3/12/2013, 48%, \$28,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls SBIR from DOE, Task Order #5: TEG Module Fabrication, S. James, End date: 5/31/2013, 48%, \$50,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

NSF and Abound Solar Inc., AIR Advanced CDTe PV Technology, W. Sampath, End date: 7/31/2013, 48%, \$2,550,000

Plasma Controls SBIR from DOD, Task Order #2: Collaborative Project on Thin Film Superlattices for Use in a Thermoelectric Module for Waste Heat..., S. James, End date: 8/14/2013, 48%, \$65,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

The Boeing Company, Ion Thruster Carbon Optics, Cody Farnell, End date: 8/31/2013, 48%, \$13,000

The Boeing Company, Ion Thruster Carbon Optics, Cody Farnell, End date: 9/30/2013, 48%, \$22,000

Seaforth, LLC SBIR from DOD, Task Order #2: Cavity Enhanced Thomson Scattering for Low Temperature Plasmas, S. James, End date: 11/18/2013, 48%, \$70,000

Plasma Controls SBIR from DOD, Task Order #2: Collaborative Project on Thin Film Superlattices for Use in a Thermoelectric Module for Waste Heat..., S. James, End date: 5/14/2014, 48%, \$50,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Aerojet Rocketdyne, Electride Cathode Development & Validation using Xenon & Krypton, Casey Farnell, End date: 9/4/2014, 48%, \$60,000

Plasma Controls Contract from AFIT, Task Order #7: Additive Manufacturing of Ion Thruster Optics, S. James, End date: 12/19/2014, 48%, \$26,052 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

The Boeing Company, Thruster Testing, Discharge Only Mode, Cody Farnell, End date: 12/31/2014, 48%, \$92,671

Plasma Controls Contract from AFIT, Task Order #6: Hall Thruster Electromagnetic Measurement System, S. James, End date: 2/12/2015, 48%, \$150,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls LLC SBIR from NASA, Task Order #9: Spark Plasma Sinter Electride-Titanium Composites, T. Holland, End date: 12/19/2015, 50%, \$39,100 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Oliver Manufacturing Company, Advanced Manufacturing Systems for Seed Treatment & Post-Treatment Drying, A. Kota, End date: 3/31/2016, 8%, \$50,000

CSURF-CSU Ventures, Audio-lingual Interface, S. James, End date: 6/30/2016, 0%, \$40,000 (Note: Prof. Williams is a co-founder of Sapien, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls LLC SBIR from SpaceX, Task Order #10: Hollow Cathode Design & Analysis for Low Cost & Manufacturability, S. James, End date: 7/30/2016, 50%, \$74,819 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Lockheed Martin Space Systems Company, SPS Manufacture and Characterization of Mayenite-Electride/Titanium Composite Cathode, T. Holland, End date: 8/16/2016, 48%, \$50,000

State of Colorado, Advanced Manufacturing Systems for Seed Treatment & Post-Treatment Drying, A. Kota, End date: 9/30/2016, 8%, \$150,000

Sapien LLC Prototype Fabrication, Task Order #2: Magnetic Field-based Body Area Network, S. James, End date: 10/15/2016, 51%, \$10,000 (Note: Prof. Williams is a co-founder of Sapien, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls LLC SBIR from NASA, Task Order #11: Hollow Cathode Use for Improving E-Beam-based Additive Manufacturing Technology, S. James, End date: 4/19/2017, 8%, \$50,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls LLC SBIR from NASA, Task Order #8: Evaluation of 3D Printed Electric Propulsion Components, S. James, End date: 5/6/2017, 50%, \$116,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls LLC SBIR from NASA, Task Order #12: Development and Testing of 3D-Printed Ion Optics Assembly, S. James, End date: 5/6/2017, 51%, \$41,516 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Lockheed Martin Space Systems Company, SPS Manufacture and Characterization of Mayenite-Electride/Titanium Composite Cathode, T. Holland, End date: 5/31/2017, 48%, \$59,818

Lockheed Corporation, Fabrication and Characterization of Mayenite/Ti Hybrid Materials, K. Ma, End date: 5/31/2017, 52%, \$10,000

Plasma Controls LLC Contract from SpaceX, Task Order #14: Testing of Hall Thruster, S. James, End date: 9/14/2017, 52%, \$4,831 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls LLC SBIR Grant from NASA, Task Order #15: Iodine Hollow Cathode Testing on Argon, S. James, End date: 6/14/2018, 51%, \$21,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Sapien LLC Contract from Vet Measure, Task Order #4: Evaluation of Temperature, Pulse, and Respiratory Rate Sensing Harness for Canine, S. James, End date: 6/30/2018, 52%, \$3,500 (Note: Prof. Williams is a co-founder of Sapien, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls LLC Contract from Aerojet, Task Order #18: Assembly of Plasma Diagnostic System, S. James, End date: 7/15/2018, 52%, \$7,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls LLC Contract from University of New South Wales, Task Order #19: Assembly and Testing of Leo Plasma Source System, S. James, End date: 2/14/2019, 52%, \$25,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls LLC Prototype Fabrication, Task Order #13: Engineering Research Center Shop Prototype Design and Fabrication Assistance, C. Thornton, End date: 12/31/2019, 51%, \$30,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls LLC SBIR Grant from NASA, Task Order #21: Iodine Hollow Cathode Development and Testing, S. James, End date: 5/1/2020, 52%, \$200,000 (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

DoD SBIR Phase 1, Ultra-long-life Hollow Cathode for High Power EP Applications, S. James, End date: 12/2019, 52%, \$35k (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Plasma Controls, LLC and Aerojet, Assembly of Plasma Diagnostic System, S. James, End date: 12/2019, 52%, \$7k (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

