

ADVENTURE TOURING MOTORCYCLE FOR INDIA

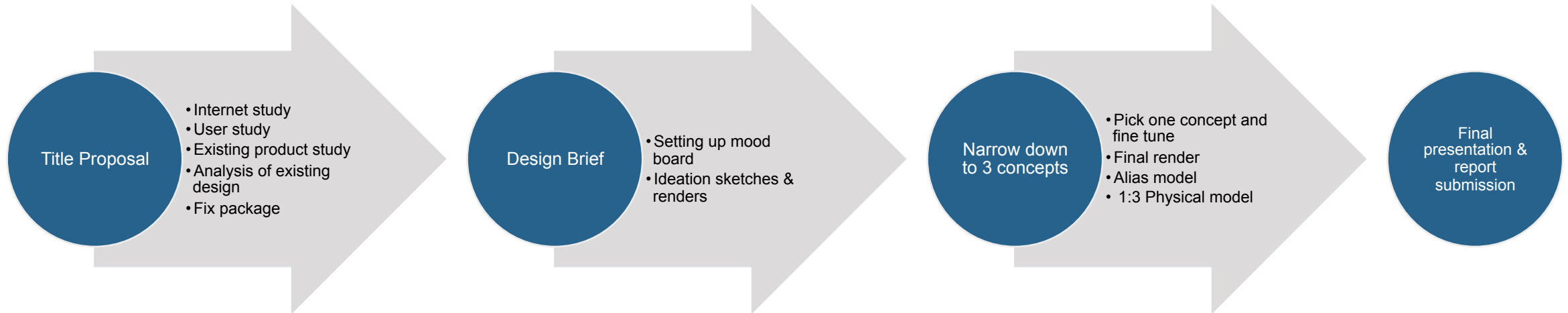
Harish Kumar

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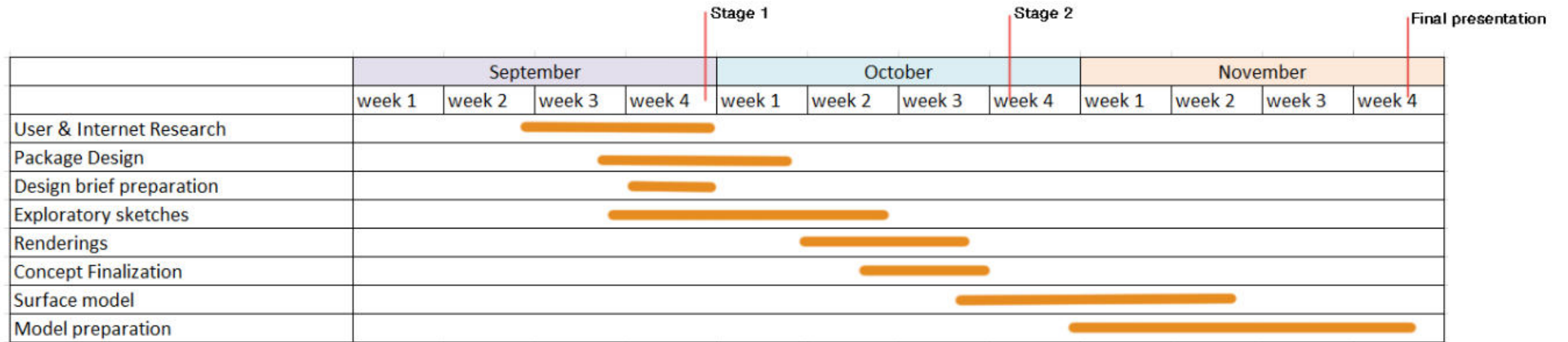
Guide : Prof. Nishant Sharma



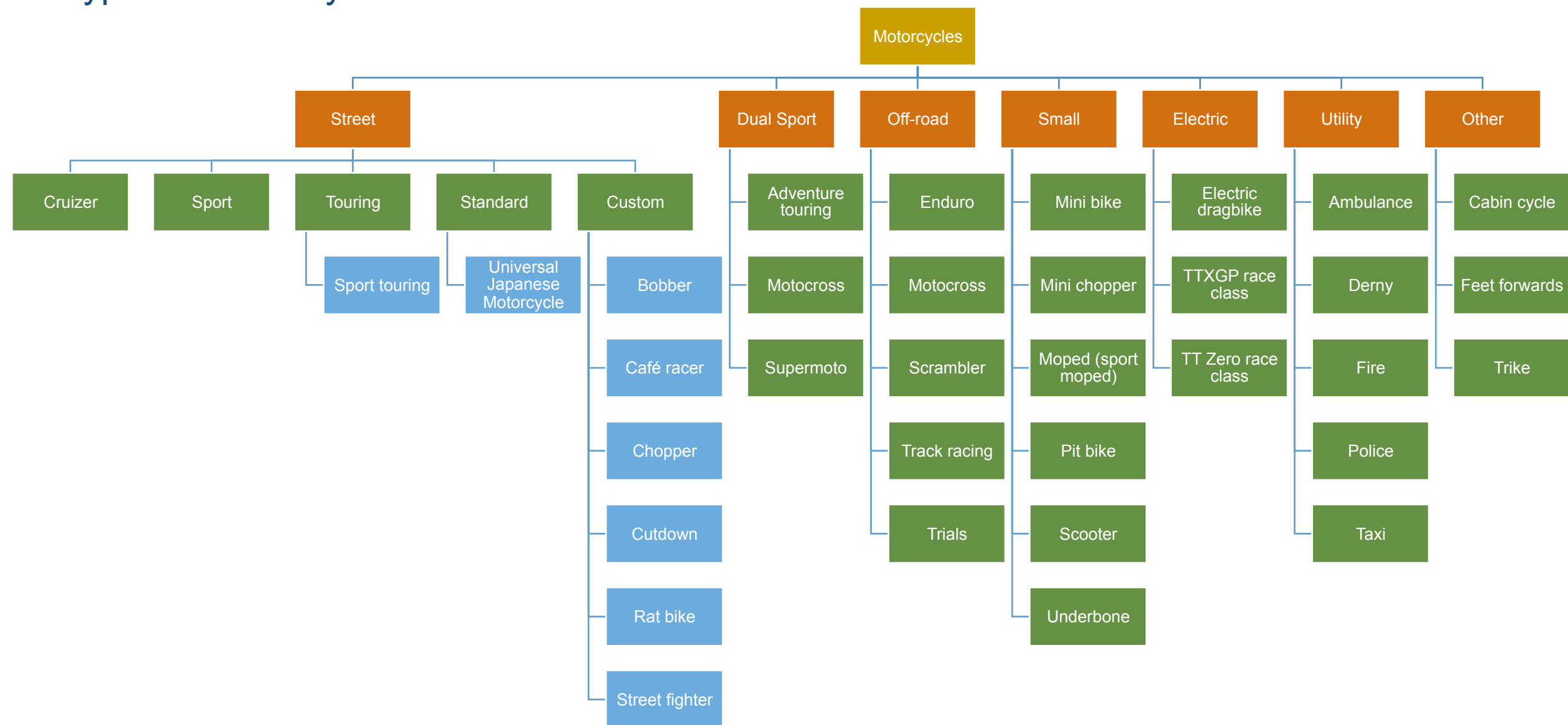
The Design Process



Process timeline



Types of Motorcycles



Street

Designed for flat roads
Usually medium to low ground clearance
Meant for comfort and speed
Pillion rider is also given importance
Less suspension travel



Cruizer



Sports



Sport tourer



Universal Japanese
Motorcycle

Street custom



Cut down



Bobber



Café racer



Street Fighter



Rat bike



Chopper

Dual Sport

For both road and off road
Long suspension travel
Multi purpose tires
Usually high capacity engine with more torque
Versatility



Adventure Tourer



Super moto



Motocross

Off road

Purely for uneven terrain
Less sprung mass
Traction tires
High ground clearance
Long suspension travel
Protection gears



Motocross



Track racing



Scrambler



Trials



Enduro

Small

Very small wheel base, and height
Usually 2 stroke
Recreation and short commuting purpose
Usually doesn't need license
Non geared



Sport moped



Mini Chopper



Pit bike



Underbone



Scooter

Electric

Powered by electric motor
Usually batteries or fuel cells
Usually for racing purpose
Weight of batteries is an issue



TTXGP race class



Electric Drag bike



TT Zero race class

Utility



Taxi



Ambulance



Derny



Fire



Police

Others



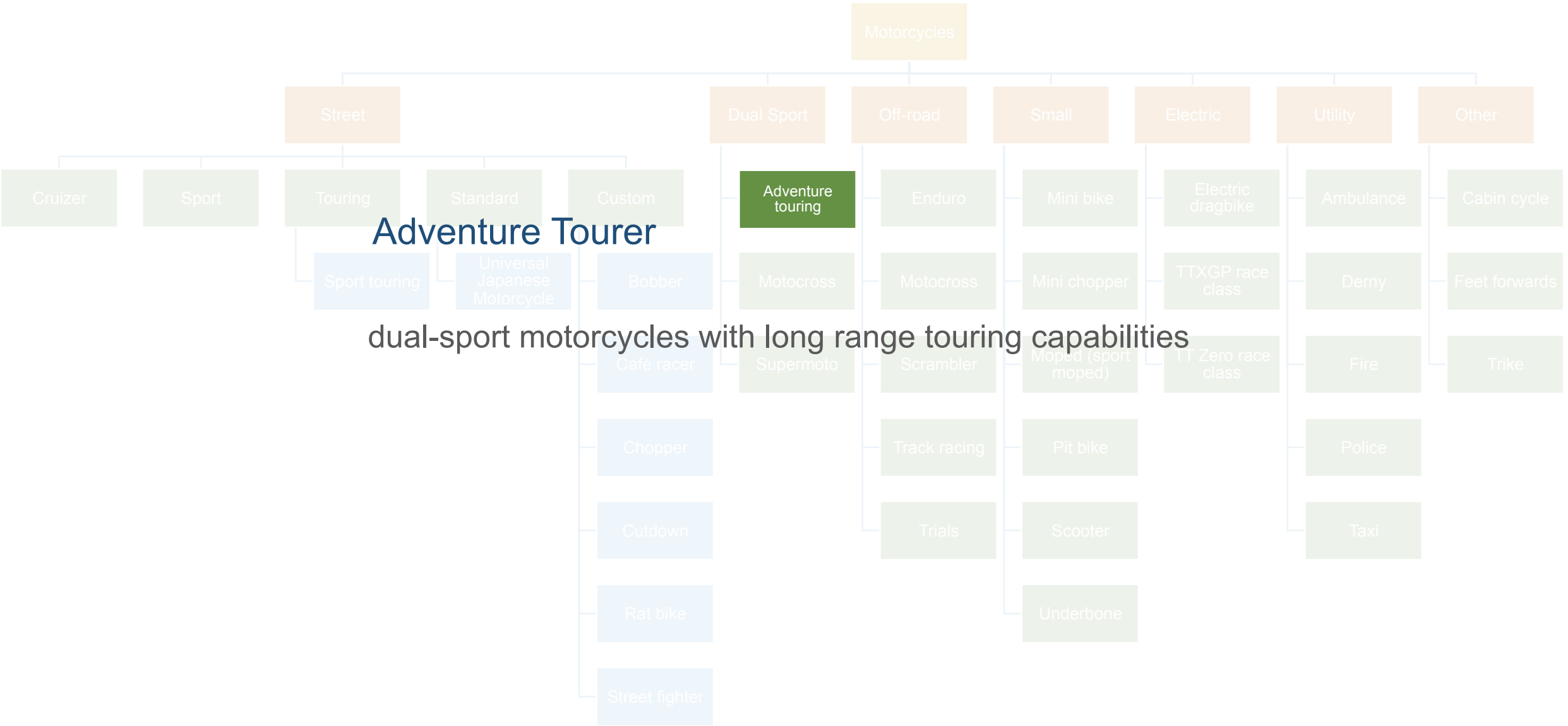
Feet forwards



Trike



Cabin Cycle





Adventure Tourer

very high ground clearance

large fuel reserves

good high-speed highway behavior and handling

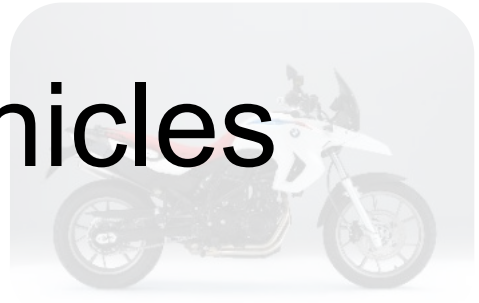
large displacement

under stressed engines for high reliability

heavy torque output



Existing vehicles





Price range : 5 to 30 lakhs

Engine displacement : 600 to 1200 cc

Horsepower : 30 to 110 bHp

Top speed : 150 to 240 Kmph

Front wheel : 19 inches to 21 inches

Rear wheel : 17 inches to 18 inches

Suspension travel : 7 inches

Rake/trail : 27 degrees / 4.4 inches



Existing vehicles



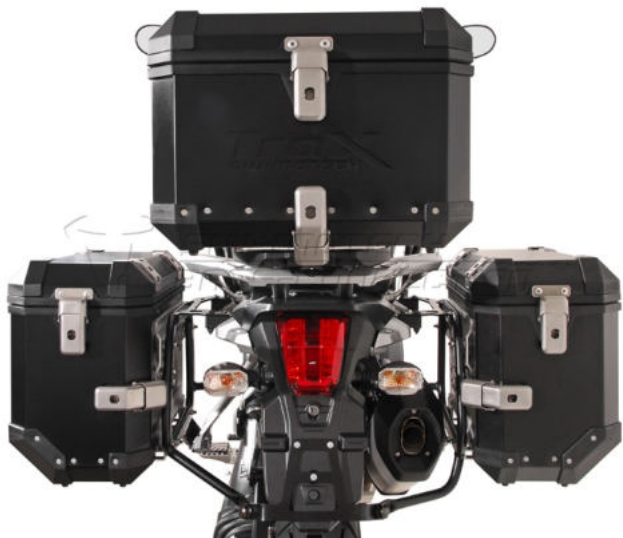
Fuel Tank





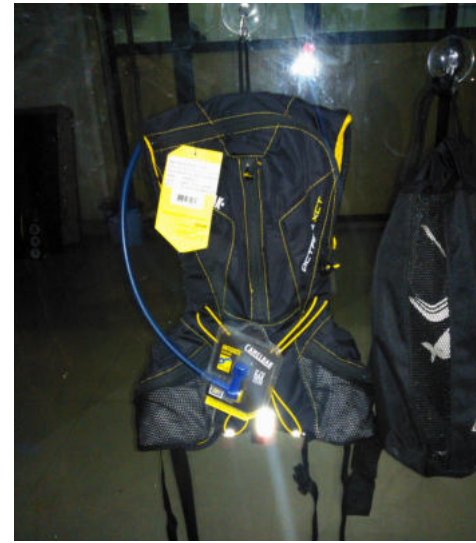
Storage Space







Helmets
riding jackets
riding gloves
riding pants
guards and armors
riding shoes
saddle bags
bungee nets
LED fog-lights,
digital speedometers
Repair Kits
Luggage
Tents and more





Silencer



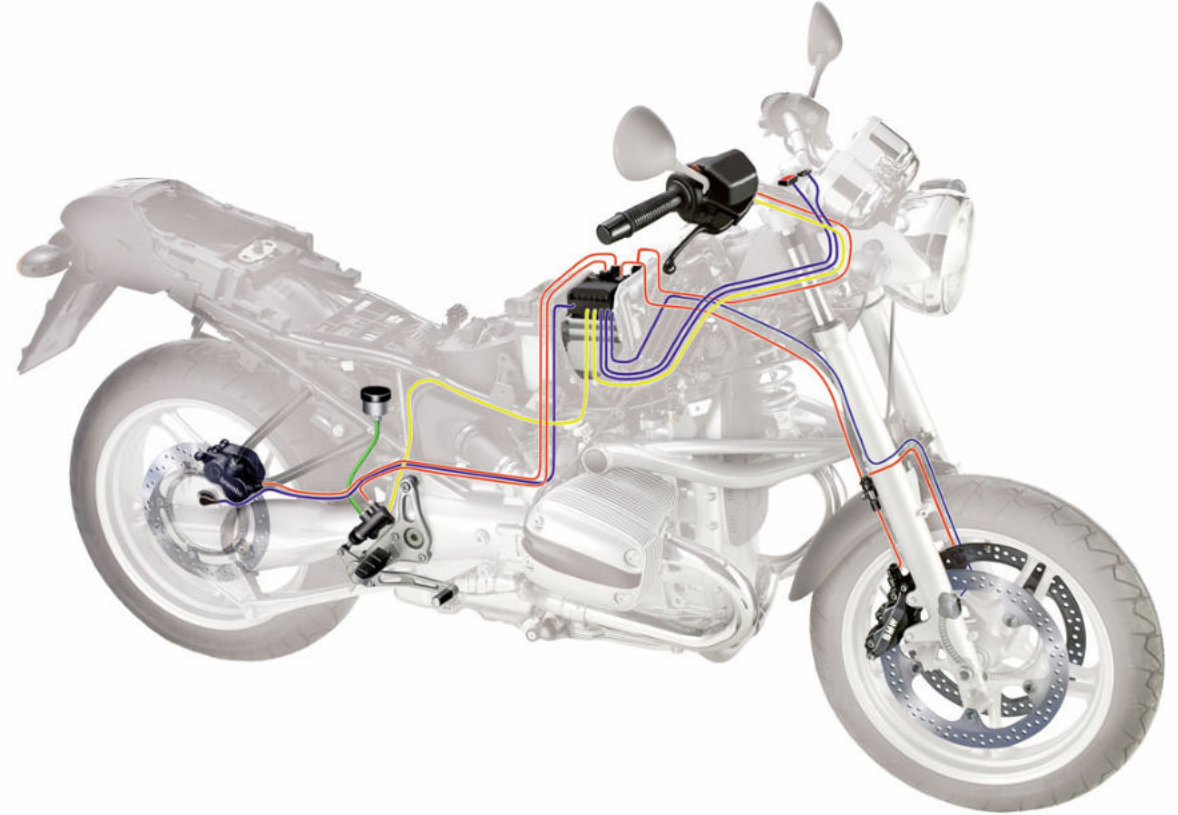
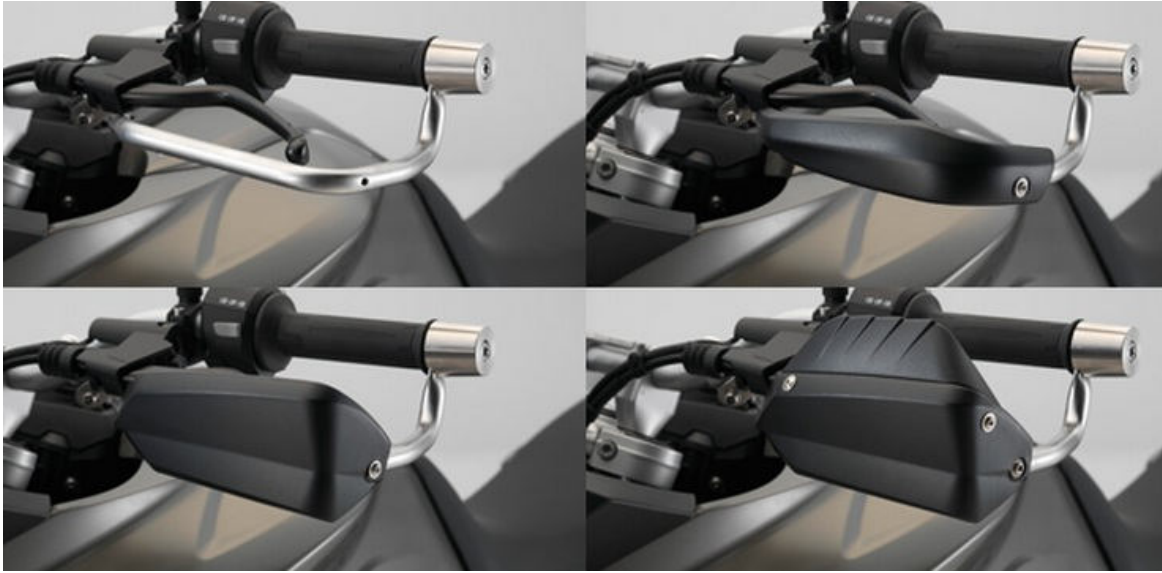
Protection



