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 (LH_2) 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 ±20% and ±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 *2024*

- Doctoral Student Special Program of the Young Elite Scientists Sponsorship Program by Chinese Association for Science and Technology (**National talent program; 3000 selected nationwide, 31 in Chinese Society of Astronautics**) *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*