**Brian A. McDonald
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**Taft, TN 38488**

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**Work: (256) 313-6470**

**EDUCATION**

Georgia Institute of Technology, Bachelor of Science, Aerospace Engineering, June 1988
Georgia Institute of Technology, Master of Science, Mechanical Engineering, May 1999
(Emphasis in Thermal Science)
Georgia Institute of Technology, Ph.D. Aerospace Engineering, July 2004 (Advisor: Suresh Menon). (Emphasis in Computational Combustion), Dissertation: “The Development of an Erosive Burning Model for Solid Rocket Motor Design Using Direct Numerical Simulation”

**PROFESSIONAL AFFILIATIONS**

Registered Professional Engineer in the state of Alabama.

**SECURITY LEVEL**: SECRET

**ENGINEERING EXPERIENCE**

Design, analysis, performance evaluation, failure investigation and subscale testing of solid and liquid rocket motors to include interior ballistics code development, thermal, structural and CFD analysis. Solid fuel ramjet design and fuel development to include subscale testing. Ramjet design code development. Numerical research and model development of solid fuel erosive burning. Liquid DACS thruster design and testing. Combustion instability in liquid thrusters. Rocket motor aging research to include ammonium perchlorate humidity effects, nitrate ester stabilizer depletion, BKNO3 friction and impact sensitivity. Thermochemical analysis of energetics.

Direct laboratory experience includes ramjet fuel formulation studies, rheology and dynamic mechanical analysis, differential scanning calorimetry, thermogravimetric analysis, ramjet fuel pipe burner, cryogenic pumping propellant head gas separation, propellant aging, carbon nanotube gas sensor testing, and nitrate ester conductivity testing as related to stabilizer depletion.

Numerical experience includes structural and thermal FEA, CFD, interior ballistics, and thermochemical analysis. Development of multiple propulsion related design tools to include erosive burning, interior ballistics, trajectory analysis, ramjet cycle analysis, particle packing algorithms, and engine design and performance codes.

**EMPLOYMENT HISTORY**

August 2007-Present - Senior Research Engineer for the United States Army’s Propulsion and Structures Laboratory.

JAVELIN, MSE, PAC3, GMD, RKV, SM III, Arrow, David’s Sling, Targets and Counter Measures, multiple Army Science and Technology propulsion programs

August 2006 – August 2007 - Principle Research Engineer III in the Center for Modeling, Simulation, and Analysis at the University of Alabama in Huntsville.

 NASA CLV program

August 2007 – August 2015 Part-time Lecturer - Department of Mechanical and Aerospace Engineering at the University of Alabama in Huntsville.
Nov. 1989 – Aug 2006 - Stone Engineering Company (SEC), Huntsville, AL.

2003-2006 Vice President, Technical Director.

1999-2003 Engineering Manager.

1989-1999 Propulsion Engineer

THAAD, PAC3, MSE, CKEM, AdKEM, GMD, Arrow, multiple Army, SMDC, and MDA propulsion related activities, Phase I and II SBIR
Sept. 1988 – Nov. 1989 - McDonnell Douglas Space Systems, Huntsville AL.

Space Lab and Space Hab

**SPECIAL ASSIGNMENTS**

Science and Technology Program PI for Development of Divert and Attitude Control Technology – FY18

Propulsion Technical Lead for Army Next Generation Lower Tier Missile Design, 2017

Failure Review Board Chairman for SM-3 SM CTV-01/02, 2016.

Science and Technology Program Co-PI for Solid Fuel Ramjet design, analysis and development – 2016-present

Failure Review Propulsion SME for GMD ADT Thruster Instability, 2015

MDA IRT, SM-3 Third Stage Rocket Motor Review, 2014

Failure Review Board Member for GM E1A and E2A Thruster Failures, 2013

MDA IFT, GMD Propulsion, 2013

Technical Lead for MDA liquid thruster oxidizer manifold explosion experiments, 2013

MDA Interceptor Knowledge Center Red Team, Arrow III, 2009

Interceptor Knowledge Center NAR member, GMD Thruster instability, 2008

Science and Technology Program PI for Carbon nanotube gas sensors for rocket motor age monitoring, 2008-2011

SBIR Phase I and II technical Lead for design and testing of spring actuated pintle controlled bi-propellant gel engine

**PATENTS**

McDonald Brian, Rice Jeremy, Stewart John, “LP-33 (Polysulfide) Solid Fueled Ramjet Fuel with Elemental Sulfur as a Decomposition Temperature Modifier”, Pending

McDonald Brian, Rice Jeremy, Stewart John, “A copolymer of LP33 and HTPB for low ignition temperature ramjet fuel applications”, Pending

McDonald Brian, Rice Jeremy, Stewart John, “Magnesium diboride fuel additive for high performance solid fuel ramjets”, Pending

**REFEREED JOURNALS**

McDonald Brian, Rice Jeremy, "Solid fuel ramjet fuel optimization for maximum thrust to drag ratio and impulse density subject to geometric restraints on missile outer mold line", *Aerospace Science and Technology*, **75**, pp. 47-57, 2018.