Motorcycle Protection



Rider Protection



Tires



**90% pavement
10% dirt.**



**75% pavement
25% dirt.**

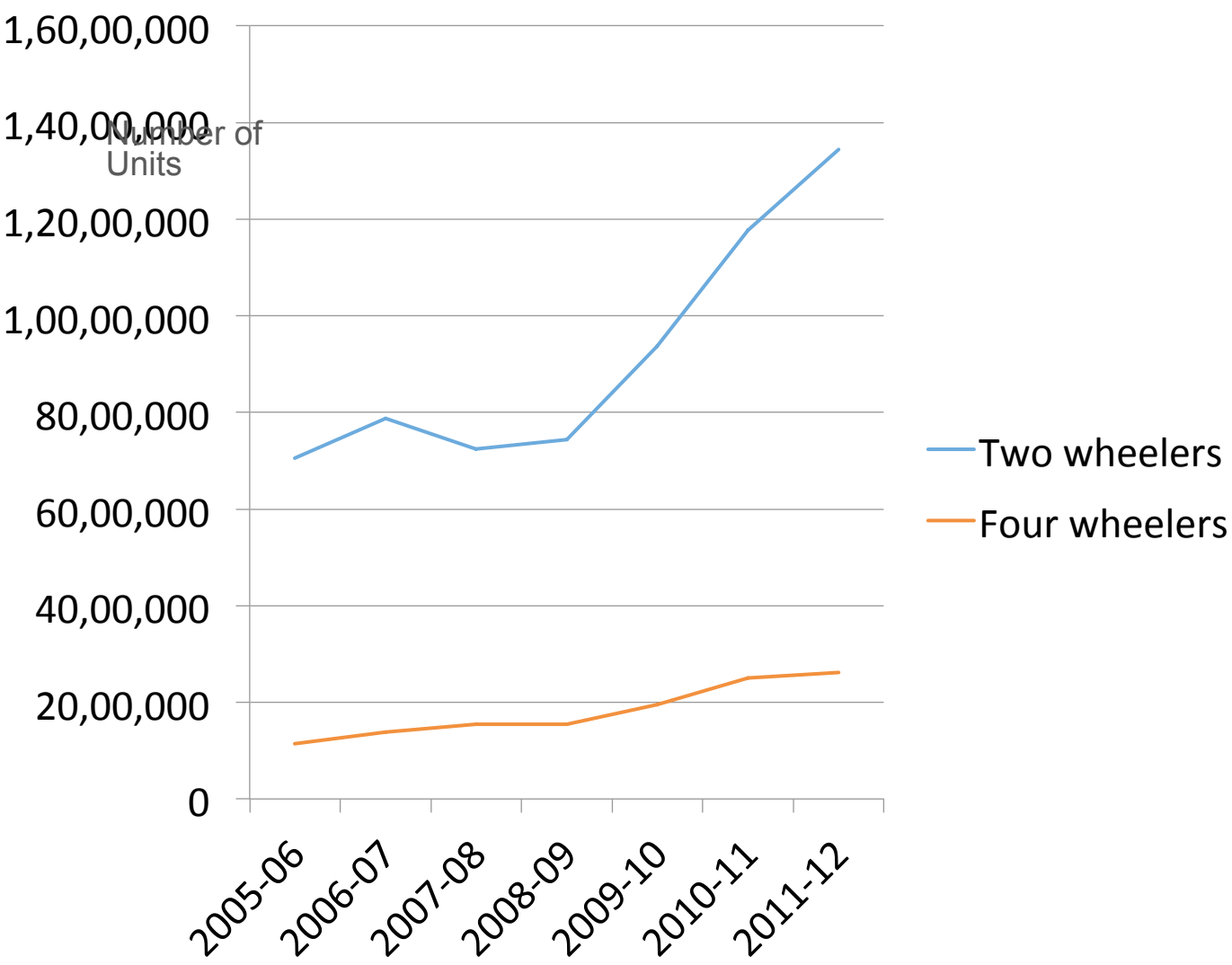


**50% pavement
50% dirt.**



**25% pavement
75% dirt.**

Recent Statistics from SIAM



Source : Society of Indian automobile manufacturers (SIAM)

Goa with South India Motorcycle Tour

Golden Triangle Motorcycle Tour

Indian Coastal Motorcycle Tour

Himalayan Heights Motorcycle Tour

Motorcycle Tour in Himachal India

Indian & Nepal Motorcycle Tour

Nepal & Tibet Motorcycle Tour

Kerala Motorcycle Tour

Top of the World Motorcycle Tour

North East Motorcycle Tour

Rajasthan Classic Heritage Tour

North with south India Tour

South India Classic Motorcycle Tour

Rajasthan Desert Motorcycle Tour



Arunkumar Francis

28 , Designer at TVS motorcycles.

Owns a Honda CB400 super4.

Longest trip : 900km - pune to bangalore.

Does touring with his friends. Occasionally goes offroad.

According to him an adventure tourer must have these minimum characteristics

“

- *able to maintain 120+kmph [25+bhp] on the highway.*
- *min, 13+lit tank [maybe a millage of 30+ is ok]*
- *gud windsheild & a detachable gps/maping device*
- *bright headlamps and a loud horn*
- *if possible a cattle catcher,..lol*
- *proper riding gear to go with,.thats about it. ”*



Sudeep Babu

- 24, Software Engineer, Accenture
- Member of Royal Indians Enfield owners club and Xbhp
- 1700 kms roundtrip Bangalore – Goa – Bangalore
- Owns Thunderbird, want to go to Himalayan Odyssey next year
- Have good knowledge about adventure tourers, planning to buy in the future
- Expectations of an adventure tourer motorcycle
 - “ Apart from the comfortable Cruising speed of 110-120
 - Long travel suspension for front and back.
 - Wire spoke Rims (Preferably with tubeless tyres)
 - Dual purpose tyres like Ceat gripp or Pirelli Scorpion trails
 - sufficiently large windscreen.
 - sufficient luggage/ bungee chord mounting points
 - ample lighting(headlamps)
 - oh yeah.. Engine Sump guard.. “
- Worried about the engine power and chassis strength



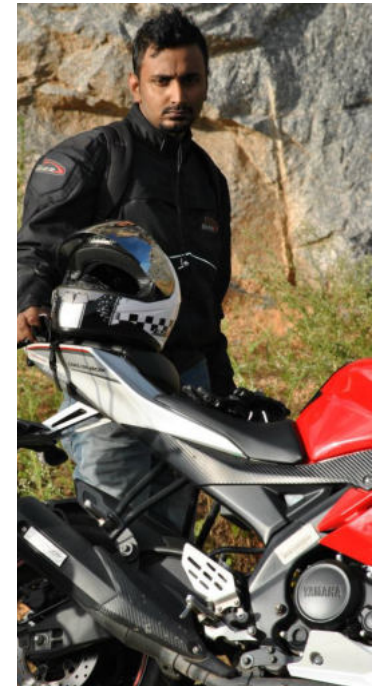
Sachin

27, Designer, General Motors

Owens a Yamaha R15 V2, Motorcycle enthusiast, Have been to many road trips, member of Yamaha motorcycling club and many more clubs in and around Bangalore.

Has Decent knowledge about Adventure Tourers, have driven them also. Done a 700 Km stretch on his motorcycle. The long riding makes him tired at times on his R15, mainly because of posture.

He likes the concept of affordable adventure tourers as he couldn't afford a proper adventure tourer. He says that adventure tourers will be good for Indian roads as most of the roads in India are bad. He needs a motorcycle which has upright stance, long suspension travel, powerful engine but less displacement, added features that suit for camping and storage.



Akshay Venganza Mudbidri

26, Travel Desk Advisor, Groupon India.

Owns a pulsar 200 NS

Rides with his friends usually, occasionally goes for planned tours.

Concept of adventure tourer according to him is *“they're comfortable, are designed to be able to be ridden on varied terrain (tarmac, dirt, off-road), usually have a decent tank range, are powerful enough to maintain high speeds all day long and are easy to maintain and service on the go.”*

Would like to have the following in an adventure tourer

- comfortable and spacious seat
- decent wind protection,
- good tank range (atleast 400km per full tank)
- powerful headlights
- reliability of the bike as a whole.



Deepak Mishra

30, Trainee AR, Omega Healthcare

Owns a Pulsar 150 CC

Have been to Bangalore – Kolkata – Bangalore

Mostly rides alone, sometimes with his friends

Does offroading on the same bike.

Not happy with its cruising capabilities .

Doesn't want additional power, he thinks its waste of fuel and money.

He hasn't driven any adventure tourer, more inclined to sport tourers like CBR 250. Likes the braking and car like feel of it.

Fuel capacity is a big concern for him.

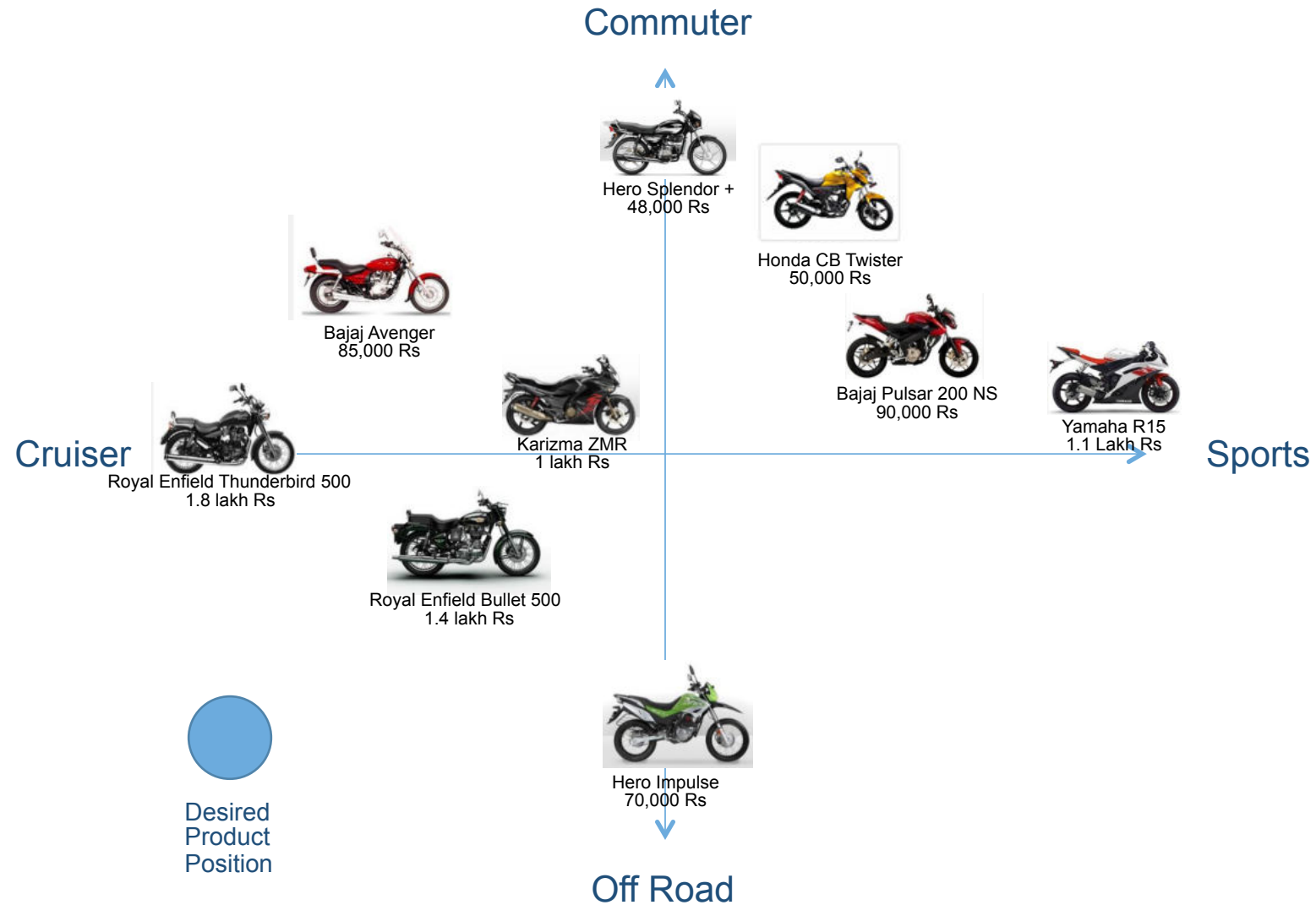
Does not like Hero Impulse as it is not performing well, but likes its shock absorbers.



Inferences from User study

- More time is spent on road and less on off-road
- No one was really interested in high speed, **moderate speed will be enough**
- Usually riding with friends or clubs
- Adventure tourer must have the following
 - **Good fuel capacity**
 - **Wind protection**
 - **Good torque engine producing around 20 bhp power**
 - **Powerful headlamps**
 - **Relaxed seating posture**
 - **Ability to maneuver easily**
 - **Space for luggage and GPS controls**
 - **Dual purpose tires**
- Displacement was never an USP of this product. Only torque matters, that too not on paper but based on experience. The torque provided by high end commuters will be more than enough for this application.
- People want to buy because of its versatility, but the cost is very high. They search for substitutes for those vehicles.

Product positioning graph



Existing motorcycles in Indian market



Hero Impulse

- The only production Offroad two wheeler available in India.-
- Nitrox-gas filled mono-shock rear suspension
- Knuckle guards
- Mount muffler
- Large and raised durable fenders
- Straight pull spokes
- Motocross seat
- High ground clearance
- Stud-type tread pattern tires
- Large front disc brakes



Bajaj Avenger

- a cruiser style motorcycle designed and manufactured by Bajaj Auto in India.
- Originally Bajaj Eliminator which had an air-cooled, single-cylinder Kawasaki engine.
- 180, 200 and 220 cc variants
- Shares Pulsars engine, Tuned for more torque.

Design Brief

Aesthetic Intent

The Aesthetics of the adventure tourer should reflect its nature of ruggedness, capability of going on any terrain, safeness and one with nature.

The motorcycle should communicate with the rider that he is safe on the vehicle even while in riders point of view.