AF SBIR Phase 2, Measurement of Neutral Xenon Using Laser, Dr. Azer P. Yalin, PI, Dr. John D. Williams, co-PI; End date: 11/2020, 52%, \$186k

NASA STTR Phase 1, Energy Species Diagnostics, Puttlitz, Christian M, PI, Dr. John D. Williams, co-PI; End date: 8/2020, 52%, \$40k (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

Lockheed Martin Space Systems Company; SPS Manufacture and Characterization of Mayenite-Electride/Titanium Composite Cathode; Ma, Kaka, PI, Dr. John D. Williams, co-PI; End date: 12/2020; 52%; \$50k

MetroLaser, Inc.",DOD-USAF-Office of Scientific Research; Measurement of Neutral Xenon Using Laser Induced Fluorescence; Yalin, Azer P, PI, Dr. John D. Williams, co-PI; End date: 10/2020; 52%; End date: 12/2018, \$186k

Lockheed Martin Corporation; Mayenite Electride Temperature Stability; Ma, Kaka, PI, Dr. John D. Williams, co-PI; End date: 9/2021; 52%; \$150k

Assurance Technology Corporation,DOD-USAF-Air Force; Conductive Materials with Low Work Function for Coating AFRL Grids; Ma, Kaka, PI, Dr. John D. Williams, co-PI; End date: 11/2023, 53%, \$20k

NSF-National Science Foundation; Continuous-Wave Laser Thomson Scattering Diagnostic for Low Temperature Plasmas, Yalin, Azer P, PI, Dr. John D. Williams, co-PI; End date: 8/2023, 52%, \$300k

Plasma Controls, LLC; Plasma Sources and Diagnostics; Puttlitz, Christian M, PI, Dr. John D. Williams, co-PI; End date: 11/2024, 53%; \$107k; (Note: Prof. Williams is a co-founder of Plasma Controls, LLC and currently serves as the Technical Director, his involvement is guided by a COI Management Plan administered by the College of Engineering at CSU.)

#### **Internally-funded Awards (Total awarded amount of \$64,500)**

CSU Clean Energy Supercluster, Thin Film-based Thermoelectric Generators, J. Williams PI, T. Bradley and D. Zimmerle co-PIs, 0%, 6/1/2011, \$16,000

CSU Space Grant Consortium, Low Work Function Electride for Electric Propulsion Applications, J. Williams, PI, X. Qian co-PI, 0%, 11/1/2010, \$8,500

CSU-Energy Institute, CdTe Thin-film Photovoltaics for Aerospace & Lightweight Applications, W. Sampath, End date: 6/30/2016, 0%, \$40,000

#### **PAPERS PRESENTED / SYMPOSIA / INVITED LECTURES / PROFESSIONAL MEETINGS / WORKSHOPS**

See conference papers listed above.

Invited Lecture: Feb. 1, 2018, Title: Electric Propulsion, Visit Sponsor: Mr. Greg Halac, President of the Northern Colorado Astronomical Society, Museum of Science Planetarium, Fort Collins, CO.

Invited Lecture: April 24, 2015, Title: Recent Progress in Electric Propulsion Research, Graduate Student Seminar Series in Aerospace and Mechanical Engineering, Visit Sponsor: Prof. Andrew Ketsdever, Head of Dept. of Aerospace and Mechanical Engineering at U. of Colorado, Colorado Springs, CO.

Invited Lecture: April 21, 2010, Title: Future Challenges in Electric Propulsion, Visit Sponsor: Prof. Jeff King, Colorado School of Mines, Golden CO.

Invited Lecture: May 18, 2009, Title: Fundamentals of Plasma Engineering, Visit Sponsor: Prof. Sampath, director of the NSF-funded Industry/University Collaborative Research Center at CSU, Fort Collins, CO

Invited Lecture: Dec. 5, 2007, Title: Plasma Thruster Fundamentals and Promise, Visit Sponsor: Mr. Grant Rhoads and Prof. Azer Yalin, AIAA Student Section at CSU, Fort Collins, CO

Invited Lecture: Sept. 03, 2007, Title: Research Problems in Electric Propulsion in the Era of Model Validation, Visit Sponsor: Prof. Joe Wang, Virginia Tech Dept. of Aerospace and Ocean Engineering, Blacksburg, VA

Invited Lecture: Jan. 04, 2007, Title: Fast Starting Hollow Cathode System for Sounding Rocket Charge Control Applications, Visit Sponsor: Prof. H. Fujii, Tokyo Metropolitan Institute of Technology, Tokyo Metropolitan University, Tokyo, Japan

Invited Lecture: Jan. 23, 2005, Title: Plasma Property Measurements Using a Fast Probe Diagnostic System, Visit Sponsor: Dr. Dave Christy, Advanced Energy, Fort Collins, CO

Invited Lecture: April 7, 2003, Title: Plasma Source for Production of Low Earth Orbit Plasma Environments, Visit Sponsors: Prof. Lon Enloe and Dr. Geoff McHarg, Air Force Academy, Colorado Springs, CO

Invited Lecture: August 26, 2002, Title: Measurements of Low Electron Temperatures in Freely Expanding, Non-Uniform Plasmas, Visit Sponsor: Dr. Dale Ferguson, NASA Glenn Research Center, Cleveland, OH

Invited Lecture: August 26, 2002, Title: Role of Colorado State University in the NASA Glenn Electric Propulsion Program, Visit Sponsor: Mr. Michael Patterson, NASA Glenn Research Center, Cleveland, OH

