

# Aleksander Sawiec

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## Professional Summary

I dis-like hearing that something is not possible because my passion for innovation drives me to explore every avenue. As a recent graduate with a Master's degree in Mechanical Engineering, I am enthusiastic about launching my career in the field. My specialization lies in computer-aided design, prototyping, and robotics, and I am eager to apply the knowledge and skills gained during my academic journey. I am committed to learning and contributing to projects that enhance operational efficiency and address real-world engineering challenges. I am seeking an entry-level opportunity to kick-start my engineering career, eager to develop my talents, and make a meaningful contribution to a dynamic engineering team.

## Skills

- SolidWorks Modeling (2D engineering drawings, 3D, Assembly, Simulation, FEA, CFD, GD&T) 4+ years
- Fusion360, AutoCAD, Inventor 2+ years
- 3D Printing 5+ years
- Ansys Workbench simulation 1+ years
- KiCad PCB design 1+ years
- Python 3+ years
- MATLAB 6+ years
- C++ 3+ years
- ROS 2+ years
- SQL 3+ years
- Prototyping 4+ years
- Automation 4+ years
- Microcontroller Programming 5+ years
- Control Systems Design 4+ years
- Soldering and wiring 4+ years
- Minitab 1 year
- Problem Solving
- Creativity
- Attention to detail
- Adaptable
- Project Management
- Hands-on Skills

## Certifications & Publications

- CWSP SolidWorks Certified Professional
- 6 Sigma Green Belt Certified
- Successfully passed the Fundamentals of Mechanical Engineering Exam (FE) **October 2022**
- Dickinson E. Youna MW. Flaim ND. Sawiec A. Granatoskv MC. (2023). A functional framework for interpreting phalangeal form. J R Soc Interface. doi: 10.1098/rsif.2023.0251.
- Gagliano, Peter & Sawiec, Aleksander & Gibbons, Dan & Granatosky, Michael. (2020). **Squamate Locomotion.** 10.1007/978-3-319-47829-6\_97-1.
- Sawiec, Aleksander & Gibbons, Dan & Gagliano, Peter & Granatosky, Michael. (2020). **Caudata Locomotion.** 10.1007/978-3-319-47829-6\_1005-1.



## Experience

### Reliability Engineer

December 2023 – Current

PSEG Long Island, Hicksville, NY

- Utilized **Oracle SQL Developer, MS Access, Excel, PI Processbook and ARCGIS Maps** to conduct **root cause** and **statistical analysis** of the **distribution and transmission systems** on Long Island leading to the identification and rectification of critical design flaws, improving overall utility reliability.
- Created **optimizations and internal tools** to increase efficiency of project identification and completion.
- Performed **daily analysis** of outages and substation events to identify patterns and inefficiencies.
- Performed **routine patrols and surveys** to inspect existing field equipment conditions.
- Created **automated reports** and collaborated with **cross-functional teams** to enhance design processes.
- Specialized in Transmission System Analysis and aided in large **Capital Expense Projects** for **PSEG Long Island** and **LIPA**.

### Laboratory Technician / Mechanical Design Engineer

June 2022 – December 2023

New York Institute of Technology, Old Westbury, NY

- Designed and built bio-inspired robots utilizing **SolidWorks, Fusion360, Kicad** and **3D printing** to analyze evolutionary features and gauge their benefits on kinematics and efficiency. Designed and built various testing hardware for animal analysis utilizing **CAD, microcontrollers** and custom software reducing study time by 30%.
- Completed **technical writing, engineering drawings** as well as presentations for related projects and work.
- Calibrated and maintained **industrial FDM** and **SLA equipment** (Markforged, Formlabs) resulting in nearly 100% uptime.

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- Offer design talents to faculty and students through **creative, modular, and dynamic prototyping designs and project management** in order to expedite their research, reducing costs for proprietary equipment by over 70%.
- Trained new associates in **laboratory procedures and standards**.
- Performed routine lab and department maintenance to keep the area clean and orderly.
- Documented information by maintaining daily logs and equipment record books.