McDonald Brian, Rice Jeremy, Stewart John, " Mechanical and thermodynamic characterization of a copolymer of LP-33 polysulfide and hydroxyl terminated polybutadiene for solid fuel ramjet applications ", *Combustion and Flame*, **184**, pp. 11-19, 2017.

McDonald Brian, Rice Jeremy, Marshall Chris, Seymour Kayla, Stewart John, "Pyrolysis-mass spectroscopy and pipe combustor analysis of the ignition and mass regression characteristics of a sulfur doped polysulfide ramjet fuel", *Combustion and Flame*, **184**, pp. 252-260, 2017.

McDonald Brian, Rice Jeremy, Stewart John, "Decomposition Characteristics of an Elemental Sulfur Doped Polysulfide Based Ramjet Fuel ", *Combustion and Flame*, **176**, pp. 1-11, 2017.

McDonald Brian, Marshall Chris, "Aging Induced Electrical Resistance Changes in an RDX Loaded Nitrate Ester Propellant with Polyglycol Adipate (PGA) and Polyethylene Glycol (PEG) Cross-linked Binders Subject to Various Thermal and Moisture Environmental Conditions", *Journal of Energetic Materials*, **35** (1), pp. 77-94, 2017.

McDonald Brian, Rice Jeremy, R., Kirkham Mark, W., “Humidity Induced Burning Rate Degradation of an Iron Oxide Catalyzed Ammonium Perchlorate/HTPB Composite Propellant”, *Combustion and Flame*, **161** (1), pp. 363-369, 2014.

McDonald Brian, Turner Tom, "A Test Series to Investigate Oxidizer Manifold Explosions Induced by Condensing Hydrazine/Monomethylhydrazine", *Journal of Propulsion and Power*, **29** (6), pp. 1257-1265, 2013.

McDonald Brian, Li Jing, "Investigation of the Use of Carbon Nanotube NOx Sensors for the Health Monitoring of Nitrate Ester Propellants", *International Journal of Energetic Materials and Chemical Propulsion*, **10** (4), pp. 321-336, 2011.

McDonald Brian, "Study of the Effects of Aging Under Humidity Control on the Thermal Decomposition of NC/NG/BTTN/RDX Propellants", *Propellants, Explosives and Pyrotechnics*, **36** (6), pp.576-583, Dec. 2011.

McDonald Brian, "Composite Propellant Density Maximization Using A Particle Packing Algorithm with Random, Volume Weighted Displacements", *JANNAF Journal of Propulsion and Energetics*, May, 2012

McDonald Brian, "Global Scaling of the Wall Momentum Function for an Erosive Burning Prediction Correlation", *JANNAF Journal of Propulsion and Energetics*, April 2009

McDonald Brian, "Numerical Analysis of the Correlation of Erosive Burning and the Threshold Condition in Solid Propellants Using the Wall Momentum Ratio", *JANNAF Journal of Propulsion and Energetics*, May 2008

McDonald Brian; Menon S., "Direct Numerical Simulation of Solid Propellant Combustion in Cross Flow", *Journal of Propulsion and Power*, May 2005

**INVITED LECTURES**

McDonald, Brian, “On-going Studies of Chemical Aging of Nitrate Ester Solid Propellants and Health Monitoring Sensor Development”, Graduate Seminar Lecture Series, Michigan Technology University, Sept. 2011.

**TEACHING EXPERIENCE**

University of Alabama in Huntsville, Department of Mechanical and Aerospace Engineering, MAE 455, Design of Thermal Systems, Summer 2006.

University of Alabama in Huntsville, Department of Mechanical and Aerospace Engineering, MAE 441/541, Air Breathing Propulsion, Fall 2006.

University of Alabama in Huntsville, Department of Mechanical and Aerospace Engineering, MAE 420/520, Compressible Aerodynamics, Spring 2007.

University of Alabama in Huntsville, Department of Mechanical and Aerospace Engineering, MAE 441/541, Air Breathing Propulsion, Fall 2007.