## **SCHOLARLY RECORD- TEACHING**

<b>Year</b>	<b>Semester</b>	<b>Course</b>	<b>Hours</b>	<b>Enrollment</b>
2024	Fall	MECH468 – Space Propulsion and Power Engineering	3	23
2024	Spring	MECH544 – Advanced Heat Transfer	3	31
2023	Fall	MECH468 – Space Propulsion and Power Engineering	3	32
2023	Spring	MECH567 – Broad Beam Ion Sources	3	7
2022	Fall	MECH468 – Space Propulsion and Power Engineering	3	18
2021	Spring	MECH344 – Heat and Mass Transfer	3	35
2020	Fall	MECH468 – Space Propulsion and Power Engineering	3	34
2020	Spring	MECH567 – Broad Beam Ion Sources	3	5
2019	Fall	MECH468 - Space Propulsion and Power Engineering	3	68
2019	Spring	MECH544 - Advanced Heat Transfer	3	30

2018	Fall	MECH468 - Space Propulsion and Power Engineering	3	70
2018	Spring	MECH567 - Broad Beam Ion Sources	3	2
2018	Spring	MECH544 - Advanced Heat Transfer	3	24
2017	Spring	MECH544 - Advanced Heat Transfer	3	22
2017	Fall	MECH468 - Space Propulsion and Power Engineering	3	37
2016	Spring	MECH567 - Broad Beam Ion Sources	3	5
2016	Fall	MECH468 - Space Propulsion and Power Engineering	3	29
2015	Spring	MECH337 - Thermodynamics	3	103
2015	Fall	MECH468 - Space Propulsion and Power Engineering	3	29
2014	Spring	MECH567 - Broad Beam Ion Sources	3	12
2014	Spring	MECH344 – Heat and Mass Transfer	3	106
2014	Fall	MECH468 - Space Propulsion and Power Engineering	3	17
2013	Spring	MECH344 - Heat and Mass Transfer	3	90
2013	Fall	MECH468 - Space Propulsion and Power Engineering	3	17
2012	Spring	MECH567 - Broad Beam Ion Sources	3	5
2012	Fall	MECH538 – Mechanical Engineering Thermodynamics	3	12
2012	Fall	MECH468 - Space Propulsion and Power Engineering	3	27
2011	Spring	MECH344 - Heat and Mass Transfer	3	98
2011	Fall	MECH468 - Space Propulsion and Power Engineering	3	27
2010	Spring	MECH344 - Heat and Mass Transfer	3	111
2010	Spring	MECH580A - Mechanical Engineering Thermodynamics II	3	5
2010	Fall	MECH468 - Space Propulsion and Power Engineering	3	20
2010	Fall	MECH538 - Mechanical Engineering Thermodynamics	3	22
2009	Fall	MECH468 - Space Propulsion and Power Engineering	3	24
2009	Fall	MECH538 - Mechanical Engineering Thermodynamics	3	13
2009	Spring	MECH344 - Heat and Mass Transfer	3	79
2008	Spring	MECH344 - Heat and Mass Transfer	3	86
2008	Fall	MECH468 - Space Propulsion and Power Engineering	3	21
2007	Spring	MECH344 - Heat and Mass Transfer	3	97
2007	Fall	MECH468 - Space Propulsion & Power Engineering	3	14
2006	Fall	MECH468 - Space Propulsion and Power Engineering	3	24

## Student Course Surveys - Numeric Summary \*

\*Data from some classes and years are unavailable. Evaluation forms changed ~2018.

TEACHER EVALUATIONS	E	AA	A	BA	P	NA	NR
MECH544, Spring 2017	78.26%	17.39%	4.35%	0.00%	0.00%	0.00%	0.00%
MECH468, Fall 2017	97.14%	2.86%	0.00%	0.00%	0.00%	0.00%	0.00%
MECH544, Spring 2017	65.00%	35.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MECH468, Fall 2016	80.00%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MECH468, Fall 2015	47.37%	42.11%	5.26%	5.26%	0.00%	0.00%	0.00%
MECH337, Spring 2015	37.50%	32.95%	18.18%	10.23%	1.14%	0.00%	0.00%
MECH468, Fall 2013	75.00%	18.75%	6.25%	0.00%	0.00%	0.00%	0.00%
MECH344, Spring 2013	40.00%	33.33%	17.33%	8.00%	1.33%	0.00%	0.00%
MECH538, Fall 2012	8.33%	41.67%	41.67%	8.33%	0.00%	0.00%	0.00%
MECH468, Fall 2012	78.26%	17.39%	0.00%	4.35%	0.00%	0.00%	0.00%
MECH567, Spring 2012	80.00%	20.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MECH468, Fall 2011	77.78%	22.22%	0.00%	0.00%	0.00%	0.00%	0.00%
MECH344, Spring 2011	46.34%	33.74%	14.36%	2.98%	2.44%	0.14%	0.00%
MECH468, Fall 2010	62.09%	32.68%	3.92%	0.00%	0.65%	0.00%	0.65%
MECH538, Fall 2010	16.11%	50.56%	21.11%	6.67%	5.00%	0.56%	0.00%
MECH344, Spring 2010	36.51%	47.62%	11.60%	2.56%	0.37%	0.24%	1.10%
MECH580A3, Spring 2010	44.44%	44.44%	8.89%	0.00%	0.00%	2.22%	0.00%
MECH468, Fall 2009	73.86%	24.84%	1.31%	0.00%	0.00%	0.00%	0.00%
MECH538, Fall 2009	32.41%	23.15%	10.19%	0.93%	0.00%	0.00%	33.33%
MECH344, Spring 2009	44.87%	45.15%	2.95%	0.14%	0.00%	0.56%	6.33%
MECH468, Fall 2008	82.72%	14.81%	2.47%	0.00%	0.00%	0.00%	0.00%
MECH344, Spring 2008	32.91%	43.80%	11.54%	6.41%	2.35%	0.21%	2.78%
MECH468, Fall 2007	70.00%	30.00%	0.00%	0.00%	0.00%	0.00%	0.00%
MECH344, Spring 2007	20.46%	50.68%	16.80%	8.81%	2.57%	0.54%	0.14%
MECH468, Fall 2006	50.79%	45.50%	3.70%	0.00%	0.00%	0.00%	0.00%
<b>Average</b>	<b>55.13%</b>	<b>31.63%</b>	<b>8.08%</b>	<b>2.59%</b>	<b>0.63%</b>	<b>0.18%</b>	<b>1.77%</b>
<b>KEY:</b>	<b>Highlights:</b> <b>Teaching Evaluation: 87% judge Prof. Williams as excellent or above average regarding his teaching.</b>						
<b>E: Excellent</b>							
<b>AA: Above Average</b>							
<b>A: Average</b>							
<b>BA: Below Average</b>							
<b>P: Poor</b>							
<b>NA: Not Applicable</b>							
<b>NR: No Response</b>							