## Server/Computer Technician

January 2018 - February 2021

GalaxyGate, Staten Island, NY

- Performed installation, maintenance and repair for servers and networking equipment.
- Supplied 24/7 technical support utilizing community channels, **reducing downtime**, and delivering same day solutions.
- Optimized power usage and thermals per rack through data analysis of power consumption and **flir thermal imaging**, reducing power consumption by 10%.

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## Education

New York Institute of Technology, Old Westbury, NY

**Master's of Mechanical Engineering**, Aerospace concentration

September 2021 - May 2022

- GPA: 3.6

New York Institute of Technology, Old Westbury, NY

**Bachelors of Mechanical Engineering**, Aerospace concentration, mathematics minor

September 2017 - May 2021

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## Projects\*

- **Intermittent Indraft Supersonic Wind Tunnel Masters Design** **May 2022**
  - Developed a cutting-edge Supersonic Wind Tunnel as part of a Master's Design project, integrating **fluid dynamics principles**. This innovative setup involved a high-pressure tank linked to a vacuum tank, featuring a supersonic nozzle and plasma generator to replicate test volume velocity and thermal conditions.
  - Employed **SolidWorks** for **design and simulation**, compared with **ANSYS**, to assess pressure vessel buckling, as well as fluid dynamics characteristics, encompassing turbulence, thermal, density, and fluid boundary layer conditions within the vessels and channels.
  - Optimized nozzle geometry through **MATLAB** script analysis of normal and oblique shock waves, subsequently validated in **SolidWorks** and **ANSYS** for precise velocity and turbulence control. Fabricated the aluminum **CNC** nozzle and designed a corresponding enclosure for the nozzle and test volume in **SolidWorks**.
- **Senior Design Robotics Project** **May 2021**
  - Designed, simulated, and programmed a fire rescue **robot** with a tank-style chassis and a **wireless/wired control system**. Equipped with an array of sensors (thermal, barometric, proximity, speaker, microphone, and video camera) to enhance maneuverability and operator awareness.
  - Utilized **SolidWorks** for design and **Kicad** for electronics, incorporating **3D printed** components, with plans for transitioning to thermally resistant materials. The steel chassis and a **6-servo robotic arm** were employed for tasks such as door handling, object manipulation, and item delivery during rescue operations.
- **Bio-Inspired Robotics** **May 2021-October 2023**
  - Designed bio-inspired robotic mechanisms using parametric CAD (**SolidWorks**) and mesh data, encompassing scaled-up models of a blue tongue skink, parrot, and more.
  - The skink design incorporated 24 servos and custom control systems for exploring augmented morphology's influence on **kinematics** and **metabolic efficiency**. Employed **sensors** and power consumption data to refine evolutionary features. Applied CT scans and **mechanical analysis** insights to create custom fastening techniques and transmissions to meet force requirements.

\*Refer to portfolio for more information

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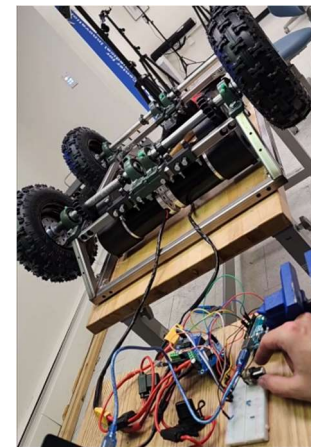
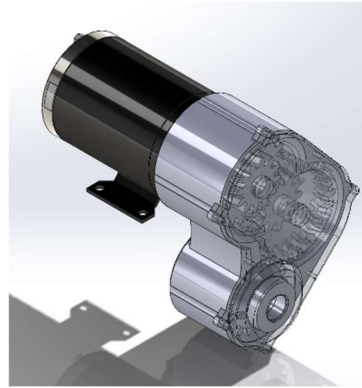
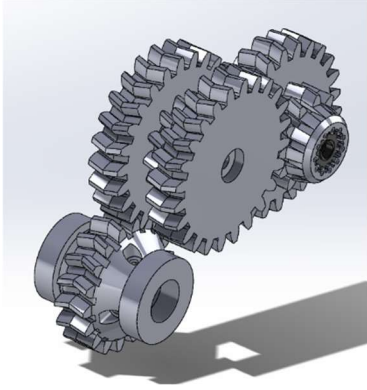
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## MVP (Modular Vehicle Platform)



### What?

Design and build a versatile, modular vehicle framework capable of multifunctional applications, including snow removal, transporting servers, or other payloads of up to 1000 pounds. This adaptable platform is engineered to traverse uphill terrain and navigate challenging landscapes.