University of Alabama in Huntsville, Department of Mechanical and Aerospace Engineering, MAE 385, Numerical Methods II, Spring 2008.

University of Alabama in Huntsville, Department of Mechanical and Aerospace Engineering, MAE 441/541, Air Breathing Propulsion, Summer 2008.

University of Alabama in Huntsville, Department of Mechanical and Aerospace Engineering, MAE 441/541, Air Breathing Propulsion, Fall 2008.

University of Alabama in Huntsville, Department of Mechanical and Aerospace Engineering, MAE 455, Design of Thermal Systems, Spring 2009.

University of Alabama in Huntsville, Department of Mechanical and Aerospace Engineering, MAE 441/541, Air Breathing Propulsion, Summer 2011.

University of Alabama in Huntsville, Department of Mechanical and Aerospace Engineering, MAE 430/530, Fundamentals of Aerodynamics, Summer’s 2011-2015.

University of Alabama in Huntsville, Department of Mechanical and Aerospace Engineering, MAE 610, Aerodynamics, Fall 2017.

**AWARDS**

2009 – Department of the Army Official Commendation for special achievement and outstanding performance in propulsion support and analysis of MDA Missile programs.

2010 – Department of the Army Official Commendation for special achievement and outstanding performance in prognostic and diagnostic, modeling, testing and health monitoring minimum signature propellants.

2011 – Department of the Army Official Commendation for special achievement for his outstanding performance and leadership, on behalf of the Missile Defense Agency (MDA), to guide the Arrow III Booster Rocket Motor through successful completion of the program Critical Design Review (CDR).

2016 – Department of the Army Official Commendation for special achievement for his outstanding performance and leadership Missile Science and Technology.

2017 – Department of the Army Official Commendation for special achievement for his outstanding performance and leadership, on behalf of the Missile Science and Technology for novel ramjet fuel development and testing.

**CONFERENCE PAPERS**

Farley C , Mills J , Bibb J , Curley M , Ruffin P , Sharma A , Kassu A , Rice J , McDonald B,”Raman studies for stockpile reliability of missiles by detecting degradation of propellant stabilizers”, Proceedings of SPIE, **9958**, San Diego, 2016.

Mathis, N.P., Pledger, K.L., McDonald, B.A., Howard, W.S., “Propulsion Development for KEAPS”, 2012 AIAA Missile Science Conference, 24-26 January 2012, Monterey, CA.

McDonald, B.A., “Effect of Humidity and Temperature Induced Aging on the Rheology of a Nitrate Ester Plasticized/Poly(glycol adipate)/Solids Loaded Propellant”, Proceedings of the 42th International Annual Conference of ICT on ‘Energetic Materials – Modeling, Simulation and Characterization of Pyrotechnics, Propellants and Explosives’, Karlsruhe, Germany, June 28-July 01, 2011., Proceedings by Fraunhofer-Institut für Chemische Technologie (ICT), D-76318 Pfinztal-Berghausen, Germany, 44-1 to 44-12, 2011.

McDonald, B.A., “Wall Momentum Scaling Law for Interior Ballistics Analysis of Homogeneous Propellants”, *DEA 1060, Aberdeen Proving Ground, May 2011*.

McDonald, B.A., “Interior Ballistics Analysis of a High Burn Rate, Free Standing Propellant Grain Thruster Motor”, *DEA 1060, Aberdeen Proving Ground, May 2011*.

McDonald, Brian, “The Application of Carbon Nano-Tube Gas Sensors for the Health Monitoring of Nitrate Ester Propellants” SYMPOSIUM AVT-176 RSY-026, Antalya, Turkey, April 2010

McDonald, Brian, “Chemical Aging Studies of Nitrate Ester Propellants” JANNAF, April 2009

McDonald, Brian, “Modeling, Simulation, and Heath Monitoring of Minimum Smoke Propellants”, PMTech 2009, Huntsville, AL, February 2009

McDonald, Brian, Little, R., “Aged Magnesium-Teflon Igniter Data Analysis, Numerical Model, and Proposed Test Apparatus”, JANNAF, May 2008

McDonald, Brian, “Numerical and Application Enhancements to an Interior Ballistic Modeling and Design Analysis Computer Program” Huntsville Simulation Conference, October 2006

McDonald, Brian, "The Analysis of Flow Oscillations in a Solid Rocket Motor Using a New Finite Differencing Computer Code", JANNAF Dec. 1995

McDonald, Brian, "A New Finite Element Geometry Based, One Dimensional, Unsteady, Internal Ballistics Code", JANNAF Dec. 1995

"The Design of a Soft Launched Shoulder Fired Weapon", JANNAF Sept. 1993

"The Preliminary Design Study of a Solid Fueled Ducted Rocket", JANNAF Sept. 1993

"Dual-Pulsed Solid Propellant Rocket Technology Application to an Autonomous Strategic Defense Interceptor", JANNAF Feb. 1992

**SELECT TECHNICAL REPORTS**

SM III SM CTV-01 Failure Review Board, “Standard Missile 3 Block IB Controlled Test Vehicle (SM-3 Blk IBC TV-01) Failure Review Board Final Report”, Missile Defense Agency, June, 2016.

