Shadi Mahjoob

Associate Professor
Mechanical Engineering Department
College of Engineering and Computer Science
California State University, Northridge
http://www.csun.edu/~smahjoob/

Education

PhD, Mechanical Engineering

University of California Riverside, CA, US, 2008

MSc, Aerospace Engineering-Aerodynamics

Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran, 2000

BSc, Aerospace Engineering

Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran, 1998

Recent Experiences

- **Research and Teacher Assistant,** Heat and Mass Transfer Lab., Mechanical Engineering Department, University of California, Riverside, CA, US
- **Academic Coordinator,** Dean Office of Bourns College of Engineering, University of California, Riverside, CA
- **Postdoctorate Research Scientist,** Nano and Micro-Fluidics Institute (Center of Smart Interface) and Institute of Technical Thermodynamics (Mechanical Engineering Department), Darmstadt University of Technology, Germany
- **Principal Scientist,** PAX Scientific Inc., San Rafael, CA, US
- **Assistant Prof.,** Mechanical Engineering Department, CSUN
- **Associate Prof.,** Mechanical Engineering Department, CSUN

Selected Recent Awards and Accomplishments

- **Outstanding Engineering Achievement Merit Award**

  The Engineer's Council, CA, 2017

- **Probationary Faculty Support Grant**

  CSUN, Fall 2018

- **Research and Graduate Studies (RGS) Summer Grant**

  CSUN, Summer 2019 and Summer 2022

- **Research, Scholarship, and Creative Activity (RSCA) Award**

  CSUN Research and Sponsored Programs, Fall 2021

- **Research Fellow of College of Engineering and Computer Science**

  Funded by the Provost office, College of Engineering and Computer Science, and the library, California State University Northridge (CSUN), 2020-21

- **Outstanding Engineering Achievement Merit Award**

  The Engineer's Council, CA, 2023

- **WISE Advisory Board Member**

  CSUN, From 2020 to present (https://library.csun.edu/WISE)

Research Background and Interest

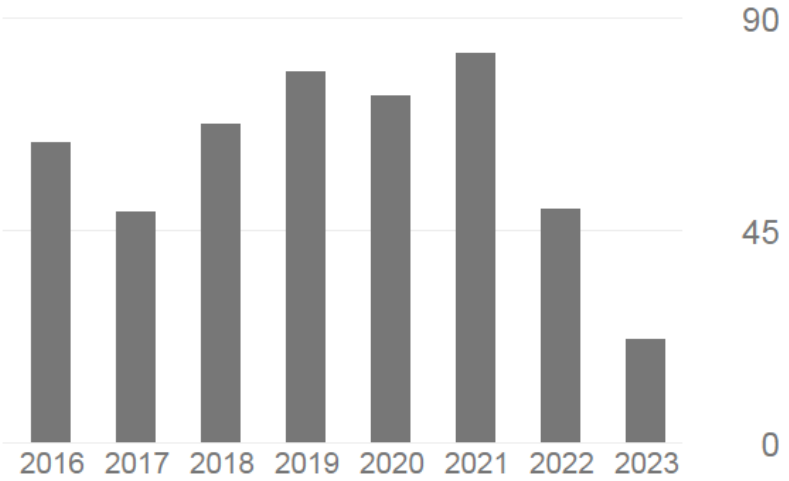
- Developed ***Thermofluid Research and Design Lab*** for fundamental and applied thermofluid research utilizing computational, experimental and analytical techniques.
- Research area include, but not limited to, electronics cooling, electric vehicle battery cooling, gas turbine cooling, bioheat transfer, transport through porous media, renewable energy and energy recovery systems, and multiphase flow & phase change.

