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HOWARD UNIVERSITY

E-TRIKE

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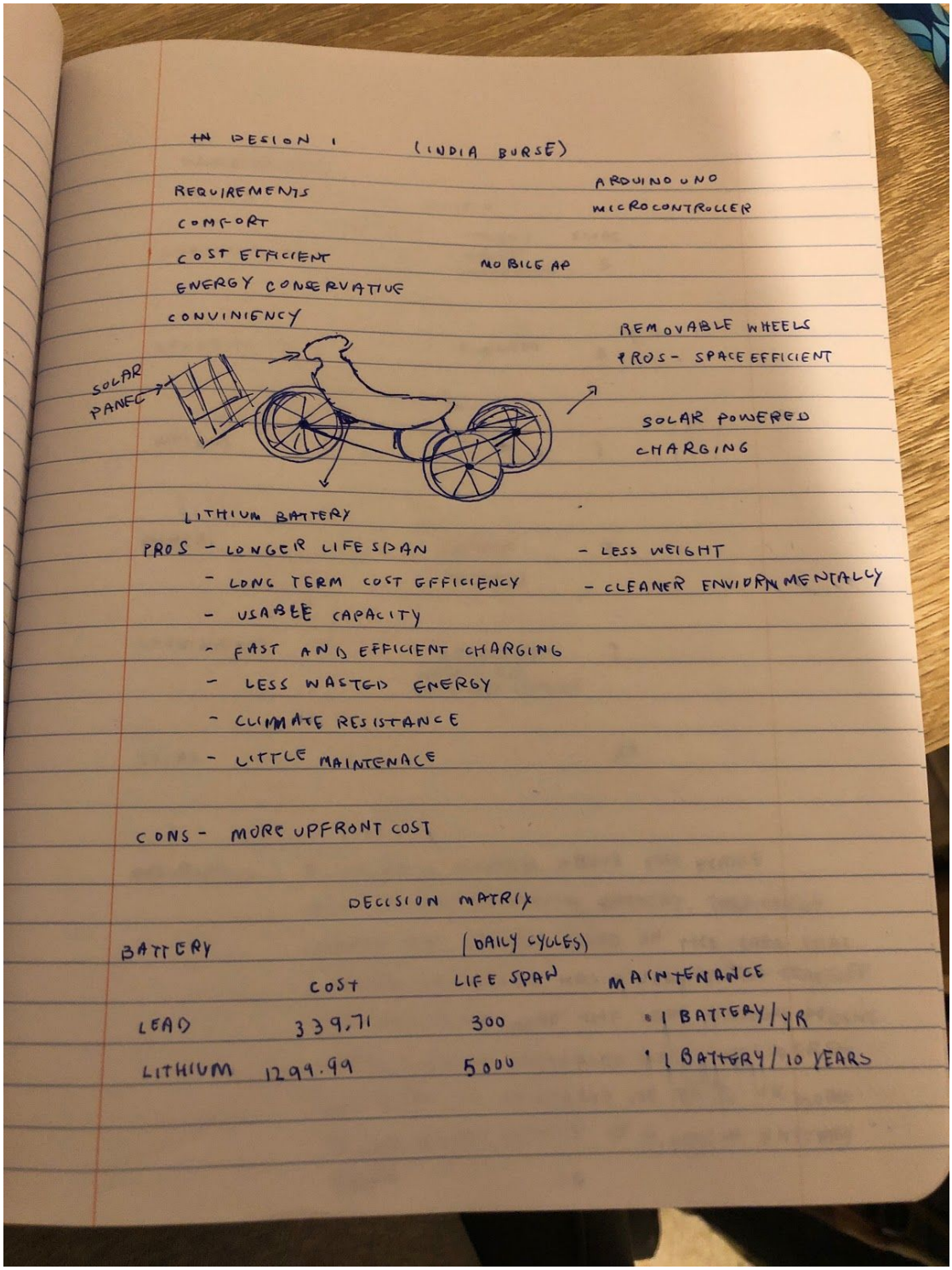
PROBLEM STATEMENT

The goal of the E-Trike is the build a vehicle that is both cost effective and energy efficient. Being there is a high demand for a better means of transportation that limits the usual of fossil fuels and pollution in the air. Hopefully the E-Trike will demonstrate these qualities. The thought process that it took to create these designs/conclusion was developed throughout our four years of undergraduate studies. The assembly of the E-Trike consists of the knowledge from both mechanical and electrical engineers.

