

Matthew David Marko, PhD, MBA, PE

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Executive Summary: A seasoned mechanical engineer and principal investigator with over a decade of leadership experience on critical technologies, complex projects, government contracts, start-up organizations, with extensive publications and patent filings. Extensive expertise with peer-reviewed publications in Thermo-Fluid Science, Tribology, Electrodynamics, Nonlinear Optics, and Computational Science.

Education:

Rutgers University , Camden, NJ Professional Master of Business Administration (M.B.A.), Summa Cum Laude	May 2019 GPA: 3.96
Columbia University , New York, NY Doctor of Philosophy (Ph.D.), Mechanical Engineering; Doctoral Thesis: <i>The Tribological Effects of Lubricating Oil Containing Nanometer-Scale Diamond Particles</i> Master of Philosophy (M.Phil), Mechanical Engineering Fellowship: Science Mathematics And Research for Transformation (SMART), 2010 Cohort	Feb 2015 Oct 2012 GPA: 3.63
Johns Hopkins University , Baltimore, MD Master of Science (M.S.) in Applied Physics, Engineering Program for Professionals	Dec 2009 GPA: 3.5
Stevens Institute of Technology , Hoboken, NJ Master of Engineering (M.Eng) in Mechanical Engineering Concentration: Thermal Engineering; Graduate Certificate in Power Generation Bachelor of Engineering (B.E.) in Mechanical Engineering, Bachelor of Science (B.S.) in Physics	May 2006 GPA: 3.7 GPA: 3.5

Select Training and Activities:

Professional Engineer (PE) in NJ, #GE49629, Licensed: October 2011 – Present

Ham Radio (Amateur Extra Class / KC2LWH)

Scuba Training: PADI Divemaster (ID Number: 269080); TDI: Decompression Procedures, Advanced Nitrox; PADI: Master Scuba Diver, Rescue, Advanced Open Water, Open Water, DSAT Deep-Tec, Peak Performance Buoyancy, Nitrox, Equipment Specialist, Navigation, Night, Drysuit, Deep, Boat, Altitude, Cavern, Wreck.

Languages: English (Native / Fluent), Spanish (Intermediate), Hebrew (Novice), Tagalog (Novice).

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Selected First-Author Publications:

- Marko, M.D. Experimental observations of the effects of intermolecular Van der Waals force on entropy. *Sci Rep* 12, 7105 (2022). <https://www.nature.com/articles/s41598-022-11093-z>
Top 100 most downloaded physics paper in Scientific Reports (2022)
<https://www.nature.com/collections/ehjdcaeiaq/>
- M.D. Marko, et al. "Leadership lessons from the Titanic and Concordia disasters", *Emerald's Journal of Management History*, Vol. 26 No. 2 (14 April 2020), pp. 216-230. <https://doi.org/10.1108/JMH-09-2018-0050>
- M.D. Marko. A Novel Method for Pressure Mapping between Shell Meshes of Varying Geometries and Resolutions. *MDPI Computation*. 2019; 7(2):29. <https://doi.org/10.3390/computation7020029>
- M.D. Marko. The Impact of Lubricant Film Thickness and Ball Bearings Failures. *MDPI Lubricants* 2019, 7(6), 48; <https://doi.org/10.3390/lubricants7060048>
- M.D. Marko. Friction of Tungsten-Based Coatings of Steel under Sliding Contact. *MDPI Lubricants*, 2019, 7, 14. <https://doi.org/10.3390/lubricants7020014>
- M.D. Marko. Coefficient-of-Determination Fourier Transform. *MDPI Computation* 2018, 6, 61. <http://dx.doi.org/10.3390/computation6040061>
- M.D. Marko. The saturated and supercritical Stirling cycle thermodynamic heat engine cycle. *AIP Advances*. Volume 10, Issue 10, August 2018. <http://dx.doi.org/10.1063/1.5043523>.
- M.D. Marko. A Discrete Approach to Meshless Lagrangian Solid Modeling. *MDPI Computation*, 5,33 (2017). <http://dx.doi.org/10.3390/computation5030033>
- M.D. Marko, et al. Tribological Investigations of the Load, Temperature, and Time Dependence of Wear in Sliding Contact. *PLoS ONE*, 12(4):e0175198 (2017). <http://dx.doi.org/10.1371/journal.pone.0175198>
- M.D. Marko, G. Shevach. Sensorless Modeling of Varying Pulse Width Modulator Resolutions in Three-Phase Induction Motors. *PLoS ONE* 12(1): e0168149 (2017). <http://dx.doi.org/10.1371/journal.pone.0168149>
- M.D. Marko, et al. Numerical and Experimental Tribological Investigations of Diamond Nanoparticles. *ASME Journal of Tribology*, **138**(3), 2016, Pg 031501. <http://dx.doi.org/10.1115/1.4031912>
- M.D. Marko, et al. Tribological Improvements of Dispersed Nanodiamond Additives in Lubricating Mineral Oil. *ASME Journal of Tribology*, **137**(1), 2015, Pg 011802. <http://dx.doi.org/10.1115/1.4028554>
- M.D. Marko. *The Tribological Effects of Lubricating Oil Containing Nanometer-Scale Diamond Particles* Ph.D. Thesis, Columbia University, 12 February 2015. <https://doi.org/10.7916/D8FF3R6G>
- M.D. Marko, et al. Disturbance of Soliton Pulse Propagation from Higher-Order Dispersive Waveguides. *Applied Optics*, **52**, 20, Pg 4813-4819, 2013. <http://dx.doi.org/10.1364/AO.52.004813>
- M.D. Marko, et al. Soliton propagation with cross-phase modulation in silicon photonic crystal waveguides. *JOSA B*, **30**, 8, Pg 2100-2106, 2013. <http://dx.doi.org/10.1364/JOSAB.30.002100>
- M.D. Marko, et al. Phase-resolved observations of optical pulse propagation in chip-scale silicon nanowires. *Applied Physics Letters*, **103**, 021103 (2013). <http://dx.doi.org/10.1063/1.4813140>

Issued Patents with USPTO:

- "Condensing Stirling Cycle Heat Engine" (11/078,869), filed 9 September 2016, Issued 3 August 2021
- "Isochoric Piston-Cylinder Heat Pump" (10/934,971), filed 17 July 2018, Issued 2 February 2021
- Marko, Matthew. "Pneumatically Actuated Energy Generator." USPTO US-20260078714-A1 (Pending). Submitted 18 September 2024, Published 19 March 2026.

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Experience:

US Navy (Civilian)

Security Clearance: SECRET

Navy Air Warfare Center, Aircraft Division (NAWCAD)

