THE STAKEHOLDERS: CELILO CYCLES

- The Project was sponsored by the company Celilo Cycles and its owner Scott Campbell.
- The goal of the project was to create a bike frame that would appeal to high performance athletes and Triathlon racers who had more lenient rules compared to those in other competitions.

- Celilo Cycles already has road/high performance bikes however these were designed to fit UCI regulations.
- The team in charge of this project hoped to design a bike that would stand out from the other products the company offered.

Oregon State University

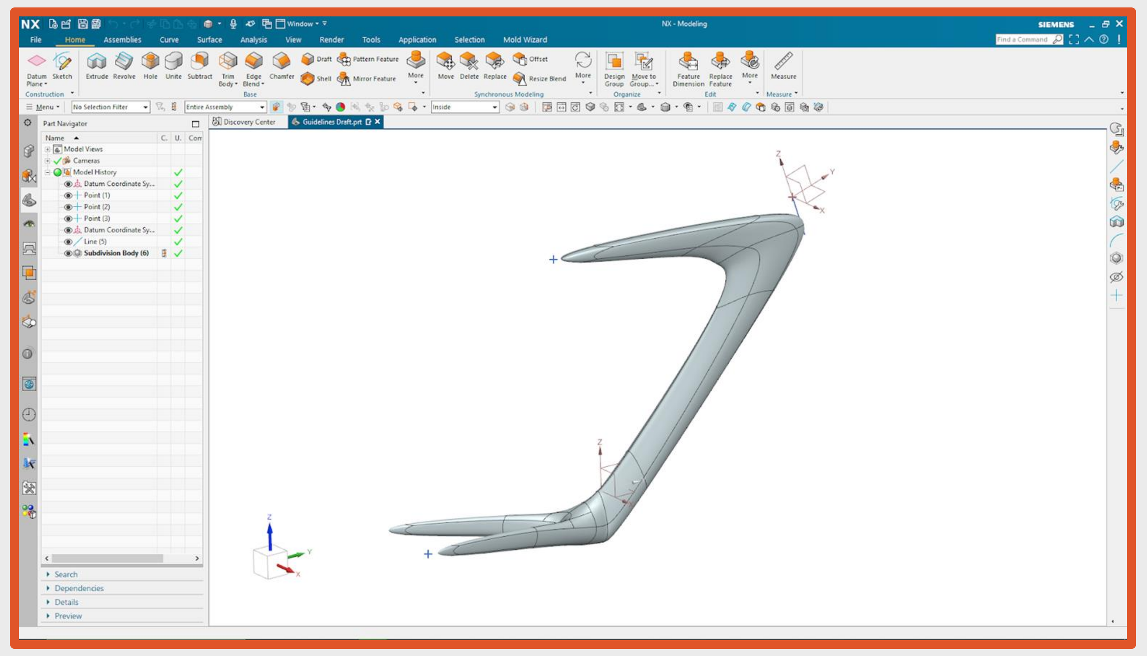
THE PROJECT: AERO-BIKE FRAME

This team used 3D modeling software and online simulation tools to design a bike frame focused on aerodynamic performance and comfort for Triathlon athletes to be manufactured and sold by a company that specializes in wooden bike frames.

THE MODELING PROCESS

SIEMENS NX

- A large portion of this project was developing a method to produce prototypes for frames that the team wanted to test.
- Computer Aided Design (CAD) modeling was performed in Siemens NX as recommended by the sponsor company, and the team explored multiple different modeling methods.
- CAD modeling, paired with CFD simulations, allowed for the team to make rapid changes and alternate versions of prototypes that could be tested and compared without the need to manufacture or 3D print physical models.

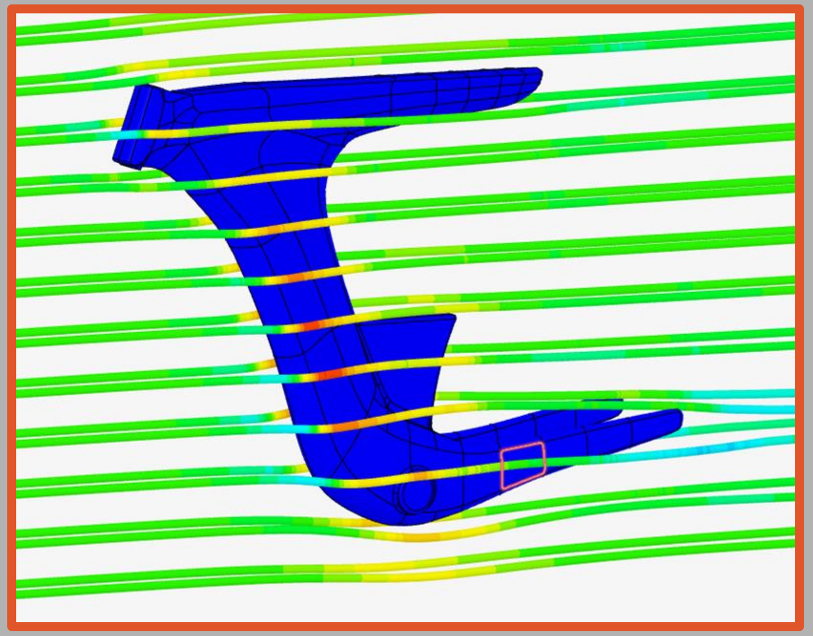


THE SIMULATIONS

- This project leaned heavily on Computational Fluid Dynamics Simulations (CFD) to help aid in the design and comparison of competing bike frames.
- Simscale, an online CFD simulation tool was used to setup different use-case scenarios to gain data.

SIMSCALE

- SimScale was used to analyze and visualize stresses and high stress concentrations on the frames. This was done to make sure they could withstand the forces applied during use.



- Each frame was run through a simulated wind tunnel at speeds expected by high performance athletes and the average drag coefficient throughout several simulations was compared to other frames.

Component	Individual Change	Drag Coefficient Result	Difference From Baseline	Percent Change
Chain Stay	Original	0.361	N/A	N/A
	Partial Rounded Top	0.356	0.005	1.39%
	Thinned	0.356	0.005	1.39%
	Rounded Tips	0.34	0.021	5.82%
	Rounded Tops	0.319	0.042	11.63%
	Flattened	0.319	0.042	11.63%
Beam Flange	None	0.44	-0.079	-21.88%
	15°	0.367	-0.006	-1.66%
	20°	0.333	0.028	7.76%
	25°	0.324	0.037	10.25%
Down Tube (Z-Frame)	Original	0.319	N/A	N/A
	3:1	0.325	-0.006	-1.88%
	4:1	0.32	-0.001	-0.31%
	Kammtail	0.343	-0.024	-7.52%

- Results from testing showed the characteristic changes to the frame which netted the best decreases in drag coefficient created and therefore the most efficient frame.