## Student Course Surveys – Summary of Selected Comments Over ~12 years

### MECH468 Space Propulsion and Power Engineering Fall 2006- (First technical elective undergraduate course taught)

“Really interesting class. Dr. Williams is a great teacher, taking time to both teach us and to make sure we understand the material; something more teachers need to do. He took the time to learn our names and made the class fun and interesting. Sometimes he’d give a HW and not talk about the material til the day it was due, which was annoying and beneficial at the same time. His tests are longer, but are full in what they test, and he is very fair assigning grades. Great job Dr. Williams, you’ve definitely been the best Prof I’ve had in a long time.”

“Dr. Williams is a very smart teacher, but sometimes the methods he used were a little above our heads. I think he thought we understood a lot of stuff when we really didn’t.”

“Really enjoyed the historical facts presented in class. Helps immensely in understanding the subject. Probably the best teacher I have encountered. Thanks.”

“This was one of the most challenging and interesting course I have taken yet. Dr. Williams did a great job of promoting engineering thought and encouraging us to solve the problems and understand them, not just plug numbers into equations.”

“This class was really interesting. Dr. Williams is the only professor I have had so far at CSU that really makes a

point to know every student's name and engage the class enthusiastically. The HW's were plentiful but fair. One thing that would have been nice is having a textbook (although we did have chapters for download on T:drive). Overall great class."

"John was very helpful outside of class. I think John is a very good teacher and cares about if the student understands what he is teaching."

"On many occasions I felt like I did not have all the necessary material to complete assignments. The good thing is Dr. Williams' willingness and availability to help outside of class."

*My response to student comments:* Revamped course notes to make concepts clearer. Provided more material on the network drive that was assigned for class use. Teaching this course opened my eyes to how interested and easy to engage undergraduate students are in their technical elective courses as opposed to interest they show in their core coursework. Overall this course went well, and I was totally unprepared for the next class I taught to undergraduates.

#### MECH344 Heat and Mass Transfer Spring 2007- (First required undergraduate course taught)

"This class was very challenging, but I feel it was one of the best courses I've taken at CSU. I truly learned a lot. I would have preferred Test 1 organization to be better; e.g., fins covered more before the test"

"I would consider spending less time on deriving equations and more time on working through examples. It would help students understand the material much better."

"In the beginning he spent the whole class deriving an equation when it is much more useful to explain and apply the equations. He got better near the end of the semester."

"We need more help with the qualitative understanding- Sometimes it feels like we blow through the difficult to understand stuff then spend lots of time on algebra and stories. More in-class examples would be useful. Great help outside of class ... very committed. I wish we spent more time figuring out how to identify and then perform problems. I have the most trouble figuring out how to start these problems."

"I know this is your first time teaching, but the lectures needed more basic info behind the basics of the material. I sometimes felt like we just jumped into material."

"From what I hear from others, nobody liked John's teaching, but I did. How can you teach using a textbook and not follow along in it? Sometimes the derivations were a bit long, but what can you do? This is complicated stuff! I enjoyed the side stories and trivia, and I encourage John to keep it up. It was clear to me that he is a very smart person and I can't think of many people who could make this course more enjoyable than John did."

*My response to student comments:* Revamped course notes to include more examples and questions to engage the class. Provided more in-class motivation for learning heat transfer concepts. More focus was directed toward explaining concepts and problem solution approaches. This teaching experience was an eye opener for me, and I have expended a tremendous amount of effort over the past 5 years to improve my undergraduate teaching techniques without dropping my expectations of the students. In response, I have seen more students learn the material, and my undergraduate teacher evaluations have improved as well.

#### MECH344 Heat and Mass Transfer Spring 2008

"Less homework (we will put the same amount of time in and learn more instead of just getting it done). I have no idea what my grade is in the class right now. Join the times and use RamCT and post grades. Suggestion: Make half test multiple choice combined with conceptual questions, other half make problem solving. This will help get a better distribution and sort the ones that have hands on understanding from those who have equation understanding. Great class Dr. Williams."

"The homework was way too challenging and long. Each midterm was like taking a new test because the format of note sheets was different every time. Class sessions ad material needed to be explained properly. Midterms need to either be shorter or longer tests with shorter questions. You are extremely helpful outside of class."

"I liked how the lectures followed the book. It really helps to have my book open during lecture because I learn the basic problem approach faster. It took me awhile to figure out how to do well on the tests, but once I did I learned a lot and got good grades."

