

# Niall Bannigan

## Mechanical Designer and Analyst

**Address** MONTRÉAL, QC

**E-mail** niallbann@gmail.com

**Phone** +1 (226) 235-2270

**Citizenship** Canadian

Background in fluid dynamics, materials science, computational and numerical simulation, and computer-aided design engineering. Interest in 3D printing, data analysis and imaging, aerodynamic flight characteristics, turbomachinery, airframe structural design, and high-power rocketry.

---

## EDUCATION

**M.E.Sc. Mechanical & Materials Engineering** GPA: 4.0 **May 2021 – Mar 2024**  
University of Western Ontario, London, ON

- Specialized in thermo-fluids subjects including wind engineering, computational fluid dynamics, computational heat transfer, boundary-layer mechanics, and fluid mechanics
- Wrote script to automate ingestion of hundreds of gigabytes of raw data and output meta-tagged files with relevant analytics associated with wind-field velocity data
- Paper published in Boundary-Layer Meteorology entitled, "Tracking the Centre of Asymmetric Vortices Using Wind Velocity Vector Data Fields"
- Demonstrated need to analyse vortex asymmetry to detect peak wind loads much greater and further away from tornado centre than found in averaged profiles
- Developed novel methods for analysing the turbulent fluctuations present in a tornado to allow for simpler comparison amongst tornado-like vortex models

**B.Sc. Physics** GPA: 3.9 **Sep 2018 – Apr 2021**  
University of Western Ontario, London, ON

- Specialized in subjects of classical mechanics, quantum mechanics, and numerical modelling in final year
- Remotely operated telescope at Sierra Remote Observatory to collect light from Persei cluster

**B.E.Sc. Mechanical & Materials Engineering\*** GPA: 3.8 **Sep 2016 – Apr 2020**  
University of Western Ontario, London, ON

- Specialized in composite materials, vibration mechanics, and advanced CAD software
- Designed a novel and robust apparatus to mimic loading the human tibia bone for testing artificial implants as part of a Capstone project for Victoria Hospital (London, ON)
- Completed a thesis paper on novel developments to tornado simulation techniques

## WORK EXPERIENCE

### Technical Judge

May 2024 – Present

Launch Canada, Timmins, ON

- Evaluated novelty and effectiveness of technical projects and team operational performance
- Determined score for each team based on their progress from reports to the launch event
- Attended the Launch Canada 2024 event and assisted with set-up and take-down of the conference and pad areas

### Graduate Teaching Assistantship

Jan 2023 – Apr 2023

University of Western Ontario, London, ON

MSE 2273B – Introduction to Fluid Mechanics and Heat Transfer, Course Instructor: Dr. E. Savory

- Demonstrated how to solve assigned homework problems including topics of fluid flow in pipes, manometry, dynamic fluid systems, and heat transfer mechanisms
- Proctored the first midterm and final exam, marked first midterm exam

### Graduate Teaching Assistantship

Jan 2023 – Apr 2023

University of Western Ontario, London, ON

MSE 2285B – Engineering Experimentation, Course Instructor: Dr. J. Makaran

- Developed extended lecture material to teach students on the general use of Arduino circuits
- Demonstrated how to solve assigned homework problems including topics of system sensitivity, binary and hexadecimal translations, and uncertainty calculations
- Proctored and marked the final exam

### Graduate Teaching Assistantship

Jan 2022 – Apr 2022

University of Western Ontario, London, ON

MME 4446B – Composite Materials, Course Instructor: Dr. Y. Fan

- Operated all lab sessions involving production and curing of flat-panel glass fibre composites
- Answered students' questions to improve their understanding of the course material
- Marked all students' assignments on calculating composite strength based on fibre alignment and loading angle
- Proctored the final exam and marked both midterm and final exams

### Graduate Teaching Assistantship

Jan 2022 – Apr 2022

University of Western Ontario, London, ON

MSE 3380B – Mechanical Component Design, Course Instructor: Dr. A. Price

- Operated a portion of lab sessions involving identifying mechanical fasteners and components as well as assembling and disassembling industrial pumps
- Proctored the final exam and marked the quizzes, projects, and final exams

### Graduate Teaching Assistantship

Sep 2021 – Dec 2021

University of Western Ontario, London, ON

MME 2212A – Mechanics of Materials, Course Instructor: Dr. L. Jiang

- Operated all lab sessions involving various methods and applications of strain gauge measurements
- Proctored the midterm exam

## **Undergraduate Summer Research Assistant**

**May 2018 – Apr 2021**

University of Western Ontario, London, ON

- Received two separate grants from the Natural Sciences and Engineering Research Council (NSERC) to work on statistical analyses of tornadoes created by numerically simulated supercells with the goal of producing a more accurate model of tornadoes
- Created code to decompose and analyse data extracted from a tornado producing simulated supercell storm automatically, with minimal user input, for rapid repetition with new datasets
- Optimised code to automatically ingest wind-field data and create statistical information and plots for further analyses
- Created code to create customizable plots to display data resulting from analyses of tornado wind-field characteristics and compare to previous literature

