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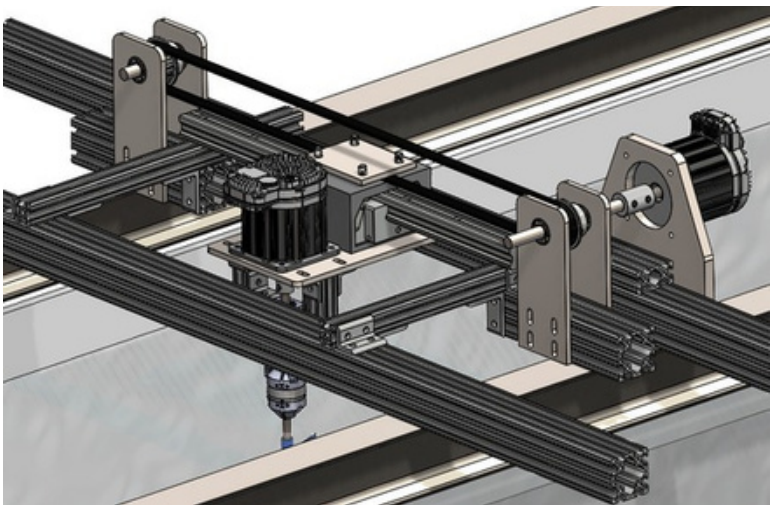
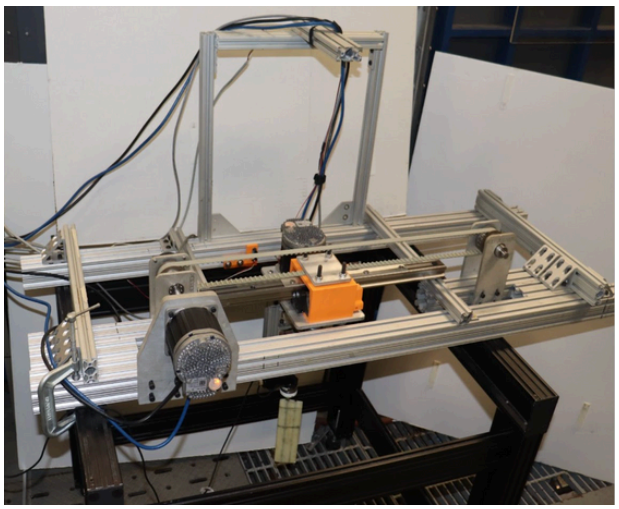
PITCH AND HEAVE SETUP FOR BIO-PROPULSION STUDIES





What?

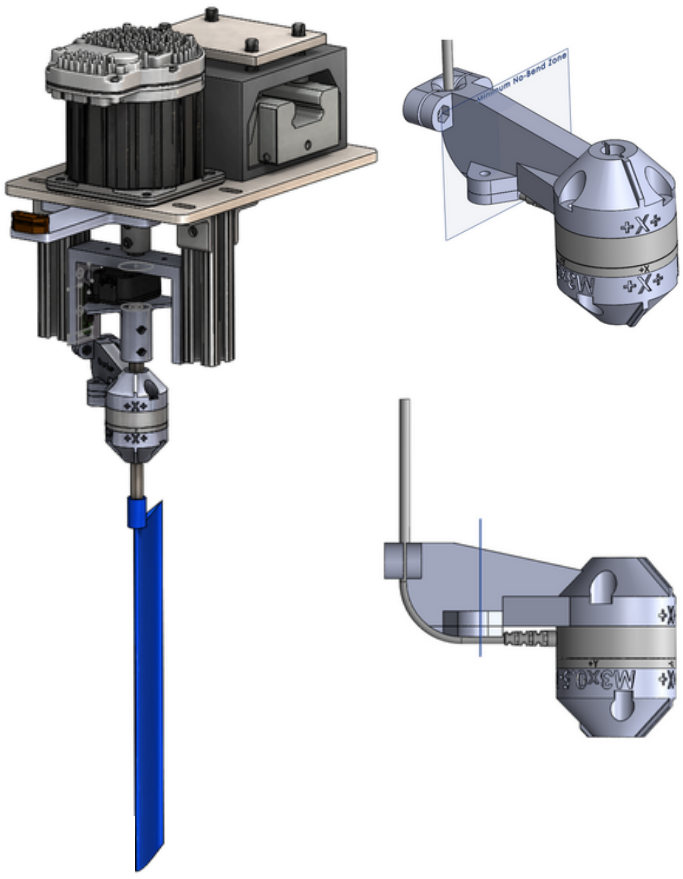
- **Design a setup to mimic robotic swimmers**, leading investigations into their hydrodynamic performance and development of **quiet underwater vehicles**, a part of a **$7.5M U.S. DOD-funded MURI project.**