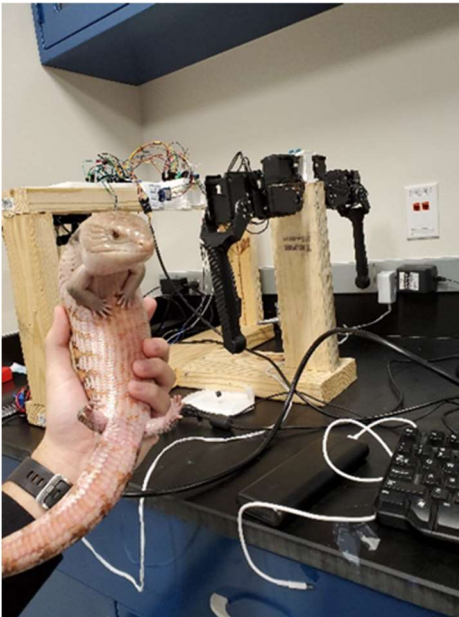
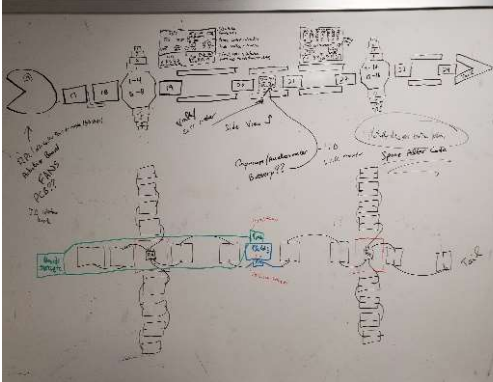
### How?

Utilized **SolidWorks** for the mechanical **design for manufacturability** and simulation. Employed high strength steel 1-inch square tube. Designed and 3D printed a **custom drivetrain and gearbox** to achieve correct forces and efficiency.

### Results.

**Hands-on experience** with diverse materials, particularly steel, **machining**, emphasized the **importance of GD&T and DFMA**. The design excelled in carrying 600+ pound loads, and the transmissions proved durable even with 3D printed components!

## Bio-Inspired Robotics - Tilibot

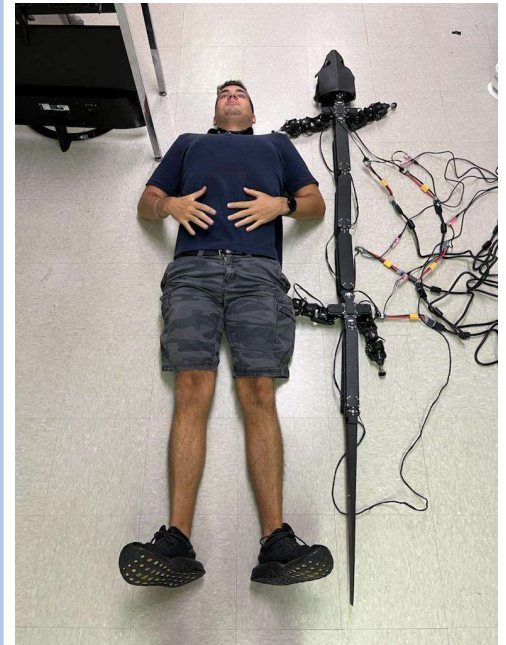


SOLIDWORKS Educational Product. For Instructional Use Only.

| ITEM NO. | PART NUMBER                                     | DESCRIPTION | QTY |
|----------|---|-------------|-----|
| 1        | MX_64T_V1_SERVOHO<br>RPL_V1_R020<br>S10(C)IMC01 |             | 1   |
| 2        | MX_64AT_V2_SERVOHO<br>RNP                       |             | 2   |
| 3        | M2S_T01   |             | 12  |
| 4        | MX_64T  |             | 24  |
| 5        | IMC01_ARM_V2_0                                  |             | 1   |
| 6        | MX_64T  |             | 4   |
| 7        | MX_64AT_V1_SERVOHO<br>RPL                       |             | 1   |
| 8        | FEEDBACK  |             | 1   |
| 9        | MX_64T  |             | 6   |
| 10       | HOPEARM_V2_0                                    |             | 1   |
| 11       | RPL   |             | 3   |
| 12       | HOPEARM_V2_0                                    |             | 1   |

ARM

SOLIDWORKS Educational Product. For Instructional Use Only.



