

# HARSH PATWA

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## Education

### Georgia Institute of Technology | Atlanta, GA

Master of Science in Aerospace Engineering, CGPA: 3.14/4.0

August, 2022 – May, 2024

- **Research Lab:** Advanced Systems Design Laboratory (ASDL)

### Hindustan Institute of Technology and Science | Chennai, India

Bachelor of Technology in Aerospace Engineering, CGPA: 9.38/10.0

July, 2018 – May, 2022

- **Relevant Coursework:** Advanced Aircraft Propulsion, Propulsion System Design-I, Rocket Propulsion, Electric Propulsion, Kinetics and Thermodynamics of Gases, Aircraft Design-I, Combustion, Jet Propulsion, Fundamentals of Space Vehicle Design, FEM for aerospace engineers, Low Speed & Compressible Aerodynamics, Computational Fluid Dynamics, Computer-Aided Design

## Skills

**Programming & Software:** MATLAB, JMP, NPSS, LabVIEW, CATIA, ANSYS, SolidWorks, AutoCAD, GD&T, C, Python, LaTeX, R, Design of Experiments (DOE), CFD, FEA, CREO

**Professional Certifications:** **Lean Six Sigma Black Belt** (Issued by CSSC), 16.00x: Introduction to Aerospace Engineering: Astronautics and Human Spaceflight (MITx Course), AstroTech: The Science and Technology behind Astronomical Discovery (The University of Edinburgh- Coursera Course)

## Projects

### Sustainable Technology Research in Electrified Aircraft Modeling (STREAM)

August, 2023 – May, 2024

*Grand Challenge Project (Sponsored by Gulfstream Aerospace), Advisor: Dr. Jimmy Tai*

- Spearheaded research and development efforts in hybrid electric powertrain technology for aerospace applications, including aircraft calibration and mild-hybrid concept exploration, resulting in the identification and selection of optimal configurations through rigorous modeling and simulation processes. Modeled and calibrated the baseline **G280 aircraft** and engine using ASDL's **Environmental Design Space (EDS)** (including NPSS, FLOPS, WATE++).
- Utilized conceptual design tools in EDS to rapidly explore and evaluate various alternative hybrid electric (HE) architectures for several aircraft and engine parameters.
- Performed sensitivity analysis and optimization studies to assess the impact of hybridization variables on key performance metrics such as block fuel, hybridization factor and constraint compliance (including TRL for battery technologies).
- Generated multiple **DOEs** including various significant aircraft and engine variables resulting in an optimal solution for various combinations of operational modes of the aircraft (includes **Takeoff boost, Climb boost and TEEM**) to understand the impact of operational modes in the block fuel reduction for on-design and off-design conditions compared to baseline configuration.
- Conducted over **40,000 hybrid case simulations**, generating multivariate regression models in **JMP** (neural models and prediction profilers) to analyze and compare optimized cases, providing critical insights into the feasibility and performance benefits of integrating hybrid technologies into existing aircraft platforms and generating new aircraft and engine models if needed.
- Generated an interactive dashboard to rapidly generate an optimal solution for a wide range of applicable aircraft and engine parameters following the requirements set by the sponsor.

### Engine Component Design and Off-Design Performance for a Turbojet

October, 2022 – December, 2022

*Advanced Aircraft Propulsion course, Instructor: Dr. Jerry Seitzman*

- Designed a turbojet engine to produce a thrust of **35 kN** with mass flow rate of nearly **38 kg/s** and pressure ratio of **12.57**.
- Selected dependent and independent variables to determine characteristics of various components of the aircraft and performed an on-design (6800 ft., 305 K, 78.8 kPa) and off-design (38000 ft., Mach 0.85) analysis to determine the overall aircraft performance.