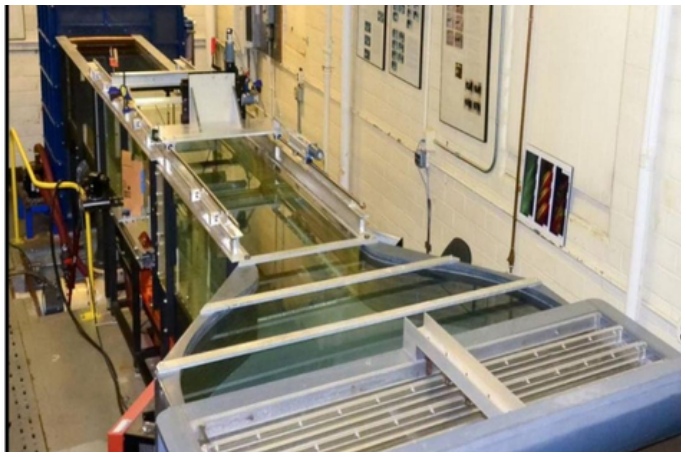
How?

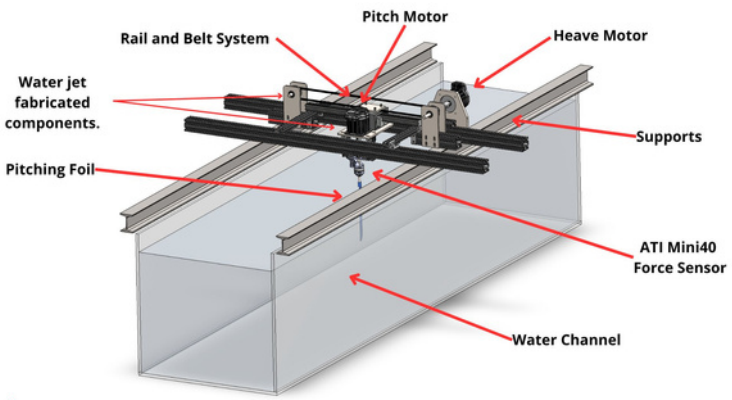
- Designed and built the setup using **SOLIDWORKS, CNC, waterjet cutting, and 3D printing.**
- **Applied GD&T** to all drawings.
- **Integrated systems** such as PIV system, 6-axis force sensor, NI DAQ data acquisition card, high-torque motors.

Results

- Gathered and analyzed **35 data sets** using **MATLAB** and NI DAQ for tests.
- Improved movement **accuracy to 98.2%, a 1.75x increase** over previous designs.
- **Reduced operational noise by 32%** through optimized control systems.