### What?

Engineered a scaled robotic model replicating the characteristics of a blue tongue skink, facilitating a comprehensive study of the influence of evolutionary physiology on **kinematics and metabolic efficiency**. This research aims to unlock insights into organic geometry that can inform the development of **highly efficient, agile, and effective robotic systems**.

### How?

The **mechanical design and simulation** was executed in **SolidWorks**, integrating 24 MX-64T servos and **Markforged Carbon Fiber** components to ensure requisite **structural integrity**. Electronic systems, encompassing power management, control, and efficiency assessment, were developed using a **Raspberry Pi** platform, employing **C++** and **Python** programming, in addition to **MATLAB** for comprehensive **data analysis**.

### Results.

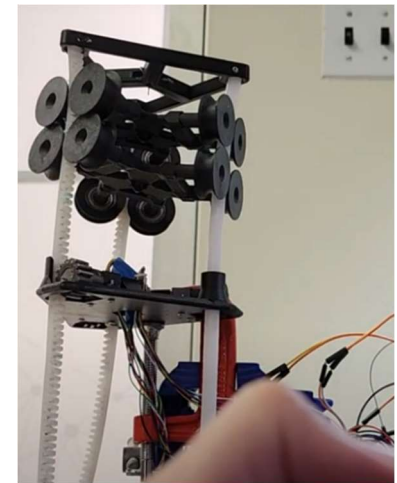
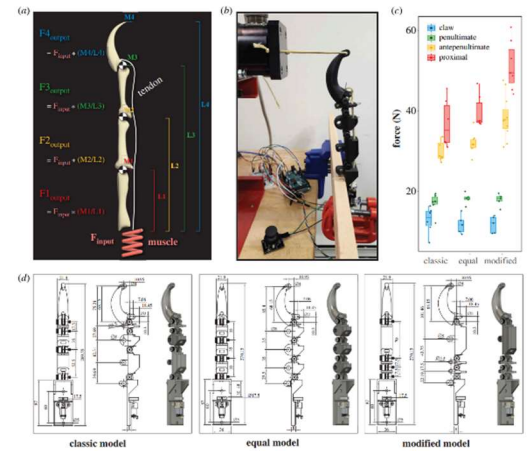
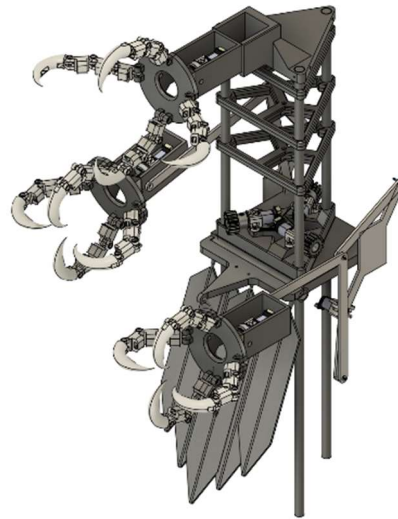
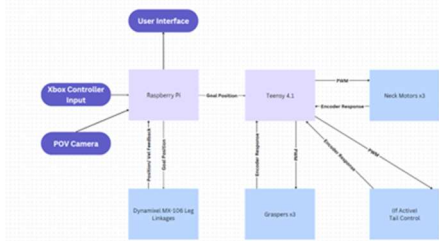
#### Publication

- Sawiec, Aleksander & Gibbons, Dan & Gagliano, Peter & Granatosky, Michael. (2020). Caudata Locomotion. 10.1007/978-3-319-47829-6\_1005-1.

An adaptable **robotic system** with **modular** capabilities, providing control over **degrees of freedom** to investigate the impact of morphology on both **efficiency** and **kinematics**.

