*Commit to excellence in teaching*
*Engage in multidisciplinary scholarly research*
*Develop externally funded research programs and center of excellence*

Curriculum Vitae

# William W. Liou

## Education

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|---|---|---|
| Ph.D. | 1991 | Aerospace Engineering, The Pennsylvania State University |
| M.S. | 1987 | Aerospace Engineering, The Pennsylvania State University |
| B.S. | 1982 | Aeronautics and Astronautics, National Cheng-Kung University, Taiwan |

## Awards and Honor

Western Michigan University Excellence in Discovery – 2016
Research and external funding over $1 million level for 5 years 2010-2015 (as a Principal Investigator)

Barnes W. McCormick Honorary Lecture – 2016
Aerospace Engineering Department, The Pennsylvania State University, 28 March 2016.

Western Michigan University Excellence in Discovery – 2015
Research and external funding over $1 million level for 5 years 2009-2014 (as a Principal Investigator)

Distinguished Alumni Award – 2012
Department of Aeronautics and Astronautics, National Cheng-Kung University, Taiwan

Distinguished University Faculty Scholar - 2009
The highest honor Western Michigan University bestows on its faculty members. Established in 1978, the honor recognizes those whose work constitutes a significant body of achievement and is widely recognized beyond the University.

National Nuclear Security Administration Defense Programs Award of Excellence - 2004
Awarded by the National Nuclear Security Administration, U.S.A
Citation: Successfully predicting performance of narrow-band re-entry radars in the presence of high-velocity plasma.

## Employment History

Western Michigan University

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| 2004 - present | Professor, Mechanical and Aerospace Engineering Department |
| 1999 - present | Founding Director, Gas Turbine Engine Test Cell, Mechanical and Aerospace Engineering Department |
| 1997 - present | Founding Director, Computational Engineering Physics Lab, Mechanical and Aerospace Engineering Department |
| 2020 - 2025 | Chair, Mechanical and Aerospace Engineering Department |
| 2010 - 2012 | Founding Director, CAViDS Hybrid Electric Applied Research (CHEAR) Laboratory, College of Engineering and Applied Sciences |
| 2007 - 2012 | Founding Director, CAViDS Consortium, College of Engineering and Applied Sciences |

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|---|---|
| 2005 - 2012 | Founding Director, Center for Advanced Vehicle Design and Simulation (CAViDS), College of Engineering and Applied Sciences |
| 1999 - 2004 | Associate Professor, Mechanical and Aerospace Engineering Department |
| 1997 - 1999 | Assistant Professor, Mechanical and Aerospace Engineering Department |

UNIT, Inc.

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|---|---|
| 1996 - 1998 | Program Manager |

NASA Glenn Research Center

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| 2000 | NASA/ASME Summer Faculty, Internal Fluid Mechanics Division |
| 1991 -1996 | Research Associate, Institute for Computational Mechanics in Propulsion, Internal Fluid Mechanics Division |

The Pennsylvania State University

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|---|---|
| 1986 -1990 | Graduate Research Assistant, Aerospace Engineering Department |
| 1985 -1986 | Graduate Teaching Assistant, Aerospace Engineering Department |

National Cheng-Kung University (Taiwan)

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| 1984 -1985 | Graduate Research Assistant, Institute of Aeronautics and Astronautics |
| 1980 -1982 | Undergraduate Laboratory Assistant, Department of Aeronautics and Astronautics |

Air Force, Republic of China (Taiwan)

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|---|---|
| 1982 - 1984 | Aviation Maintenance Technician |

## Professional Honors and Appointments

- Associate Fellow, American Institute of Aeronautics and Astronautics (AIAA)
- Editorial Board, Journal of Cardiovascular Disorders, 2016-present
- Editorial Board, International Journal of Aerospace Engineering, 2010-present
- Executive Board, Center for high Performance Computing and Big Data, WMU, 2014-present
- Editorial Advisory Board, Journal of Aircraft, 2008-2013
- A 2007 Innovation Michigan Award Finalist. Business Review of Western Michigan
- Who's Who in Academia, News Digest International

# 1. DEVELOPMENT EXPERIENCE

## Entrepreneurship Development

Principal Investigator, Western Michigan University I-Corps Program. 2015.

## Research Center of Excellence Development

Center for Advanced Vehicle Design and Simulation (CAViDS)
Founding Director. 2005-2012

Founding Director (2010-2012). CAViDS Hybrid Electric Applied Research (CHEAR) Laboratory.