"This class being after lunch made it difficult to pay attention some times (nap time ...). I would like to see more examples in class that are like the tests and homework, and fewer examples out of the book. (If I have questions about those => office hours.) This is a very interesting class and sparked a desire to learn more."



"I appreciate the willingness to help outside of office hours. I thought the book was very good. One area of improvement would be to work more examples. Some of the homework assignments were too long and very difficult."

"This is the best class I've taken in college thus far. You got me really excited about nuclear power in the Navy. Thanks a ton and can't wait for class with you next semester."

"You need to make the homework a little bit easier. It is very, very difficult. I had a hard time learning from the lectures. I'm not sure what needs to change but something needs to be done. Try to make it more interesting."

"You did a wonderful job at challenging us with the material. I was able to learn a very complicated subject with hard work and ease. Thanks."

"I really enjoyed the lectures, and I enjoyed the fact that the class was geared toward learning for learning and not just to pass the exams. It made people aware of the things that are going outside of the classroom. The outside thought was the kind of thing many professors neglect in the classroom."

*My response to student comments:* Revamped course notes for a second time. Included more examples and discussion of examples. Included more discussion to engage students in new ideas of how to utilize their growing knowledge of heat transfer. Decided to provide 3 hours of group office hours to reach more students with more examples and discussion. Revamped the homework to include some problems directed at simple concepts and one more difficult problem. Developed RamCT session where students could download homework assignments from and where they could track their progress in the course. Moved class time from 1:00 pm to 8:00a.

MECH344 Heat and Mass Transfer Spring 2009 (Large Class at 117 Students, 8:00a class, 97% Rate Instructor as Good)

"John Williams is the best prof. I have had at CSU."

"Good class, though I enjoyed MECH468 more. I think the class size makes this one harder. 8 am pop quizzes are cruel. Your lectures are the best of any professor I've had."

"Williams is awesome. You should probably give him a raise. He's one of three teachers I've had throughout my entire degree that actually cared whether or not he helped the students rather than being consumed with his research."

"Good class. Limiting tangents would be good, but sometimes are a nice change of pace. Warn us for quizzes and homework due 1 day a week would be nicer."

"Honestly Dr. Williams was the best teacher I've had at CSU so far. He is a very nice person and seems to care about his students more than other professors. Nothing bad to say except that his lectures go to fast, needs to slow down, and let everyone know what is going on."

"Class was very enjoyable. I would have liked to have done better. The intellectual application of the material was very thought provoking and very helpful for other classes (primarily Thermo Lab)."

"I enjoyed this class, however, the frequency of homework assignments and pop quizzes was at time frustrating. At the same time, the homework increased my understanding of the HW and the quizzes scared me into coming to class. (But maybe make the quizzes a bit easier.)"

"Great lectures. I appreciated the occasional joke or video at 8:00 am. A more focused problem set for exams would be helpful."

"I really enjoy your stories and your lessons and applications from industry. They're what I'll remember most."

"The office hours were very helpful. The professor and TA were very knowledgeable about the material and always willing to help. They were interested in the students' needs and learning. More classes should be similar to this course. Amazing work!"

"Awesome Prof! Would recommend to anyone! Material can be a little dry but Dr. Williams makes it easy to understand."

"This is the most challenging course I have come across yet."

*My response to student comments:* Revised notes to further simplify explanations. This was the last MECH344 class I would have a TA assigned, and so I implemented group homework assignments and a multiple choice test format in future classes. This reduced the workload on my "super" grader and me. The "super" grader, an undergraduate, was recruited

from this class to serve in the following year. This student was also part of the Pi Tau Sigma Honor society I advise. I also began a tutoring program using students from Pi Tau Sigma to help with providing more office hours. The class size is becoming unmanageable, and will continue to worsen over time as our department undergraduate population continues to grow. I am now seriously contemplating the development of short video tutorials and related techniques to demonstrate how to approach the solution to common problems. I also believe that several recitation sessions would be useful to the students to increase their exposure to instructors. I have joined the undergraduate curriculum committee where I will attempt to address these issues.

#### MECH468 Space Propulsion and Power Engineering Fall 2009

“Great class as always Dr. Williams. I do wish we had more time to look at the physics aspects of photovoltaics and nuclear reactors. Probably my favorite class so far.”

“Dr. Williams is a great teacher!”

“Dr. Williams is enthusiastic about mat'l and had desire for us to succeed/benefit from learning. Thank you.”

“One of my favorite professors. Does a good job as explaining difficult concepts. Any lack of understanding due to my laziness not his failures as a teacher, which he has none of. Also has funny jokes.”

“Dr. Williams is one of the most valuable assets to the ME program at CSU. He invests as much time in the classroom as his research, and this makes the learning experience valuable and exciting.”

“This was the most challenging course I have encountered so far as far as material content. I really enjoy Prof. Williams' courses; he always keeps the class involved and is very knowledgeable about the content. This class has further interested me in Aerospace.”

*My response to student comments:* Reviews are good, but the biggest vocal complaint I continue to receive about this class is that it doesn't have a book assigned to it. I've struggled with finding a book that would work, but have failed to do so. I continue to find information that I post to the MECH468 network drive, and I've changed the syllabus to identify all of this material. The syllabus information is helping the students realize that they have significant amounts of written information to strengthen their understanding of the material.

#### MECH538 Mechanical Engineering Thermodynamics Fall 2009 (First Graduate Level Course Taught)

“Another good class. Good lectures, but the beginning of the course went very fast.”

“Always a joy coming to class. Thanks!”

“Prof. Williams is super helpful outside of class and very enthusiastic. It would have been nice if the problem sets and course lectures related a little more closely to one another.”

“I felt we spent so much time deriving equations the class lost direction about what we were supposed to be learning. The course increased my knowledge of math but not thermo.”

