Michael Gutierrez

Caltech Astrophysics/Engineering

Time flies like an arrow. Fruit flies like a banana.

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https://guutz.com

TITLE		INITIAL	DATE
Project Portfolio	DESIGNED	MG	12.17.22
	DRAWN	MG	12.17.22
	CHECKED	MG	12.17.22
	APPROVED	MG	12.17.22
SCALE 1:1	UNLESS OTHERWISE STATED DIMENSIONS ARE IN INCHES. REMOVE BURRS AND BREAK SHARP EDGES.	SHEET 1 OF 5	

ORGANIZATION

Caltech

	NAME	DATE	SHEET 2 OF 5
DRAWN	Michael Gutierrez	Dec. 2022	

PROJECT TITLE

Refurbishing a Radio Telescope

What: A 6-meter dish antenna donated to CIT in 2005 by NASA JPL. It hasn't been used for the better part of a decade and has fallen into disrepair. Servo motors and wideband feed remained intact.

Why: Caltech lacks many hands-on learning tools for astronomy and radio science which are accessible to undergrads. I wanted to change that!

The "before" picture, as of 12/10/22... new remote control software, UHF-capable front end, and hopefully a paint job coming soon!

ORGANIZATION

MIT HAYSTACK OBSERVATORY

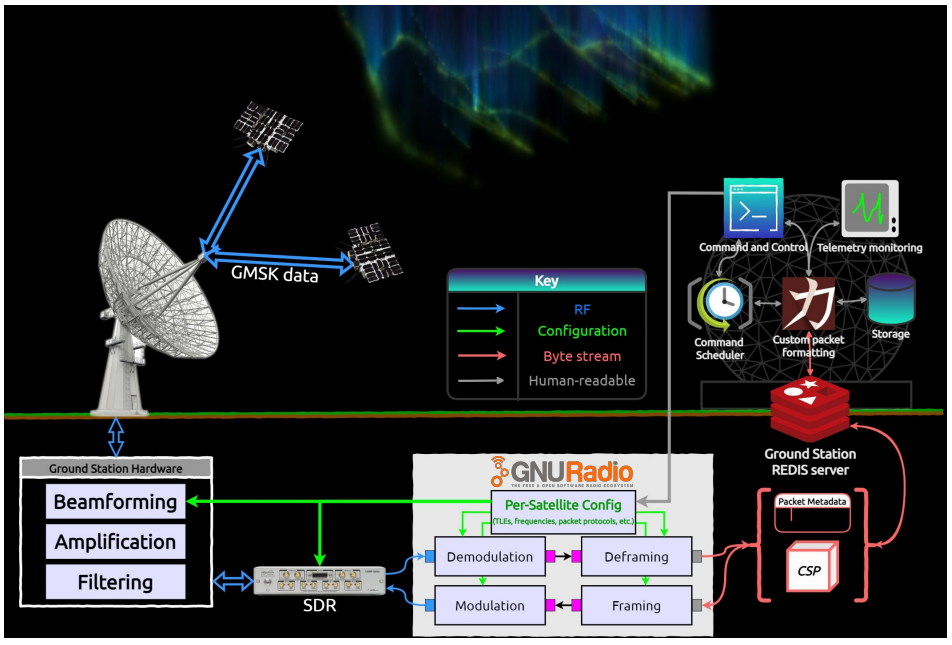
	NAME	DATE	SHEET 2 OF 5
DRAWN	Michael Gutierrez	Aug. 2022	

PROJECT TITLE

AERO/VISTA CubeSats

What: An upcoming NASA mission featuring a pair of twin satellites with deployable vector antennas. They will make high quality recordings of radio emissions from the Aurora Borealis/Australis.

For my summer internship, I co-designed and coded a ground station interface customized to the particular needs of the AERO/VISTA mission. My work was focused on radio comms.



Block diagram of the ground station interface. Everything "underground" in the diagram is hardware I tested and/or software libraries I wrote.