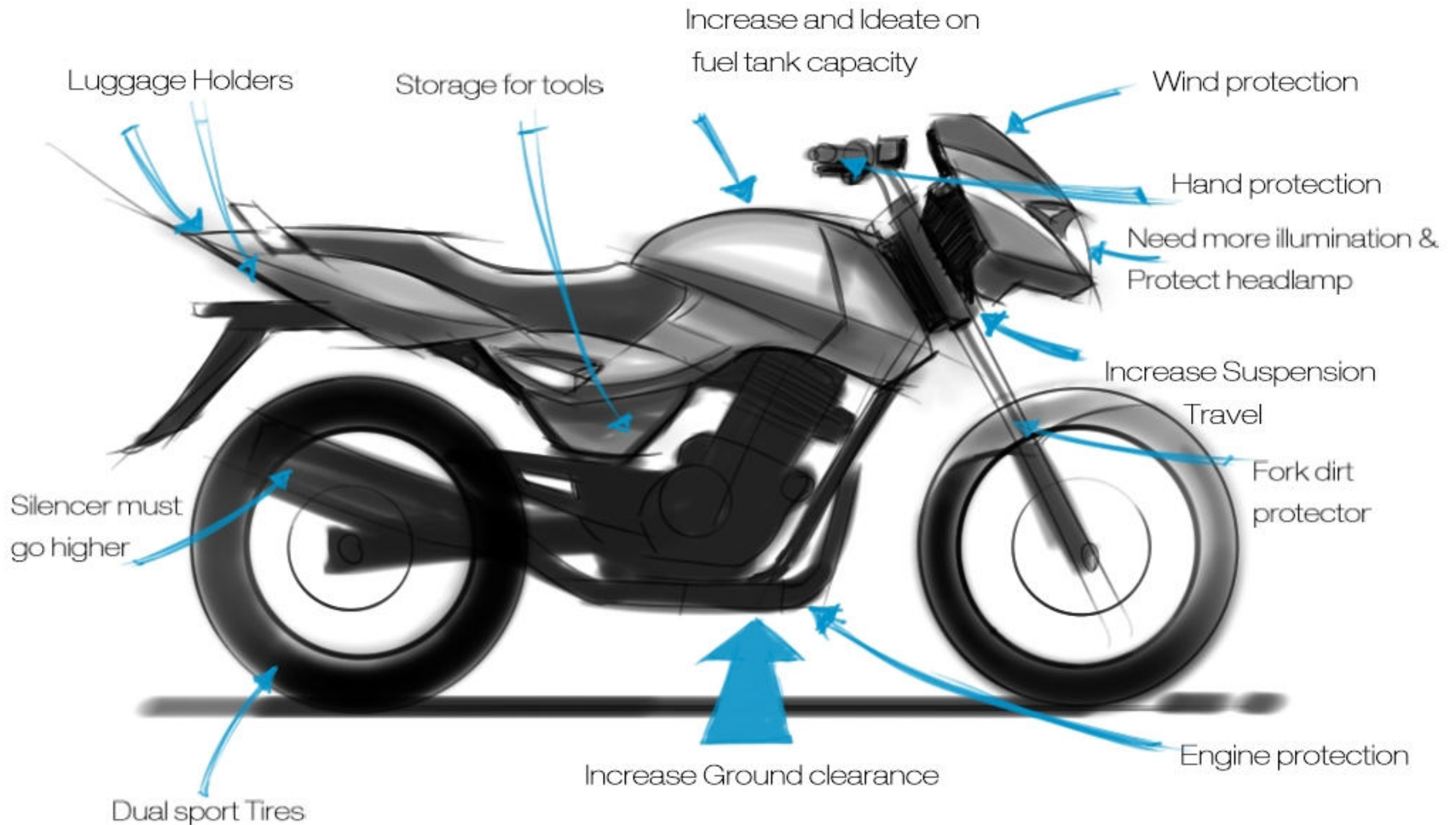
Technical Specifications

The technical Specifications are borrowed from Bajaj Pulsar as it got more power and most affordable in that segment. For an adventure tourer power is critical, at the same time this project is about affordability. So 150 CC is the best choice.

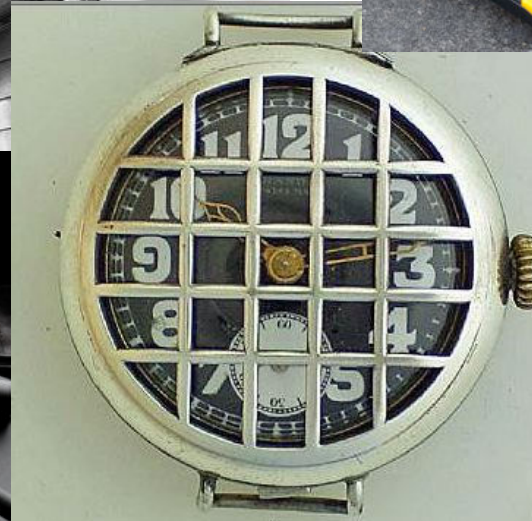
- **Engine :** Engine Displacement (CC) - 149.1 CC
Engine Type DTS-I - Air Cooled
Power (PS@rpm) - 15.6 PS
Torque (Nm@rpm) - 12.5 Nm
- **Chassis Type :** Double Cradle Frame
- **Length :** 2055 mm
- **Wheel base :** 1320 mm

Packaging

The riders pose should be upright with standard commuter vehicle foot pegs position. High visors for wind protection, high suspension travel and enough protection for rider and engine. The cost must be low as possible.



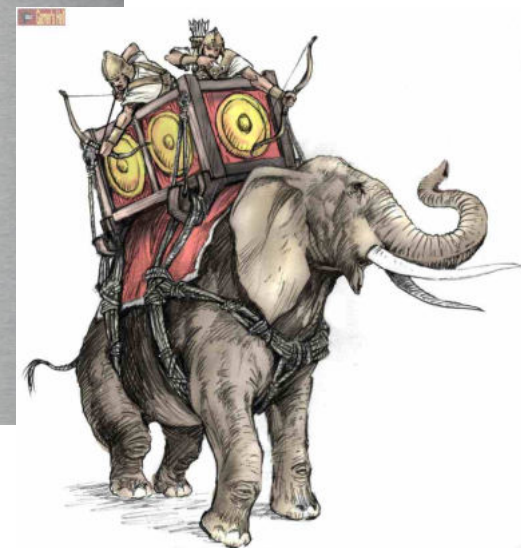
Rugged



Versatile



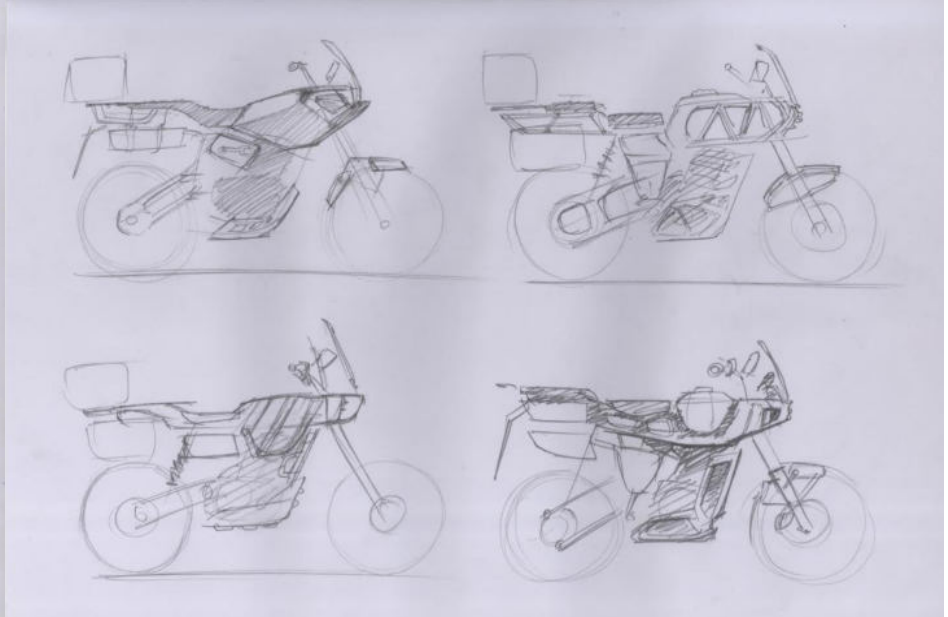
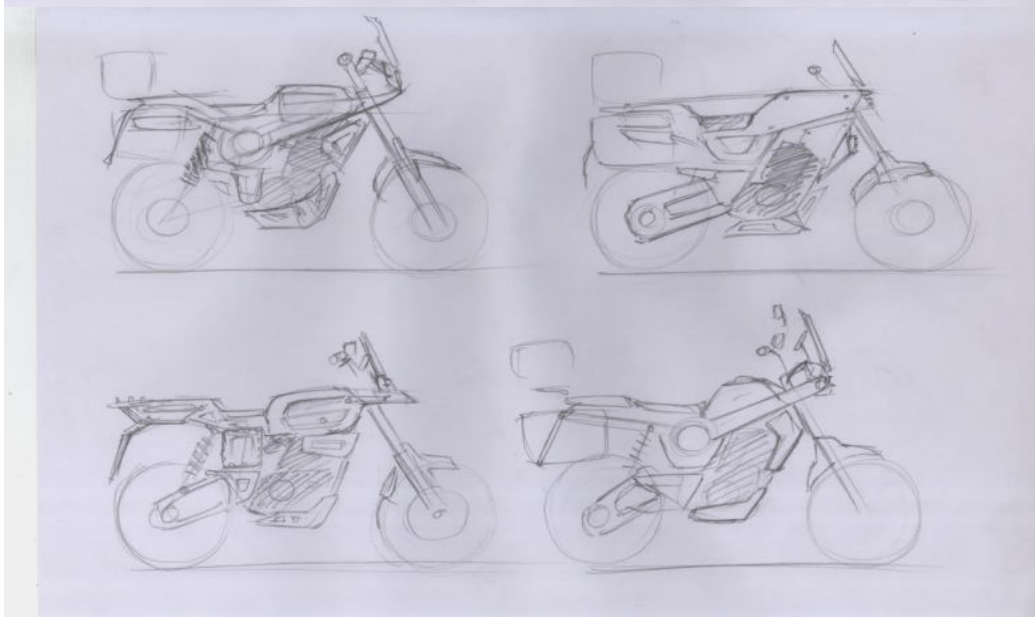
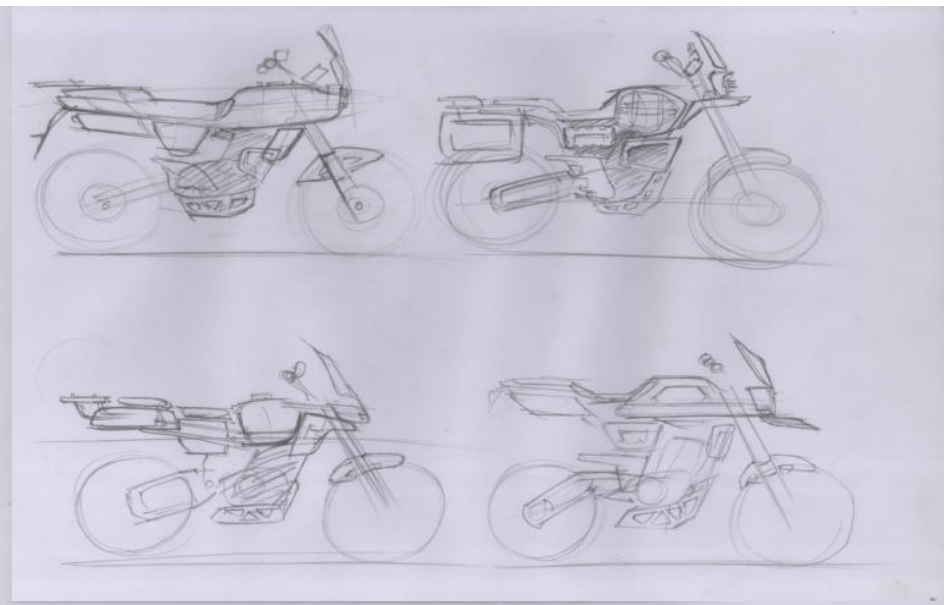
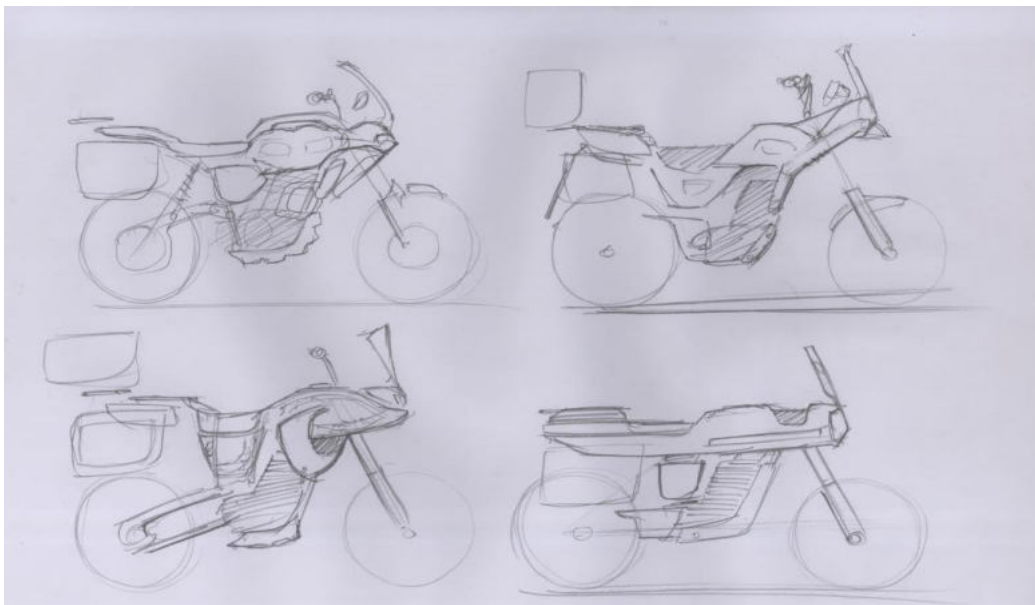
wiseGEEK

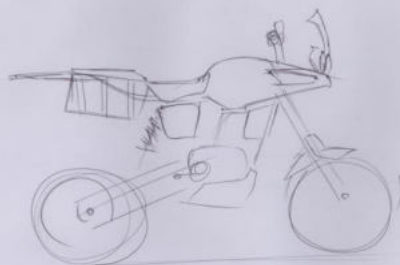
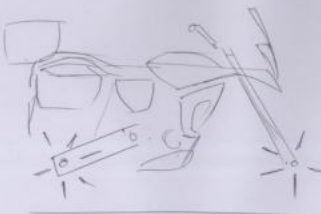
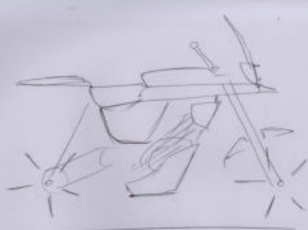
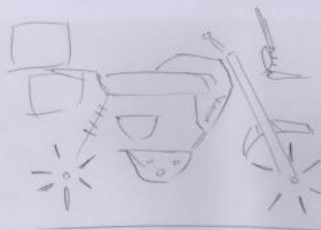
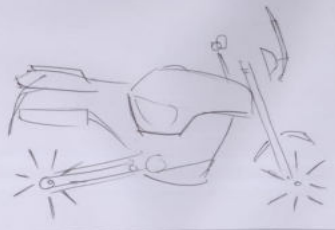
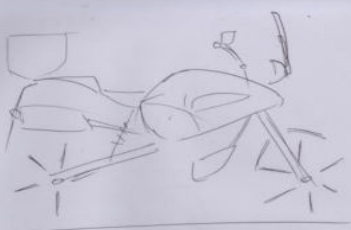


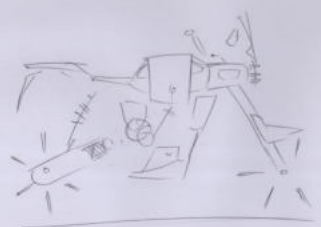
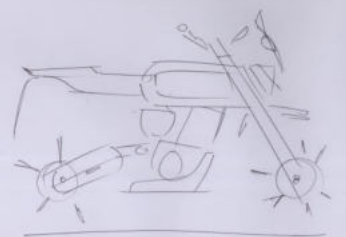
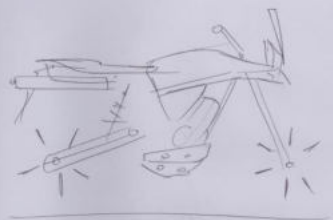
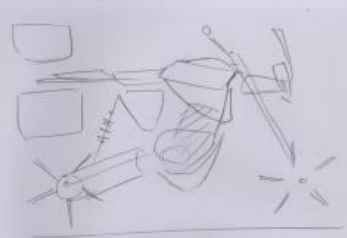
One with nature

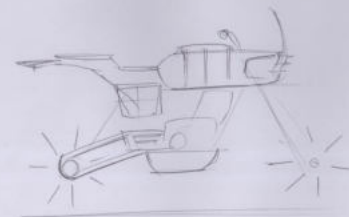
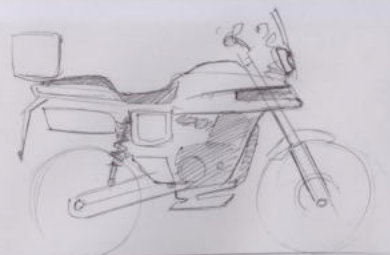
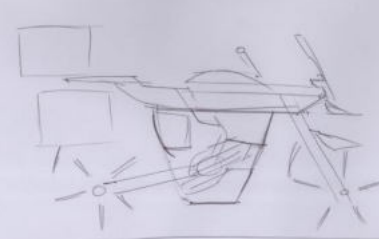
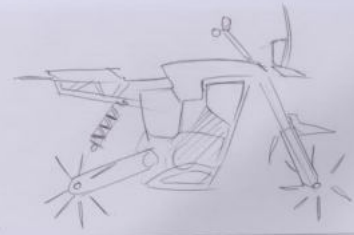


Initial Explorations









Directional Renders



Ergonomics



2013 KTM 1190 Adventure

Calculated seat height: 34.0"
Forward lean: 6°
Knee angle: 95° (smaller number means more bent)
Hip angle: 96° (smaller number means more crouched)



2013 Ducati Multistrada 1200

Calculated seat height: 33.9"
Forward lean: 3°
Knee angle: 91° (smaller number means more bent)
Hip angle: 95° (smaller number means more crouched)



2013 Kawasaki Versys 1000

Calculated seat height: 33.5"
Forward lean: 0°
Knee angle: 93° (smaller number means more bent)
Hip angle: 89° (smaller number means more crouched)



2013 BMW R1200GS

Calculated seat height: 34.4"
Forward lean: 6°
Knee angle: 96° (smaller number means more bent)
Hip angle: 99° (smaller number means more crouched)



2014 Triumph Tiger Explorer XC

Calculated seat height: 33.8"
Forward lean: 9°
Knee angle: 92° (smaller number means more bent)



2012 Yamaha Super Tenere|XT 1200Z

Calculated seat height: 33.1"
Forward lean: 3°
Knee angle: 94° (smaller number means more bent)
Hip angle: 96° (smaller number means more crouched)



2012 Honda Crosstourer|VFR1200X

Calculated seat height: 33.8"
Forward lean: 6°
Knee angle: 93° (smaller number means more bent)
Hip angle: 88° (smaller number means more crouched)



2010 Suzuki V-Strom 1000|DL1000

Calculated seat height: 33.7"
Forward lean: 0°
Knee angle: 96° (smaller number means more bent)
Hip angle: 103° (smaller number means more crouched)