“More homework based problems in class rather than extensive derivations may help gain more applicable knowledge. In other words, how can we actually use all this knowledge?”

“Be less theoretical and more examples. Tell what to prepare for next class to make it more effective.”

*My response to student comments:* Revamped notes to include more examples. Eliminated some of the longer, less informative derivations. Attempted to increase ways to engage class. Organized each lecture to include specific aims and explanations of why we deriving/developing certain equations.

#### MECH344 Heat and Mass Transfer Spring 2011

“I enjoyed this class. Williams was approachable and I learned a lot from him. He made a difficult subject manageable. His positive attitude worked better than coffee most mornings. Thanks John.”

“Great professor. Very available to help students with demanding homework assignments. Office hours in Titan computer classroom were great.”

“This was the most interesting class I had this semester. I really enjoyed the subject and also enjoyed having you as our teacher. Your knowledge and enthusiasm were great. Thank you for a great semester.”

“Often, we would have to do HW on material that had not yet come up in lecture. This made the assignments

almost impossible in some cases, and should be changed.”

*My response to student comments:* Revamped parts of introductory lectures to explain that college is about the transition from teacher-guided learning to self-guided learning. I also added motivational statements when new subjects are introduced to stir the imagination. For example, I added lecture material that explained how a student could make a ‘billion dollars’ if they discovered a way to remove the heat transfer limitations imposed by a boundary layer. The lecture material included information on how researchers are currently working to do this and how far they have come.

#### MECH468 Space Propulsion and Power Engineering 2014

“Dr. Williams remains one of my favorite professors on the CSU campus, and it has been a pleasure learning from him.”

“I would suggest organizing the course folders on the t:drive in a way so they are organized by chapters essentially. It would help a bit if it was easier to find the different documents.”

“Better organization of notes would be nice (i.e., explains all of the parts of an equation the first time it is written by actually writing down variable names, and titles of what we are doing written on the board.”

*My response to student comments:* I re-organized the t:drive resources to make them easier to find and use. I updated and added documents that contain summaries of equations and methods on how to apply them with the variable names defined. I revamped the notes to include a lecture objective page with titles of what will be discussed and reminders on lecture pages to write out variable names as equations are derived and discussed.

#### MECH468 Space Propulsion and Power Engineering Fall 2016

“Great Job! Awesome lectures. Super hard material but I was able to grasp it very well with you teaching it. Pretty sure you may be the smartest teacher on campus!”

“This course was the hardest interesting course I had. Just go easy with next year’s class.”

“Awesome class and taught well on a lot of topics. More examples during lecture would be a bit more helpful. Having the reading on the t:drive was great for not needing to purchase books. Take home exams were nice to have and were challenging. Dr. Williams was very approachable and inclusive of everyone and got to know everyone’s name and learned about his students. Book club meeting was fun.

“Excellent course with interesting material. Office hours were very helpful. Dr. Williams is extremely knowledgeable about topics discussed and provided meaningful homework assignments to help reinforce learning.”

“I really appreciate your help sessions. And when you talk about current advancements in the field – shows that you care and you want to inspire us to become motivated engineers and that is cool!”

“This was by far my favorite class at CSU. The class size and content were the 2 driving factors. With a smaller class size it is much easier to instigate class participation as well as discussion. With the other classes well into having 160+ students, it is difficult to get much from the class. Finally I was allowed to choose a class that contains content that interests me. Many of the other required classes feel like bloated/rushed content that someone decided was relevant. There needs to be more options for technical electives as well as smaller class sizes. My only complaint is that this is the only class that covers space propulsion and orbital mechanics. We want more aerospace options.”

*My response to student comments:* Reviews were very positive this year. I’d like to add in more in-class participation and I started doing some of this.

#### MECH544 Advanced Heat Transfer Spring 2018 (missed 6 weeks mid-semester after ‘5-by-pass’ open heart surgery)

“It was absolutely wonderful having Dr. Williams as a teacher. Not only was he able to communicate the material, his enthusiasm and energy level kept the class engaged and interested, which is not easy to do in an 8am class. I would recommend Dr. Williams to anyone and would be happy taking more courses with him as the professor.”

“Overall, you made a good situation out of a really difficult semester. You handled the balance between class and your extra life problems well. Overall, you’re a good professor you just seemed to immediately go to random tangents if you got nervous. This is okay but keeping a little more organized would be helpful.”

*My response to student comments:* I plan on improving the summary viewgraph material that I share with the students before class. This material helps me keep organized as some students suggest would be highly helpful to them. I attempted

to engage the class with questions that don't necessarily have a right or wrong answer. This works, but I need to practice doing questions in this manner. Although I included several in class, "work together" quizzes this semester, I want to implement more opportunities for the students to work together on solving problems and explaining concepts during class time.

## **ADVISING:**

### STUDENT ADVISING / GRADUATE SUPERVISION

#### **Undergraduate Students:**

The CSU Mechanical Engineering Department uses professional staff to advise undergraduate students regarding academic issues. I typically supervise between 1 and 3 undergraduate interns in my lab at any given time.

#### **Graduate Students:**

##### Current Graduate Advisees: (5 total)

Thomas Andreano, M.S. (Start Fall 2018, expected graduation: Summer 2020)

Ryan Ham, MS, (Start Fall 2018 expected graduation: Spring 2020)

Seth Thompson, Ph.D. (Start Fall 2019, expected graduation: Spring 2022)

Jack VanGemert, M.S. (Start Fall 2019, expected graduation: Fall 2020)

Malcolm Roux, Ph.D. (Start Fall 2019, expected graduation: Spring 2023)

##### Current and Past Graduate Student Committee Memberships

See table included on next page (last updated 6/2018).

