

Weitong Liu

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Research Institute of Aero-Engine
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EDUCATION

Beihang University, Beijing, China

Ph.D. in Engineering Thermophysics, Research Institute of Aero-Engine

Sep. 2021 – Jun. 2026 (expected)

Supervisors: Prof. Guoqiang Xu and Prof. Yanchen Fu

Beihang University, Beijing, China

B.Eng. in Aerospace Propulsion Engineering, School of Energy and Power Engineering

Sep. 2017 – Jun. 2021

GPA: 3.82 / 4.00

RESEARCH EXPERIENCE

Thermal Management System for Hydrogen-Fueled Aero-Engines

Oct. 2024 – Present

Investigating thermal management architectures for liquid hydrogen (LH₂) turbofan engines to enhance safety, efficiency, and deep utilization of hydrogen fuel.

- Developed an energy-flow-oriented thermal modeling approach leveraging Kirchhoff's voltage law to eliminate redundant computational intermediates, achieving maximum temperature deviation of 3.11%.
- Proposed a synergistic heat recovery–dissipation architecture incorporating four functional heat exchangers and a helium-based intermediate cycle.
- Analyzed the influence of key thermodynamic parameters on engine performance, and established their optimal values for maximizing thermal efficiency.

Intermediate Cycle Heat Exchange System (Ph.D. Thesis)

Feb. 2023 – Present

Investigating intermediate cycle heat exchange systems to increase operational stability margins and enable safe, efficient utilization of onboard fuel heat sinks in aerospace applications.

- Proposed a full-process optimization framework from design to operation, reducing system weight while enhancing heat transfer performance.
- Developed a transfer matrix-based system model to achieve holistic identification of the heat exchanger heat transfer characteristics, achieving a maximum parameter deviation of –4.79%.
- Conducted steady-state and transient experiments with multilevel heat exchange system using multiple working fluids to investigate energy transport behavior.

Experimental Study of Airfoil-Fin Printed Circuit Heat Exchanger (PCHE)

Oct. 2022 – Jan. 2023

Examined flow and heat transfer performance of airfoil-fin PCHE for advanced energy systems.

- Experimentally evaluated PCHE performance with supercritical hydrocarbon fuel and high-pressure water.
- Developed empirical correlations for Nusselt number and friction coefficient, with deviations of $\pm 20\%$ and $\pm 8\%$, respectively.
- Assessed six different Nusselt number calculation methods against experimental data, identifying their applicability and limitations.

Heat Transfer of Supercritical Hydrocarbon Fuel

Jul. 2021 – Sep. 2022

Explored heat transfer mechanisms of supercritical hydrocarbon fuel for thermal protection.

- Conducted experiments on vibration-enhanced heat transfer of supercritical pressure hydrocarbon fuel RP-3 in laminar tube flow.
- Measured thermophysical properties (density) of RP-3 at 6–8 MPa and 323–783 K using a flow method.
- Performed numerical simulations of forced, natural, and mixed convection heat transfer of n-decane in laminar flow at supercritical pressures.

RESEARCH SKILLS

Thermal System Modeling and Optimization

- Energy-flow modeling, analysis, and optimization of thermal systems using MATLAB, including both design-phase and operational optimization.
- Parametric and sensitivity analysis for thermodynamic performance improvement in complex energy systems.

Microchannel Heat Exchanger Design and Analysis

- Design, performance evaluation, and thermodynamic characterization of high-efficiency, compact, low-pressure-drop microchannel heat exchangers.
- Investigation of heat transfer enhancement and deterioration mechanisms in supercritical fluids

Experimental Expertise

- Extensive multi-scale flow and heat transfer experimental experience, including: microchannel heat transfer tests (millimeter scale), thermal–hydraulic performance tests of heat exchangers, and complex thermal system experiments.
- Experience in both cryogenic (liquid nitrogen, ~ 77 K) and high-temperature (air up to ~ 900 K) experimental environments.

Software Proficiency

- MATLAB, NX, AutoCAD, ANSYS Fluent, Adobe Illustrator, Origin, Microsoft Office Suite.