INDIVIDUAL SOLUTION DESIGNS

DESIGN 1: INDIA BURSE



~~DESCRIPTION:~~

DESIGN DECISION MATRIX

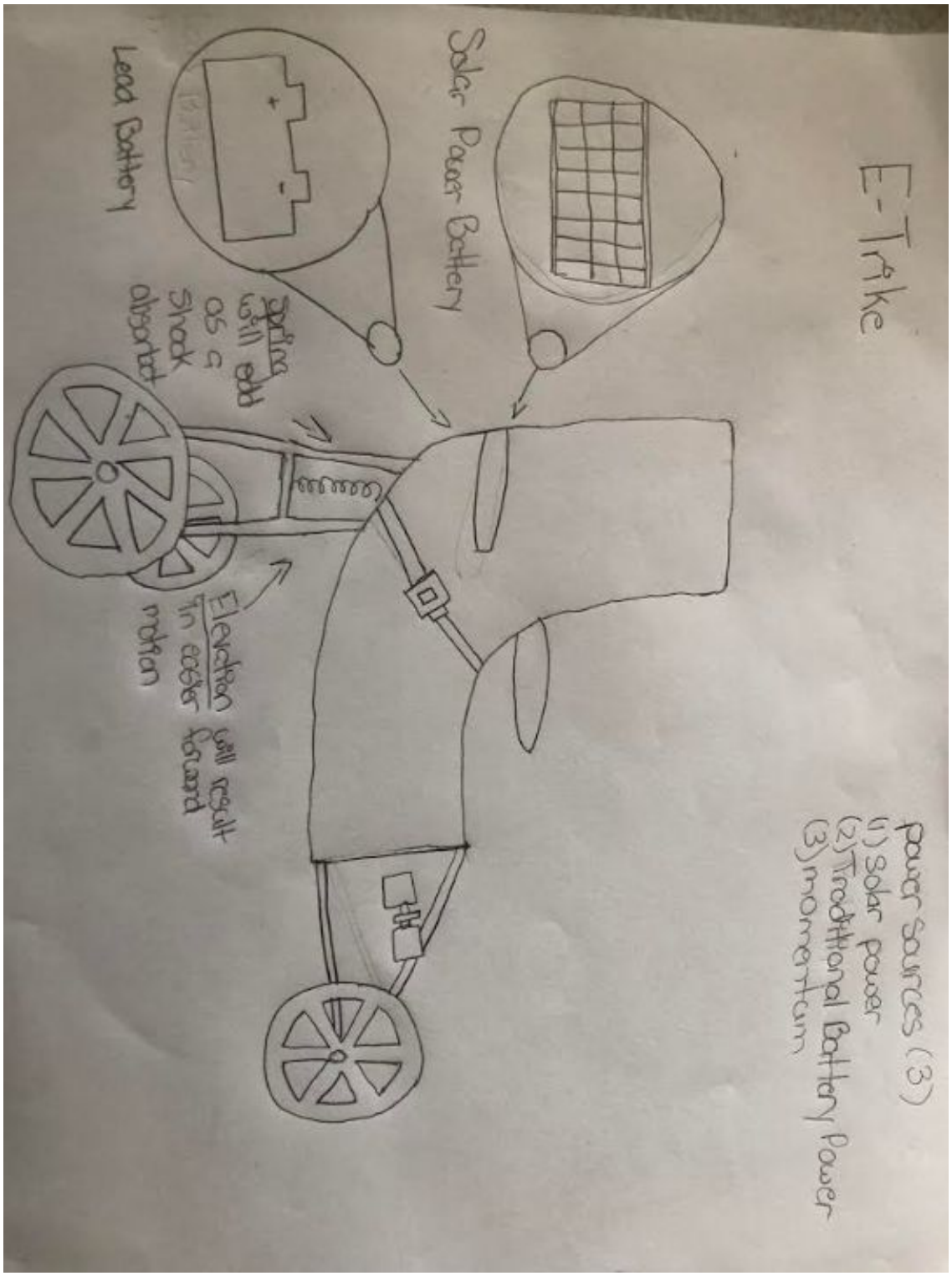
	WEIGHT	DESIGN	SCORE
FUNCTIONALITY		DESIGN AROUND SMARTPHONE	5
CONNECTIVITY		BLUETOOTH	5
WEIGHT			7
POWER		LITHIUM BATTERY	9
CONVINIENCE		DETACHABLE WHEELS FOR EFFICIENT STORAGE	7
TOTAL			33

DESCRIPTION: AS SHOWN IN DIAGRAM ABOVE THE STRIKE WILL INCLUDE A LITHIUM BATTERY. THIS DESIGN CHANGE WAS SELECTED BASED ON THE IDEA THAT LITHIUM BATTERIES HAS A VERY SMALL TRADEOFF FOR EFFICIENCY THAT THE LEAD BATTERY DOESN'T HAVE. LITHIUM BATTERIES ARE CONSIDERED PRACTICAL TO REGULARLY USE 85% OR MORE OF THE RATED CAPACITY OF A LITHIUM BATTERY BANK. →

LITHIUM BATTERIES CAN BE CHARGED QUICKLY TO 100% OF CAPACITY, UNLIKE WITH LEAD ACID ~~THERE~~ WHERE THERE IS AN ABSOPTION PHASE. THEY ARE ALSO MORE ENERGY EFFICIENT WHICH MEANS THEY ARE EXTREMELY COMPATIBLE WITH SOLAR POWERED CHARGING (HELPS YOU GET THE MOST OUT OF CHARGING).