## Bio-Inspired Robotics - Parrot Bot

### Parrot Bot Control Overview



### What?

Design a **continuum style robot** inspired by parrot physiology, with a specific focus on studying their beak's function as an additional appendage for climbing and their tail's role as a **spring mechanism** to generate counterforces during climbing maneuvers. Analyze how changing these mechanical members augments **efficiency and functionality**.

### How?

Applied **Fusion 360** for **mechanical design** and **simulation** to faithfully reproduce CT scan data while adhering to specific **design parameters**. Implemented small **DC motors and servos** with customized gear systems, as well as various mechanical components including **transmissions, twisted rope amplifiers, linkages, and rack-and-pinion mechanisms**. Fabrication involved both **3D printing**, utilizing both **rigid and flexible materials**, to craft the necessary components. Electronics contained **Raspberry Pi** and **Teensy** in conjunction with a **suite of sensors** and a **first-person point of view camera**.

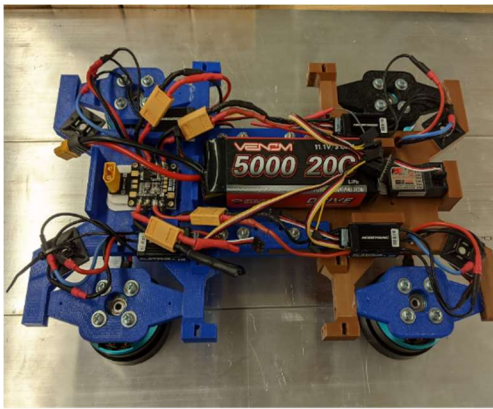
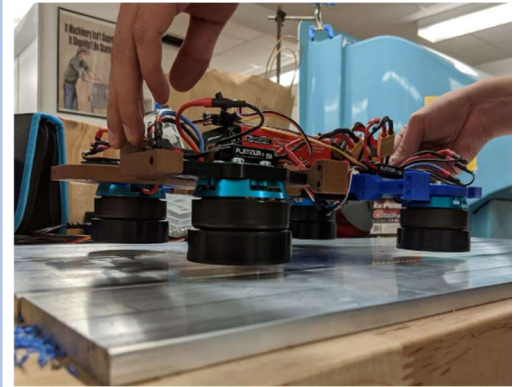
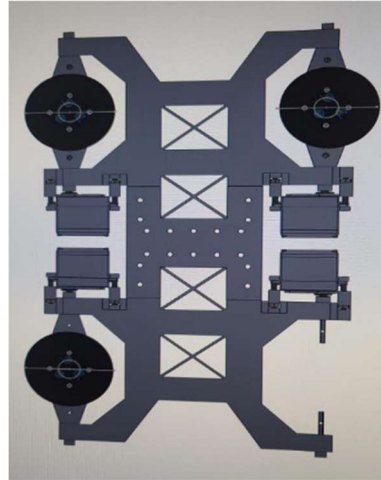
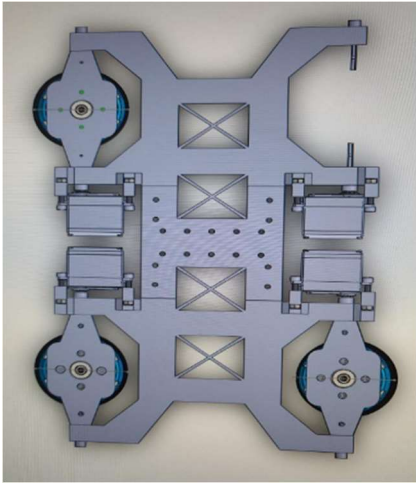
### Results:

Established the **groundwork** for **experimentation** aimed at evaluating the impact of **mechanical factors**, including phalangeal sections, on **force output and efficiency**, as well as assessing the influence of beak and tail geometry and design on climbing performance.

#### Related Publications:

- Dickinson E, Young MW, Flaim ND, Sawiec A, Granatosky MC. A functional framework for interpreting phalangeal form. J R Soc Interface. 2023 Aug;20(205):20230251. doi: 10.1098/rsif.2023.0251. Epub 2023 Aug 16. PMID: 37582408; PMCID: PMC10427194.
- Gagliano, Peter & Sawiec, Aleksander & Gibbons, Dan & Granatosky, Michael. (2020). Squamate Locomotion. 10.1007/978-3-319-47829-6\_97-1.