PUBLICATIONS

First-Author and Primary-Contributing student Publications

- [1] **Weitong Liu**, Guoqiang Xu, Yiang Liu, Xiuting Gu, Jiayang Wang, Jingzhi Zhang, Yanchen Fu*, “From Design to Operation: Integrated Optimization of Intermediate Cycle Heat Exchange Systems for Aero Engines”, *International Journal of Heat and Mass Transfer*, (Under Review)
- [2] **Weitong Liu**, Guoqiang Xu, Xiuting Gu, Yiang Liu, Jiayang Wang, Jingzhi Zhang, Yanchen Fu*, “Synergistic Heat Recovery–Dissipation Architecture for Hydrogen Turbofans: Integrated Heat Current Modeling with Multi-Parameter Thermodynamic Analysis”, *Energy*, (Under Review)
- [3] **Weitong Liu**, Guoqiang Xu, Xiuting Gu, Jingshuai Yao, Mowen Li, Ming Lei, Qun Chen*, Yanchen Fu*, “Experimental Analysis and Thermodynamic Modeling for Multilevel Heat Exchange System with Multifluid in Aero Engines”, *Energy*, 2025, 315: 1343737. (**ESI Highly Cited Paper**)
- [4] **Weitong Liu**, Xiuting Gu, Yiang Liu, Jiayang Wang, Ruoyu Wang, Yanchen Fu*, “Innovative Thermal Management for Liquid Hydrogen Aero Engines: A Comparison with Kerosene Systems”, *EUCASS*, 2025.
- [5] Yanchen Fu, **Weitong Liu**, Shenzhou Shi, Ruoyu Wang, Yinlong Liu, Guoqiang Xu*, “Density Measurements of Aviation Kerosene RP-3 Over the Temperature Range From (323 to 783 K) Under Supercritical Pressures (6 to 8 MPa)”, *Chinese Journal of Aeronautics*, 2025, 38(7): 103474. (**Second author; primary contributing student author**)
- [6] **Weitong Liu**, Guoqiang Xu, Haoxing Zhi, Ruoyu Wang, Mowen Li, Yanchen Fu*, “Experimental Evaluation of Hydrothermal Performance in Airfoil-Fin PCHE with Supercritical Pressure Hydrocarbon Fuel”, *International Communications in Heat and Mass Transfer*, 2024, 159: 108279.
- [7] **Weitong Liu**, Haoxing Zhi, Han Qi, Yanchen Fu*, “Experimental Insights into Thermal-Hydraulic Performance of A Compact Printed Circuit Heat Exchanger with Airfoil Fins Using High-Pressure Water”, *International Conference on Micro/Nanoscale Heat Transfer. American Society of Mechanical Engineers*, 2024, 88155: V001T09A001.
- [8] Yanchen Fu, **Weitong Liu**, Juan Wang, Lina Zhang, Jie Wen, Hongwei Wu, Guoqiang Xu*, “Experimental Investigation on Heat Transfer Enhancement of Supercritical Pressure Aviation Kerosene in Tubular Laminar Flow by Vibration”, *Applied Thermal Engineering*, 2024, 257: 124206. (**Second author; primary contributing student author**)
- [9] **Weitong Liu**, Guoqiang Xu, Xiaojia Gang, Han Qi, Mowen Li, Jie Wen, Yanchen Fu*, “Theoretical Modeling, Experimental Validation, and Thermodynamic Analysis on Intermediate Heat-Exchange Cycle System”, *International Communications in Heat and Mass Transfer*, 2024, 156: 107635.
- [10] Yanchen Fu, **Weitong Liu**, Han Qi, Qun Chen, Jie Wen, Guoqiang Xu*, “Heat Transfer Area Optimization of Intermediate Heat-Exchange Cycle System for Aero Engines”, *International Journal of Heat and Mass Transfer*, 2024, 220: 124995. (**Second author; primary contributing student author**)
- [11] **Weitong Liu**, Guoqiang Xu, Yanchen Fu*, Jie Wen, Nan Zhang, “Numerical Investigation on Forced, Natural, and Mixed Convective Heat Transfer of N-Decane in Laminar Flow at Supercritical Pressures”, *International Journal of Heat and Mass Transfer*, 2023, 209: 124129.

Other Co-Authored Publications

- [1] Han Qi, Guoqiang Xu, **Weitong Liu**, Lina Zhang, Yanchen Fu*, “Flow and Heat Transfer Characteristics in Small Diameter Tube Bundles with A Staggered Layout: An Experimental Study”, *Journal of Enhanced Heat Transfer*, 2024, 31(5): 33-52.
- [2] Zhe Zhang, Zeyu Wu*, Xiang Luo, **Weitong Liu**, “Numerical Study on Convective Heat Transfer of Liquid Metal Gallium in Turbine Guide Vane”, *Aerospace*, 2023, 10(6):548.
- [3] Han Qi, **Weitong Liu**, Shenzhou Shi, Xiaojia Gang, Yanchen Fu*, “Analysis of A Compact Printed Circuit Heat Exchanger with Airfoil Fins in Aero Engine Cooling Systems: An Experimental Study”, *IGTC*, 2023.
- [4] Haoxing Zhi, Juan Wang, **Weitong Liu**, Xiaojia Gang, Yanchen Fu*, “Numerical Research of The Factors Influencing The Flow Heat Transfer and Thermal Oxidation Coking Process of Aviation Kerosene RP-3 Under Supercritical Pressure in Miniature Serpentine Tubes”, *ACTS*, 2024.
- [5] Yanchen Fu, Guoqiang Xu, Jie Wen, Yongkai Quan, Han Qi, **Weitong Liu**, Yinlong Liu, “Device and method for measuring thermal conductivity of high-temperature and high-pressure liquid”, *US Patent App*, 2023.

ACADEMIC ACTIVITIES

Teaching

- Engineering Thermodynamics, with Prof. Yanchen Fu, Beihang University, 2022

Conference Attendance

- Oral presentation at the 11th European Conference for Aerospace Sciences, [EUCASS 2025](#), Rome, Italy
- Oral presentation at the 7th ASME International Conference of Micro/Nanoscale Heat and Mass Transfer, [MNHMT 2024](#), Nottingham, UK
- International Gas Turbine Congress, [IGTC 2023](#), Kyoto, Japan
- [China Space Conference 2025](#), Shanghai, China

FELLOWSHIP, HONORS & AWARDS

- Chinese National Scholarship for Doctoral Postgraduates

- Doctoral Student Special Program of the Young Elite Scientists Sponsorship Program by Chinese Association for Science and Technology 2024
- The Academic Excellence Foundation of Beihang University for Ph.D. Students 2024
- The First Prize of Academic Scholarship, Beihang University 2024, 2025
- Excellent Academic Innovation Achievement Award, Beihang University 2024
- Outstanding Postgraduate, Beihang University 2024
- Merit Student, Beihang University 2024
- Postgraduate Studentship Beihang University 2021-2025
- Graduate Freshmen Scholarship, Beihang University 2021