

## Expert is not retained without a fully executed contract



**Timothy J. McCoy, PhD, PE, CDR, USN(ret.)**

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## Resume

### Summary:

Dr. McCoy presently serves on the faculty at the University of Michigan where he teaches courses and conducts research in Naval Architecture and Marine Engineering. Having served in the US Navy for 22 years, he has over 38 years of experience working in government, industry and academia. His expertise includes marine engineering, forensic engineering, power and control systems, technology development, ship design and construction, ship operations as well as education and training. He has created and led new engineering organizations in both industry and government. Dr. McCoy is an IEEE Fellow, a member of ASNE, SNAME and ABYC. He is a Licensed Professional Engineer and has over 60 technical publications. His key skills include:

- **Marine Engineering**
- **Forensic Engineering**
- **Ship Design and Shipbuilding**
- **Technology Development**

### Key Skills and Accomplishments:

**Marine Engineering:** Knowledgeable in design and development of power and propulsion systems for ships. Specific accomplishments in this area include:

- Experienced with the design of several types of propulsion plants, including: gas turbine (COGAG), Diesel (CODAD), combined plants (CODLOG, CODLAG) and Integrated electric (IPS, IFEP).
- Designed power and propulsion systems for surface combatant, amphibious ships and submarines.
- Teaches marine engineering subjects for both graduate and undergraduate students.
- Developed hybrid electric drive retrofit into the US Navy's Arleigh Burke (DDG-51) class destroyers. Created fuel consumption and life-cycle cost models incorporating both part-load efficiencies and operational profiles that demonstrated the multi-million dollar fuel savings potential for this technology. As a direct result of these studies, the US Navy pursued this technology and awarded a \$119M contract to implement hybrid drive on up to 35 ships.
- Led a team of engineers in the development of the U.S. Navy's Integrated Power System (IPS) Full Scale Advanced Development test program. This \$200M effort included designing, procuring and testing hardware and control software for naval electric power and propulsion systems for US Warships. This development program was a key enabler for selection of IPS to power the US Navy's DDG-1000, Zumwalt class destroyers as well as the Royal Navy's Type 45 destroyers and Queen Elizabeth class aircraft carriers.
- Managed a team of engineers developing the US Navy's Standard Monitoring and Control System (SMCS) through design development and shore-based testing. SMCS was the first network-based software driven automatic machinery control system for US Navy ships. SMCS technology has since been implemented in several classes of ships (CG-47, LPD-17, DDG-51, DDG-1000, LCS-2, T-AOE-6 and CVN-77).
- Completed an evaluation of Silicon-Carbide power electronics technology for shipboard applications for the Defense Advanced Research Projects Agency (DARPA).

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**Forensic Engineering:** Experienced with failure analyses and root cause analysis methods.

- Served as an expert witness in an International Chamber of Commerce (ICC) arbitration case involving catastrophic failure to a combined diesel and gas turbine propulsion (CODAG) propulsion system.
- Served as an expert witness in a wrongful death lawsuit. Participated in testing and evaluation of an outboard motor system and determined root cause for unintended operation.
- Conducted an independent design and construction audit of the LSV-2, a 1/3 scale autonomous submarine. Electromagnetic Interference (EMI) between the power system and vessel control system resulted in un-intended emergency surfacing. Developed design solutions that, when implemented, resolved the EMI problems and allowed the vessel to complete its research missions.
- Selected by US Navy's Chief Engineer to serve on a Failure Review Panel for determining the cause and recommend corrective actions for a failed 38 MW prototype propulsion motor for the Navy's DDG-1000 destroyer. Determined the cause of a catastrophic equipment failure during factory testing and made recommendations for design changes to prevent re-occurrence. Conducted root cause analysis, examined equipment and test results and development of design changes that, when implemented, resulted in successful factory and full-power land-based testing.
- Conducted a command investigation into the allision of USS Howard (DDG 83) with a submerged launching ways at BIW shipyard in Maine. Determined root causes and made recommendations for procedural changes to prevent any recurrence.
- Performed a technical evaluation of the LPD 17 class solid-state frequency converter design and vendor capabilities. Provided recommendations to the shipbuilder that resulted in cancellation of the original contract and selection of an alternate vendor for this mission-critical equipment.