## Hovercraft/Hyperloop



### What?

Design and build a **lightweight mechanical frame** and control surfaces for a **hoverboard/hyperloop prototype**. This innovative design harnesses the power of spinning neodymium magnets to induce eddy currents, consequently generating a repulsive force, which, in this context, achieves both lift and controlled translational movement.

### How?

The designs were meticulously crafted in **SolidWorks** and subjected to rigorous simulation to guarantee **structural integrity**, proper degrees of freedom, and appropriate **mass distribution and balance**. To achieve the desired lightweight and balanced configuration, we leveraged **3D printing** techniques with a focus on minimizing material mass in key sections.

### Results.

This endeavor led to the creation of a **successful prototype**, demonstrating the ability to maneuver with **translation and rotation in three dimensions**. The device was effectively controlled through the integration of a **remote controller** and **PID systems**, which regulated motor **RPM** and **tilt** to achieve precise directional control.

## Intermittent Indraft SuperSonic Wind Tunnel Masters Design

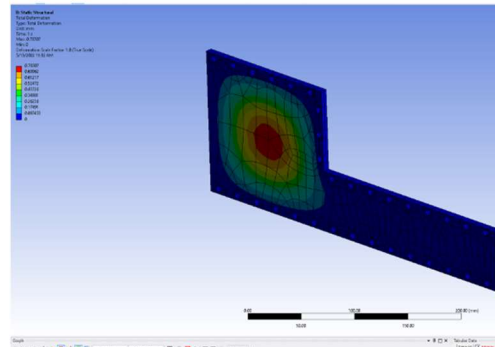
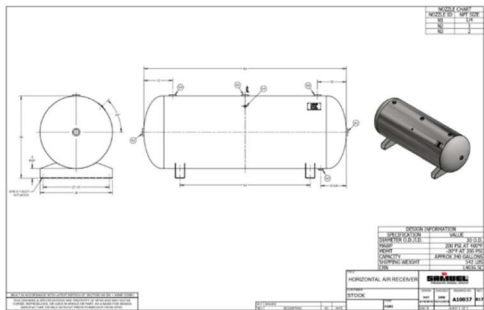
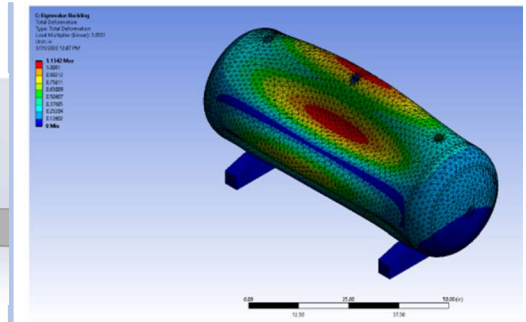
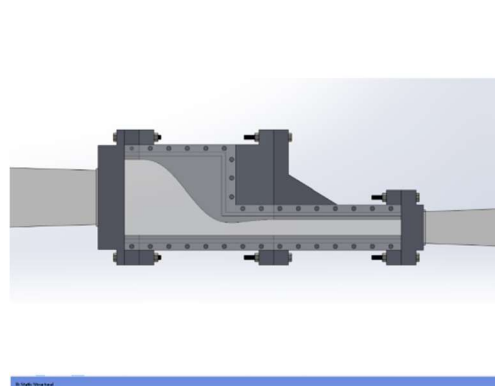
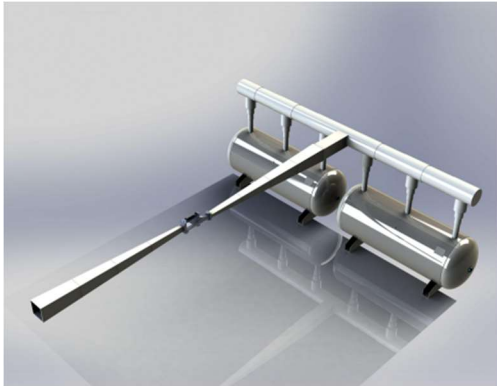
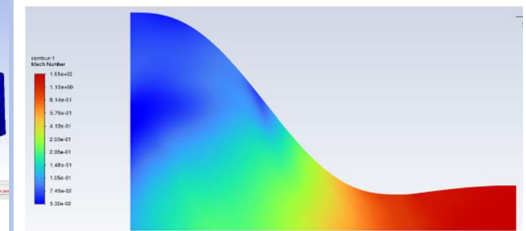