## Academic Laboratory Development

Computational Engineering Physics Lab
Founding Director. 1997 – present

Gas Turbine Engine Test Cell
Founding Director. 1999- present

## Academic New Course Development

- Biofluid Mechanics: from Earth to Space (AE 6200) – 2017
- Electric Hybrid Vehicle Fundamentals (ME 5950) – 2011
- Hydrodynamics Stability (ME 5950/ME 6950) – 2000
- Microfluid Mechanics (ME 5950/ME 6950) – 2004
- Turbulence (ME 6350) – 2004

## Post-Doctoral Students Development

7. Dr. J. Xu — 2019 – 2021, 2023-2024, Computational simulations of oil churning loss in ground vehicles. Ventricular cerebrospinal fluid flow and brain motion. Funded by the U.S. National Science Foundation and CAViDS Consortium.

6. Dr. Y. Yang — 2008 – 2019, Blast Wave Fluid Structure Interactions, Multiphysics vehicle power train and drive train simulations. Biomechanics of human heart valve implant, shoulder implant, and ventricular cerebrospinal fluid flow and brain. Funded by the U.S. Department of Defense TARDEC of the U.S. Army RDECOM, CAViDS Consortium, CHEAR Lab, Georgeau Construction Research Institute, U.S. National Science Foundation, Eaton Corp. and ExacTech, Inc.

5. Dr. Y. Zhang — 2013 – 2015, Blood Circulation System Simulator for Fluid Heart Funded by Borgess Hospital and WMU.

4. Dr. P. Anusonti-Inthra — 2010 – 2012, Cyclonic Particle Separation and Engine Cooling. Funded by the U.S. Department of Defense TARDEC, U.S. Army RDECOM and CAViDS Consortium

3. .Dr. M.H. Lu — 2008 – 2010, Large Eddy Simulations of Flow over Rough Wall Funded by the U.S. Department of Defense Office of Naval Research of the U.S. Navy.

2. Dr. Y.C. Fang — 2003 – 2004, Laminar Breakdown using Direct Simulations Monte Carlo Method. Funded by NASA Langley Research Center

1. Dr. F.J. Liu — 2002 – 2003, Simulations of Flow Transition over Underwater Bodies. Funded by the U.S. Department of Defense Office of Naval Research of the U.S. Navy

## Graduate Students Development

Ph.D. Dissertation Directed

8. *Accumulation of Polar Vorticity on Giant Planets; Towards a Three-Dimensional Theory*
Dr. Shawn Brueshaber. 2020.

Funded in part by NASA Earth and Space Science Fellowship Program

7. *A Direct Forcing and Heating Immersed Boundary-Lattice Boltzmann Method for Arterial Wall Thermography*
   Dr. Oluyinka Olugbenga Bamiro. 2011.

6. *Analytical, Computational and Experimental Studies of Capillary Flow in Complex Geometries*
   Dr. Yongquing Peng. 2009.
   Funded in part by Proctor and Gamble company.
   Co-advised with Dr. Peter Parker of Paper Engineering, Chemical Engineering, & Imaging Department at WMU.

5. *Modeling Fluid Structure Interaction over A Fin Attached to A NACA0012 Airfoil*
   Dr. Srinivasa Pantula. 2008
   Funded by the U.S. Department of Defense Air Force Office of Scientific Research (AFOSR).

4. *Atomistic-Based Finite Element Simulation of Carbon Nanotubes*
   Dr. Yang Yang. 2008.
   Funded in part by CAViDS Consortium of WMU.

3. *A New Rough Wall Layer Modeling for Turbulent Flows Using the Brinkman Equation*
   Dr. Meng-Huang Lu. 2008.
   Funded by the U.S. Department of Defense Office of Naval Research (ONR).

2. *Parallel Simulation of Microflows by DSMC and Burnett Equations*
   Dr. Yichuan Fang. 2003.
   Funded in part by NASA Langley Research Center and the U.S. DoE Sandia National Laboratory.

1. *Numerical Studies of Transition for Flows around Multi-Element Airfoils*
   Dr. Fengjun Liu. 2002.
   Funded in part by the U.S. Department of Defense Office of Naval Research (ONR).

### Master's Thesis Directed

3. *Computational Analysis of a Wing Oscillator*
   Ryne Radermacher. 2012.

2. *Biofuel Characteristics in Micro Turbojet Application*
   Ing Huang Tan. 2012.

1. *A K-Epsilon Extension for Wall-Bounded Flows on a Broadband Aeroacoustics System Simulator*
   David R. Gonzalez. 2006.

