Thermally Cooled MotorBike Capsule

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1. **Description of the idea:**
   We propose to develop a bike capsule that will provide thermal coolness to the driver and the passenger. The foldable shed will be an extra attachment to the bike protecting the people from precipitation, sunlight, and hot and humid climate along with safety insurance. The cooling system will be provided by two means, depending on the version of the capsule: The water cooling system and the Air Conditioning system. The Air-Conditioning vehicle will also be enclosed from sideways. Our main purpose is to produce a cost-effective technology, which can be very useful in every type of adverse environment.

2. **Status of Work: Self-Project**
   A team of 5 members is currently working on the design and attachment of the capsule and simulation of the vehicle. Several blueprints have been created after the topology analysis for the model pursuing the water cooling method. For the air-conditioning mode, we will enclose the capsule from the sides, leaving space for leg extensions. Structural and Crash Analysis is in evaluation, whereas convective heat transfer is another progressing concern.

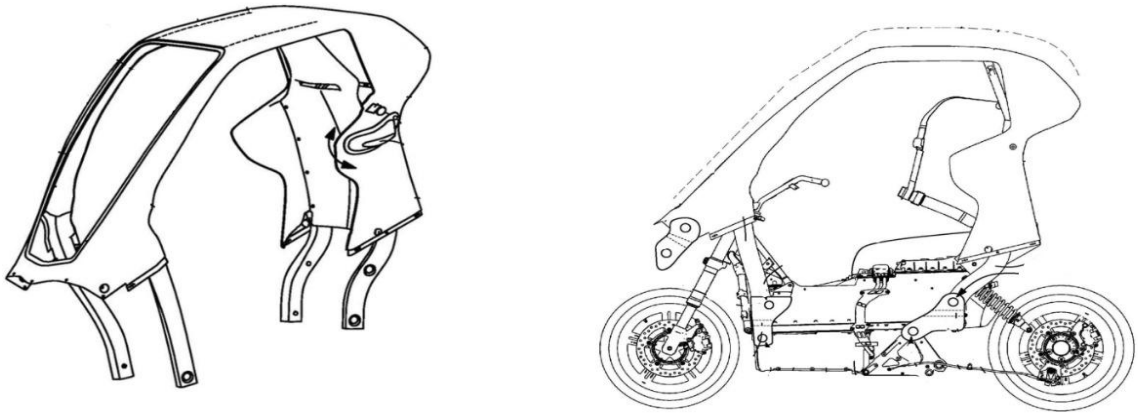
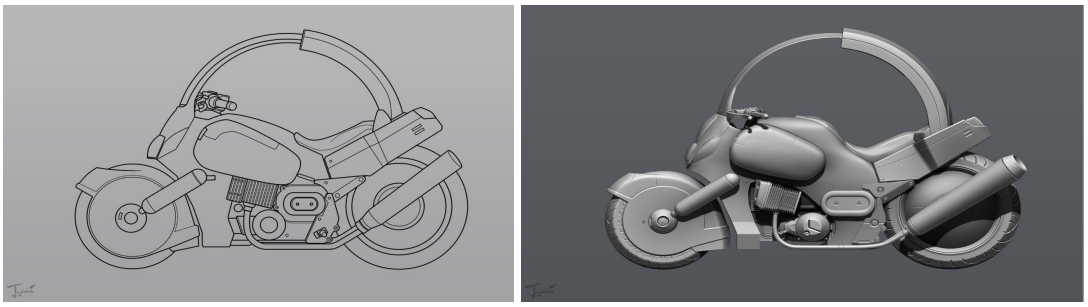


Figure 1: Blueprint of capsule and model for CAD Design



(a) *(b)*

Figure 2: Alternative design for our model

3. **Science and Working principle:**
    - The folded capsule must be made of light material to avoid large extra weight that may decrease the efficiency of our motorbike. Secondly, it must have good strength for the driver's safety in case of collision. So, we have selected Carbon Fibre Composites along with Styrofoam because of their high strength, low cost, and less density.
    - The structure of the capsule will resemble an egg shape, which will prove worthy during the crash analysis testing; thus providing extra safety to the passenger and the driver. Along with this, aerodynamically, the capsule's structure will help to gain momentum in a better way, and at high speed will act as a glider for deviating raindrops or other materials from the driver's field of vision.
    - The whole design will be light and symmetrical for easy balance.
    - The CAD models in the form of Digital Twins will be used for structural, topology, and explicit dynamics analysis for proper testing of the vehicle before the production of a prototype.
    - Thermal cooling will be provided by two means, by water cooling method and second is air-conditioning. In the water-cooling method, drafts will continuously circulate cooling water through heat exchangers and other equipment where the water absorbs heat. That heat is then rejected to the atmosphere by the partial evaporation of the water where upflowing air is contacted with the circulating downflow of water. The loss of evaporated water into the air exhausted to the atmosphere is replaced by cooled stored water which should be replenished from time to time.

- The air-conditioning method will provide the best interior environment for the passengers, however, the extra installation of fans for the distribution of air, battery, and ventilation will increase the bulkiness of the vehicle. Thus, a proper analysis will be made for their placement and weight distribution.

4. **Final Deliverable of the project:**

The final product of our project will have two versions:

a) Roofed Motobike with a water-cooling system installed.
b) Enclosed Capsule with the Air-Conditioning system installed.

Having all the features of a motorbike, as it will be an upgraded version of it, our model will ensure greater safety and comfort to people. These types of vehicles are going to be the future of the automotive industry. Few companies are also working on these modified bikes, but they get restricted due to the high budget of vehicles. So far, PERAVES Monotracer has been only launched as a commercialized product, but its main purpose is to serve as a sports bike. Also, it costs more than 90 thousand US Dollars to the customer.



Figure 3: PERAVES Monotracer

The main purpose of the project is to get the desired product on a cost-efficient budget; so that it may come in handy for regular

transportation even in adverse weather conditions. With proper vehicle dynamics, crash analysis, weight distribution, and thermal cooling analysis, our product will form an upgraded version of today's two-wheelers on the road.
Some of the designs which we are inspired by are:



a) *b)*

Figure 4: a) Honda Elysium b) Benelli Adiva

These products are not launched eventually due to high-cost which is due to many additional features they want to include and also due to new designs of the vehicle, especially for the roof.

4. **Who would be the beneficiary of the product and why?**

The proposed technology will mostly be advantageous for urban people in the following ways:

a) Cost-effective: Our technology will be less expensive compared to other products in the competition. Also, the use of a roof will save additional costs in the form of helmets and leather clothes.
b) Thermal Cooling: The most highlighting feature of our product is to rightfully save the driver and the passenger from a hot and humid climate. Both of our models will serve this comfort.
c) Safety: Our cover will provide extra protection, and its egg shape will help the driver during direct collisions. Along with this, the passengers will be protected from any natural particles in the air.
d) Sunlight and Rain Protection: A capsule will well act as a shed in case of precipitation and harsh sunlight.

e) Protection from foreign particles: With the help of moderate momentum, the front part of the capsule will act as a glider to deviate raindrops and other particles, thus helping more than the helmet.
f) Structural Advantage: Maximum speed will be attained in less time than a normal bike due to the aerodynamic structure of the capsule.