ORGANIZATION

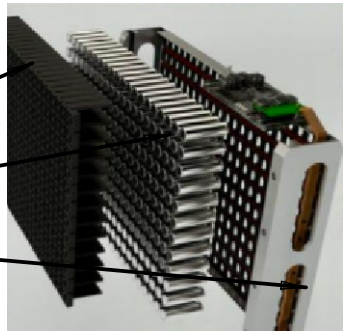
XOS

	NAME	DATE	SHEET 3 OF 5
DRAWN	Michael Gutierrez	Sep. 2021	

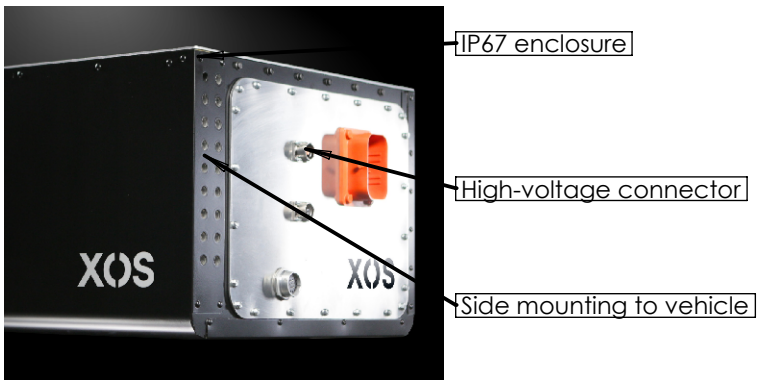
PROJECT TITLE

Lyra Battery Pack System

More info: xostrucks.com



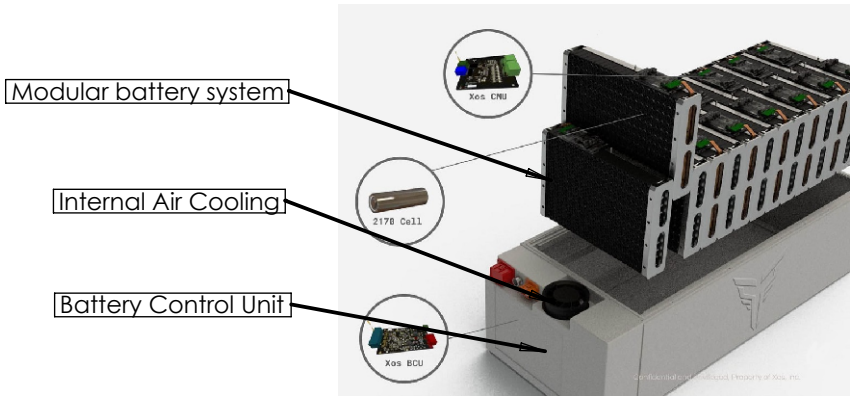
What: A modular system of **30 and 60kWh electric vehicle batteries** designed, prototyped, manufactured, and tested all under one roof. During my internship I served a supporting role in the entire process from start to finish.



How: Battery modules **(above)** run cell-level diagnostics and can be easily expanded or replaced.
Full packs **(left, below)** have a cooling unit and overload failsafes. They can be chained together to increase vehicle range.
I participated in **design reviews**, implemented changes in **CAD**, fabricated test parts, communicated updates to manufacturers, and ran **environmental testing**.

Tools used:

- 3DX CATIA / ENOVIA
- 2D Drafting / GD&T
- Finite Element Analysis
- Vibration Testing
- Water jet
- MIG Welding

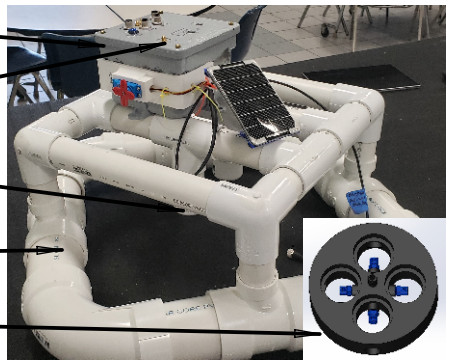


Why: These packs were designed specifically for Xos's **last-mile delivery fleets**. 4 of them can provide about **200 miles of range**, making them ideal for routes that return to the same location each night. Desigining and manufacturing them in-house allows for **more flexibility** in implementing changes and responding to customers' needs.
Xos's trucks are not self-driving, nor do they have any fancy bells or whistles; the goal is to build reliable, low-maintenence, environmentally friendly trucks that work today. And they happen to be electric.
Xos has **successfully deployed trucks with UPS and Loomis**, and has orders for many more with FedEx and others.

ORGANIZATION		NAME	DATE	SHEET 4 OF 5
H2Ok Innovations	DESIGNED	Michael Gutierrez	May 2021	

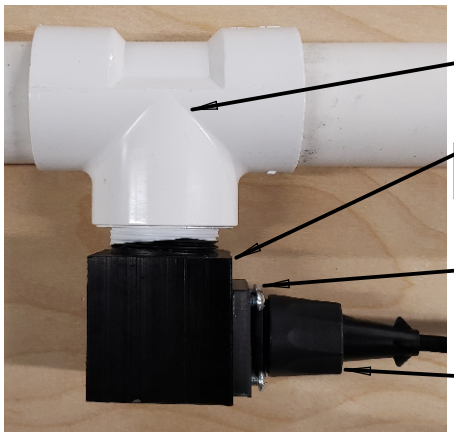
PROJECT TITLE

AquaSensors



What: A compact, low-cost assembly of chemical and optical sensors that **remotely measure and transmit water quality information.**