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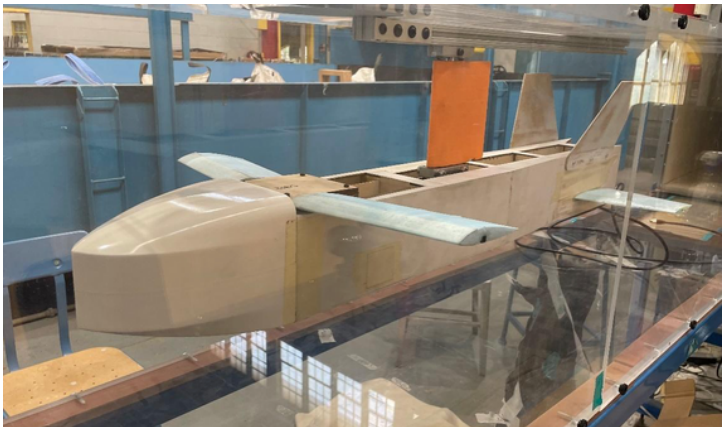
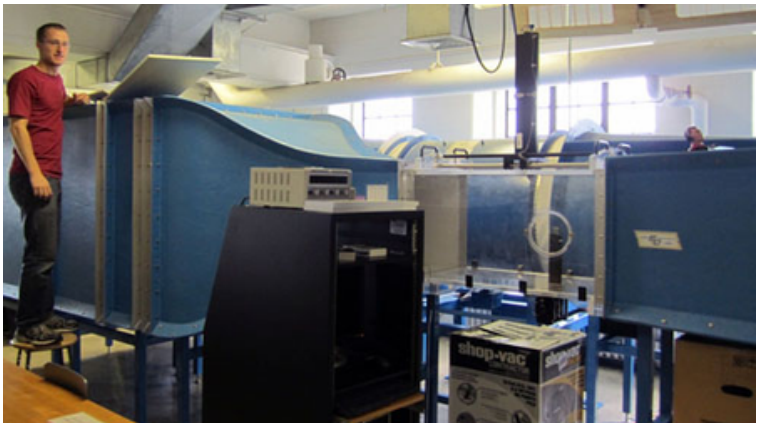
WIND TUNNEL DRONE TESTING - AEROTARGETS INTERNATIONAL





What?

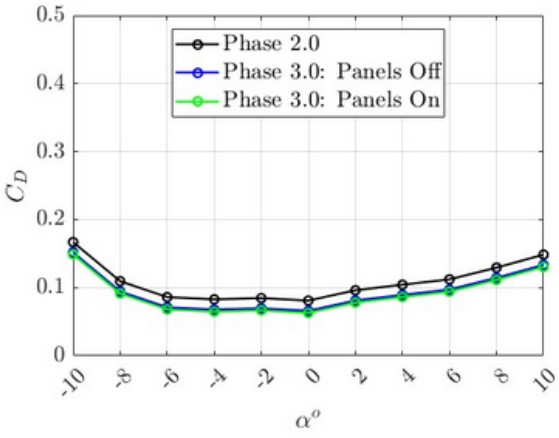
- **Scaled down a military-use drone** to perform **tests in a wind tunnel** to evaluate performance characteristics.
- Splited experiment into 3 phases focusing on (1) preliminary **aerodynamic stability** studies, (2) a scaled up model at a higher Re used for extensive drag tests with panels off and (3) with panels on.

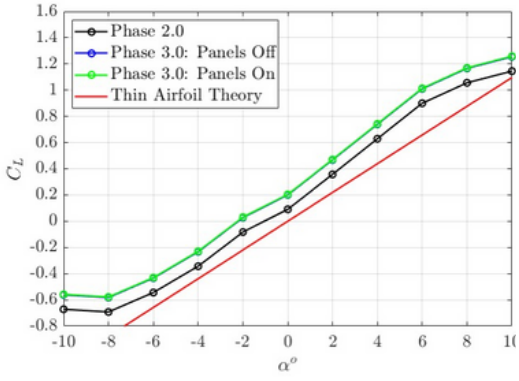
How?

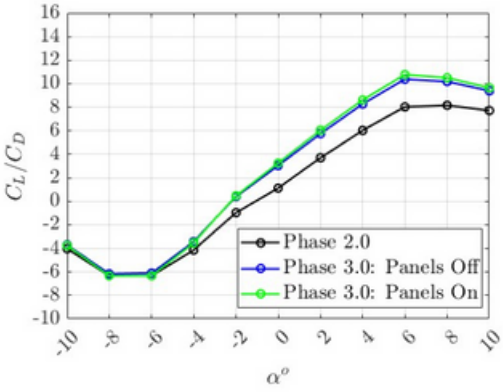
- **Build a 4-bar linkage structure** that allows change to all angles needed.
- Used **SolidWorks** to scale down and alter model for **compatibility** with force sensor / wind tunnel.
- Utilized an NI DAQ card and **MATLAB** to **acquire and process data.**