http://www.csun.edu/~smahjoob/People.htm

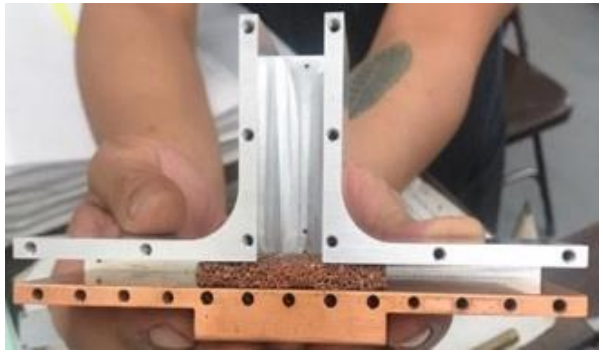
Google Scholar Citations

https://scholar.google.com/citations?user=4FKmhMIAAAAJ&hl=en

	All	Since 2018
Citations	891	377
h-index	8	8
i10-index	8	8



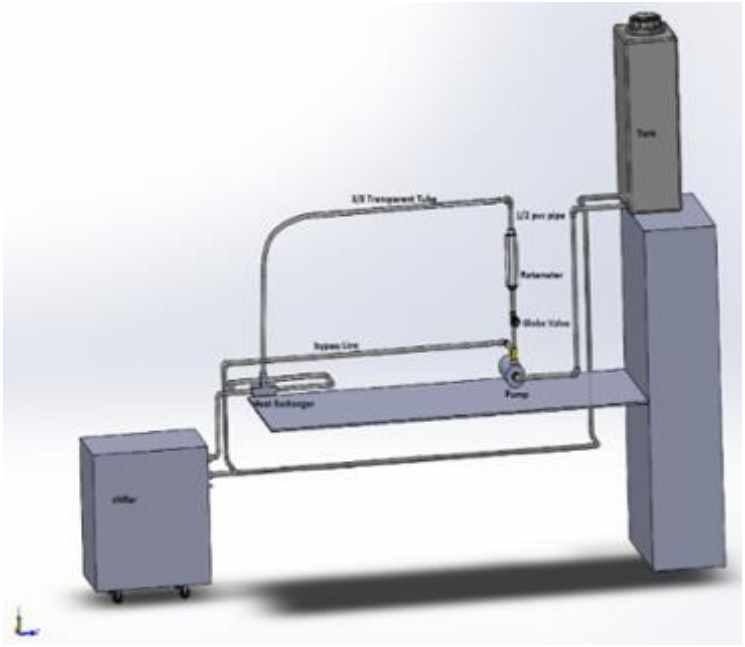
Research Background and Interest

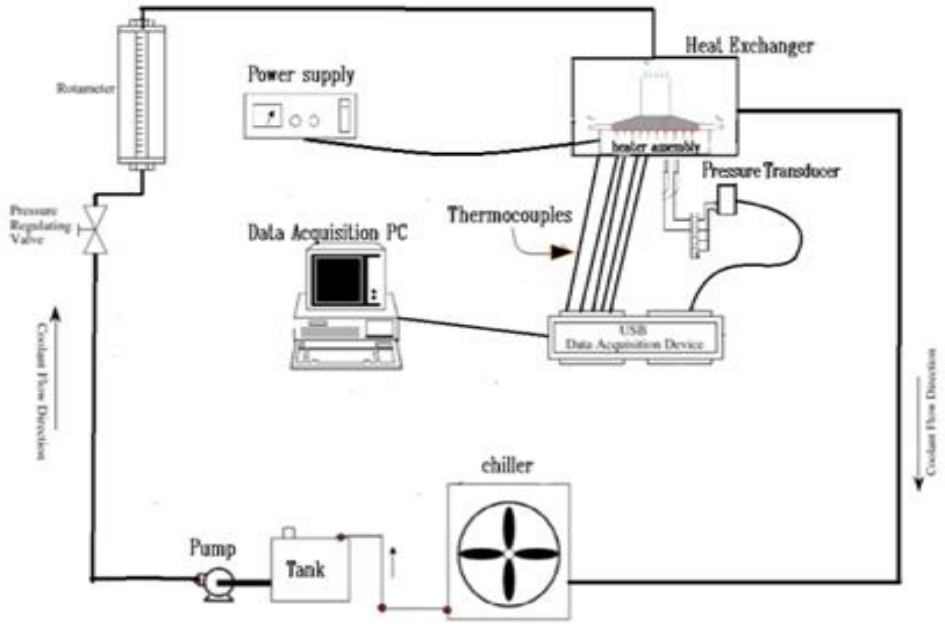


Manufactured metal foam filled channel for experimental tests.

Experimental setup for liquid cooling Investigations.

Research Background and Interest

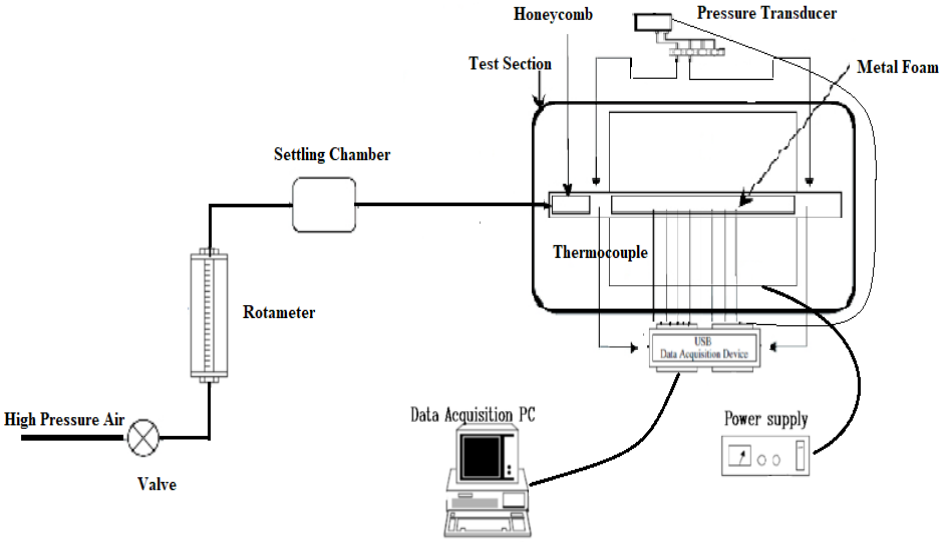




A schematic of experimental setup for liquid cooling studies.