Fig. 6.3 Total Deformation of 0.78 mm

| Tabular Data |                 |
|--------------|-----------------|
| Mode         | Load Multiplier |
| 1            | 3.8331          |
| 2            | 3.9009          |
| 3            | 5.4549          |
| 4            | 5.5499          |
| 5            | 7.0344          |



### What?

Conceived, designed, and simulated an **Intermittent Indraft Supersonic Wind Tunnel** with a dedicated test volume, aimed at providing our university with a cutting-edge facility for the testing and evaluation of **supersonic designs and airflow dynamics**.

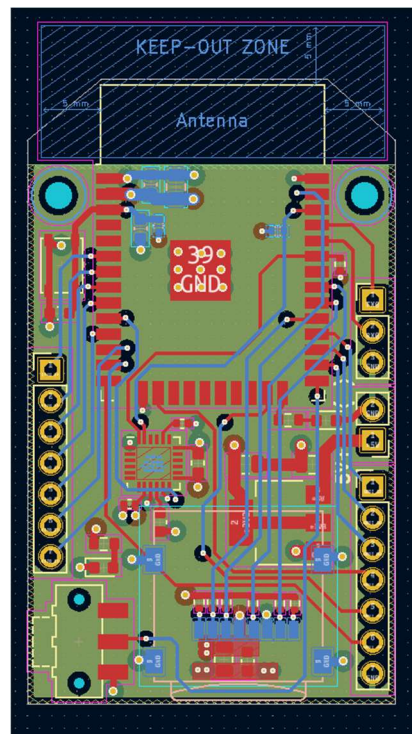
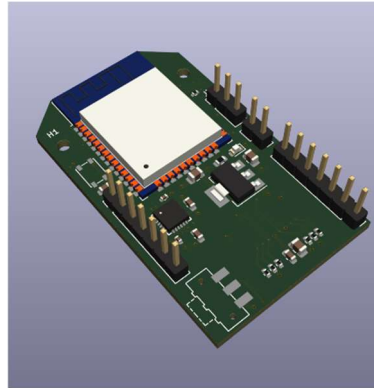
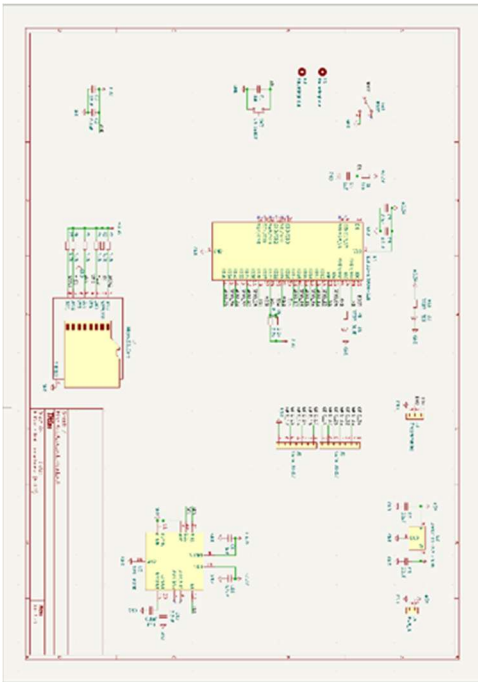
### How?

Applied **SolidWorks** for precise mechanical design. Employed **MATLAB** in combination with custom scripts, factoring in **shock angle** and **nozzle design**, to craft a nozzle that achieved the desired Mach number while **mitigating turbulence and vibrations**. Utilized **ANSYS Workbench** and **SolidWorks** simulation to rigorously assess system stability, **structural integrity**, and flow characteristics under varying loads. Applied **Fusion 360 CAM** for **CNC** machining of the nozzle geometry and the acrylic test volume covers.

### Results.

This design not only ensures the necessary **safety margins for sustained functionality** but also significantly enhances the university's capabilities and **research potential**. Through thorough **design and simulation**, we confirmed its **feasibility** and viability, effectively mitigating the risk of catastrophic failures.