**Ship Design and Shipbuilding:** Experienced with ship design and construction from initial concept studies through in-service support. Specific accomplishments in this area include:

- Led a team of 110 engineers and technicians with responsibility for engineering, quality assurance, testing and sea trials oversight for all Arleigh Burke (DDG-51) class ships constructed in Maine, a portfolio of approximately \$9 Billion. Initiated LEAN process initiatives resulting in an estimated 20% efficiency improvements for Navy engineering and quality assurance oversight of the shipyard.
- Headed design and construction efforts for the San Antonio (LPD-17) class amphibious transport ships in Maine. Supervised a team of government engineers and managed a \$400 Million subcontract. Guided US Navy shipbuilding realignment efforts in Maine, resulting in a \$1 Billion taxpayer savings.
- Facilitated the US Navy's industry collaboration with both competing teams during phases II and III of the DDG-1000 design development. Assisted both industry teams with incorporating an Integrated Power System (IPS) into their designs for the Navy's DDG-1000 destroyer.
- Provided oversight for the design and construction of USS Supply (AOE-6). Developed and implemented numerous design improvements, including accommodation for hypergolic liquid fueled missiles, remedying diesel generator start-air shortfall, reconciled specification conflicts for aviation facilities and resolved longitudinal strength structural issues.
- Supervised over 20 graduate level academic ship design studies.
- Successfully drydocked over 50 ships and boats, including the first simultaneous twin-docking of two frigates in the Southwest Marine floating drydock in San Diego. Responsible for safe navigation of the ship, personnel safety of line handlers, divers and others as well as environmental compliance of repairs done while in dock.

**Technology Development:** Experienced with development and fielding of new technologies for ships and other heavy industries. Specific accomplishments in this area include:

- Constructed a kilowatt-scale marine engineering laboratory at the University of Michigan. This first-of-kind lab features interconnected electric power & generation, electric propulsion, water cooling and

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engine fuel systems. Conducting research using advanced machine learning methods for prediction of failures in machinery systems to enable fully autonomous vessels.

- Explored novel electric generator technologies with Purdue University through a Navy awarded STTR contract.
- Developed power and propulsion component and system design tools suitable for concept-level ship design using set-based design methods.
- Conducted research in exergy-based nonlinear control systems for shipboard power systems.
- Conducted university research in the areas of: ship and complex system design, control and monitoring systems, finite inertia power systems, machinery autonomy and systems engineering.
- Built a team of engineers and acquisition professionals to develop advanced power, propulsion and control solutions for Navy ships. Grew the office's research & development budget six-fold, to more than \$150M, despite an overall decline in the DoD R&D budget.
- Directed power system feasibility studies for insertion new sensors and weapons into US warships including a high power ballistic missile defense radar, electromagnetic rail guns and solid-state laser weapons.
- Developed zonal battery-based energy storage modules to enable up to 6,400 barrels/ship/year fuel savings. Awarded a \$88M contract to backfit energy storage technology onto DDG-51 class ships.
- Initiated studies for development of multipurpose energy storage modules to provide for grid stability, transient mitigation for electric weapons and backup power.
- Served as US Technical Representative on several international Information Exchange Agreements. Initiated a \$40M Project Arrangement with the United Kingdom to jointly develop advanced shipboard power and automation systems for submarines and surface ships. Started development of a new Master Information Exchange Agreement with the UK to enable sharing of information for in-service ships.
- Began cooperative research & development between US Navy and US Department of Energy in nonlinear controls for ship and micro-grid power systems.
- Developed state-of-the-art medium-voltage solid-state motor drives for naval, marine and oil & gas markets.
- Developed artificial intelligence based prognostics software to predict failures on rotating machines.
- Led development of the Standard Monitoring and Control System (SMCS) through shore-based development and operational testing.

### Work Experience:

<b>2018 – present</b> <i>Professor of Engineering Practice</i>	<b>University of Michigan</b>	<b>Ann Arbor, MI</b>
<b>2014 – present</b> <i>President</i>	<b>McCoy Consulting, LLC</b>	<b>Box Elder, SD</b>
<b>2009 – 2014</b> <i>Director, Electric Ships Office (PMS-320)</i>	<b>US Navy, Program Executive Office for Ships</b>	<b>Washington, DC</b>
<b>2007-2009</b> <i>Director of Research &amp; Development; President, Converteam Naval Systems Inc.</i>	<b>Converteam North America</b>	<b>Pittsburgh, PA</b>
<b>2006-2007</b> <i>Senior Power Systems Engineer</i>	<b>BMT Syntek Technologies, Inc.</b>	<b>Arlington, VA</b>
<b>1984-2006</b>	<b>United States Navy, Engineering Duty Officer</b>	<b>Various Locations</b>
<ul style="list-style-type: none"> <li>• <i>Associate Professor of the Practice, Naval Construction and Engineering (Mechanical Engineering Department), Massachusetts Institute of Technology, Cambridge, MA</i></li> <li>• <i>Technical Director and Program Manager's Representative, Supervisor of Shipbuilding, Bath, Me</i></li> <li>• <i>Deputy Program Manager and Technical Director, Integrated Power Systems Program, Naval Sea Systems Command, Arlington, VA</i></li> </ul>		