##### *Brief Summary:*

Served/serving on >75 graduate student committees.

Served as advisor or co-advisor to >23 graduate students who graduated with MS and/or PhD degrees.

Served on 21 graduate student committees as the outside committee member.

Last	First	Dept	Role	Status or Outcome		
Clifton	Nathan	CIVE-PHD	Outside Member	Active		
Friss	Adam	MECH-PHD	Committee Member	Active		
Ham	Ryan	MECH-MS	Advisor	Active		
Martinez	Marco	MECH-MS	Advisor	Active		
Nivala	Peter	MECH-PHD	Committee Member	Active		
Polak	Scott	MECH-PHD	Committee Member	Active		
Randall	Alfred	SYSE-DD-PHD	Outside Member	Active		
Thompson	Seth	MECH-MS	Advisor	Active		
Wolf	Jonathan	MECH-MS	Advisor	Active		
Farnell	Casey	MECH-PHD	Advisor	Grad'd	Fall	2007
Martinez	Rafael	MECH-MS	Advisor	Grad'd	Fall	2007
Zoerb	Kirk	MECH-MS	Advisor	Grad'd	Fall	2007
Miller	Nathan	MECH-MS	Committee Member	Grad'd	Fall	2010
Lutz	Markus	MECH-MS	Committee Member	Grad'd	Fall	2011
Woidt	James	CIVE-MS	Outside Member	Grad'd	Fall	2011
Leach	Randolph	MECH-MS	Committee Member	Grad'd	Fall	2012
Metz	Garrett	MECH-MS	Advisor	Grad'd	Fall	2012
Swanson	Drew	MECH-MS	Advisor	Grad'd	Fall	2012
Wagner	Nicholas	MECH-MS	Committee Member	Grad'd	Fall	2012
Blash	Derek	MECH-MS	Advisor	Grad'd	Fall	2013
Rath	Jordan	MECH-MS	Committee Member	Grad'd	Fall	2013
Clopper	Christopher	CIVE-MS	Outside Member	Grad'd	Fall	2014
Fredrick	Sarah	CHEM-PHD	Outside Member	Grad'd	Fall	2014
Robeson	Michael	CIVE-PHD	Outside Member	Grad'd	Fall	2014
McArdle	Patrick	MECH-MS	Advisor	Grad'd	Fall	2015
Mullins	Carl	MECH-MS	Advisor	Grad'd	Fall	2015
Michalos	Christopher	CIVE-PHD	Outside Member	Grad'd	Fall	2016
Moritz	Joel	MECH-MS	Advisor	Grad'd	Fall	2016
Swanson	Drew	MECH-PHD	Committee Member	Grad'd	Fall	2016
Boehm	Kirk	MECH-MS	Advisor	Grad'd	Fall	2017
Cramer	Corson	MECH-PHD	Committee Member	Grad'd	Fall	2017
Day	Travis	ELEG-MS	Outside Member	Grad'd	Fall	2017
Hensen	Tucker	MECH-MS	Advisor	Grad'd	Fall	2017
Lauffer	Dustin	MECH-MS	Committee Member	Grad'd	Spring	2004
Surla	Vijaya	MECH-MS	Committee Member	Grad'd	Spring	2004
Farnell	Cody	MECH-PHD	Advisor	Grad'd	Spring	2007
Surla	Vijaya	MECH-PHD	Committee Member	Grad'd	Spring	2007
Mauck	Justin	MECH-MS	Advisor	Grad'd	Spring	2008
Martin	Russell	MECH-MS	Advisor	Grad'd	Spring	2009
Lee	Brian	PHYS-MS	Outside Member	Grad'd	Spring	2010

Riedel	Nicholas	MECH-MS	Advisor		Grad'd	Spring	2010
Tao	Lei	MECH-PHD	Committee Member		Grad'd	Spring	2011
Topper	James	MECH-MS	Committee Member		Grad'd	Spring	2011
Trujillo	Nathan	BNGR-ME-MS	Co-Advisor		Grad'd	Spring	2011
Turner	Michael	CIVE-MS	Outside Member		Grad'd	Spring	2011
Riedel	Nicholas	MECH-PHD	Advisor		Grad'd	Spring	2012
Kopacz	Joseph	MECH-MS	Committee Member		Grad'd	Spring	2013
Morozko	Zoe	MECH-MS	Advisor		Grad'd	Spring	2013
Cobb	Ami	CIVE-MS	Outside Member		Grad'd	Spring	2014
Joslin	Jessica	CHEM-PHD	Outside Member		Grad'd	Spring	2014
Lee	Brian	PHYS-PHD	Outside Member		Grad'd	Spring	2014
Liu	Dajiang	MECH-PHD	Committee Member		Grad'd	Spring	2014
Parker	Thomas	CIVE-MS	Outside Member		Grad'd	Spring	2014
Rand	Lauren	MECH-PHD	Advisor		Grad'd	Spring	2014
Chestnut	Allen	CIVE-MS	Outside Member		Grad'd	Spring	2015
Cramer	Corson	MECH-MS	Advisor		Grad'd	Spring	2015
Kephart	Jason	MECH-PHD	Committee Member		Grad'd	Spring	2015
Wold	Kathryn	BNGR-PHD	Outside Member		Grad'd	Spring	2015
Bevis	Taylor	MECH-MS	Committee Member		Grad'd	Spring	2016
Klema	Matthew	CIVE-MS	Outside Member		Grad'd	Spring	2017
Nguyen	Bao	MECH-MS	Co-Advisor		Grad'd	Spring	2018
Arthur	Timothy	CHEM-PHD	Outside Member		Grad'd	Summ	2010
Krous	Erik	ELEG-MS	Outside Member		Grad'd	Summ	2010
Jurgensmeyer	Austin	MECH-MS	Advisor		Grad'd	Summ	2011
Ursic	Michael	CIVE-MS	Outside Member		Grad'd	Summ	2011
Bayer	Rebecca	CHEM-MS	Outside Member		Grad'd	Summ	2012
Kobyakov	Pavel	MECH-PHD	Committee Member		Grad'd	Summ	2014
Leszczak	Victoria	MECH-PHD	Committee Member		Grad'd	Summ	2014
Sorkin	Jonathan	MECH-MS	Committee Member		Grad'd	Summ	2014
Trujillo	Nathan	MECH-PHD	Committee Member		Grad'd	Summ	2014
Rahman	Akm	MECH-PHD	Committee Member		Grad'd	Summ	2015
Walsh	Sean	MECH-MS	Committee Member		Grad'd	Summ	2016