Research Background and Interest

Experimental setup for air cooling Investigations.

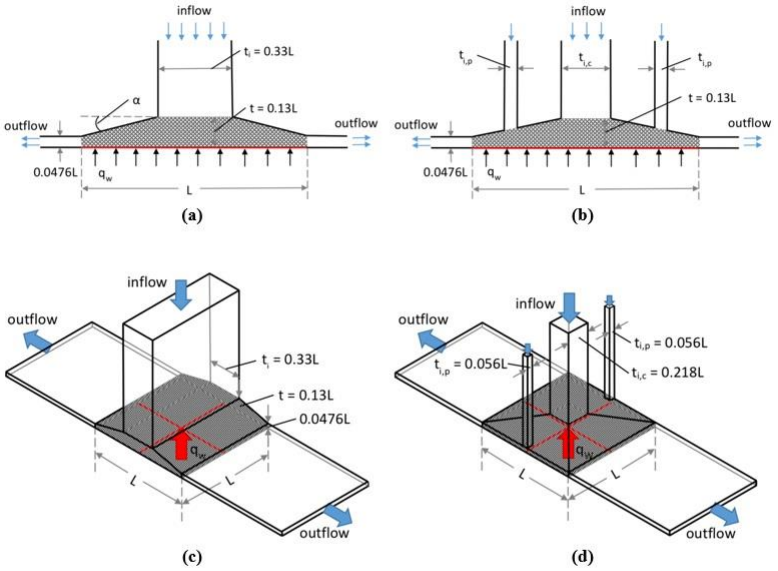


A schematic of experimental setup for foam filled and rib-structure channels employing air coolant.

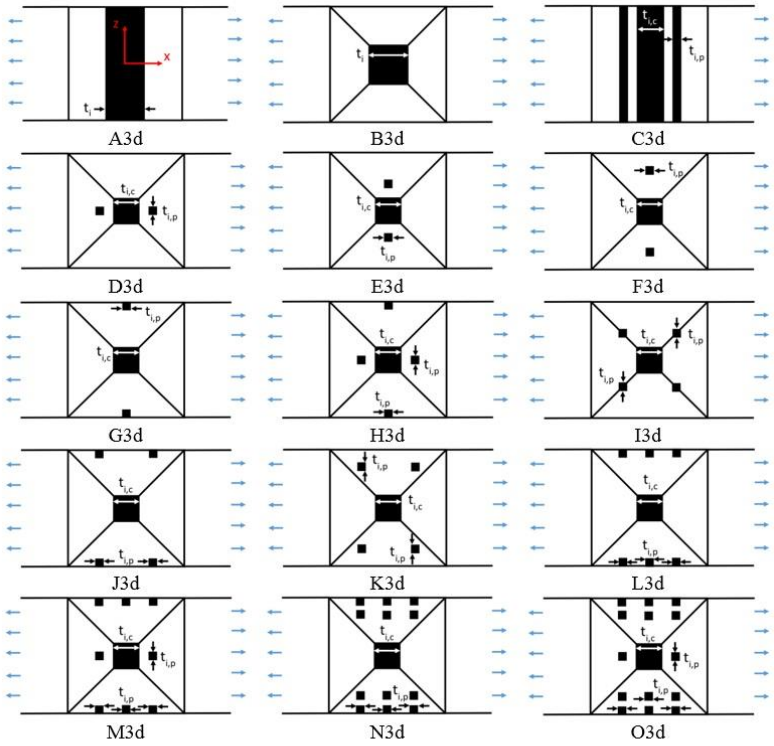
Research Projects

- Experimental and Numerical Investigation of Jet Impingement, Direct and Indirect Liquid and Gas Cooling with Application in Electronics Cooling, Hotspot Removal, and Electric Vehicle Battery Cooling.
- Experimental, Numerical, and Analytical Investigation of Transport through Porous Media with Application in Advanced and Highly Efficient Heat Management Devices.
- Experimental and Numerical Investigation of Gas Turbine Cooling and Turbomachinery Systems with Application in Power Plants and Airplane Jet Engines.
- Numerical and Analytical Investigation of Transport through Biological Media with Application in Hyperthermia Cancer Treatment.
- Experimental and Numerical Investigation of Multiphase flow and Phase Change with Application in Advanced Heat Exchanges and Heat Pipes.

Electronics Cooling and Hotspot Removal



Schematic diagrams (a) front view of single jet impingement, (b) front view of multi jet impingements, (c) a three dimensional case with single rectangular cross section inlet channel, and (d) a three dimensional case with multi square cross section inlet channels.