### Experimental Investigation of Mini Supersonic Wind Tunnel for Flow Visualization

November, 2021 – April, 2022

*Senior Year Project, Mentor: Dr. Vishnu Kumar G C*

- Designed and developed a mini-scale supersonic wind tunnel in **CATIA** and tested airflow over a 2-D spike model at **Mach 1.6 – 1.8**.
- Fabricated the tunnel with **110 cm length** and slit widths of **2 mm** and **5 mm** using **3-D printing** technology and used **Schlieren** setup to visualize the flow in the wind tunnel and measured deflection angle ( $\theta$ ) and oblique shock angle ( $\beta$ ) from multiple captured images.
- Evaluated Mach number using  $\theta$ - $\beta$ -M relation and concluded the maximum Mach number achieved to be **1.8**.
  - **Harsh Patwa, Palakshi Gandhi, Srishti Maharajan, Vishnu Kumar G C (2023). Experimental investigation of mini supersonic wind tunnel for flow visualization, ICMMT-22 Journal of Physics: Conference Series, 2484 (2023) 012030**

### Design of a Single Seater Experimental Research Aircraft

January, 2021 – November, 2021

*Aircraft Design Project – I, II course, Advisor: Prof. Jensin Joshua*

- Conceptualized an experimental aircraft with advanced **STOVL** capabilities and high maneuverability.
- Gathered and analyzed data from various aircraft, made selections for aircraft components & calculated various performance metrics.
- Designed a CAD model of the aircraft using Autodesk AutoCAD and performed structural analysis on fuselage, wing, and landing gear using **ANSYS Static Structural**.

## **Work Experience**

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**Graduate Research Associate, Georgia Institute of Technology | Atlanta, Georgia** *January, 2024 – May, 2024*

- Engineered a comprehensive research and development project focused on the implementation of hybrid electric powertrain technologies in super mid-sized business aircraft, encompassing concept identification, modeling, simulation, calibration efforts, and the generation of multi-variate surrogate models, resulting in significant findings and recommendations for future aircraft design and optimization.
- Modeled the notional hybrid electric architecture integration with the baseline aircraft (G280) and created an interactive dashboard to rapidly generate an optimal solution for a wide range of applicable aircraft and engine parameters. (**STREAM – Grand Challenge Project sponsored by Gulfstream Aerospace**)

**Graduate Teaching Assistant, Georgia Institute of Technology | Atlanta, Georgia** *August, 2023 – December, 2023*

- Teaching assistant of ME 1670 (Introduction to Engineering Graphics and Visualization) course for a class of 40 students.

**Project Trainee Intern, Brahmastra Aerospace Systems | India** *July, 2021 – August, 2021*

- Gained experience with research methodologies, utilizing **ANSYS** for industrial application of aerodynamics.
- Created detailed CAD models of an aircraft wing, blended wing and gas turbine blade using **CATIA** resulting in accurate representations of the components for further analysis and design improvements.
- Performed fluid flow analyses over a wing using ANSYS, examining the effects of different angles of attack on boundary layer characteristics, leading to insights into aerodynamic performance enhancements.

**Student Intern, NPHSAT Systems Pvt. Ltd. | India** *June, 2020 – July, 2020*

- Learnt to design a CubeSat and an antenna for wireless applications using **ANSYS HFSS**.
- Obtained valuable insights from industry leading professionals, networked with fellow students and gained skills in software including **ANSYS – Fluent and Static Structural**.

## **Volunteer and Co-curricular Activities**

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**General Secretary, Hindustan Institute of Technology and Science | Chennai, India** *July, 2019 – November, 2021*

### ***Nebula Astronomy Club***

- Aided in the publication of various scientific articles in the monthly newsletters pertaining to the field of Astronomy.
- Coordinated and led the initiatives of the astronomy club, fostering a vibrant and inclusive community of students passionate about astronomy and space exploration.
- Developed and maintained partnerships with local observatories, planetariums, and astronomical societies to enhance club members' access to telescopes, educational resources and observing facilities.

**Event Coordinator, Hindustan Institute of Technology and Science | Chennai, India** *August, 2019 – November, 2019*

### ***Cultural Fest- YARONA 2019***

- Orchestrated and executed the planning and coordination of various events and activities during the fest, ensuring smooth operation and timely execution.

**The Robin Hood Army | Chennai, India** *July, 2019 – March, 2021*

### ***Hunger and Education***

- Worked towards collecting surplus food from restaurants and the community to serve less fortunate people.
- Collaborated with United Way of Chennai, one of the largest philanthropic organizations worldwide, in strengthening the outreach by successfully completing Marathon to collect funds and donations for the most needful and benefit right causes.

**Note:** Open to relocation