### Current Graduate Students

3. Madan BK – Doctoral degree program. Rocket plume surface interactions in space. Researching endolymph in cochlea of human.
2. Ryan Lubbers - Doctoral degree program. Computation of chemically reacting flows
1. Jonathan Wine – Master's degree program. Researching transitional flow and instability in low-pressure turbine of gas turbine engine.

## Multidisciplinary Research Development

Build externally funded research programs. Develop graduate student researchers and post-doctoral researchers. Develop computing hardware, including computer workstations and computer clusters.

### Basic Research

- *Big data Analytics for fire and smoke prediction*
- *Computational medical engineering*
- *Computational nano-mechanics*
- *Continuum fluid dynamics*
- *Microfluid dynamics*
- *Parallel computing*

### Applied Research

- *Ground vehicle simulations*

### Research in Green Energy

### Patents Applied

- Magnetic-Particle-Based Wind Power Generator Without Moving Parts, provisional patent
- Wireless Monitoring System and Communication Device for Blood Glucose Monitoring, provisional patent
- Aeroship, provisional patent

## 2. AWARDED CASH RESEARCH GRANTS & CONTRACTS

**Basic Research**

| | |
|---|---|
| Title: | *Explore Impacts of Head Motion on Cerebrospinal Fluid Flow Dynamics using Simulation and Real-Time Medical Imaging* |
| Role: | Principal Investigator |
| Sies of Performance: | Western Michigan University and Juntendo University Hospital (Japan) |
| Funding Agency: | National Science Foundation (NSF) |
| Period: | 2022-2025 |
| Title: | *Hearing and Vision Loss in the Aging Population: From Molecules to Society* |
| Role: | Co-Principal Investigator |
| Sies of Performance: | Western Michigan University |
| Funding Agency: | Western Michigan University |
| Period: | 2022-2023 |
| Title: | *Turbulent Ventricular Cerebrospinal Fluid Flow Dynamics in Physiological and Pathological Conditions* |
| Role: | Principal Investigator |
| Sies of Performance: | Western Michigan University and Juntendo University Hospital (Japan) |

Funding Agency: National Science Foundation (NSF)
Period: 2017-2020

Title: *Fire Safety in Smart Building – Big Data Analytics for Fire and Smoke Prediction*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: Georgeau Construction Research Center
Period: 2018-2019

Title: *Fire Safety in Smart Building – 4D Fire and Smoke Simulation*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: Georgeau Construction Research Institute
Period: 2017-2018

Title: *WMU/Borgess Clinically Motivated Cardiovascular Simulation Research*
Role: Principal Investigator
Sites of Performance: Western Michigan University and Borgess Heart Research Institute
Funding Agencies: Western Michigan University and Borgess Heart Research Institute
Period: 2013-2014

Title: *Physics-Based Wall Layer Modeling for Large Eddy Simulation of Flows over Rough Wall*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: Office of Naval Research (ONR) of the U.S. Navy
Period: 2008-2011

Title: *Analytical, Computational and Experimental Studies of Capillary Flow in Complex Geometries*
Role: Principal Investigator
Sites of Performance: Western Michigan University
Funding Agencies: Proctor and Gamble
Period: 2007-2009

Title: *Airfoil/Wing Flow Control Using Flexible Extended Trailing Edge*
Role: Co-Principal Investigator
Sites of Performance: Western Michigan University and NASA Langley Research Center
Funding Agency: Air Force Office of Scientific Research (AFOSR) of the U.S. Air Force
Period: 2006-2008

Title: *New Rough Wall Layer Modeling Using the Brinkman's Equation*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: Office of Naval Research (ONR) of the U.S. Navy
Period: 2005-2008

Title: *Simulations of Flow Transition over Underwater Bodies*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: Office of Naval Research (ONR) of the U.S. Navy
Period: 2003

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|---|---|
| Title: | *DSMC Simulations of Laminar Flow Breakdown on Space Transport Systems* |
| Role: | Principal Investigator |
| Sites of Performance: | Western Michigan University and GAB Consulting Pty Ltd. (Australia) |
| Funding Agency: | NASA Langley Research Center |
| Period: | 2001-2003 |

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|---|---|
| Title: | *Unified LES/RANS Approach Using Conservation Element and Solution Element Method* |
| Role: | Principal Investigator |
| Site of Performance: | Western Michigan University |
| Funding Agency: | NASA Glenn Research Center |
| Period: | 2001 |