## **SELECTED ORAL PRESENTATIONS**

- "Developing More Accurate Models of Tornadoes." CSME Congress 2022, Edmonton, AB, 5 June 2022
- "Developing More Accurate Models of Tornadoes." CSME-CFDSC Congress 2021, Charlottetown, PE, 30 June 2021
- "Tracking Asymmetric Vortex Centres Using Wind-Field Vector Data." 3MT USRA Day 2020, London, ON, 21 January 2021
- "Developing More Accurate Models of Tornadoes Using Simulated Supercells." 3MT USRA Day 2019, London, ON, 20 August 2019 (3<sup>rd</sup> Place)
- "Developing More Accurate Models of Tornadoes Through Computational Analysis of The Tornado Wind Fields Produced by Simulated Supercell Events." CSME-CFDSC Congress 2019, London, ON, 3 June 2019

## **ACADEMIC PROJECTS**

### **Turbopump Design & Integration**

**Dec 2022 – Present**

Launch Canada, Mississauga, ON

- Designed a custom bearing compression ring to apply mild axial force to forward bearing during startup transient of the turbopump, saved purchase of expensive commercial part
- Designed a custom locking fastener for holding the rear bearing without constraining stator
- Performed basic calculations and computer modelling of turbopump parts and sections
- Designed spreadsheet-based part management system with total automation and BOM lists for each necessary section of the project

### **Project Technical Lead**

**Sep 2017 – Aug 2022**

WE Rocketry Team, London, ON

- Placed 10<sup>th</sup> globally at the Spaceport America Cup 2022 for overall design and 1<sup>st</sup> amongst (equivalent) Canadian teams with a top speed of 1145 km/h and a max altitude of 3871 m
- Designed and manufactured carbon fibre composite-sandwich fins of minimal undesired drag, cost, and risk of damage upon landing
- Designed and manufactured a carbon fibre composite nose cone for turbulence drag at Mach 1 speeds; optimised for vacuum mould infusion and added durable aluminium nose cone tip

- Designed and manufactured carbon fibre composite tubes for optimal stiffness-mass ratio
- Designed robust coupler for four cases of carbon-carbon connection, required to separate in-flight and withstand large body forces present during lift-off
- Assisted team technical projects in production and design of avionic components, recovery systems, and all structures required
- Performed failure mode analysis on couplers using finite element analysis simulation software
- Performed 2D computational fluids dynamics simulations on entire rocket body to understand drag forces present at maximum velocity
- Performed comprehensive safety analysis and outline of testing regime for validation of critical components with accompanying reports
- Lead team manufacturing efforts by designing moulds, acquiring raw materials, machining parts, and performing any manufacturing required while staying within a limited budget
- Maintained all activities whilst team members graduated or lost interest throughout the COVID-19 pandemic
- Wrote rigorous manuals with high quality diagrams, images, and instructions for members of the team in future years to have access to previously learned knowledge
- Generated high quality grant proposals resulting in approximately \$10 000 for team spending and \$25 000 in machining, UV epoxy coat protective application, and other in-kind services
- Currently acting as mentor for team by suggesting revisions and checking design choices such as transitioning to a male-mould setup to increase reliability of the interior concentricity of parts, which facilitates easier assembly

### **Formula SAE**

**Sep 2016 – Dec 2017**

University of Western Ontario, London, ON

- Assisted in CAD modelling of common parts and ensuring valid representation of the real-life components on the software replica
- Prepared foam core and carbon fibre sheets for composite sandwich infusion process

## **TECHNICAL EXPERIENCE AND SKILLS**

- Programming Languages: C++, MATLAB, and Python
- Software Proficiency: SOLIDWORKS, StarCCM+, AxCYCLE, AxSTREAM, ANSYS Fluent, CURA (3D Printing), Visual Studio Code, Microsoft Office, LaTeX, Adobe Photoshop, and Inkscape
- Certifications: SOLIDWORKS – Simulation, Mechanical Design, and Surfacing *Professional* Level; Turbomachinery for Emerging Space Applications – Liquid Rocket Propulsion
- Languages: English fluency and niveau A2 compréhension du français

## **AWARDS**

Ontario Graduate Scholarship	May 2022 – Apr 2023
Canada Graduate Scholarships – Master's Award	May 2021 – Apr 2022
Ontario Graduate Scholarship (Opted to Decline)	May 2021 – Apr 2022
Ontario Professional Engineers Foundation for Education Scholarship	Sep 2019 – Apr 2020
Dean's Honor List	Sep 2017 – Apr 2021
The Western Scholarship of Excellence	Sep2016 – Apr 2017