2012 KTM 990 Adventure

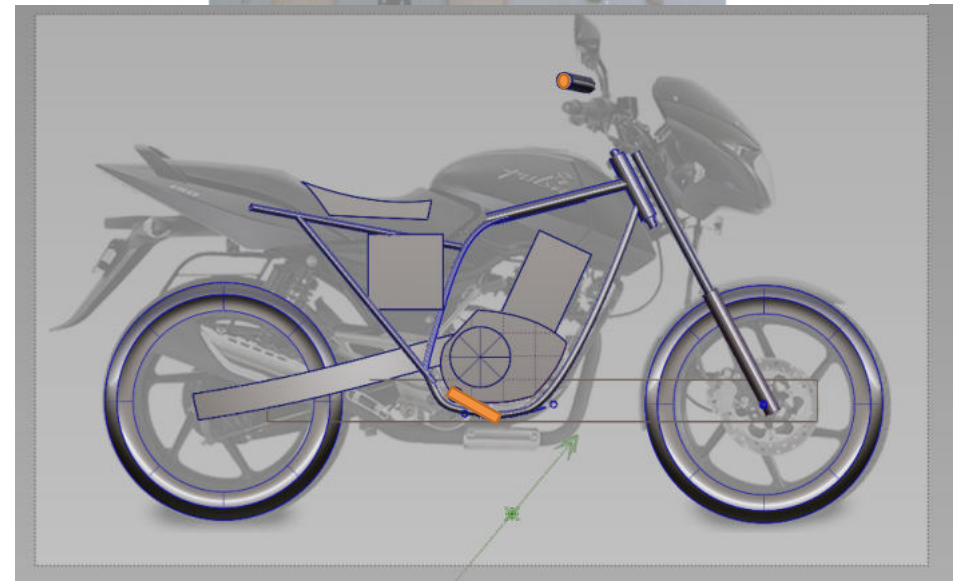
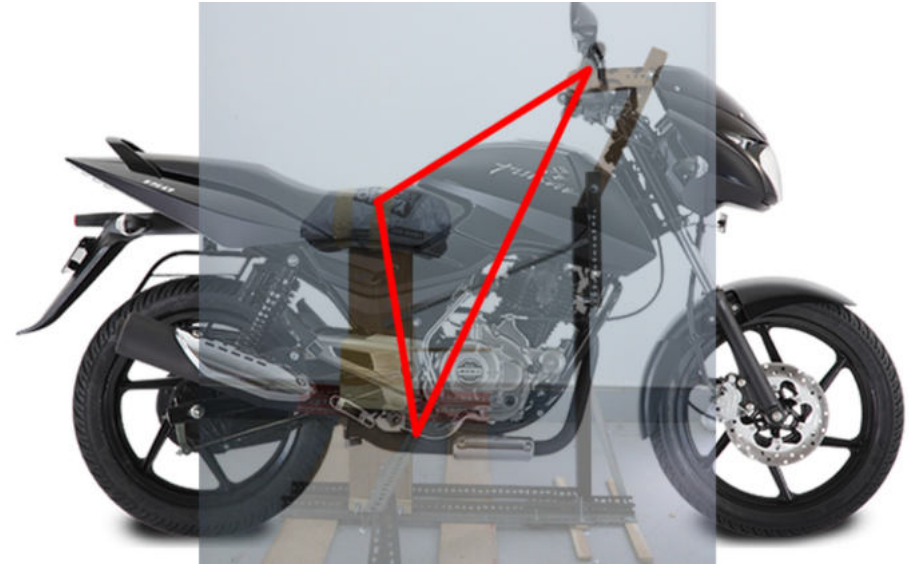
Calculated seat height: 34.3"
Forward lean: 2°
Knee angle: 95° (smaller number means more bent)
Hip angle: 99° (smaller number means more crouched)



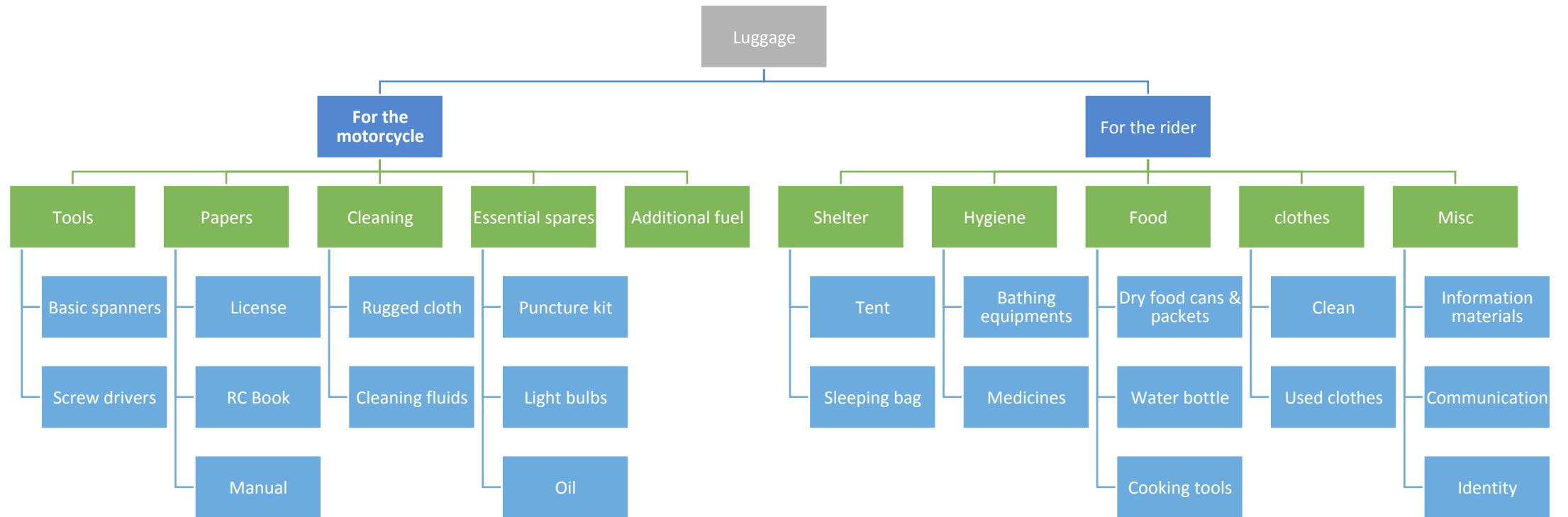
Test Rig

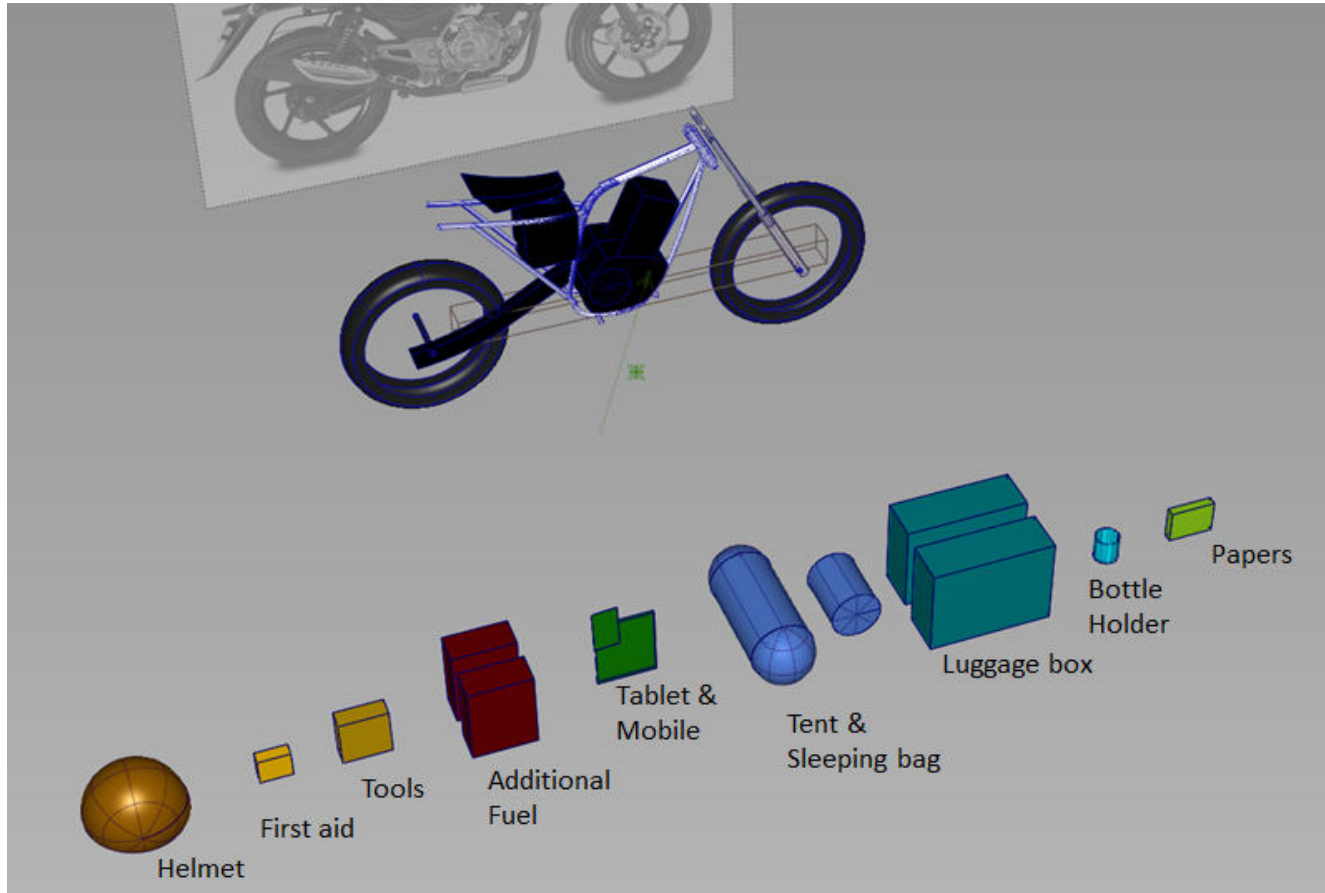


Finalized Ergonomics

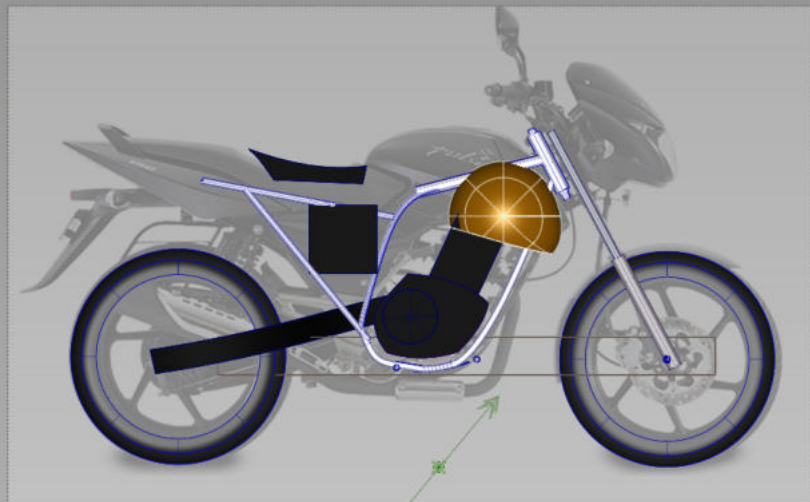
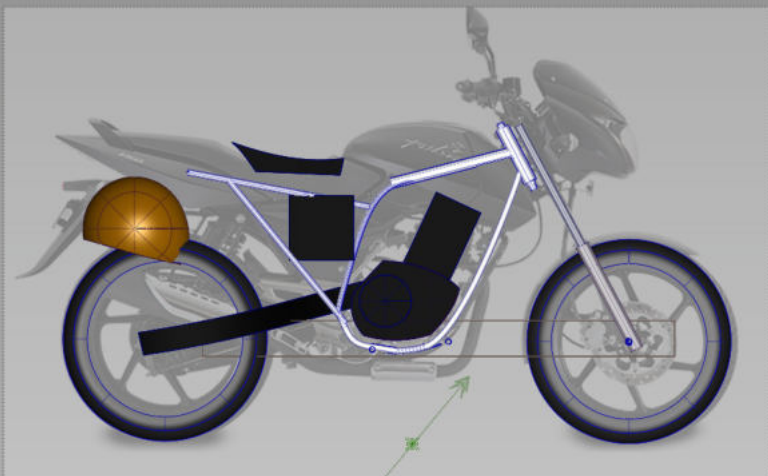
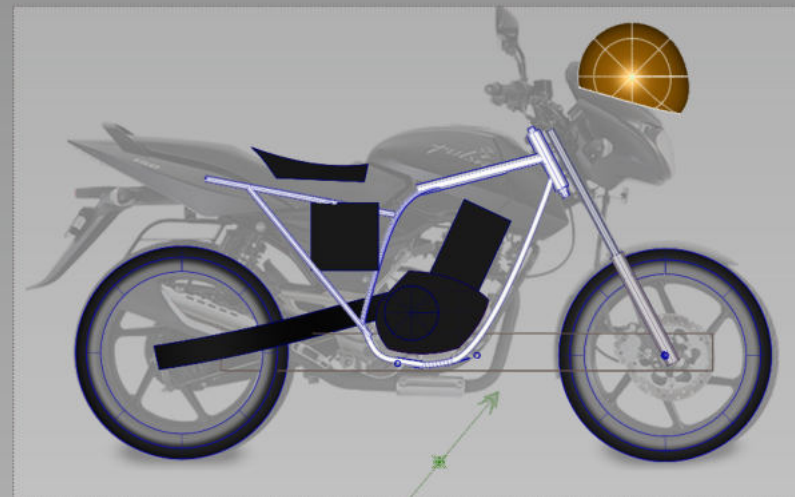
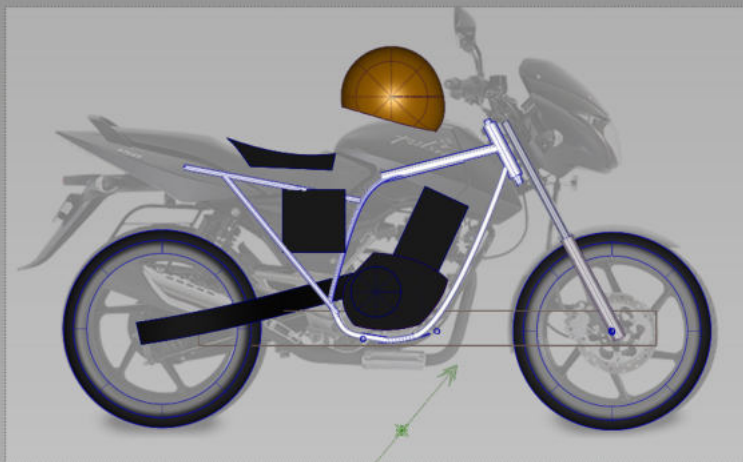
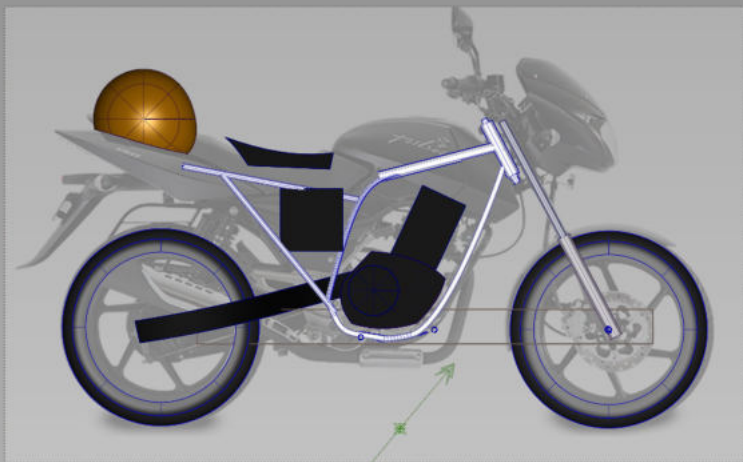