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|---|---|
| Title: | *MEMS Flow and Heat Transfer Simulations* |
| Role: | Principal Investigator |
| Site of Performance: | Western Michigan University |
| Funding Agency: | Michigan Space Grant Consortium |
| Period: | 2000 |

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|---|---|
| Title: | *Bursting Frequency Prediction in Turbulent Boundary Layers* |
| Role: | Principal Investigator |
| Site of Performance: | Western Michigan University |
| Funding Agency: | Sandia National Laboratories of the U.S. Department of Energy |
| Period: | 1999-2002 |

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|---|---|
| Title: | *Calculation of the Flow Transition and Separation over Two-Dimensional Multi-Element Airfoil* |
| Role: | Principal Investigator |
| Site of Performance: | Western Michigan University |
| Funding Agency: | NASA Langley Research Center |
| Period: | 1998-2000 |

**Applied Research**

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|---|---|
| Title: | *Oil Churning Loss Simulations* |
| Role: | Principal Investigator |
| Site of Performance: | Western Michigan University |
| Funding Agency: | CAViDS Consortium (Caterpillar Inc., DANA Inc., Eaton Corp., Lubrizol) |
| Period: | 2016-present |

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|---|---|
| Title: | *Hydraulic Torque Converter Efficiency Simulations* |
| Role: | Principal Investigator |
| Site of Performance: | Western Michigan University |
| Funding Agency: | CAViDS Consortium (Caterpillar Inc., Lubrizol) |
| Period: | 2015-2017 |

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|---|---|
| Title: | *Reverse Shoulder Arthroplasty (RSA) Modeling* |
| Role: | Principal Investigator |
| Sites of Performance: | Western Michigan University and Cleveland Clinic |
| Funding Agency: | Exactech, Inc. |
| Period: | 2014-2017 |

Title: *Fluid/Structure Interactions of a Mixing Element*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: CAViDS Consortium (Caterpillar Inc.)
Period: 2014-2015

Title: *Fluid/Structure Interactions of a Hydraulic Line*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: CAViDS Consortium (Caterpillar Inc.)
Period: 2014-2015

Title: *Fluid/Structure Interactions of a Fan Test Facility*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: CAViDS Consortium (Caterpillar Inc.)
Period: 2014-2015

Title: *Assessment of OpenSource Computational Fluid Dynamics Codes*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: CAViDS Consortium (Caterpillar Inc., Eaton Corp., Lubrizol)
Period: 2013

Title: *Heat Transfer and Cooling Fluid Flow Simulations for Rotary Engine*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: CAViDS Consortium(Caterpillar Inc.)
Period: 2011-2013

Title: *Heat Transfer & Aerodynamics Flow Simulations for Vistronic Fan Drive*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: CAViDS Consortium(BorgWarner Inc.)
Period: 2011-2014

Title: *GPU and Cloud Computing Investigation*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: CAViDS Consortium(Caterpillar Inc., Eaton Corp., Lubrizol)
Period: 2011-2013

Title: *Fluid-Structure-Thermal Interactions of Exhaust Manifolds*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: CAViDS Consortium (Caterpillar Inc.)
Period: 2011-2012

Title: *CFD Simulation of Cooling Flows of CPS Heavy-Fuel Rotary Engine*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: CAViDS Consortium (L-3 Corp.)
Period: 2011-2012

Title: *Dynamics of Pneumatic Fan Drive Friction Liner*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: CAViDS Consortium (BorgWarner Inc.)
Period: 2011

Title: *Brake Fluid-Thermal Interaction Simulation*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: CAViDS Consortium (Caterpillar Inc.)
Period: 2011

Title: *Frictional Plate Wear*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: BorgWarner, Inc.
Period: 2010

Title: *Computational Simulations of Wind Turbine Extreme Aerodynamic Loading and Power Curve*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: Sepstar Inc.
Peroid: 2009-2010

Title: *Continuous monitoring Wireless and Communication Device for Blood Glucose*
Role: Co-Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: WMU Research Foundation, OVPR Technology Development Fund, and the Michigan Initiative for Innovation and Entrepreneurship
Period: 2009

Title: *Aerothermal Simulations of the L-3 AVDS Engine Cooling Fan*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: CAViDS Consortium (Caterpillar Inc., Eaton Corp., Lubrizol)
Period: 2008

Title: *CFD of Air Flow in Automotive Intake Air Ducts*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: CAViDS Consortium (MANN+HUMMEL USA Inc.)
Period: 2007

Title: *Simulations of Oil Flow in Heavy-Duty Tandem Axle*
Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: CAViDS Consortium (Dana Corp)
Period: 2007