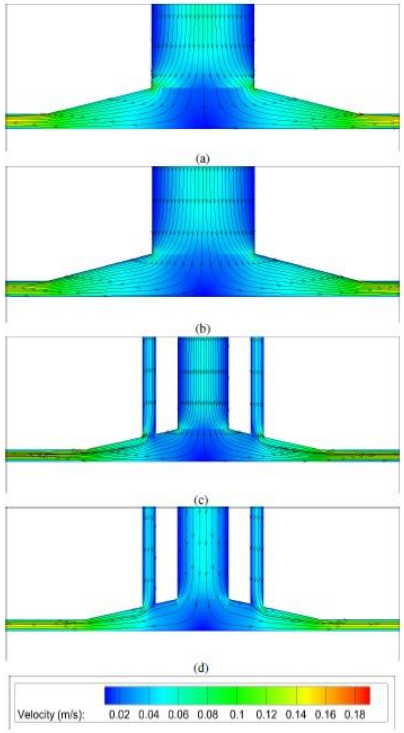


The top view (x-z plane) of the investigated three dimensional single and multi jet impingement cases.

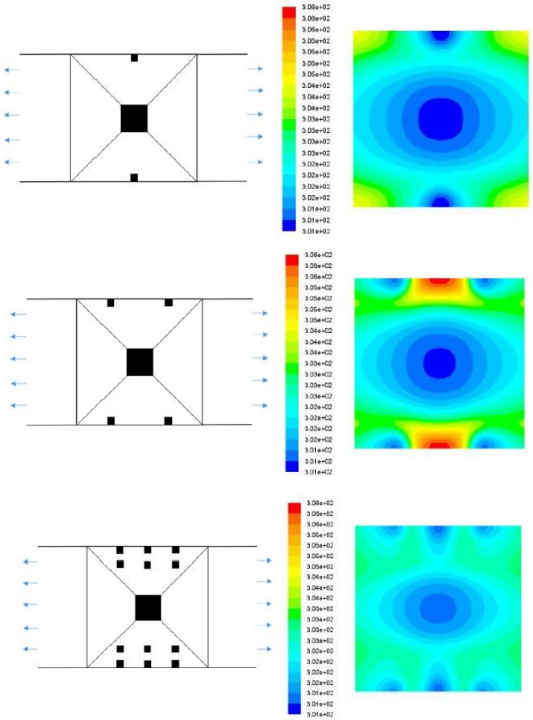
• **Zing, C., Mahjoob, S.**, and Vafai, K., "Analysis of Porous Filled Heat Exchangers for Electronic Cooling." **International Journal of Heat and Mass Transfer** Vol. 133, pp. 268-276, 2019.

• **Zing, C.** and **Mahjoob, S.**, "Thermal Analysis of Multi Jet Impingement through Porous Media to Design a Confined Heat Management System", ***ASME Journal of Heat Transfer***, Vol.141, No. 8, 2019.

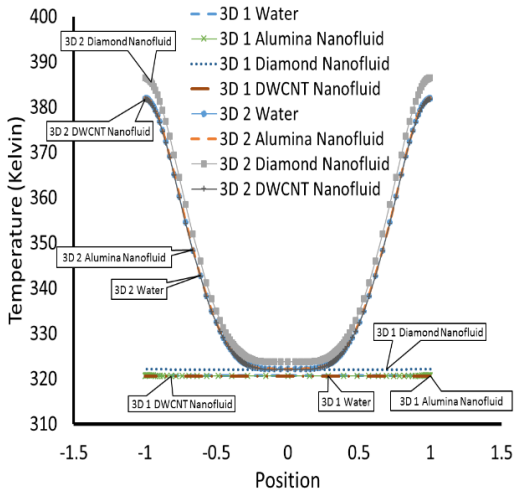
Electronics Cooling and Hotspot Removal



Streamlines and velocity contours along streamwise direction (a) Case A: ε=0.45, (b) Case A: ε=0.9, (c) Case B: ε=0.45, and (d) Case B: ε=0.9.