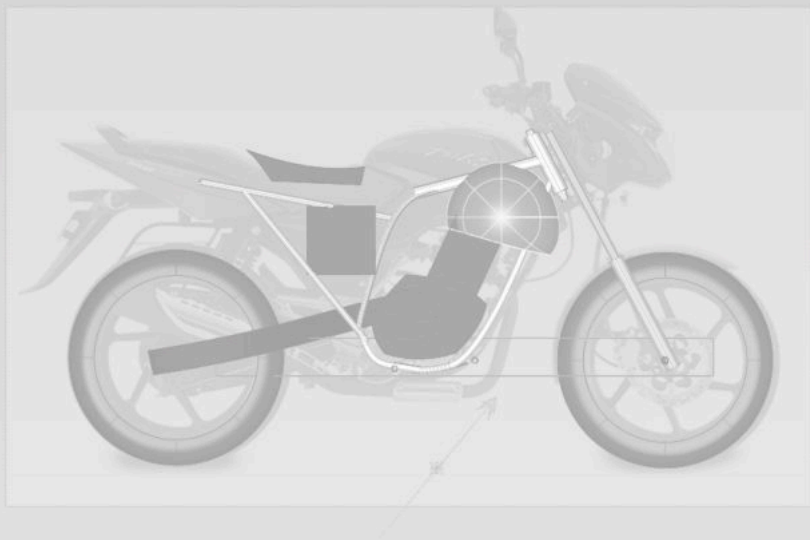
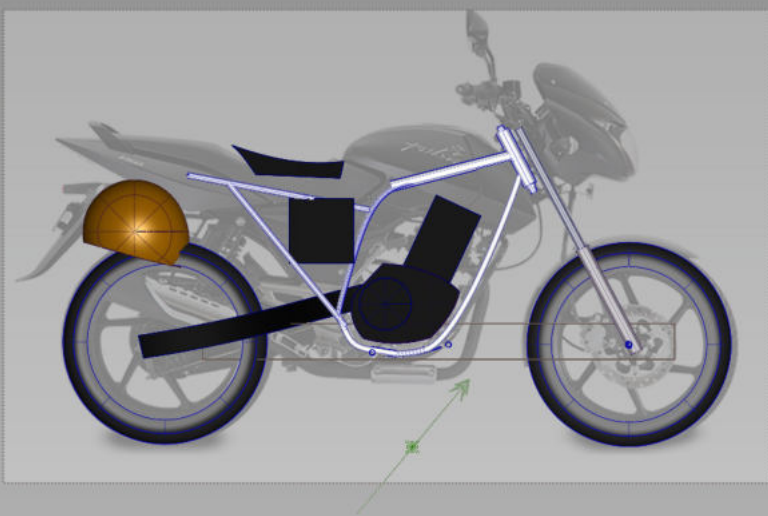
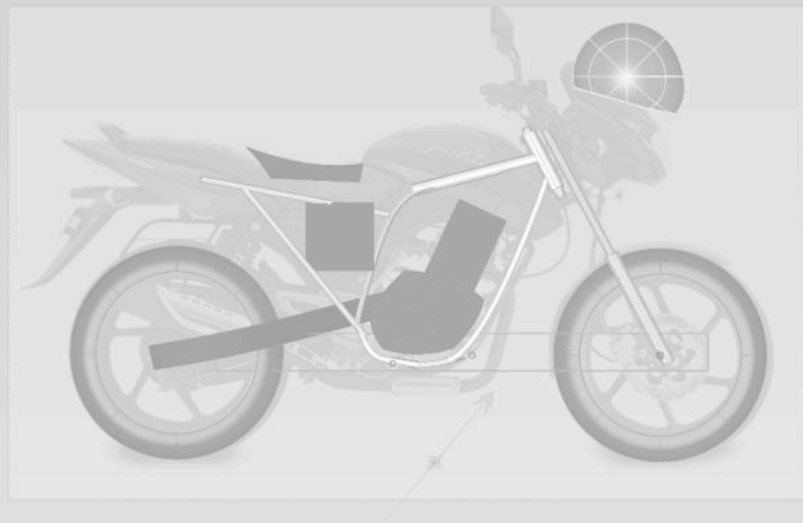
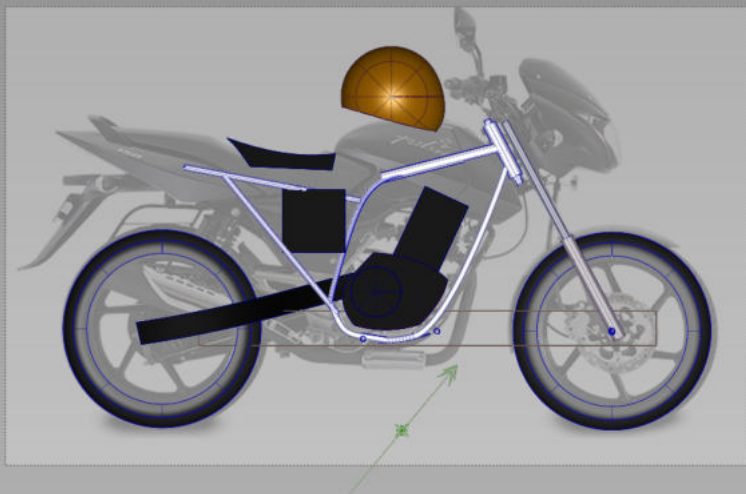
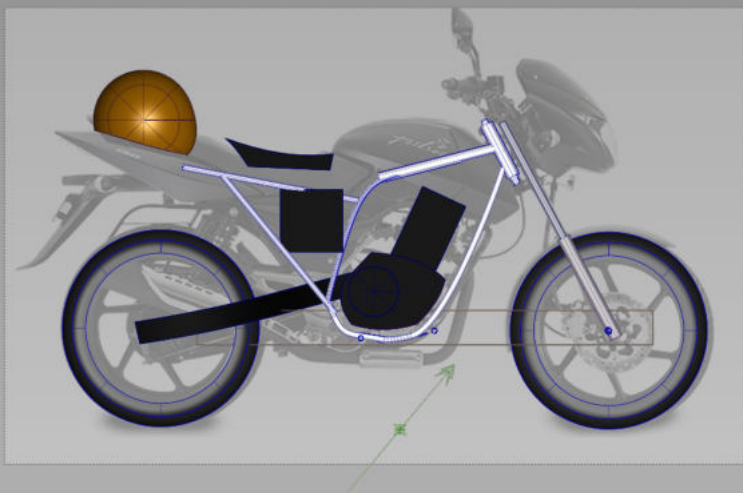
Luggage

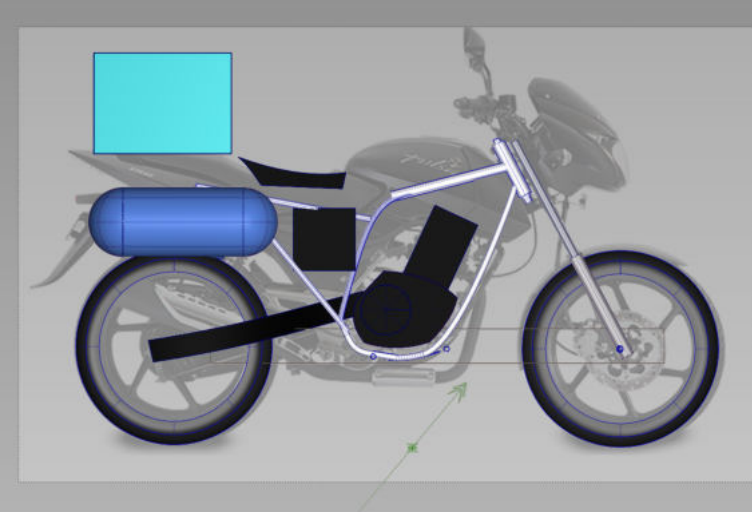
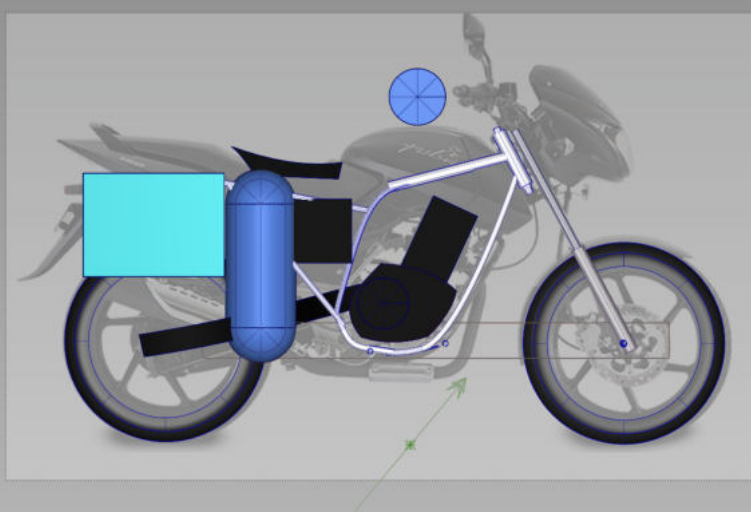
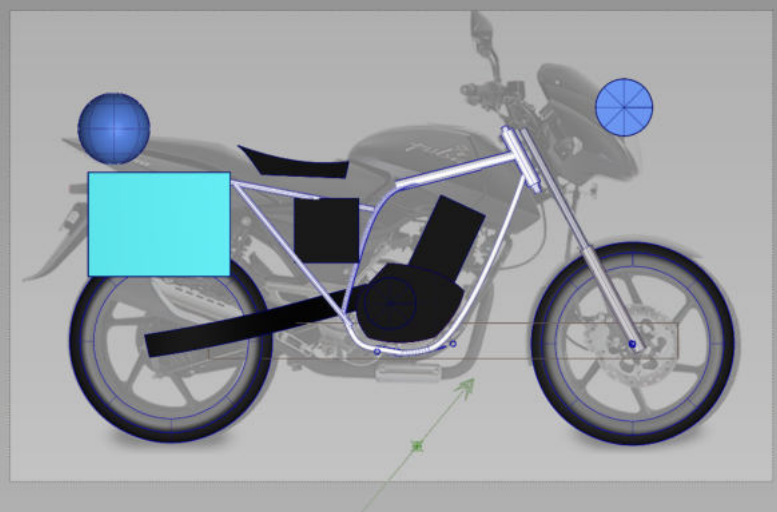
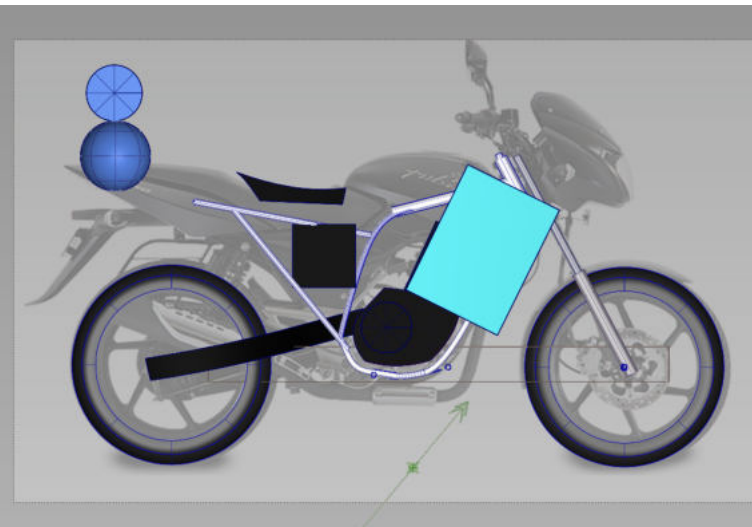
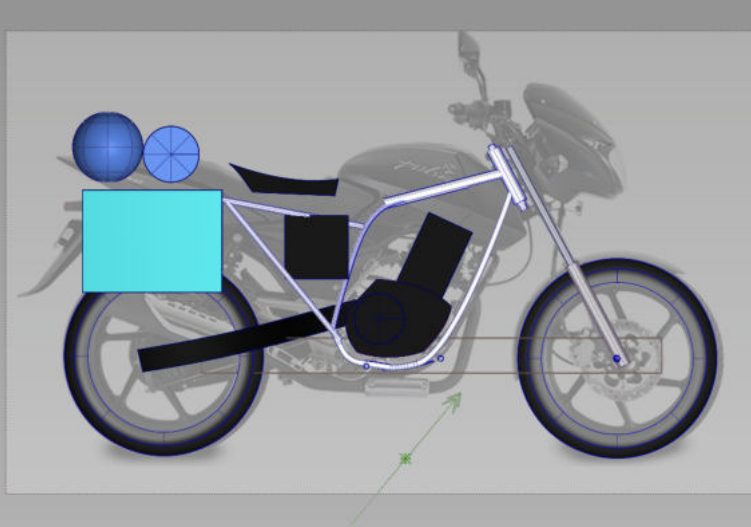
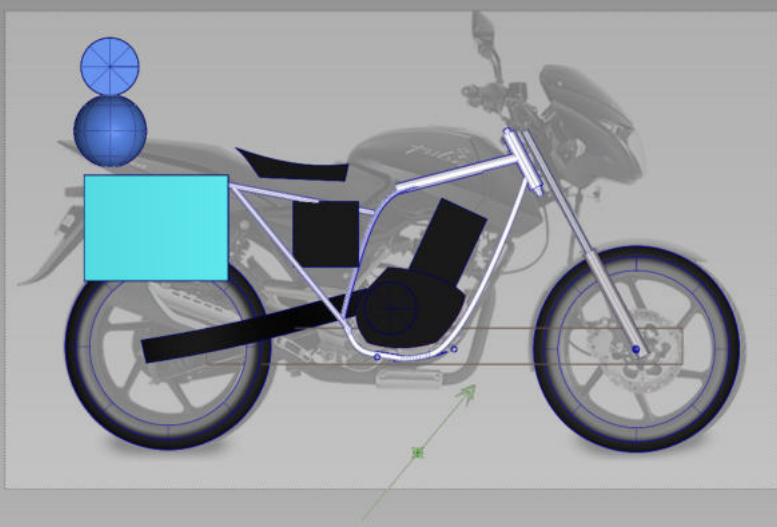


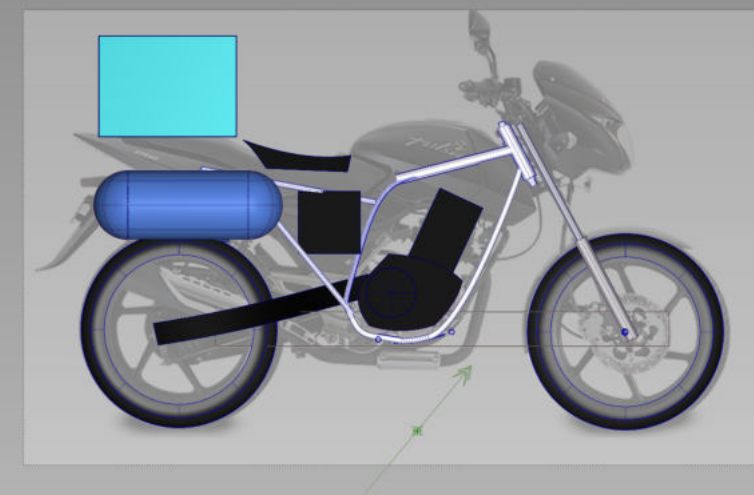
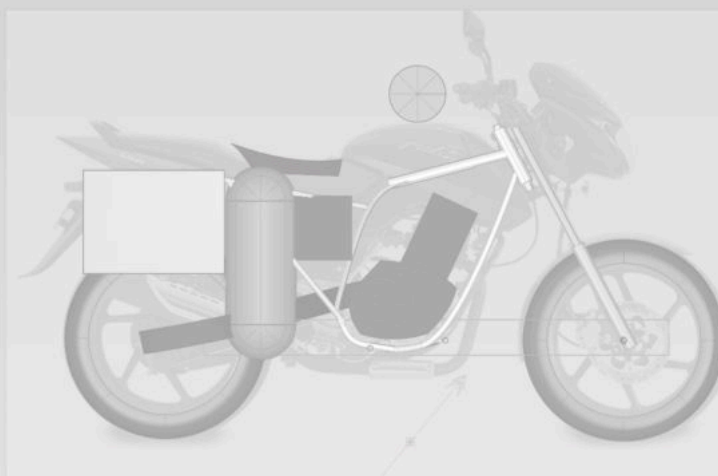
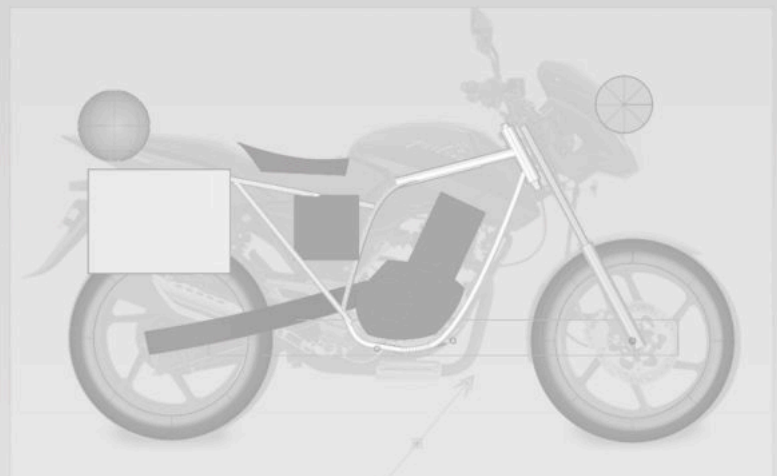
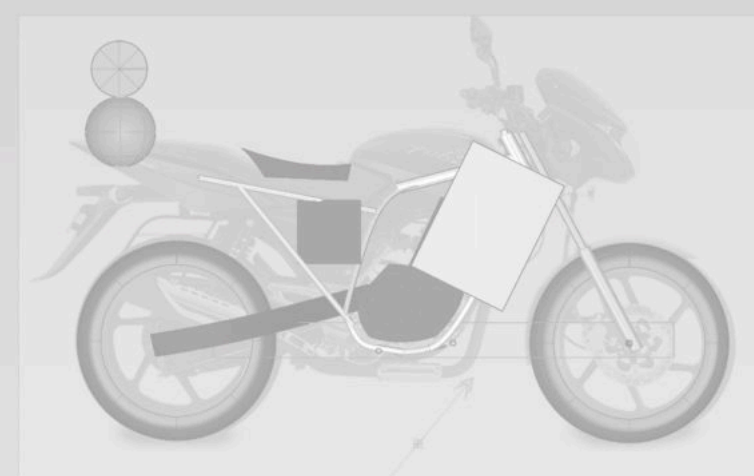
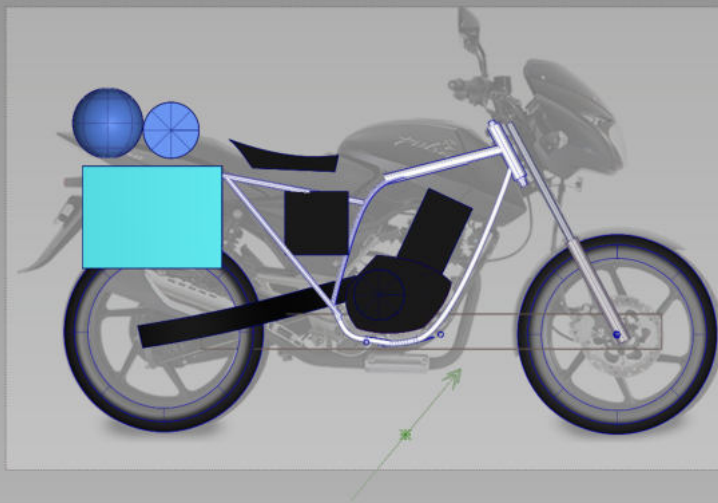
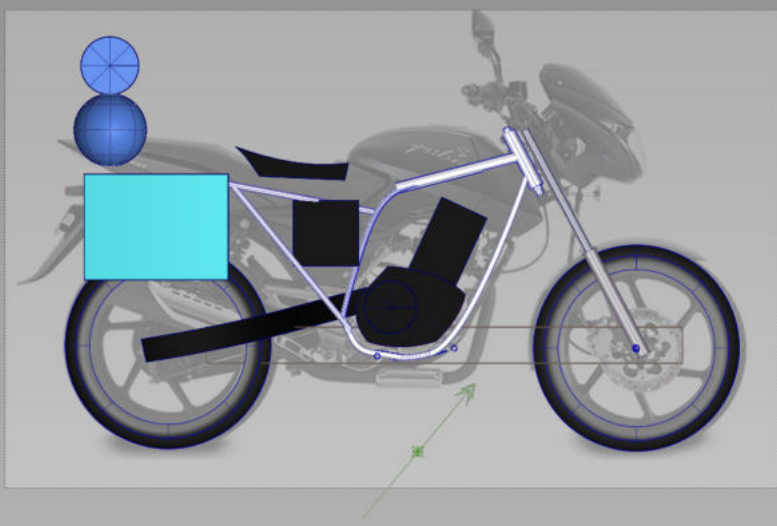