Results

- Phase 1 revealed that the model is **dynamically stable** in both pitch and roll motions around its CG and weakly stable in yaw.
- Phase 2 and 3 showed a **lower drag coefficient**, increasing its L/D ratio.
- Communicated with AeroTargets engineers to recommend fuselage design modifications, **achieving a 10% drag reduction.**







AEROTARGETS INTERNATIONAL

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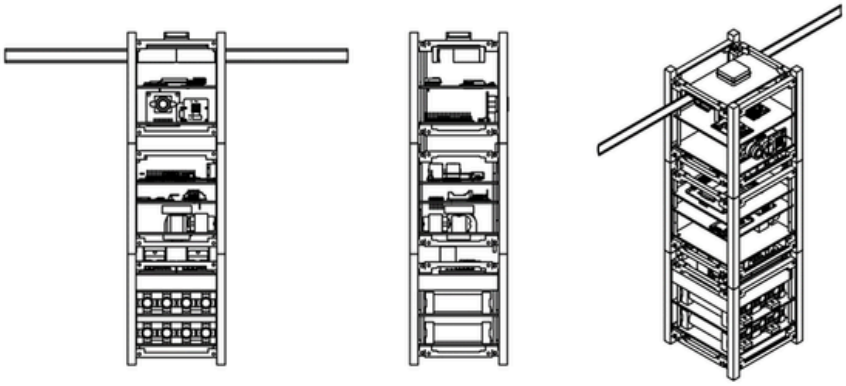
SKILLSAT STARTUP



What?

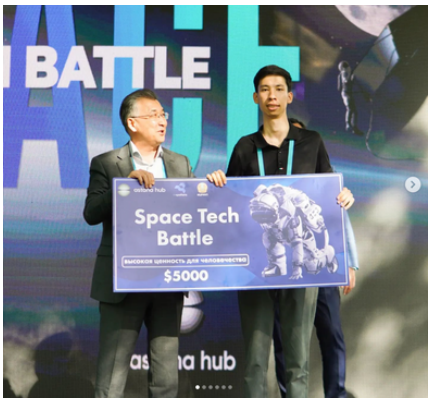
- **Founded SkillSat**, an EdTech startup to **manufacture STEM kits** that teach students to build stratospheric satellites.

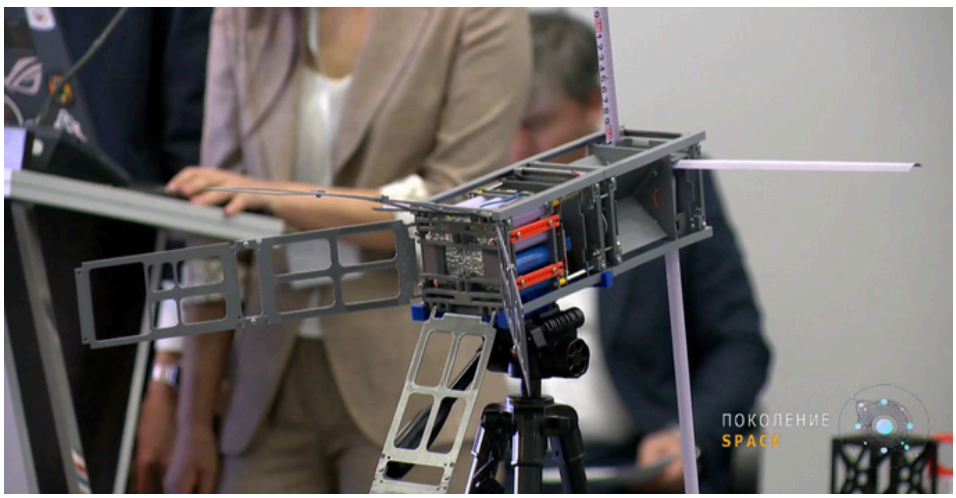
How?