Temperature contours across the base



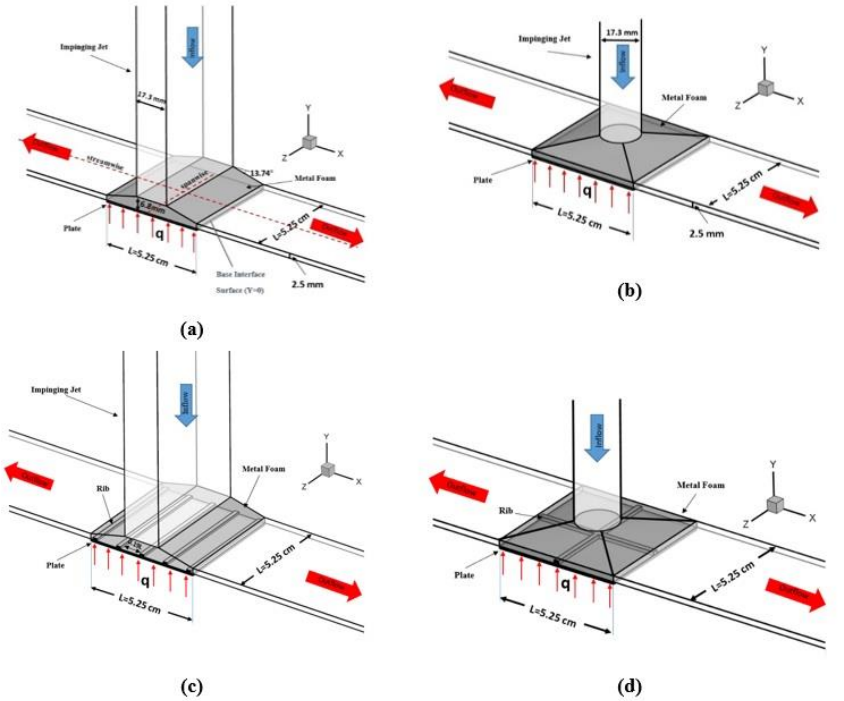
Temperature distribution along the streamwise direction on the base centerline for 3D cases ($3D_1$: rectangular cross sectional inlet channel and $3D_2$: square cross sectional inlet channel) for different porous material, coolants, and porosity

Zing, C. and **Mahjoob, S.**, "Numerical Investigation of Thermal Transport in Confined Single and Multiple Jet Impingements Through Porous Filled Non-Uniform Cross Section Channels", **Proceedings of 2018 IEEE Itherm Conference**, May 2018.

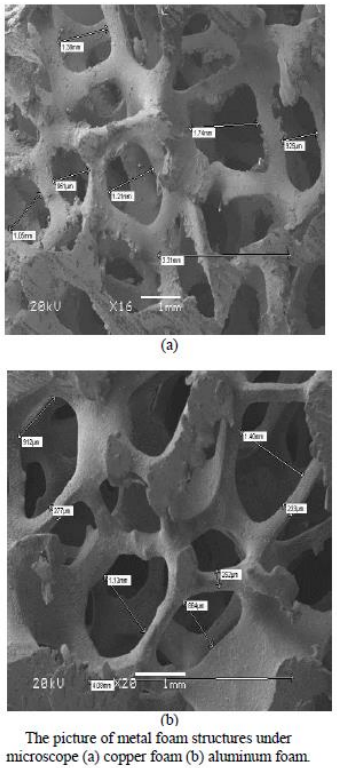
Zing, C. and **Mahjoob, S.**, "Numerical Analysis of Thermal Transport in Nano Fluidic Porous Filled Heat Exchangers for Electronics Cooling", **Proceedings of ASME 2017 Summer Heat Transfer Conference**, July 2017.

Zing, C. and **Mahjoob, S.**, "Investigation of Heat Transfer Through Multi Jet Heat Exchangers Utilizing Local Thermal Non-Equilibrium Model", **Proceedings of IEEE Conference on Technologies for Sustainability (SusTech)**, Nov. 2018.

Electronics Cooling and Hotspot Removal



Schematics of the foam filled cooling system (a) slot jet impingement (b) circular jet impingement (c) slot jet impingement through foam-rib combination (b) circular jet impingement through foam-rib combination.

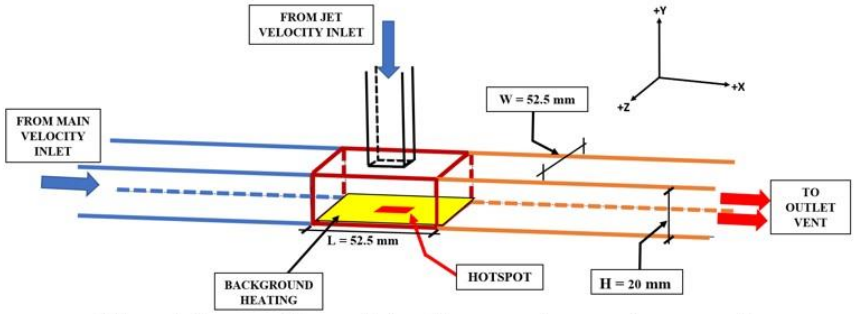


The picture of metal foam structures under microscope (a) copper foam (b) aluminum foam.