## POSTDOCTORAL CANDIDATES/ RESEARCH SCIENTISTS / RESEARCH ASSOCIATES

### Current:

Casey C. Farnell, Research Scientist II, 2007 – present

Cody C. Farnell, Research Scientist II, 2007 – present

Shawn C. Farnell, Research II, 2018 – present

Seth J. Thompson, Research Associate II, 2021 - present

## **SERVICE RELATED ACTIVITIES:**

**Collaboration:** During my years with the CSU Mechanical Engineering (ME) Department I have made a concerted effort to collaborate with fellow CSU academics with the intention of fostering and demonstrating openness and good will, and to lay the groundwork for small groups of academics to organize around similar interests. Although I have not yet successfully organized a small group of ME professors who would share equipment and space and collaborate to secure funding, I have succeeded in collaborating, mentoring, or assisting several professors when they were new to the department by securing contracts and publishing journal articles with them. I have collaborated with Azer Yalin (6 contracts, 4 journal papers), Thomas Bradley (3 contracts), Ketul Popat (3 contracts, 4 journal papers), Arun Kota (2 contracts, 1 journal paper), Troy Holland (2 contracts, 1 journal paper), and Kaka Ma (1 contract). I've also worked collaboratively with W. Sampath and his group (4 contracts, 4 journal papers). Finally, although I'm not on contracts with Xinfeng Gao, I did introduce her to senior Boeing personnel, which helped her secure several large contracts with Boeing and establish a research group at CSU. Each member of the faculty approach service differently, and I have chosen to expend my energies in service to other academics to enhance the cross-pollination of ideas and promote broad dissemination of research results.

**Graduate Student Committees:** I am currently on or have served on a total of 75 graduate student committees at CSU and one at UCCS. A large sub-group of these, 23, were performed as the 'outside committee' member, which demonstrates my ability to interact with and serve the greater CSU academic community. I have also assisted ME graduate students who were unable to continue their research with another professor. When Troy Holland left CSU I took on one of his students, paying him a stipend and serving as his advisor so he could finish his MS degree and start work at SpaceX. I also co-funded and co-advised another student with Thomas Bradley once this student's original graduate

project was cancelled and before he started work at Lockheed Martin.

**Faculty in Residence:** I was selected to serve from August 2023 to August 2024 as the sole faculty in residence on the CSU campus in the Academic Village Engineering Learning Resource Center. I interacted with freshmen engineering students during various activities to get them used to approaching and talking to faculty.

## **COMMITTEES:**

### **University Committees**

Engineering Learning Resource Center, Faculty in Residence, 2023-2024  
Committee on Libraries, Member, 2006-2009  
Export Control Committee, Member, 2008-2009

### **College Committees**

College of Engineering Silver Metal Committee, 2011, 2012, 2013

### **Department Committees**

Graduate Student Committee, 2011-2014  
Undergraduate Student Committee, 2011  
Grade Appeal Committee, 2011  
Mechanical Engineering Advisory Panel (MEAP), 2009, 2011-2015  
Department Head Search Committee, 2009  
Department Self Study Committee, 2009, 2010  
Faculty Search Committees, 2007, 2008, 2012-2016  
Award Committee, 2015-2018 (head of committee in 2018)  
Thermal Sciences Lead Coordinator, 2019

## **PROFESSIONAL AFFILIATIONS AND ACTIVITIES:**

### **Memberships in professional societies**

AIAA, Senior Member, 2002-2014  
AIAA, Member, 1991-2002  
Pi Tau Sigma, 1985  
Tau Beta Pi, 1985

### **Conference Related Service**

31st International Electric Propulsion Conference, Ann Arbor, MI, Session chair, 2009  
42nd Joint Propulsion Conference, Sacramento, CA, Session Chair, 2006  
29th International Electric Propulsion Conference, Session Chair, 2005  
53rd JANNAF Conference, Chair of Technology Assessment Group: In-Space Propulsion Program, 2005  
40th Joint Propulsion Conference, Fort Lauderdale, FL, July 2004, Session Chair, 2004

### **Journal (Manuscript) Reviewing**

Journal of Physics D: Applied Physics; Plasma Sources, Science, and Technology; IEEE Transactions on Plasma Science, Journal of Propulsion and Power, Journal of Spacecraft and Rockets, Review of Scientific Instruments.

## **OTHER ACTIVITIES/ACCOMPLISHMENTS - SERVICE/OUTREACH:**

### **Special service to the state/community related to professional expertise**

CEPPE Laboratory K-12 Outreach, Mentor, 2009  
Presentation on Orthopedic Implants to Fossil Ridge Middle School, 2011

### **Consultations related to professional expertise**

Woodward Governor, Inc., 2010  
Engineered Coatings, Inc., 2006