LITHIUM BATTERIES ARE MORE EFFICIENT IN LOW TEMPATURES, THE ARE LOW MAINTENANCE AND EASY TO COMPARTMENTALIZE, TAKING UP LESS SPACE AND WEIGHING LESS THAN A LEAD ACID BATTERY.

DESIGN 2: AYANA WALKER



DESCRIPTION OF TOP 2 DESIGNS WITH PROS AND CONS

DESIGN 1 : ADDITION OF LITHIUM BATTERY AND SOLAR PANEL	
PROS	**CONS**
Longer Life span	**More upfront costs (up to a $1000 dollar difference)**
Fast and efficient charging and ability to integrate with solar charging (allows you to get the most out of each charge)	
Less wasted energy, so more energy conservative	
Climate resistant (functions fine in low temperatures)	
Little maintenance (1 battery lasts up to 10 years)	
More cost efficient in the long run when you consider how many times you would have to replace the lead acid battery.	

DESIGN 2 :	
PROS	**CONS**
No balance needed	**Expensive**
Manual power recommended but not required	**Visual Appeal**
Multiple sources of energy	
Shock absorbant	
Light weight	
Infinite Battery Life	

Note: The two designs show a different body structure for the E-Trike such as two wheel in the front or in the back. We decided to place the two wheel in the front for better mobility.

DECISION MATRIX FOR TOP DESIGN SELECTION

	Weight	Design 1	Score	Design 2	Score
Functionality	**1**	● **Arduino** ● **Smartphone**	**5**	● **Smartphone**	
Connectivity	**4**	● **Bluetooth**	**5**	● **Bluetooth**	
Weight	**5**		**7**		
Power	**2**	● **Lithium Battery**	**9**	● **Solar Power** ● **Lead Battery**	
Convenience	**3**	● **Little maintenance** ● **Detachable wheels for mobility and easy storage**	**7**	● **Retractable**	
Total			**33**		

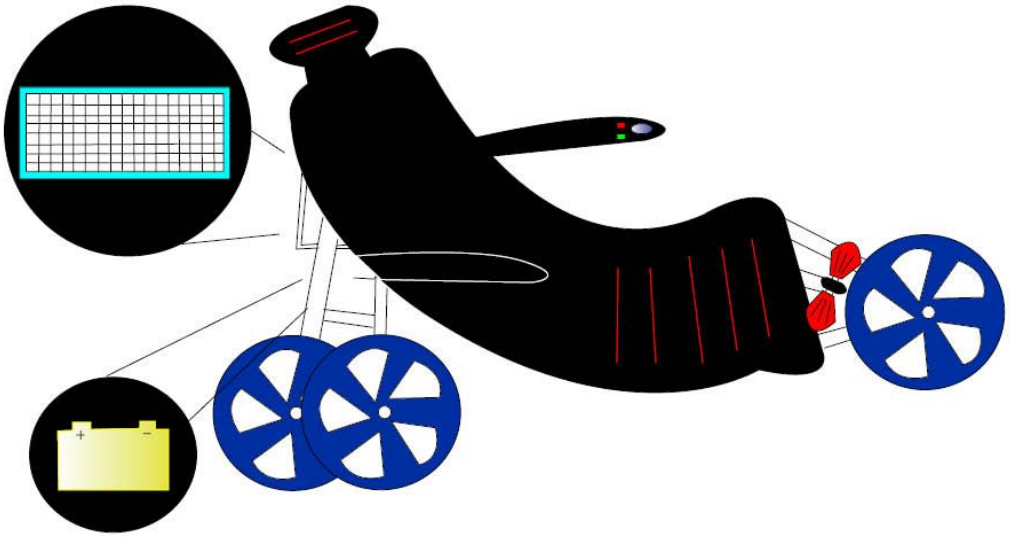
FINAL DESIGN

Solar Panel(1)

Plugged into the framework of the trike in order to provide an alternative and energy conservative source of power.

Push Button(2)

Controls for the optional motorized aspect of Trike for those who are not able to pedal.



Pedals(3)

Provide a energy saving and exercise intuitive option for riders who would prefer to pedal instead of just ride.

Lithium Battery(4)

Provide a more energy efficient, durable, and long lasting power/charging source.

Elevation(4)

The ability to use less balance as possible And for easier momentum.

SOLUTION DESIGN DESCRIPTION

As shown in the diagram above, the E-TRIKE will include a lithium battery(4). This design change was selected based on the idea that lithium-ion batteries has a very small cost tradeoff for efficiency that the lead acid battery doesn't have. Lithium batteries are considered practical to regularly use 85% or more of the rated capacity of a lithium battery bank. Lithium batteries can be charged quickly to 100% of capacity unlike lead acid where there is an absorption phase that accounts for the last 15-20% of a charge. They are also more energy efficient due to their compatibility with solar powered charging(1) which helps you get the most out of charging whenever you are in sunlight. Lithium batteries are also more efficient in low temperatures in comparison to lead and they are low maintenance - one battery typically lasting about 10 years. Lithium ion batteries are easy to compartmentalize, taking up less spaces and weighting less than lead batteries making it more mobile and convenient.