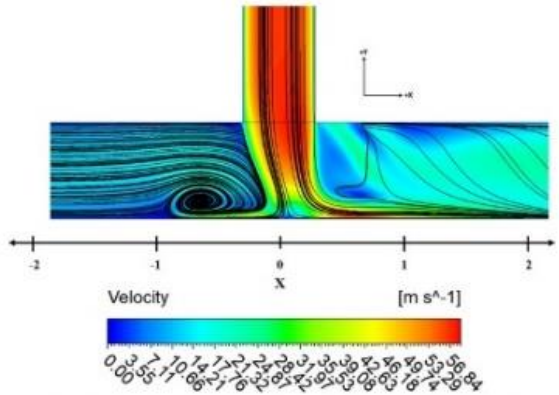
Mahjoob, S. and **Kashkuli, S.,** "Thermal Transport Analysis of Injected Flow through Combined Rib and Metal Foam in Converging Channels with Application in Electronics Hotspot Removal", **International Journal of Heat and Mass Transfer**, Vol. 177, Oct. 2021.

Kashkuli, S. and **Mahjoob, S.**, "Numerical Investigation of Thermal Transport in Foam Filled Heat Exchangers Employing Circular and Non-Circular Jet Impingement Cross Sections", **Proceedings of 2020 IEEE ITherm Conference**, July 2020.

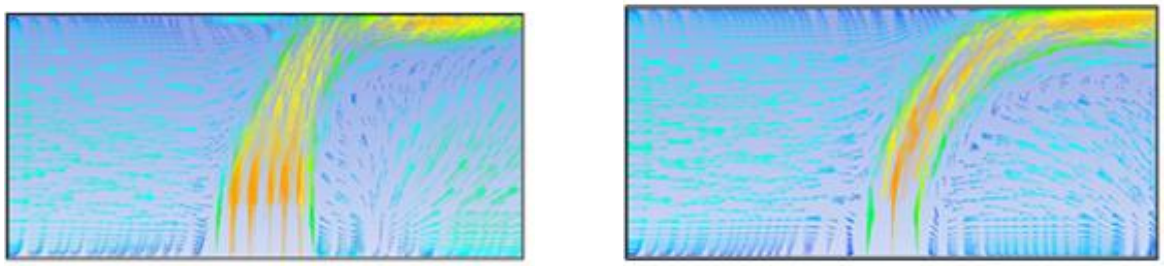
Electronics Cooling and Hotspot Removal



Schematic diagram of the studied cooling system (not to scale, truncated)



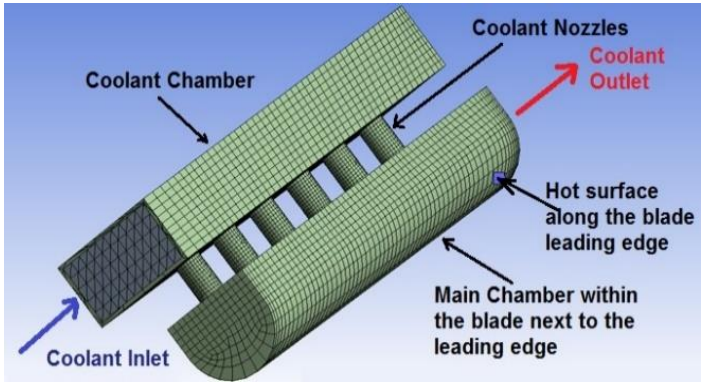
Streamlines and velocity contour for the square vertical jet at the center plane (z=0)



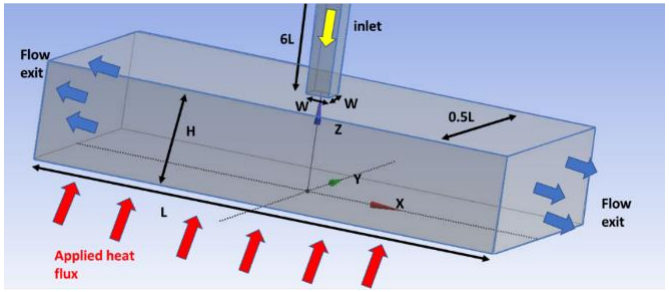
Flow velocity find for square and span-wise jets

Corvera, C. and **Mahjoob, S.**, "Analysis of Jet and Cross Flow Interaction with Application in Hotspot Electronics Cooling", **Proceedings of 2022 IEEE Itherm Conference**, June 2022.

Gas Turbine Cooling

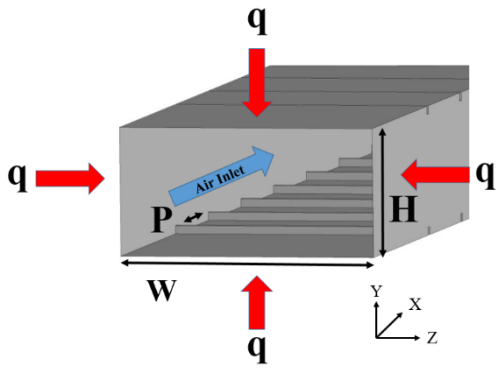


Schematic of gas turbine internal cooling system for leading edge of a blade.