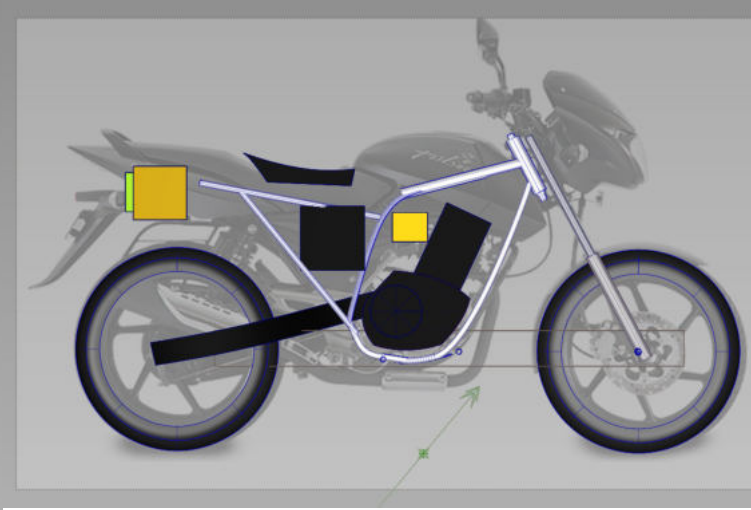
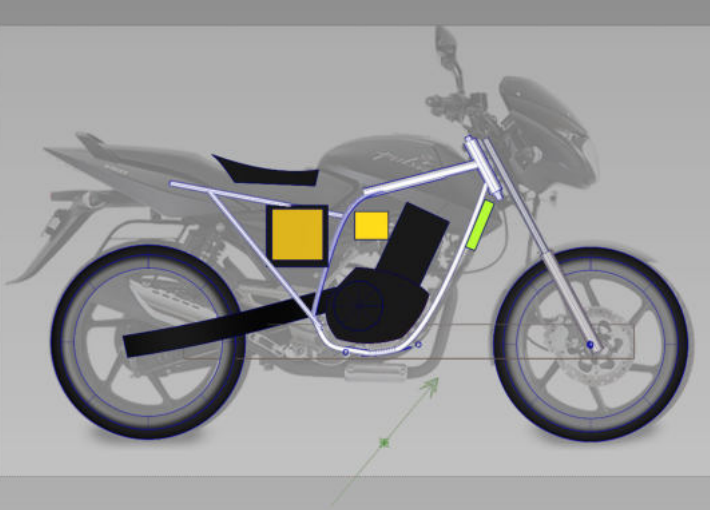
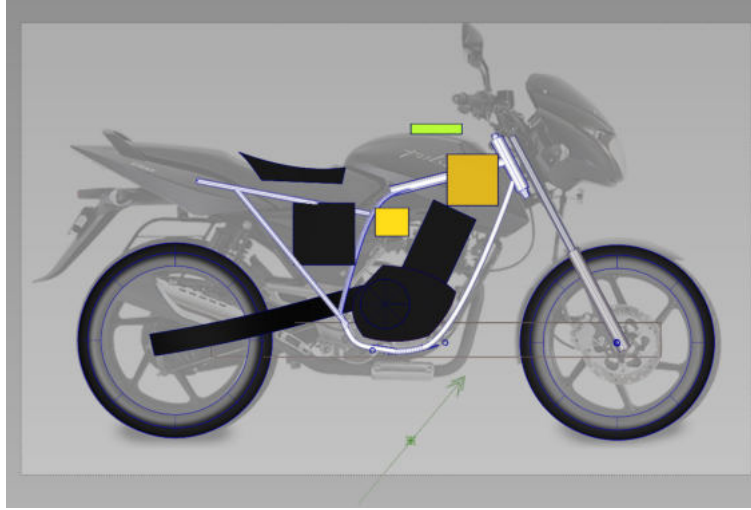
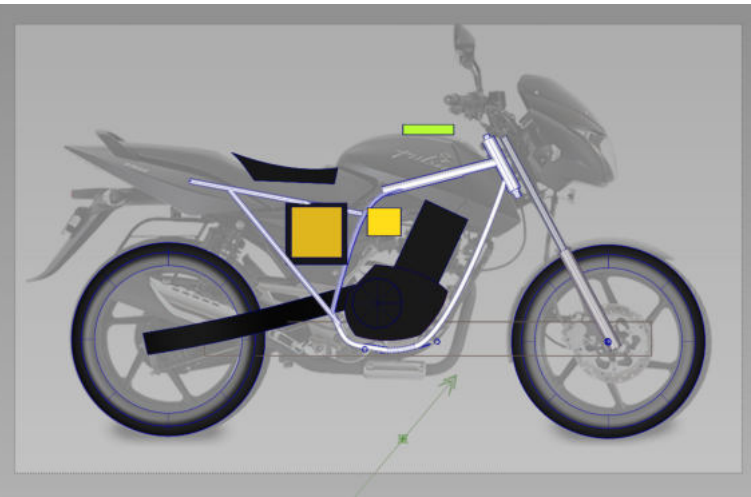
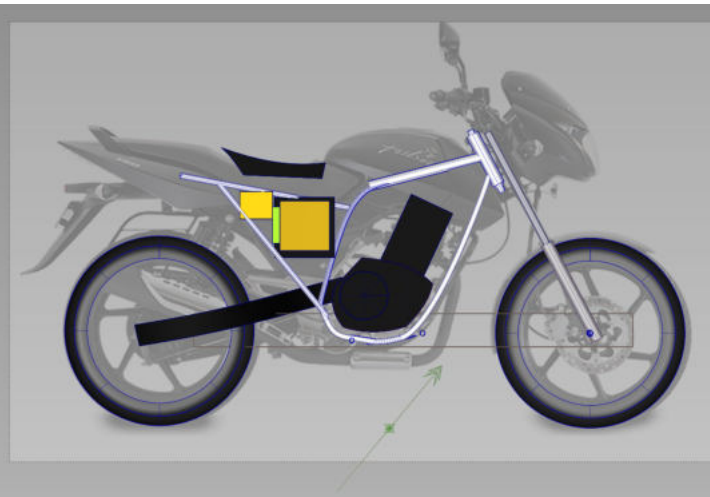
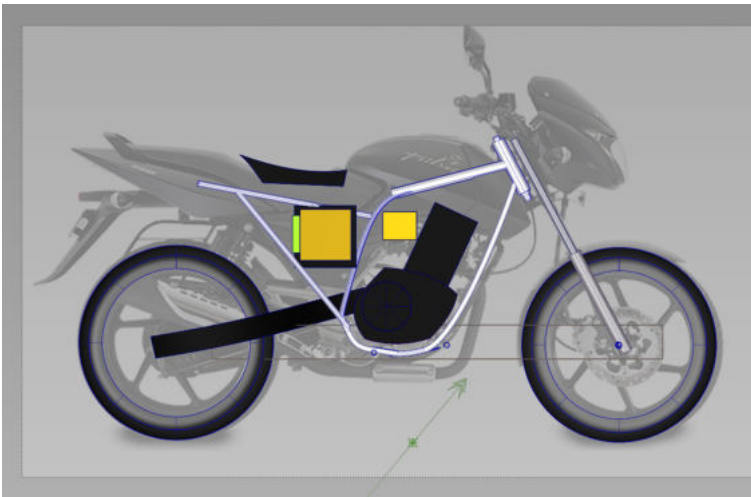
Tent – 200 X 550(diameter) mm
Sleeping Bag – 200 X 160(diameter) mm
Tool Box – 180 X 150 X 50 mm
Tablet – 240 X 185 X 94 mm
Mobile Phone – 150 X 80 X 10 mm
Water bottle – 80 mm diameter
First Aid kit – 100 X 90 X 50 mm
Additional Fuel – 5 L ,shape can vary

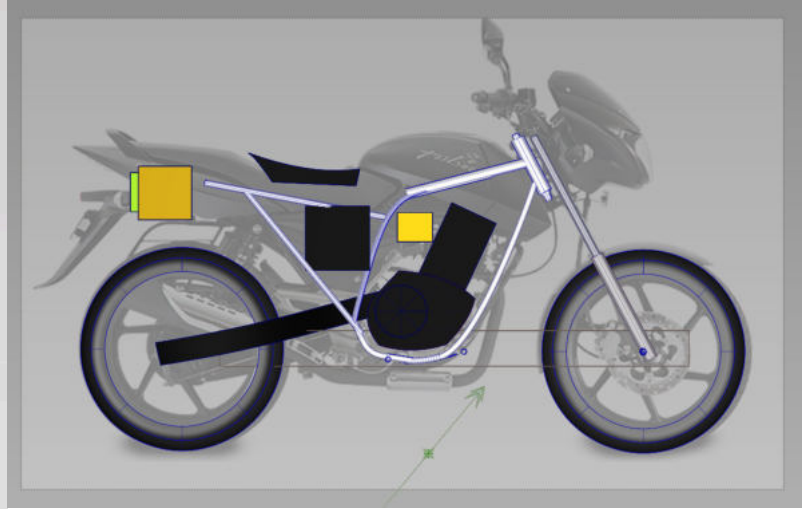
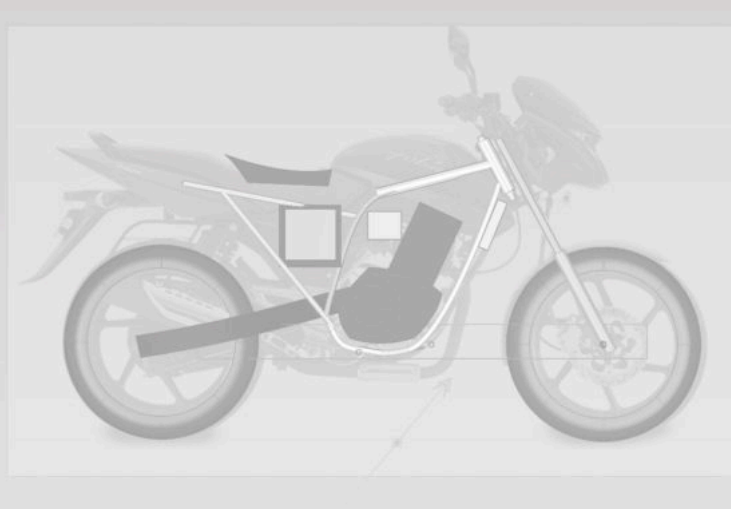
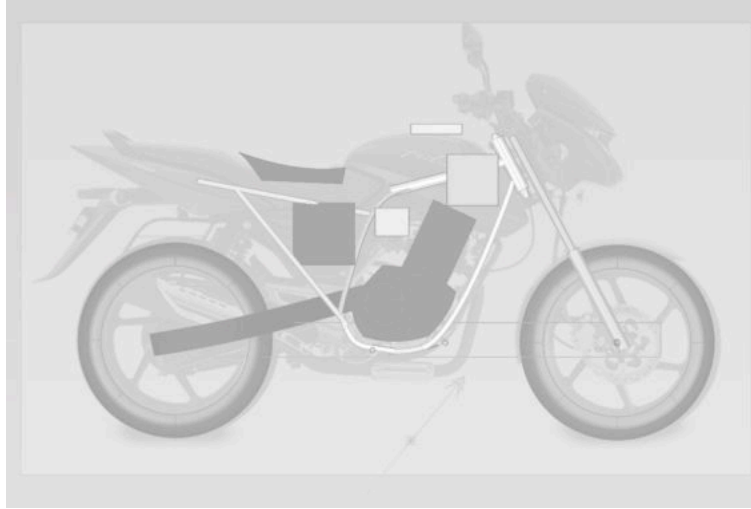
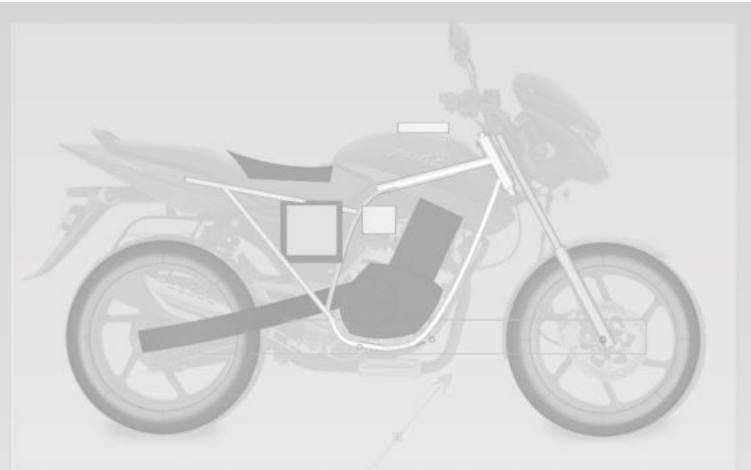
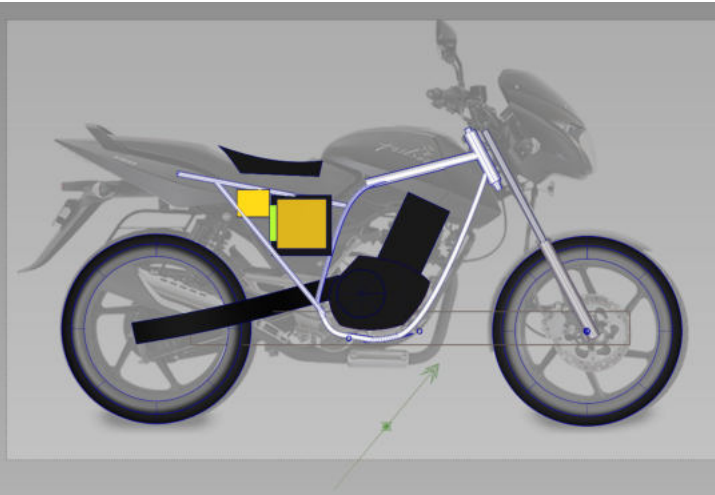
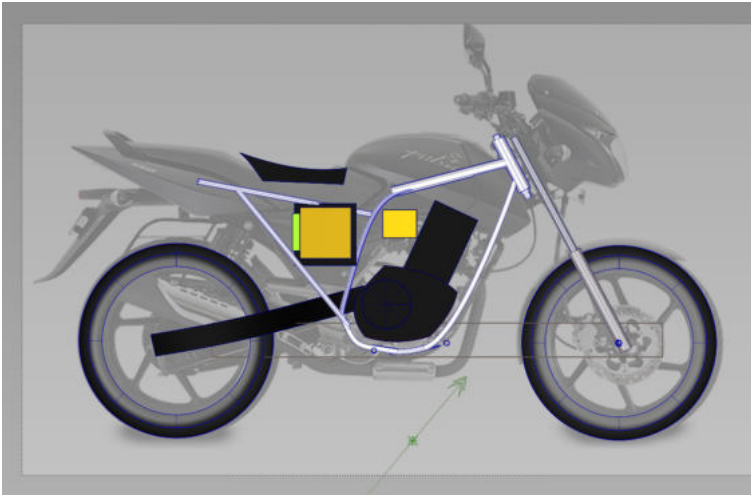