More info: h2okinnovations.com

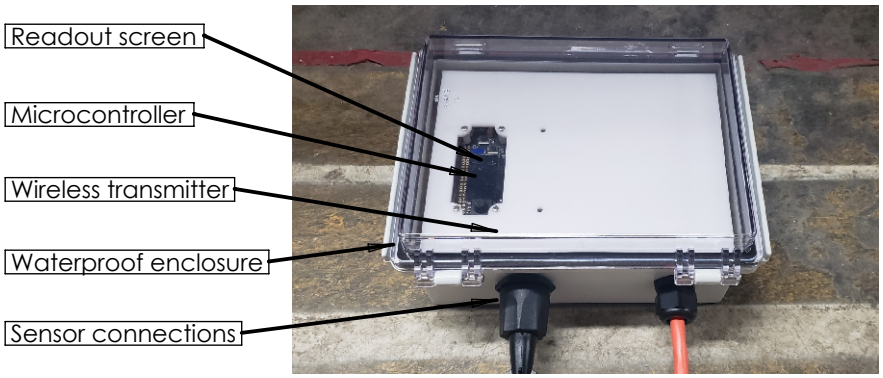


How: This floating AquaSensor package **(above)**, designed for long-term autonomous operation in harsh marine environments, was my first independent project at H2Ok.

I designed this pipe-mounted AquaSensor **(left)** according to specifications of a potential client's water processing plant, as well as an electronics enclosure for the "brains" **(below)**.

Tools used:

- SolidWorks
- Fusion CAM
- Python/C
- Microcontrollers
- 3D Printers
- CNC mill/lathe
- Laser cutter



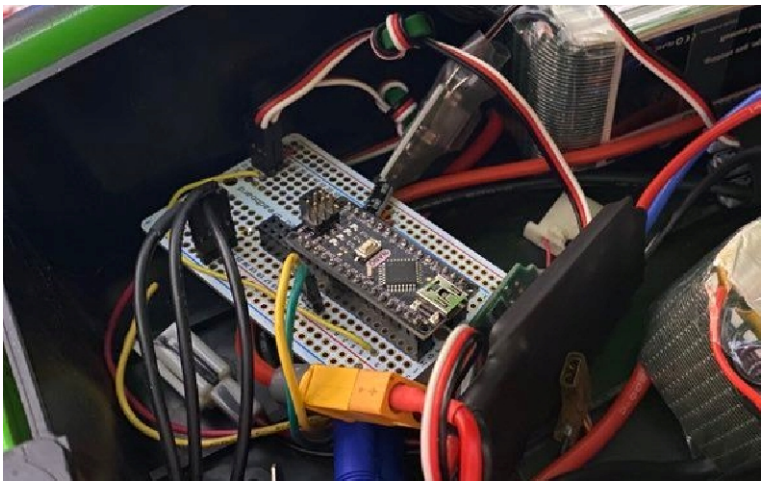
Why: AquaSensors can be cheaply deployed en masse and constantly send data to an AI algorithm in the cloud.
Upcoming changes in water quality can be accurately predicted, enabling preventative action for large-scale water supply issues like harmful algal blooms or sudden spikes in industrial process contaminants.
The floating AquaSensor was **successfully piloted with the U.S. Geological Survey** in Fall 2020, and the inline sensors were **deployed with a major manufacturing company** in Winter 2021.

ORGANIZATION	NAME	DATE	SHEET 5 OF 5
Artisan's ASYLUM	DESIGNED Michael Gutierrez	May 2021	

PROJECT TITLE

Jet Scooter

What: Two model aircraft EDF fans strapped onto the back of a broken motor scooter (stripped of the motor)I found in a cruft pile.



How: The powertrain consisted of two **6000mAh LiPo batteries** with 50C discharge rate, two **80A ESC units**, and two 70mm EDF engines. The ESCs are controlled by an **Arduino Nano** attached to one of those solderable breadboards that Adafruit sends you for free with some orders that you never have anything to do with... until now! I used the throttle already on the scooter for power on/off, and a potentiometer mounted on the handlebar for speed control.
Preliminary testing indicated that while the engines are powerful enough to send loose dust and leaves flying, they **can't quite get a human over ~10mph**. Also the battery life leaves something to be desired. In the next iteration, **I plan to switch to Li-ion cells and add afterburners** to make it a real jet scooter!

Video: youtube.com/watch?v=Id7ZNdEKoJc