Title: *Rocket Nozzle Plume Simulations using DSMC/Continuum Hybrid Methods*

Role: Principal Investigator
Site of Performance: Western Michigan University
Funding Agency: Aerojet
Period: 2006

**Developed and Managed Programs and Projects**

Center for Advanced Vehicle Design and Simulation (CAViDS)

Title: *Ground Vehicle Fatigue Modeling, Blast Wave Simulation, Sensor Data Analysis, and Structural Optimization for Reliability, Safety, and CBM*
Funding Agency: Tank-Automotive Research, Development & Engineering Center (TARDEC), Research, Development and Engineering Command (REDCOM) of the U.S. Army
Role: Principal Investigator
Period: 2009-2012
Personnel: 13 faculties from 3 engineering departments, numerous undergraduate and graduate students, post-docs, technicians.

Title: *Fatigue Life Methodology*
Role: Principal Investigator
Funding Agency: Eaton Corporation
Period: 2011-2011

Title: *Dual-Use Ground Vehicle Condition-Based Maintenance*
Role: Principal Investigator
Funding Agency: Tank-Automotive Research, Development & Engineering Center (TARDEC), Research, Development and Engineering Command (REDCOM) of the U.S. Army
Period: 2008-2011
Personnel: 8 faculties from 3 engineering departments; 5 graduate and 6 undergraduate students; technicians.

Title: *Advanced Digital Hydraulic Hybrid Drive System. Phase III*
Role: Principal Investigator
Funding Agency: EATON Corporation, Hydraulic Division.
Period: 2010-2011
Personnel: 3 faculty from Mechanical and Aerospace Engineering; 1 post-doc. 1 graduate student; technicians.

Title: *Advanced Digital Hydraulic Hybrid Drive System. Phase II*
Role: Principal Investigator
Funding Agency: EATON Corporation, Hydraulic Division.
Period: 2009-2010
Personnel: 2 faculties from Mechanical and Aerospace Engineering; 1 research staff. 1 post-doc. 1 graduate student; technicians.

Title: *Dual-Use Ground Vehicle Reliability Prediction and Optimization, Tank Elastomer Pads Fatigue, and Vehicle Occupant Shock Wave Impact Load Prediction*
Role: Principal Investigator

Funding Agency: Tank-Automotive Research, Development & Engineering Center (TARDEC), Research, Development and Engineering Command (REDCOM) of the U.S. Army
Period: 2008-2010
Personnel: 5 faculties from 3 engineering departments; 2 post-doc. 5 graduate and 5 undergraduate students; technicians.

Title: *Heavy Truck Rollover Characterization – Phase III* B
Role: Principal Investigator
Funding Agency: National Transportation Research Center, Inc., Oak Ridge National Lab of the U.S. Department of Energy
Period: 2009
Personnel: 3 faculties from 3 engineering departments; 1 graduate and 3 undergraduate students.

Title: *Advanced Digital Hydraulic Hybrid Drive System*
Role: Principal Investigator
Funding Agency: Eaton Corporation
Period: 2008-2009
Personnel: 3 faculties from Mechanical and Aerospace Engineering; 1 post-doc. 2 graduates; technicians.

Title: *Heavy Truck Rollover Characterization – Phase III* A
Role: Principal Investigator
Funding Agency: National Transportation Research Center, Inc., Oak Ridge National Lab of the U.S. Department of Energy
Period: 2007-2008
Personnel: 3 faculties from 2 engineering departments; 1 graduate and 3 undergraduate students.

Title: *Simulation-Based Heavy-Duty Truck Structural Reliability Analysis, Track Pin Bushing Fatigue, and HMMWV Underbody Scanning*
Role: Principal Investigator
Funding Agency: Tank-Automotive Research, Development & Engineering Center (TARDEC), Research, Development and Engineering Command (REDCOM) of the U.S. Army
Period: 2007
Personnel: 8 faculties from 3 engineering departments; 8 graduate and 5 undergraduate students; technicians.

CAViDS Hybrid Electric Applied Research (CHEAR) Laboratory
Role: Principal Investigator
Funding Agency: Eaton Corp.
Period: 2010-2014
Personnel: 3 faculty investigators, 1 post-doc, research staff, numerous undergraduate students, and graduate students.

**Research Equipment Development**

Title: *MRI: Acquisition of a High-Performance Cluster for Multidisciplinary Computational Research*
Role: Co-Principal Investigator

Funding Agency: National Science Foundation (NSF)
Period: 2011-2016
Personnel: Four co-principal investigators and two graduate students.

