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MEEN 401-502 Project Proposal
Race Canoe Fabrication from Fiber-Epoxy Composite – estimated approx. $1k

Problem Motivation:

The sport of canoe racing has begun to enjoy some attention in recent years, with articles in the $Texas\ Monthly$[1] and $Austin\ Monthly$[2], among others, featuring stories about the hallmark *Texas Water Safari*. Ultra-marathon canoe races like this demand sleek, yet rugged boats that can survive severe impacts, without sacrificing speed and weight.

Problem:

The *Texas Water Safari* is a long and grueling race, demanding lightweight boats that can endure tough impacts and minimize drag, while remaining maneuverable enough to navigate the winding rivers. While conventional aluminum canoes have become popular for their low cost and longevity, they are clumsy and heavy. This team will explore alternative materials and designs to produce a race canoe capable of excelling in conditions like those of the *Texas Water Safari.*

This problem will be approached in three phases:

Research – the team will explore material and geometric designs. This also includes investigations in drag and paddle style.

Design – the team will create detailed plans for creation of a canoe using the previous research

Fabrication – the team will work to produce a canoe using plans from the design phase

Market:

Although small, the growing network of canoe paddlers is strong in the state of Texas, especially around the San Marcos and Guadalupe rivers. Canoeing is popular year-round in Texas, and some paddlers begin training for races many months in advance. Furthermore, canoes can last many years, with some still being raced from over 20 years ago. These benefits and the growing interest in endurance canoe racing ensure sufficient market demand.

Budget Estimate (for a solo-unlimited composite canoe, very small):

Composite canoes have become dominant in canoe racing, but other options are to be considered. Below is a sample budget for a typical composite canoe.

As a baseline, solo unlimited canoes retail for approximately $4k from commercial manufacturers like $Diller$[3], with exceptionally good deals to be found secondhand at about $2k. I have seen several $articles$[4] online that claim a cost of approximately $1k is possible when building it by hand.

The following are rough cost estimates:

- Matrix
  - Carbon Fiber $\frac{\$40}{yd} \times 20yd = \$800$
  - Or Kevlar $\frac{\$30}{yd} \times 20yd = \$600$
- Epoxy
  - Resin $\$35/gal \times 2gal = \$70$
  - Hardener $\$35/gal \times 2gal = \$70$
- Mold
  - Rental – estimated $100
  - Or Materials – estimated $100
- Fabrication supplies (brushes, stands, gloves, mask, sanding, release agent/wax, …) $\$75$

Total: $915 - $1115

Personal Connection:

I have completed the 265mi Texas Water Safari twice and trained for it for the last three years (it was cancelled in 2020 due to COVID). I have paddled approximately 1500mi in these composite boats and was considering building one myself for competition in 2022. When I saw the email from Ashley Schmitt, I thought this could be an excellent way to document my research and fabrication process, while also building something that I (or another paddler) could actually use in the race!

In addition to the materials research and fabrication, I am interested in canoe dynamics.

I have done some preliminary fabrication research, compiled here:
https://github.com/XDwightsBeetsX/canoe

A Texas Water Safari legend and Texas A&M Alum, John Bugge, currently fabricates many of the top competition boats using this composite approach. I have yet to contact him, but he could be a great resource for this project.

The Texas Water Safari site: https://www.texaswatersafari.org/home/

References:

[https://www.texasmonthly.com/list/lets − go − wild/no − 14 − texas − water − safari/][1]

[https://www.austinmonthly.com/this − all − female − team − is − revolutionizing − the − texas − water − safari/][2]

[$https://www.savageriver.com/canoes/usca - competition - cruiser - c - 1$][3]

[$https://skyaboveus.com/water - sports/Building - a - Cedar - Strip - Canoe - Estimating - the - Costs$][4]

[$https://www.robbiemallett.com/carboncanoe$] – DIY carbon fiber canoe