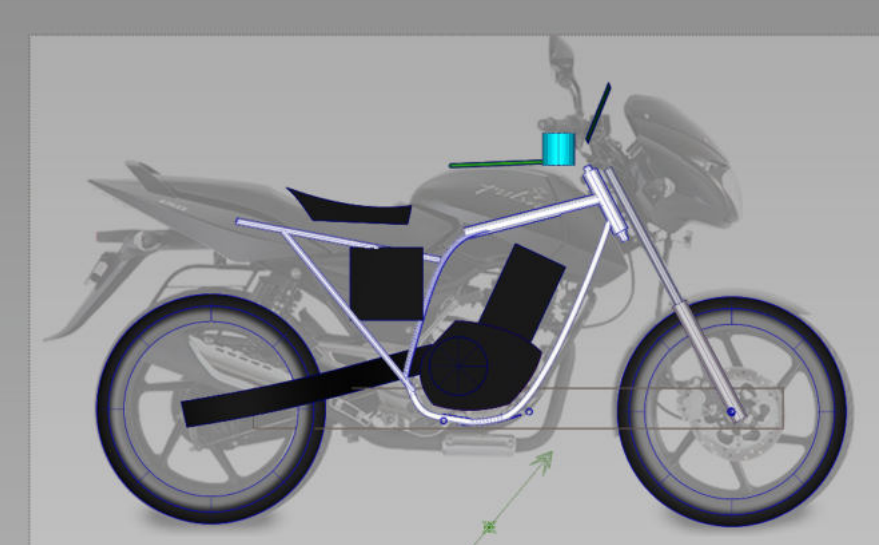
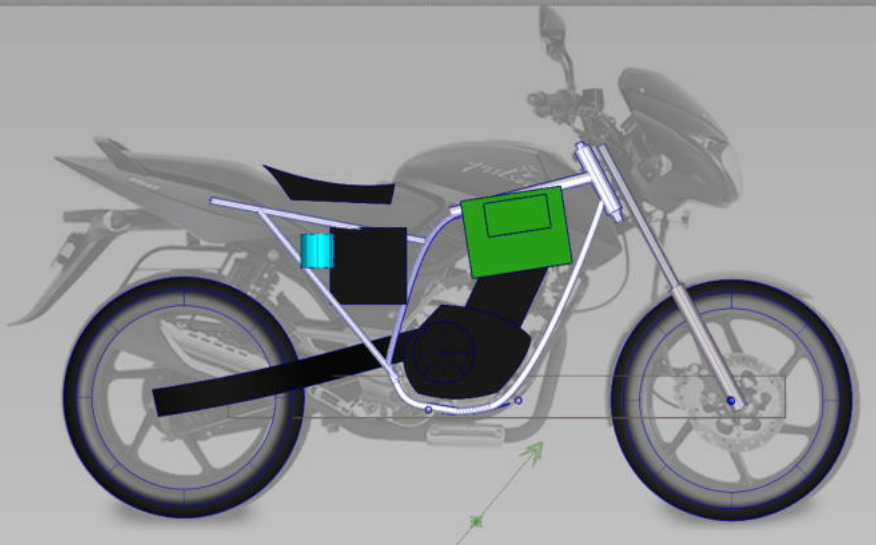
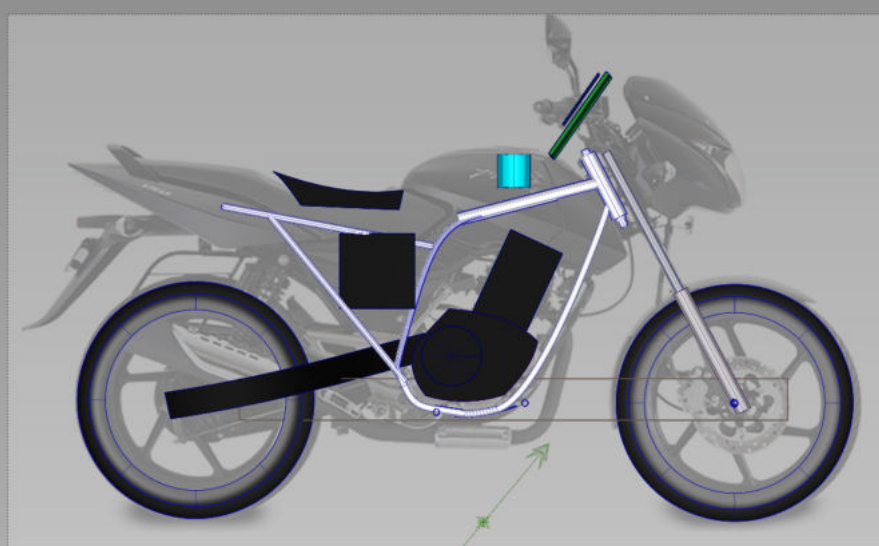
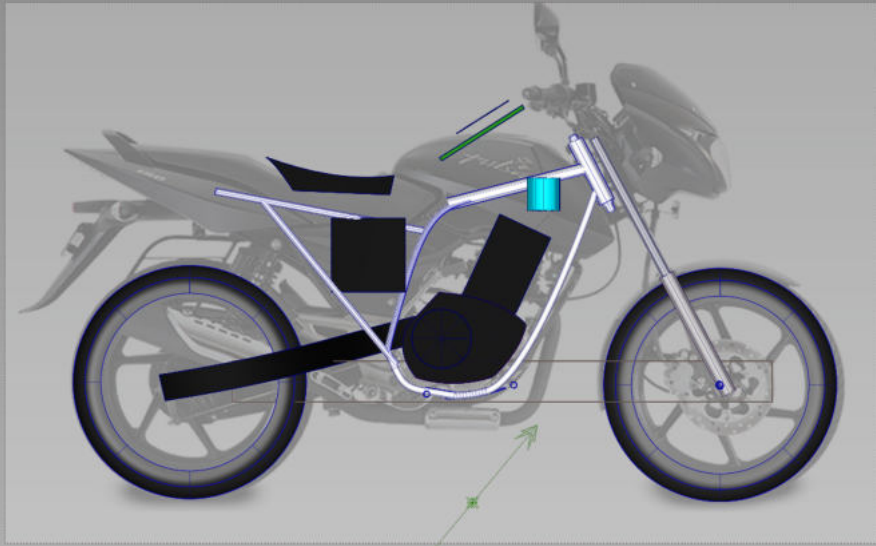


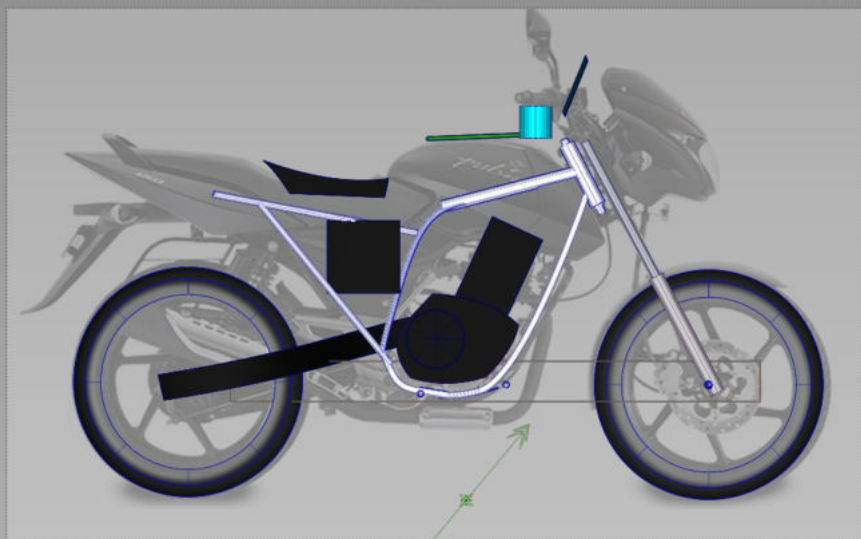
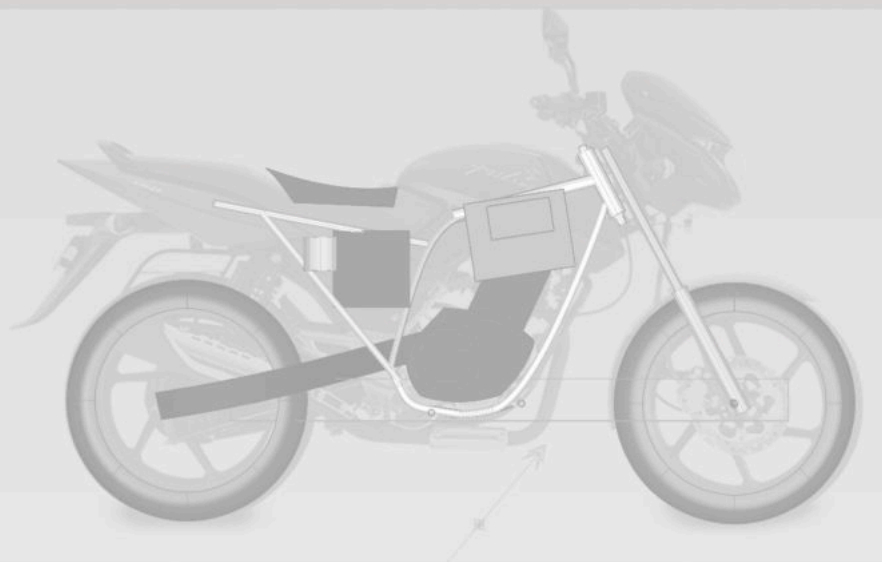
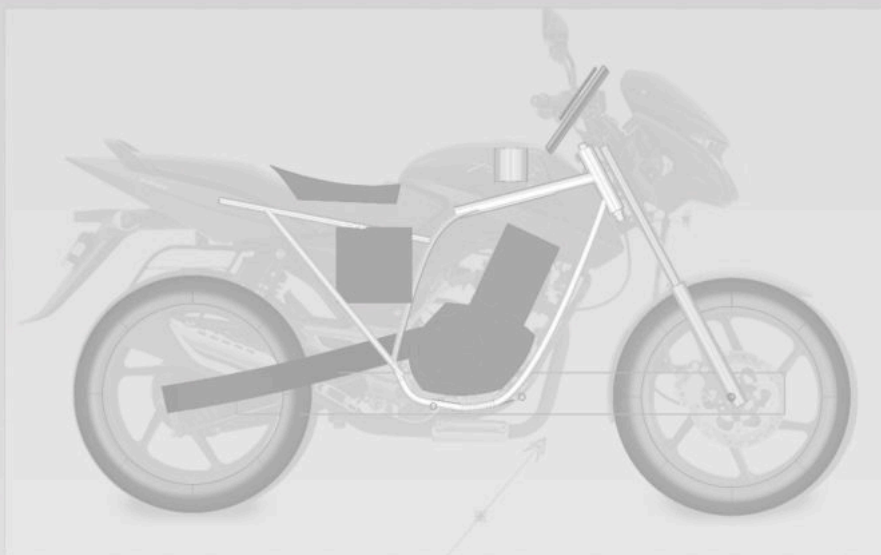
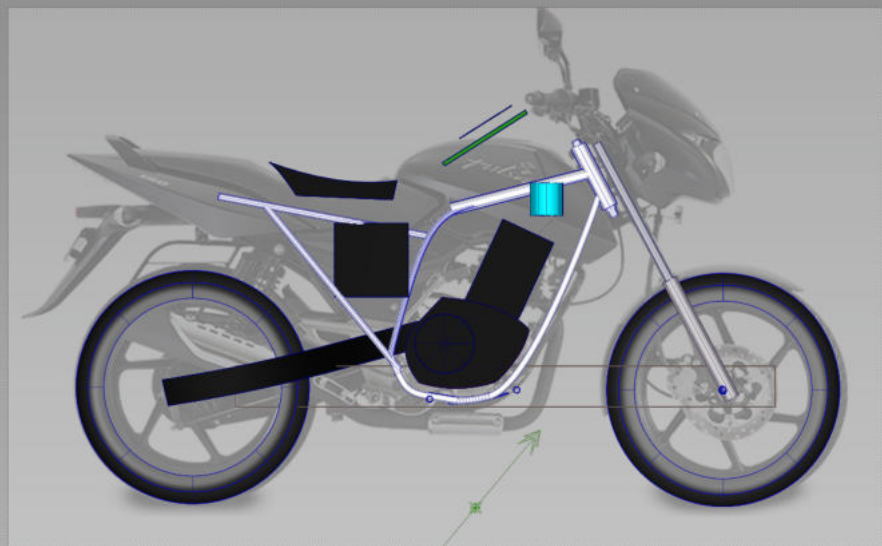


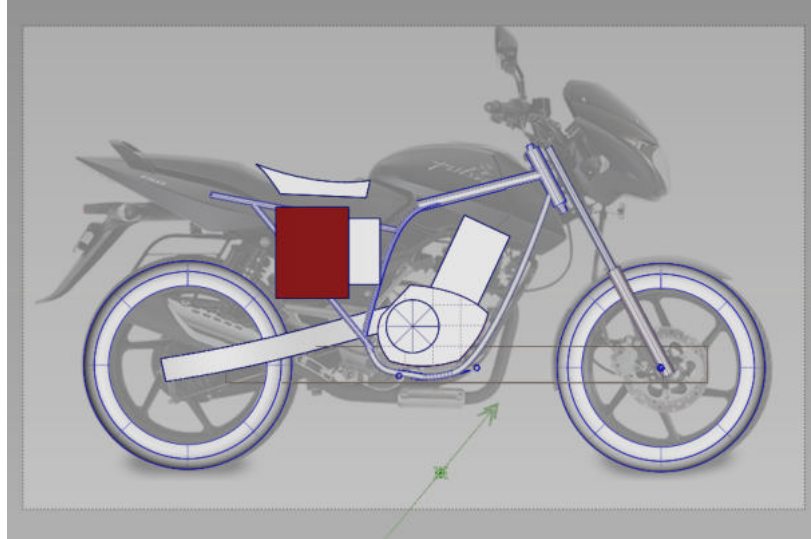
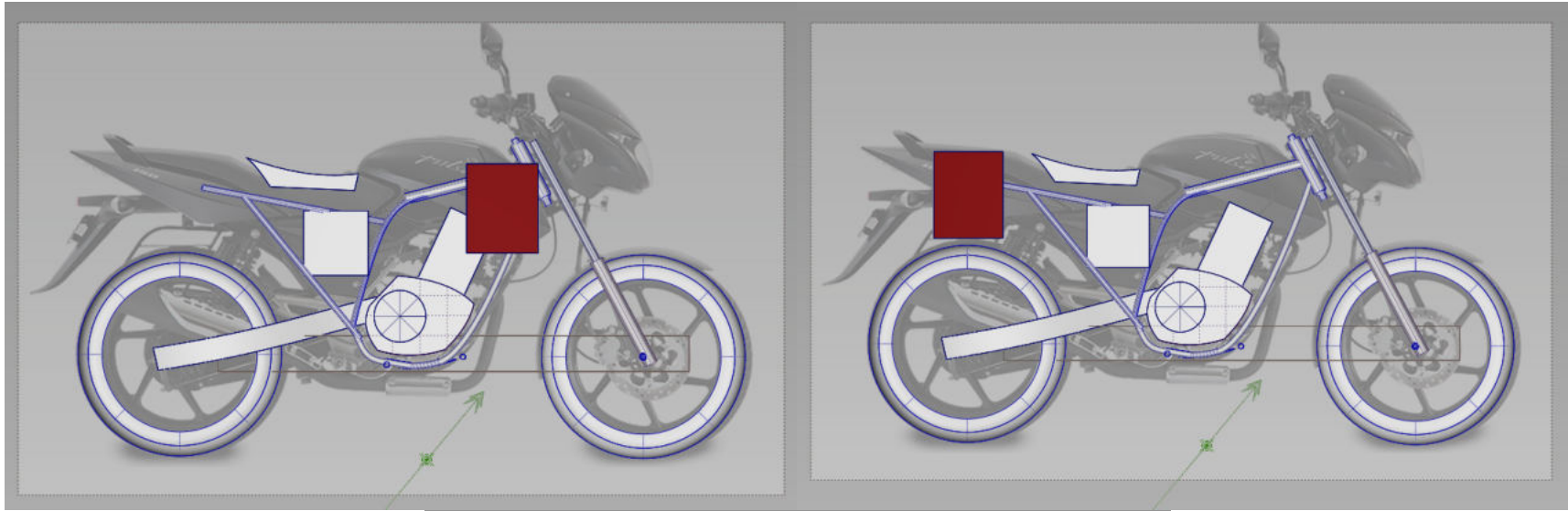


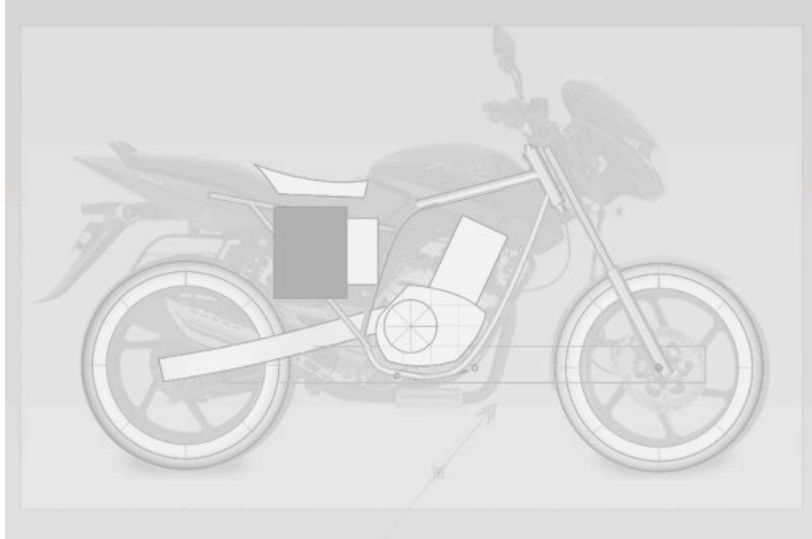
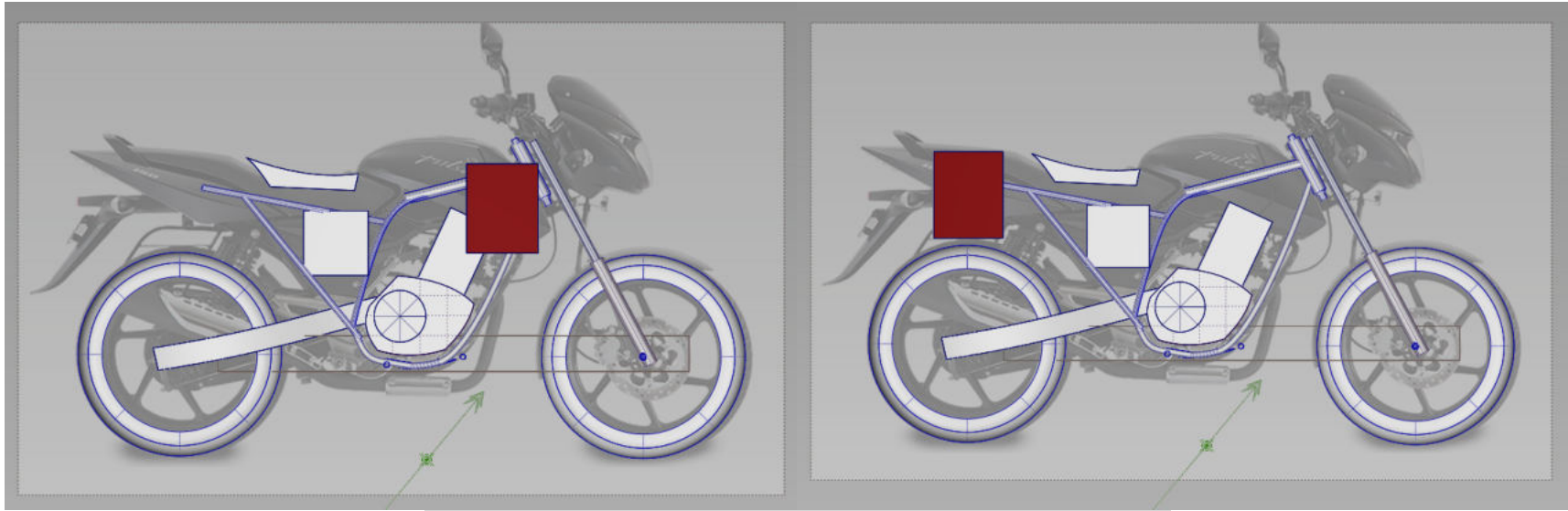