- Used **Arduino and Raspberry Pi** as the base for satellite systems.
- Utilized **additive manufacturing** to prototype 25+ designs.
- Applied **DFA and DFM** principles to **reduce production costs by 44%**.
- **Tested prototypes** at the National Space Center of Kazakhstan.

Results

- **Launched satellites to Near Space** (40 km+) via stratospheric balloons.
- **Raised $15K** in funding and distributed 80+ kits to 240+ students across 25+ schools.
- Recognized as a **Top-3 SpaceTech** and Top-15 EdTech Startup by **Forbes Kazakhstan**.





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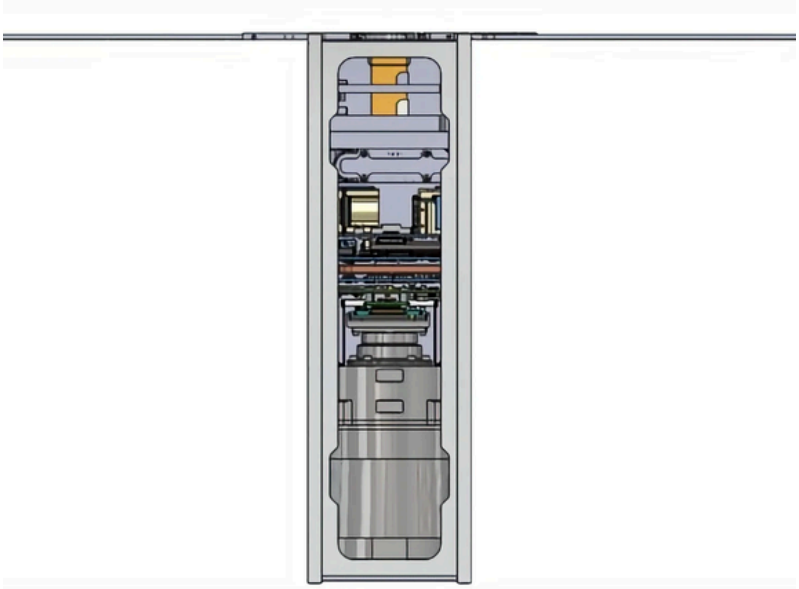
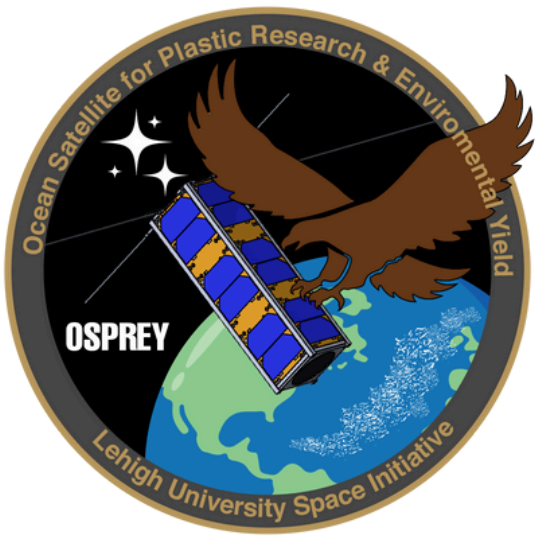
OSPREY CUBESAT - LEHIGH UNIVERSITY'S FIRST NANOSATELLITE





What?

- Designed and led the development of **Lehigh University's first CubeSat**, OSPREY, a 3U satellite using a VS/SWIR camera system to detect ocean plastic within a 1-square-meter area for ocean trash monitoring.

How?

- **Lead CAD modelling in SolidWorks**, optimizing the center of mass and moments of inertia.
- **Used GD&T principles**, applied material selection, mass budgeting, to ensure tolerance and compliance with NASA standards.
- **Managed a team** of 6 students and **coordinated with other sub-teams** to integrate deployable solar cells and antenna systems

Results

- **Raised $150,000** in funding from Lehigh alumni and sponsors.
- **Optimized the mass budget** by 23% and **increased payload volume** by 33%.
- **Successfully submitted a proposal** for NASA's 2024 CubeSat Student Launch Initiative.