## Accelerometer PCB ESP 32



### What?

Engineered a **compact, power-efficient** accelerometer data collection device featuring **wireless connectivity** and **microSD** card storage. This versatile tool facilitates the analysis of both robotic and animal kinematics, offering the advantages of **portability, lightweight design**, and minimal interference with subjects involved.

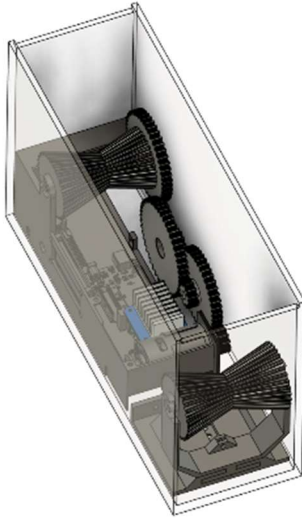
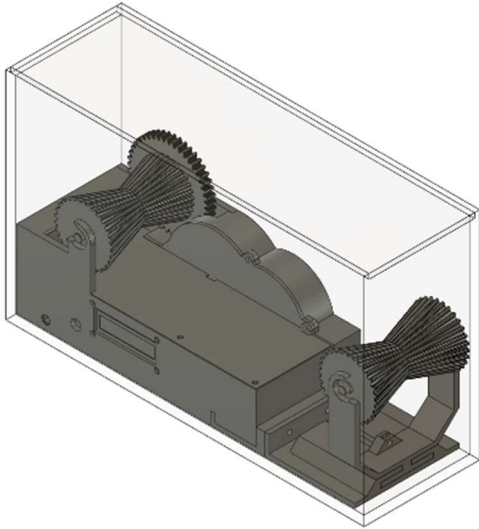
### How?

Utilized **KiCad** for design. Employed an ESP32-based chipset, combining WiFi and Bluetooth capabilities, along with a 9-degree of freedom **imu**, to develop a streamlined and **efficient sensor board**.

### Results.

The implemented design successfully enabled the testing of **acceleration data**, facilitating the interpolation of **velocity** and **translation** of components or subjects. Moreover, the board features exposed pins, offering the flexibility for **wireless or wired** triggering, as well as the integration of **additional sensors** when required.

## Bird Box



### What?

Design and build a **modular** runway system for assessing avian metabolic rates, the project mandates the ability to accommodate different rope diameters, regulate rope tension, **control rope speed** within an airtight, transparent chamber, and monitor oxygen, carbon dioxide, and humidity levels to **evaluate metabolic efficiency**.

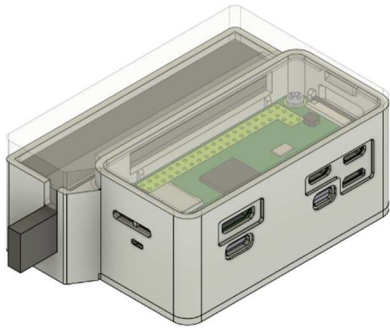
### How?

Employed **Fusion 360** to create an enclosure for the **motor and transmission**, ensuring the desired velocity range. Implemented an **Arduino** with an LCD display for **real-time rope velocity feedback** and a potentiometer for speed control. The tensioning system was meticulously designed, featuring a precision-adjustable bolt. Additionally, **3D printing** was harnessed for crafting both the transmission and the enclosure.

### Results.

This project yielded a **precise and adaptable** runway system for metabolic analysis. Proper **component tolerancing** ensured **seamless assembly** and smooth operation. Resulted in **drastically decreasing the cost and complexity** of such a device and testing.

## Pi GoPro Accelerometer



### What?

Design and build a **compact enclosure** to house a **Raspberry Pi Zero**, a USB accelerometer detection board and battery while **optimizing space** and preserving functionality and user-friendliness.

### How?

Employed **Fusion 360**, integrating open-source models and measuring devices with calipers to **re-create parts in CAD**. The physical enclosure was then manufactured using **3D printing** and assembled by hand.

### Results.

The outcome was a **compact and efficient** device that **maintained functionality**, enabling uninterrupted testing while a customized sensor board was in development. This approach **minimized research downtime and cost savings**, avoiding the need to invest in costly, specialized sensor boards.