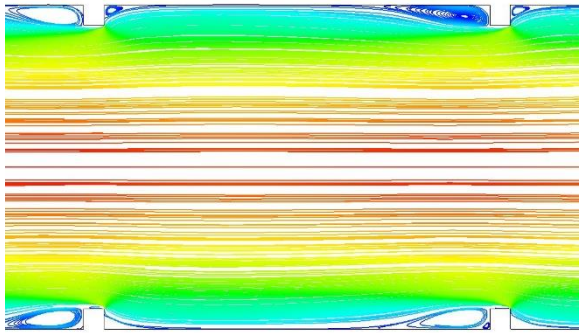


The schematic diagram of the investigated uniform cooling channel with single air jet impingement.

Garcia, A. and **Mahjoob, S.**, "Numerical Study of Thermal Transport in Channel Flows Employing Jet Impingement Cooling Enhanced with Flow Turbulators", **Proceedings of 2021 IEEE Itherm Conference**, June 2021.



A schematic diagram of the investigated ribbed channel



Streamlines at the central section of the ribbed channel along the axial direction.

Huynh D. and **Mahjoob, S.**, "Numerical Analysis of Structured Ribbed Channels for Electronic Cooling Applications", **Proceedings of IEEE 2020 ITherm Conference**, July 2020.

Patent Pending

- **High Efficiency Thermal Management Device for Use with Components Having High Heat Flux Values, US Patent Application No.: 16/423901**

  Inventors: Mahjoob, S. and Zing, C.
  Publication number: 20200126892
  Filing Date: May 28, 2019
  Publication Date: April 23, 2020
  Online Access: https://patents.justia.com/patent/20200126892

- **Portable Rapid Microfluidic Thermal Cycler for Extremely Fast Nucleic Acid Amplification**

  Inventors: Beer, N.R., Vafai, K., Mahjoob, S.
  Publication number: 20090226971
  Filing Date: Nov. 13, 2008
  Publication Date: Sept. 10, 2009
  Online Access: https://patents.justia.com/patent/20090226971

Upper Division Undergraduate Courses Taught at CSUN from Fall 2015

ME370: Thermodynamics

Summer 2016, Fall 2016, Summer 2017, Fall 2017, Spring 2018, Summer 2018, Fall 2018, Summer 2019, Fall2019, Summer 2020, Summer 2021

ME375: Heat Transfer I

Fall 2015, Spring 2016, Fall 2017

ME376: Heat Transfer in Electrical and Electronic Systems

Spring 2017, Fall 2017, Spring 2018, Fall 2018, Spring 2019, Fall 2019, Spring 2020, Fall 2020, Fall 2021, Spring 2022, Fall 2022

ME390: Fluid Mechanics Fall 2019

ME483: Solar, Wind and Geothermal Energy Spring 2017

ME496CFD: Undergraduate Computational Fluid Dynamics Fall 2022

AE486 A&B: Aero Senior Design Fall 2018, Spring 2019, Fall 2019, Spring 2020, Fall 2020, Spring 2021, Fall 2021, Spring 2022, Fall 2022, Spring 2023

Graduate Courses Taught at CSUN from Fall 2015

ME575: Applied Heat and Mass Transfer

Spring 2016, Spring 2017, Spring 2018, Spring 2019, Spring 2020, Spring 2022, Spring 2023

ME583: Thermal-Fluid Systems Design

Fall 2015, Fall 2016, Fall 2022

ME675A: Conduction and Radiation Heat Transfer

Fall 2015, Fall 2021

Aero Senior Design Project

California wildfires are becoming an increasingly pressing issue and the mobilization of resources can be difficult while fighting wildfires. As such, it is necessary to develop more options for reducing mobilization time. CSUN Aero Senior Design students try to develop solutions to this issue by designing more efficient aircraft and ground vehicle system that autonomously fights wildfires.

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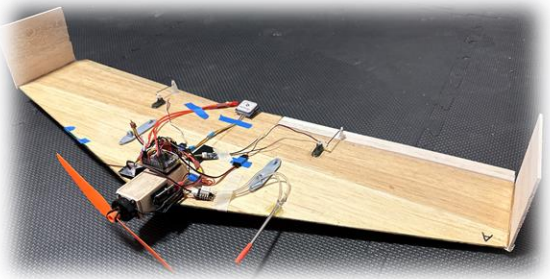
http://www.csun.edu/~smahjoob/SeniorDesign.htm

Aero Senior Design Project

The Aero Senior Design course is a two-semester capstone project at Mechanical Engineering department to design, manufacture, assemble, and test a radio controlled airplane. In this project, senior undergraduate students apply engineering fundamentals, analysis skills, and software to design, manufacture, and test an innovative remote controlled primary aircraft to deliver and release humanitarian payloads into a targeted area. In addition to the primary aircraft, the students design, manufacture, and test a Powered Autonomous Delivery Aircraft (PADA) and an autonomous Ground Transport Vehicle (GTV). This three vehicle system models a scaled down firefighting operation.