McDonald, Brian A., Javelin Stockpile Reliability Program Test Cycle (srptc) 12, Block 1 Stockpile Reliability Test Cycle (blk1tc) 6, And Reset Test Cycle (rtc) 13 Mechanical Properties, Chemical Analysis, And Static Firing Report , RDECOM-TR-RDMR-WD-17-17

McDonald, Brian A., Australian Javelin Stockpile Reliability Test Mechanical Properties and Chemical Analysis Report, RDECOM-TR-RDMR-WD-13-62

Turner, Tom; McDonald, Brian A., M-20 Fuel Condensation Induced Pre-Ignition Spike Test Series Final Report, RDECOM-TR-RDMR-WD-13-24

McDonald, Brian A., Javelin Stockpile Reliability Test Cycle-8, Block-1 Stockpile Reliability Test Cycle-2, and Reset Test Cycle-9 Mechanical Properties, Chemical Analysis, and Static Firing Report, RDECOM-TR-RDMR-WD-13-18

McDonald, Brian A., Javelin Stockpile Reliability Test Cycle-7 Mechanical Properties, Chemical Analysis, and Static Firing, RDECOM-TR-RDMR-WD-13-17

McDonald, Brian A., The Development of the Wall Momentum Erosive Burning Scaling Law and Macro Scale Erosive Burning Scaling, RDECOM-TR-RDMR-WD-10-15

McDonald, Brian A., Javelin Stockpile Reliability Program Test Cycle-6 and Reset Test Cycle-7 Mechanical Properties, Chemical Analysis, and Static Firing Report, RDECOM-TR-RDMR-WD-10-05

McDonald, Brian A., Javelin Stockpile Reliability Program Test Cycle-5 and Reset Test Cycle-6 Mechanical Properties and Chemical Analysis Report, RDECOM-TR-RDMR-WD-09-20

McDonald, Brian A., Javelin Stockpile Reliability Program (SRP) Test Cycle-4 (TC-4) Propulsion System Performance and Shelf-Life Evaluation, RDECOM-TR-AMR-PS-08-24

McDonald, Brian A., Javelin Reset Test Series Mechanical Properties Evaluation and Static Fire 2007 Year-End Report, RDECOM-TR-AMR-PS-08-04

McDonald, Brian, Static Test and Chemical Analysis of Accelerated Aged Testing of DODICs PL53 and PM93 USMC Javelin Anti-Tank Weapon System, RDECOM-TR-RDMR-WD-14-26

McDonald, Brian A., Javelin Stockpile Reliability Test Cycle-9, Block-1 Stockpile Reliability Test Cycle-3, and Reset Test Cycle-10 Mechanical Properties, Chemical Analysis, and Static Test Report, RDECOM-TR-RDMR-WD-13-61

Marotta, Stephen A.; McDonald, Brian A.; Ogle, Levi; Simmons, David, Nitrate Ester (NE) Chemical Sensor Detection, RDECOM-TR-RDMR-WD-14-37

McDonald, Brian A., Javelin Stockpile Reliability Test Cycle-10, Block-1 Stockpile Reliability Test Cycle-4, and Reset Test Cycle-11 Mechanical Properties, Chemical Analysis, and Static Firing Report, RDECOM-TR-RDMR-WD-15-09

McDonald, Brian A., Ignition Sensitivity Analysis of Field-Aged M36 Propellant and Boron Potassium Nitrate (BKNO3) Igniter Pellets, RDECOM-TR-RDMR-WD-15-14

An Analysis Of Gem 40 Case Weight And Dome Deflection – Feb 2002
CKEM -09 Post Test Data Analysis – June 2002
Constant Pressure Throttleable Engine SBIR Phase II Final Report – June 2003
CFD Analyses Of Controllable Propulsion Concepts - June 2004
Structural Analysis Of Stars Motor Shipping Restraint – Oct 2004
VT-1 SN1142 Motor Reliability Prediction – Nov - 2005