Title: *High Performance Computing Cluster*
Role: Principal Investigator
Funding Agency: Tank-Automotive Research, Development & Engineering Center (TARDEC), Research, Development and Engineering Command (REDCOM) of the U.S. Army
Period: 2008

Title: *Cost-Effective Parallel Computational Mast*
Role: Co-Principal Investigator
Funding Agency: Western Michigan University
Period: 2001

**Undergraduate Student Research**

Title: *Multiplatform RC Aircraft*
Role: Mentor
Funding Sponsor: WMU ORI Undergraduate Award for Research and Creative Scholarship Excellence Award
Period: Spring 2023

Title: *Aerodynamics of Wind Loading on Building*
Role: Mentor
Funding Sponsor: WMU OVPR Undergraduate Research Excellence Award
Period: Spring 2020

Title: *Land, Air, Surface, and Submarine Unmanned Aerial System*
Role: Mentor
Funding Sponsor: WMU OVPR Undergraduate Research Excellence Award
Period: Spring 2018

Title: *Validation of the MKV Aeroship through Flight Testing*
Role: Mentor
Funding Sponsor: WMU OVPR Undergraduate Research Excellence Award
Period: Fall 2015

Title: *Automotive Exhaust waste Heat Recovery System using Thermoelectric*
Role: Mentor
Funding Sponsor: WMU OVPR Undergraduate Research Excellence Award
Period: Spring 2015

Title: *GT-15V Turbojet Engine*
Role: Mentor
Funding Sponsor: WMU OVPR Undergraduate Research Excellence Award
Period: Fall 2014

***Curriculum Development***

Title: *Electric Ducted Fan Platform – A Portable Lab Module for Aircraft Electric Propulsion*
Role: Faculty

Funding Agency: WMU College of Engineering and Applied Sciences
Period: 2019

Title: *Turbine Engine Laboratory Enhancement for Aeropropulsion Education*
Role: Principal Investigator
Funding Agency: Michigan Space Grant Consortium
Period: 2004

Title: *MEMS Flow and Heat Transfer Simulations*
Role: Principal Investigator
Funding Agency: Michigan Space Grant Consortium
Period: 2000

## Refereed Professional Journal Publication

49. "Quantitative computer vision analysis of Time-Spatial Labeling Inversion Pulse MRI images for ventricular cerebrospinal fluid dynamics in heads in motion," J. Xu, W.W. Liou, , S. Yamada, M. Nakajima, M. Miyajima, and K. Horikoshi. Submitted for journal publication (2025).
48. "Linear stability of boundary-layer flow over porous bed," W.W.Liou. Submitted for journal publication (2025).
47. "Lube oil expulsion in a front axle predicted using particle-based simulations," J. Xu, W.W.Liou, and D. Dawson. **SAE International Journal of Passenger Vehicle Systems**. 16(1) (2023). DOI:10.4271/15-16-01-0005.
46. "Transmission fluid properties effects on performance characteristics of a torque converter: A computational study," Y. Yang, W.W. Liou, F. Qureshi, D.J. Whitticar, M.E. Huston. **Tribology Transactions** (2021). DOI: 10.1080/10402004.2021.1964662.
45. "Does acromion anatomy affect the risk of acromion stress fracture after reverse shoulder arthroplasty?" V. Sabesan (MD); D. Lima (MD); R. Rudraraju (MD); Y. Yang (PhD); M. Stankard; W. W. Liou (PhD). **Seminars in Arthroplasty: JSES**, 31(1) , 8-14 (2020).
44. "GIS-Based Automatic Flight Planning of Camera-Equipped UAVs for Fire Emergency Response," M. Sulaiman, H. Liu, M. Binalhaj, W.W. Liou, O. Abudayyeh. **International Journal of Mechatronic and Mechanical Engineering**, 14(5), 203-208 (2020).
43. "The role of greater tuberosity healing in reverse shoulder arthroplasty: A finite element analysis," V. Sabesan (MD); D. Lima (MD); Y. Yang (PhD); M. Stankard; M. Drummond (MD); W. W. Liou (PhD). **Journal of Shoulder and Elbow Surgery**, 29, 347-354 (2020).
42. "Oscillating-Wing unit for power generation," T. Liu, R.S. Ramasamy, W.W. Liou., and D.M.Salazar. **Journal of Power and Energy**, 233(4), 510-529 (2019).
41. "A computer simulation of short-term adaptations of cardiovascular hemodynamics in microgravity," B.Gerber, J.Singh, Y.Zhang, W.W.Liou. **Computer in Biology and Medicine**, 102, 86-94 (2018).
40. "Unsteady disturbances in micro-Rayleigh-Bénard flows using direct simulation Monte Carlo method," Y.Fang and W.W.Liou. **International Journal of Aeroacoustics,** 17 (4-5) 425-437, (2018).
39. "Computational conjugate heat transfer analysis of a hybrid electric vehicle inverter," Y.Yang, W.W.Liou, and X. Kang. **Heat Transfer Engineering**, 39, 1715-1725 (2018).
38. "Effect of lateralized design on muscle and joint reaction forces for reverse shoulder arthroplasty," W.W. Liou, Y. Yang, G.R. Petersen-Fitts (MD), D.J. Lombardo (MD), S. Stine, V. Sabesan (MD). **Journal of Shoulder and Elbow Surgery**, 26, 564-572 (2017).
37. "Numerical study of low-Reynolds number flow over rotating rigid helix: an investigation of the unsteady hydrodynamic," W.W.Liou and Y.Yang. **Fluid Dynamics Research**, 4 (47) (2015).
36. "Modeling of high sodium intake effects on left ventricular hypertrophy," Y. Zhang, W.W. Liou,