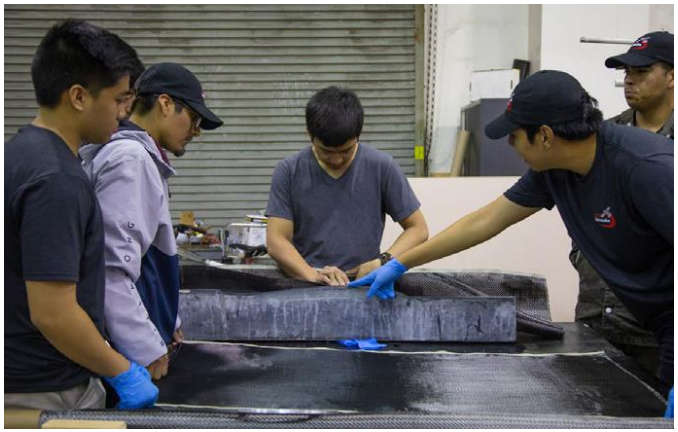
Primary Aircraft, PADA, and GTV



PADA

GTV

2018-19 Aero Senior Design



SAE International Aero Design West Competition in Van Nuys, California, April 5-7, 2019.
The team received **4th place in Technical Design Report** and **4th Place in Technical Presentation**.

2019-20 Aero Senior Design

SAE International Aero Design East Competition in Lakeland, Florida, March 6-8, 2020.

2020-21 Aero Senior Design

- 2020-21 Aero Senior Design team received **4th Place** in presentation in **2021 International SAE Aero Virtual Competition (Advanced class)**.
- The team placed **1st** in **Mechanical Engineering Department** in Senior Design Project Showcase.
- The students also received **3 Awards** (1st and 2nd places in **2021 CSUNPosium**

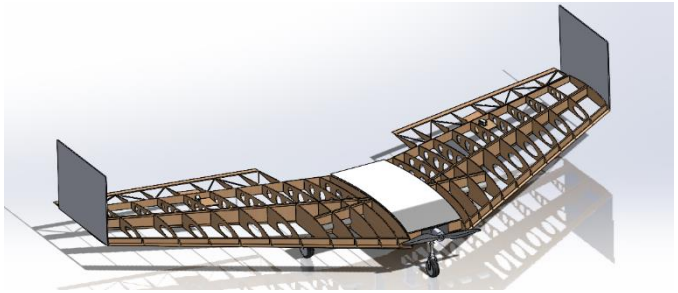
2021-22 Aero Senior Design

- 2021-22 Aero Senior Design team won two awards in **International SAE Aero West Competition in the Advanced Class** in Van Nuys, CA, in April 2022:
  - **2nd Place Award for Mission Performance**
  - **3rd Place Award for Technical Presentation**
- The team won two awards in Senior Design Project Showcase, held by the CSUN college of Engineering and Computer Science in May 2022.
  - **College Top Senior Design Project Display (Grand Prize, Award: $1000)**
  - **Top Overall Oral Presentation of Mechanical Engineering Department (Award: $500)**
- The team also received **three First-Place** awards in 2022 CSUNPosium**.**

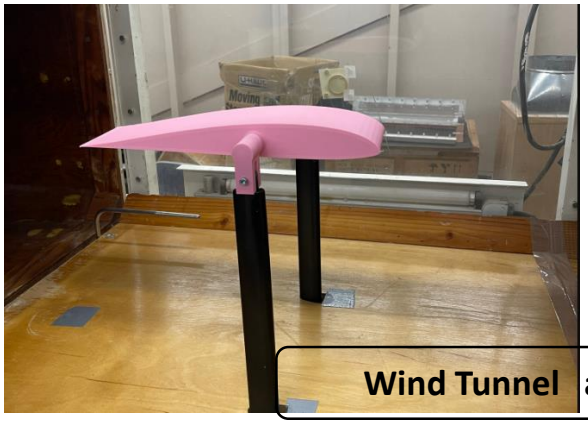
2022-23 Aero Senior Design

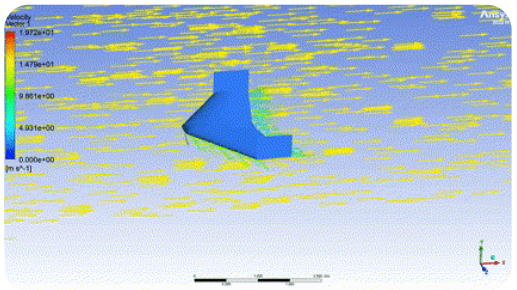
- 2022-23 Aero Senior Design team received
  2nd Place Standing in Technical Presentation
  in 2023 International SAE Aero West Competition-Advanced Class.

- The team also received
  Two 1st place Standings
  in 2023 CSUNPosium held by CSUN.



2022-23 Aero Senior Design





Wind Tunnel and CFD Analysis

Thank you!