08/2010 – Present

- Served as an engineering analyst for the Water Twister Team for the Advanced Arresting Gear for the new CVN-78 Ford-class aircraft carriers. Responsibilities included:
 - Traveled to CVN-78 (via a C-2 Greyhound utilizing both AAG and EMALS) during an active deployment, to conduct a scheduled inspection of the Water Twister in between air-operations.
 - Participated in test site reviews at Jet Car Track Site (JCTS) and Runway Arrested Landing Site (RALS);
 - Developed and gave oversight of accumulators to successfully mitigate thermal volume increases, and all related hydraulic and mechanical components to the Thermal Volume Compensator;
 - Transferred Computational Fluid Dynamics (CFD) data to different meshes for Finite Element Analysis (FEA);
 - Organized and developed troubleshooting approaches for data processing and analysis of CFD data;
 - Developed and performed a custom experimental study to assess the coefficient of friction for the polygon coupling interface between the Purchase Cable Drum (PCD) shaft and the Water Twister rotor on AAG;
 - Provided guidance on urgent questions regarding Ball Bearing Life Cycle and Failure Analysis;
 - Evaluated design concepts with Rain-flow Analysis and Fracture Life Prediction, as well as Fatigue Life Analysis, for the Water Twister utilized in the Mk 15 Advance Arresting Gear recovery equipment;
 - Conducted technical reviews to determine acceptability of changes to contract services or equipment to determine the usability of items not meeting the requirements of the contract;
 - Participated in design engineering development, testing and analysis of test data, manufacturing development, and production to meet the operational specifications for the Advanced Arresting Gear;
 - Adapted mechanical engineering principles during necessary significant departures from established practices;
 - Designed mechanical devices to support the development, testing or repair of systems and their components;
 - Clarified problems by recognizing patterns, developing models using analogies, and drawing parallels;
 - Developed program solutions to mitigate or eliminate obstructions within assigned project parameters;
- NAVAIR Naval Innovative Science & Engineering (NISE) FY2024 Execution Coordinator, overseeing the execution of a \$102 million budget.
- Principal Investigator (PI) on several scientific projects on a wide range of subjects, with several peer reviewed publications, including:
 - Tribology (lubrication, friction, wear, ball bearings);
 - Nonlinear optics (fiber optics, chip scale silicon nano-waveguides, computational numerical simulations, experience and expertise on ultrafast optical test set-ups);
 - Electrodynamics (radars and electromagnetic coupling, electromagnetic motors, Maxwell's equations);
 - Numerical and computational methods (Fourier transforms, Lagrangian solid modeling, mesh conversion);
 - Thermodynamics and energy conversion.
- Directed technical and personnel resources, while acting as Principal Investigator advancing state-of-the-art technologies for insertion into SE and ALRE systems:
 - "Nonlinear Analysis of Ultrafast Pulses with Modeling & Simulation and Experimentation" (2012 – 2014);
 - "Smoothed Particle Applied Mechanics" (2014 – 2016); "Ball Bearing Failures during Rapid Accelerations and Declarations seen in AAG & EMALS" (2018 – 2019); and "Friction and Abrasion Testing for the Cross-Deck Pendant CDP / Tail-hook Interface" (2020); "Eddy Current Braking Technologies for Energy Absorbing System (EAS) in AAG" (2021).
- Journeyman Leadership Development Program (JLDP) participant; (2019 – 2021)
- NAVAIR Leadership Development Program (NLDP) participant; (Cohort 2022)
- Individuals With Disabilities Advisor Team (IWDAT) co-lead: 2020 – 2022
- Asian American Pacific Islander (AAIP) Diversity Action Team (DAT) co-lead, 2023 – 2025

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Navy Surface Warfare Center Dahlgren Division (NSWC DD) 11/2008 – 08/2010

- Systems Engineering with Integrated Topside Design (ITD) / Electromagnetic Environmental Effects (E3), for amphibious assault (L-class) ships
- Integrated Product Team (IPT) lead for integration of equipment (antennas, guns, etc) locations on topside of US Navy ships; Performed electromagnetic coupling analysis
 - SSX-1 antenna (LHD), MK 38 Mod 2 (LHD), Fire-Scout antenna (FFG), and Video-Scout antenna (LHD).
 - Handled major issues and controversy involving collaboration and compromise
- Participated in ship checks, site reviews and engineering assessment of Navy vessels, in port and underway.
- Systems Engineering with Integrated Topside Design (ITD) / Electromagnetic Environmental Effects (E3), for amphibious assault (L-class) ships
- Ship classes: Wasp (LHD), Tarawa (LHA 1), Austin (LPD 4), America (LHA 6), San Antonio (LPD 17), Whidbey Island (LSD 41), Harpers Ferry (LSD 49), Avenger (MCM), Blue Ridge (LCC 19), & Oliver Perry (FFG)

Navy Acquisition Internship Program 09/2006 – 11/2008

Rotations with experience in: Warfare Systems, Directed Energy and Electric Weapons, Sea-Keeping, Computational Fluid Dynamics, Temporary Services in a shipyard, and Mine Detection and Ship Signatures

Seaside Heights Board of Education, President 01/2025 – Present

- President of the Seaside Heights Board of Education, a Pre-K to 6 school district in Seaside Heights, NJ.

Marko Motors LLC (Founder and Owner) 06/2018 – Present

- Founded a small technology start-up company with the mission to develop superior electricity producing solar engines based on the Stirling cycle.
- Published manuscripts in AIP Advances and Nature Scientific Reports, presented at conferences (APS, Rutgers University), 3 issued patents with the USPTO.