and V. Gupta (MD). **Computer in Biology and Medicine**, 58, 31-39 (2015).

35. "A best practices guide to CFD education in the undergraduate curriculum," J.D. Eldredge, I. Senocak, P. Dawson, J. Canino, W.W. Liou, R. LeBeau, D.L. Hitt, M.P. Pumpfkeil, and R.M. Cummings. **International Journal of Aerodynamics**, 4, 200-236 (2014).
34. "Computational aerodynamics of baseball, soccer ball, and volleyball," P.Jalilian, P.K. Kreun, M.M. Makhmalbaf, W.W. Liou. **American Journal of Sports Science**, 2(5), 115-121 (2014).
33. "A direct heating immersed boundary-lattice Boltzmann method for thermal flows," O.O. Bamiro, W.W. Liou. **International Journal of Numerical Methods for Heat and Fluid Flow**, 24, 169-200 (2014).
32. "Shock wave impact simulations of a vehicle occupant using fluid/structure/dynamics interactions," Y.Yang and W.W. Liou, J.Sheng, D.Gorsich, S.Arepally. **International Journal of Impact Engineering**, 52, 11-22 (2013)[1]
31. "Computational study of compressive loading of carbon nanotubes using quasi-continuum method," Y. Yang and W.W. Liou. **Journal of Computational Science**, 3, 142-149 (2012).
30. "Microgas turbine engine characteristics using biofuel," E. Tan and W.W. Liou. **The Hilltop Review**, 5, 40-50 (2011).
29. "Analytical investigation of free surface flow in multi-layer porous media," Y. Peng, W.W. Liou, and P. Parker. **Colloids and Surfaces A: Physicochemical and Engineering Aspects**, 380, 213-221 (2011).
28. "A reduced-order general continuum method for dynamic simulations of carbon nanotube," Y.Yang and W.W.Liou. **International Journal for Nanotechnology and Molecular Computing**, 2 (3), 1-24 (2010).
27. "Effects of flexible fin on low-frequency oscillation in post-stall flows," T. Liu, J.Montefort, W.W.Liou, and S.Pantula, **AIAA Journal**, 48, No. 6, 1235-1247 (2010).
26. "A new second-order closure for rough-wall turbulent flows using the Brinkman equation," M.-H.Lu and W.W.Liou. **Computers and Fluids**, 39, 626-639 (2009).
25. "Analytical modeling of capillary flow in tubes of nonuniform cross section," W.W. Liou, Y.Peng, P.Parker. **Journal of Colloid and Interface Science**, 333, 389-399 (2009).
24. "Rough wall layer modeling using the Brinkman equation," W.W.Liou and M.-H.Lu. **Journal of Turbulence**,10, 1-24 (Invited) (2009).
23. "Aeroship: A hybrid flight platform," T.Liu, W.W.Liou, and M.Schulte. **Journal of Aircraft**, 46, 667-674 (2009).
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17. "Computational simulations of the mixing of cerebrospinal fluid in human brain ventricles at rest and in motions," W.W.Liou, J.Xu, S.Yamada, M.Nakajima, M.Miyajima, K.Horikoshi. World Congress on Biomedical Science and Engineering, November 6-7, 2025, Vienna, AUSTRIA.
16. "Computational analysis of churning loss reduction and meshing lubrication in a baffled gearbox," J.Xu, W.W.Liou, Madan BK. SAE 2025 Energy & Propulsion Conference & Exhibition, October 14-16, 2025, Ypsilanti, Michigan.
15. "Flow induced forces on simulated Cochlea hair bundles using computational modeling," W.W. Liou, Madan BK, P.V.Blinkiewicz, J.Duncan. The 3rd Joint Symposium on Advanced mechanical Science and Technology, November 26-29, 2023, Keelung, TAIWAN.