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- *Project Manager, Standard Monitoring and Control System (SMCS), Naval Surface Warfare Center, Carderock, MD*
- *New Construction Project Officer, Supervisor of Shipbuilding, San Diego, CA*
- *Repair Project Officer, Supervisor of Shipbuilding, San Diego, CA*
- *Drydocking Officer, Supervisor of Shipbuilding, San Diego, CA*
- *First Lieutenant and Communications Officer, USS John Young (DD-973), U.S. Pacific Fleet*

### Education:

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|--------------------------------------------------------|-----------------------------|
| • Massachusetts Institute of Technology, Cambridge, MA | Ph.D. in Naval Engineering  |
| • Massachusetts Institute of Technology, Cambridge, MA | Naval Engineer              |
| • Massachusetts Institute of Technology, Cambridge, MA | S.M. Electrical Engineering |
| • University of Illinois, Urbana, IL                   | B.S. Mechanical Engineering |
| • Parkland College, Champaign, IL                      | A.S. Engineering Science    |

### Professional Affiliations:

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- Registered Professional Engineer: California, Michigan
- Certification: Program Management, Level III, US Department of Defense (DoD)
- Institute of Electrical and Electronics Engineers (IEEE), Fellow
- Society of Naval Architects and Marine Engineers (SNAME), Member
- American Society of Naval Engineers (ASNE), Member
  - Associate Editor, *Naval Engineers Journal*
- American Boat and Yacht Council (ABYC), Member

### Selected Publications:

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#### *Selected Publications (Over 70 publications total):*

- S. A. Olson, T. J. McCoy and M. D. Collette, "Laboratory-Scale Multiphysics Ship Machinery Plant for Autonomous Machinery Research," *IEEE Transactions on Transportation Electrification*, vol. 10, no. 4, pp. 7886-7893, Dec. 2024, doi: 10.1109/TTE.2024.3443743.
- Almquist, T., et. al., "Hardware Modeling of Diesel Engine Fuel System Failure Modes and Coupled Shipboard Dynamics," *IEEE Electric Ship Technologies Symposium (ESTS)*, Alexandria, VA, Aug 1-4, 2023.
- L. Rashkin, J. Neely, T. McCoy, N. Doerry, *Excitation Control of Dual-Wound Machines for Coupling Mitigation*, **United States Patent** No. 11,527,942, Dec 13, 2022.
- Eddy H. Trinklein, Gordon G. Parker, Timothy J. McCoy, "Modeling, optimization, and control of ship energy systems using exergy methods," *Energy*, Volume 191, 2020, 116542, ISSN 0360-5442,
- Trinklein, E., Parker, G., McCoy, T., Robinett, R., Weaver, W., "Reduced order multi-domain modeling of shipboard systems for exergy-based control investigations," *Naval Engineers Journal*, Vol. 130, No. 3, pp. 87-105, Sept. 2018.
- L. J. Rashkin, J. C. Neely, S. F. Glover, T. J. McCoy, and S. D. Pekarek, "Dynamic Considerations of Power System Coupling through Dual-Wound Generators," *2017 IEEE Electric Ship Technologies Symposium (ESTS)*, Washington, D.C., 2017, pp. 493-500.
- McCoy, T., "Electric Ships: Past, Present and Future," *IEEE Electrification Magazine*, Vol. 3, No. 2, pp. 4-11, June 2015.
- McCoy, T., "Integrated Power Systems – an Outline of Requirements and Functionalities for Ships," *Proceedings of the IEEE*, **Invited Paper**, Vol. 103, No. 12, pp. 2276-2284, December 2015.
- Leeb, S., et. al., "Load Modeling For Power System Requirement and Capability Assessment," *IEEE Transactions on Power Systems*, Vol. 30, Issue 3, May 2015.
- McCoy, T., Amy, J., "The State-of-the-Art of Integrated Electric Power and Propulsion Systems and Technologies on Ships," *ASNE Electric Ship Design Symposium*, February 2009, **Invited Keynote Paper**.
- McCoy, T., et. al., "Hybrid Electric Drive for DDG-51 Class Destroyers," *Naval Engineers Journal*, vol. 119, No. 2, 2007.

### Personal Information:

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- Citizenship: US Citizen
- Security Clearance: DoD SECRET
- Veteran Status: Honorably Discharged, Disabled Veteran