14. "Lube oil expulsion in a front axle predicted using particle-based simulations," W.W.Liou, D. Dawson. J.Xu. SAE WCX, April 18-20 2023, Detroit, Michigan.
13. "Computational fluid dynamics (CFD) modeling of torque converter and experimental validation," W.W.Liou, Y.Yang, D.Whitticar, F.Qureshi, M.E.Huston Engine & Drive Train V: Special Topics, Surface/Wear Session, 74th Society of Tribologists and Lubrication Engineers (STLE) Annual Meeting and Exhibition, May 19-23, 2019. Nashville, Tennessee.
12. "CFD modeling of fluid properties on torque converter efficiency in automatic transmissions", Y.Yang, W.Liou, D.Whitticar, F.Qureshi, M.E.Huston WCX 9-11 April 2019, Detroit, Michigan. SAE paper 19PFL-0996.
11. "Does greater tuberosity healing affets biomechanics of reverse shoulder arthroplasty?" V.Sabesan (MD), W.Liou (PhD), Y.Yang (PhD), M.Stankard (BS), Diego Lima (MD), M Drummond (MD). Orthorpaedic Summit, December 5-8, 2018, Las Vegas, Nevada.
10. "Cardiovascular hemodynamics and body fluid homeostasis in microgravity – a computer simulation" Y. Zhang and W.W. Liou, 34th American Society for Gravitational and Space Research Conference, October 31 – November 3, 2018, Rockville, Maryland.
9. "Does acromion anatomy affect acromion stress fracture after reverse shoulder arthroplasty?" V. Sabesan, (MD), W. Liou (PhD), Y. Yang (PhD), D. Lima (MD). International Society for Technology in Arthroplasty, 10-13 October 2018, London, UK.
8. "Does greater tuberosity affect implant performance in reverse shoulder arthroplasty ?" V. Sabesan, (MD), W. Liou (PhD), Y. Yang (PhD), M. Stankard (BS), D. Lima (MD). American Shoulder and Elbow Surgeons 2018 Annual Meeting, 11-14 October 2018, Chicago, Illinois.
7. "Does tuberosity healing affect the biomechanics of reverse shoulder arthroplasty?" D. Lima (MD), W. Liou (PhD), Y. Yang (PhD), J.M. Villa (MD), V. Sabesan (MD). Orthopaedic Research Society 2018 Annual Meeting, 10-13 March 2018, New Orleans, LA.
6. "Biomechanical Assessment of Lateralized design for Reverse Shoulder Arthroplasty," V. Sabesan (MD), G. Petersen-Fitts (MD), D. Lombardo (MD), W.W. Liou (PhD) and Y. Yang (PhD).

17th Annual Meeting of the International Society for Computer Assisted Orthopaedic Surgery, 14-17 June 2017, Aachen, Germany.

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4. "Shoulder-Kinematics and Mechanics," V.Sabesan (MD), G.Petersen-Fitts (MD), W.Liou, Y.Yang, S.Stine (MD), Orthopaedic Research Society 2016 Annual Meeting, poster presentation, 2016.
3. "Effect of Lateralized design on Muscle and Joint Reactive Forces for Reverse Shoulder Arthroplasty, " D. Lombardo(MD), Y.Yang, W.W.Liou, S.Stine (MD), G.Petersen-Fitts (MD), V.Sabesan (MD). International Congress of Shoulder and Elbow Surgeons 2016. Also, Michigan Orthopaedic Society 2016 Annual Scientific Meeting 17-19 June 2016, Mackinc Island, Michigan.
2. "Biomechanical analysis of commercially available RSA Design," D.Lombardo (MD), Y. Yang (PhD) W.W.Liou (PhD), C.Frank, V.Sabesan (MD). Presentation at the American Academy of Orthopaedic Surgeons Annual Meeting 2016.
1. "DSMC simulations of disturbance dynamics in a forced chaotic flow," JANNAF Joint meeting, Dec.1-5, 2003, Colorado Springs, Colorado.