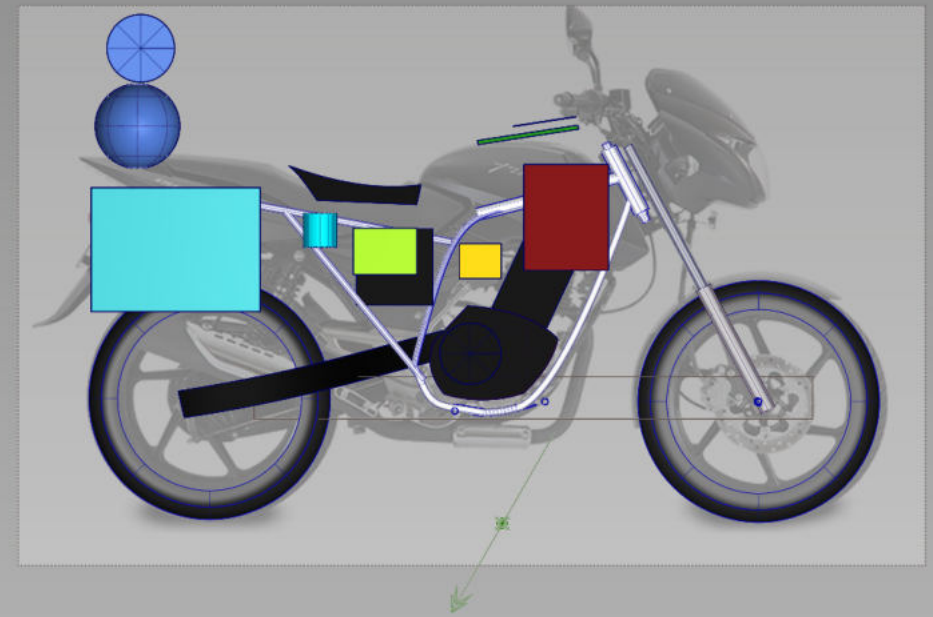
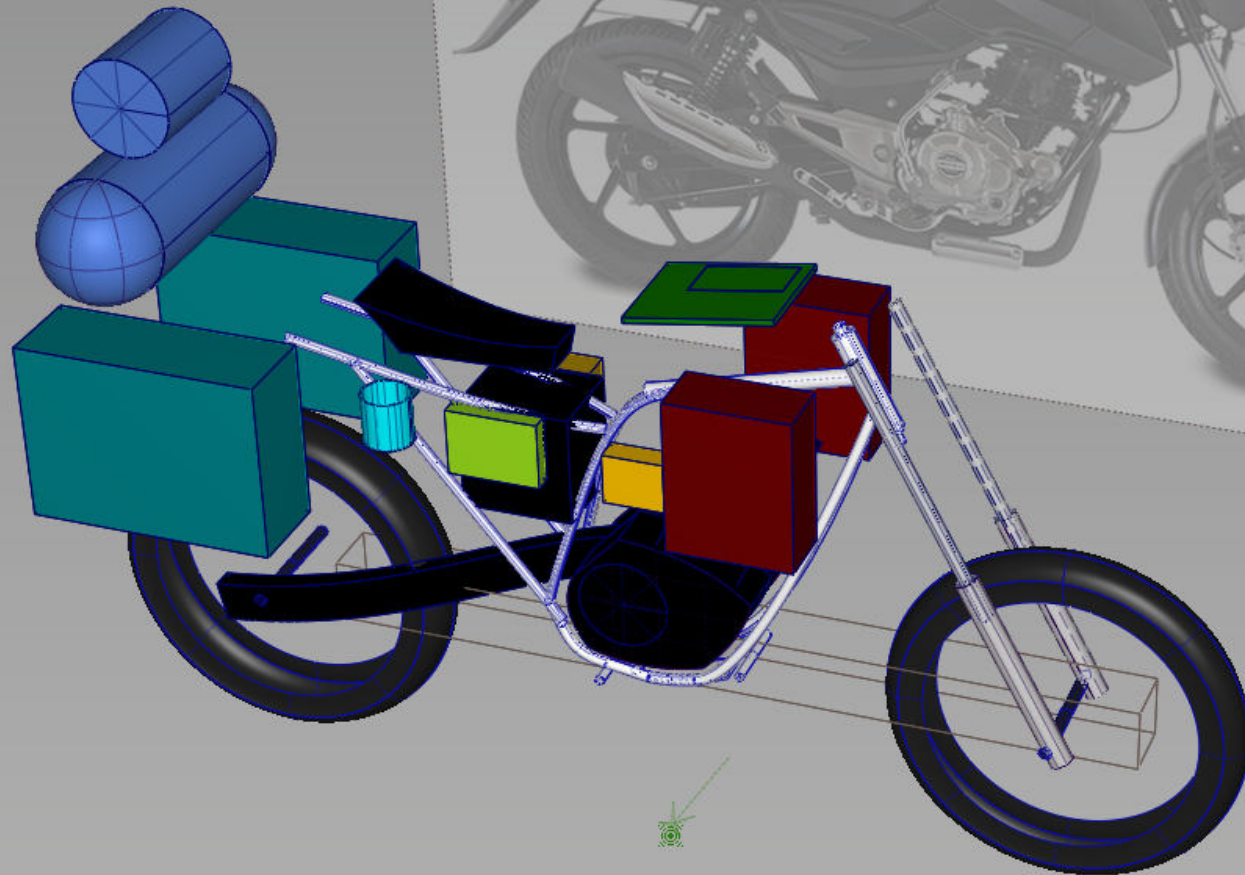




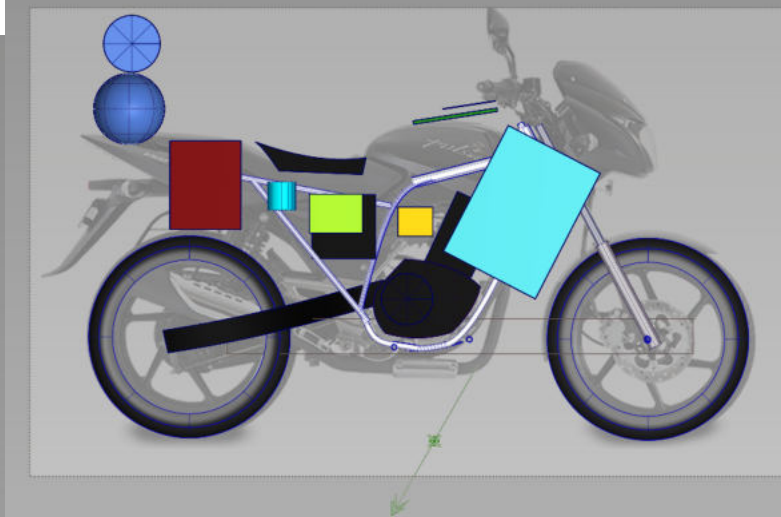
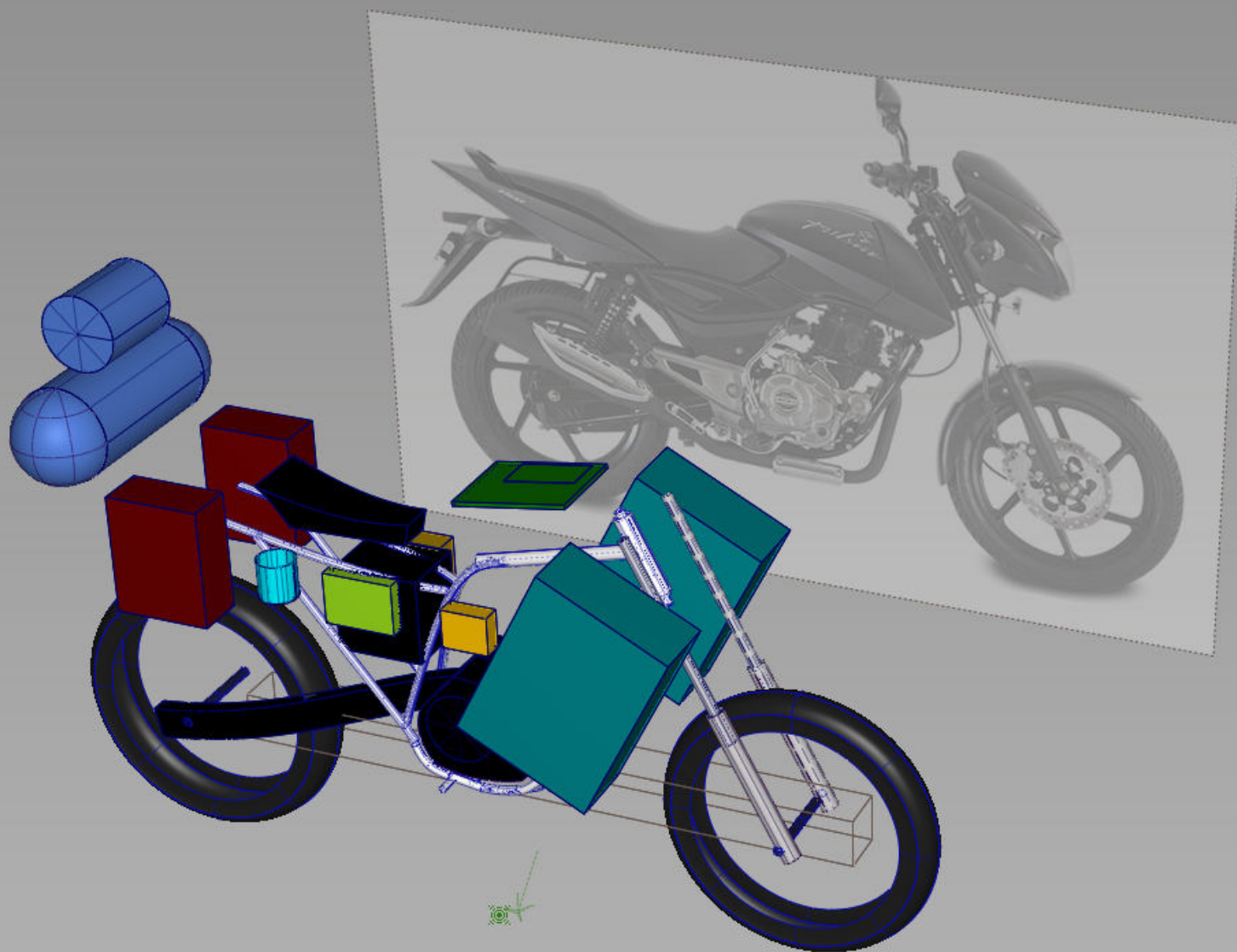




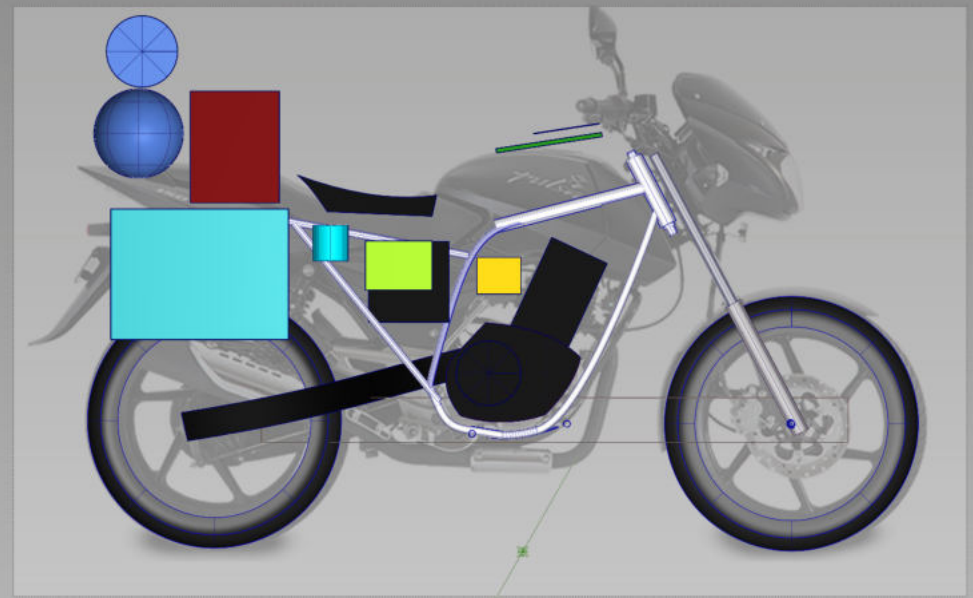
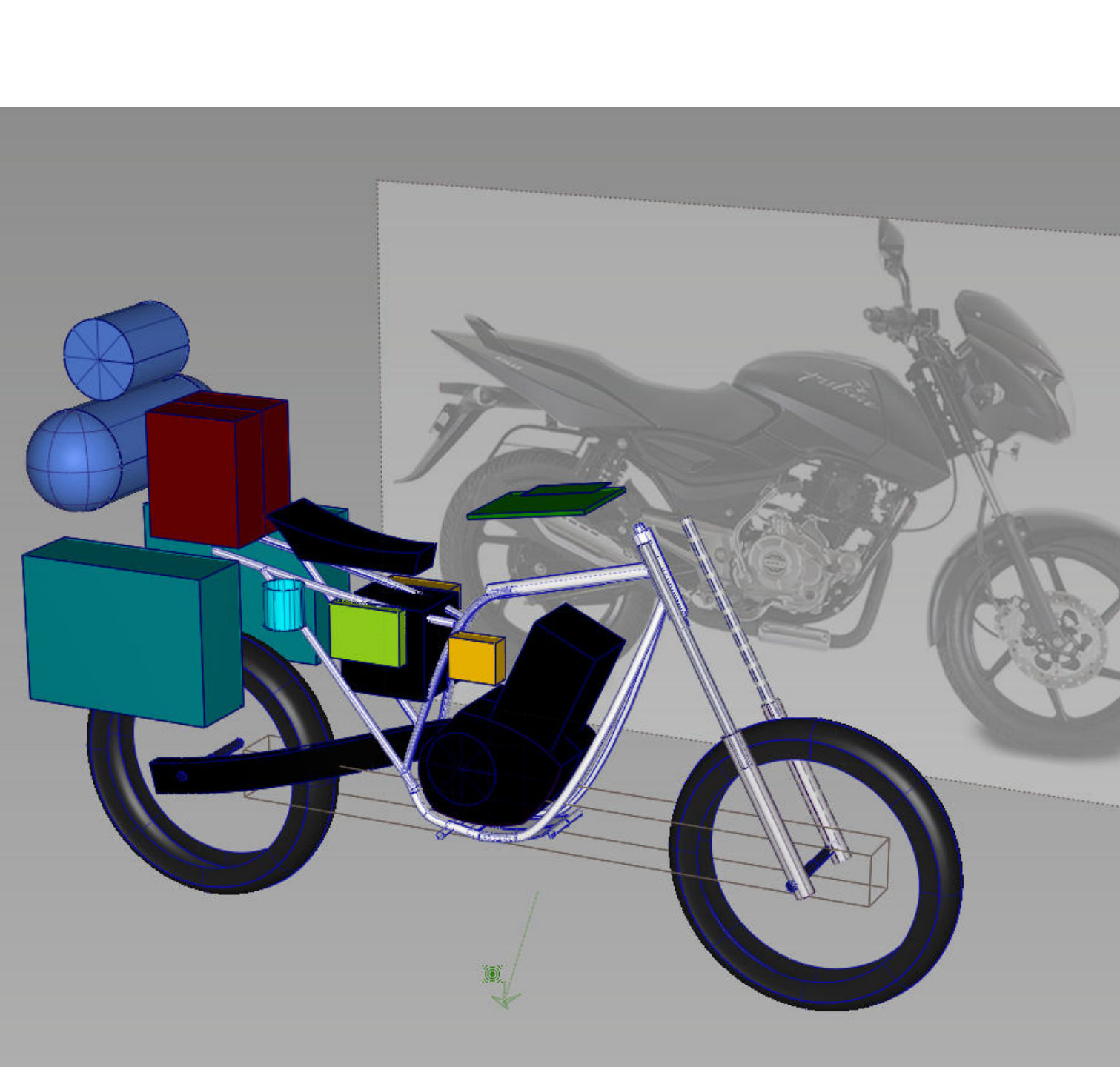




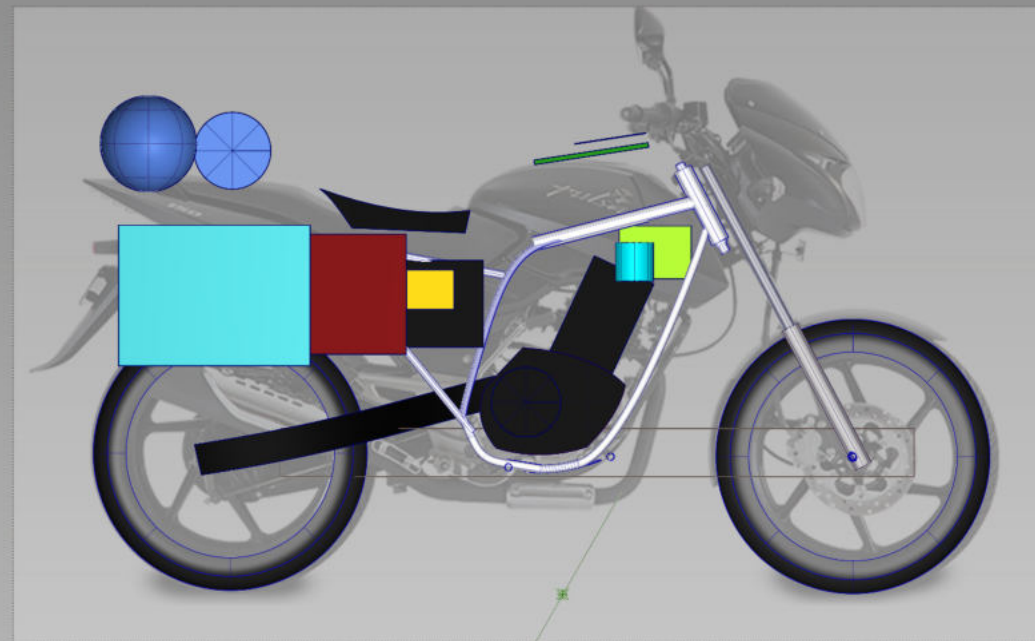
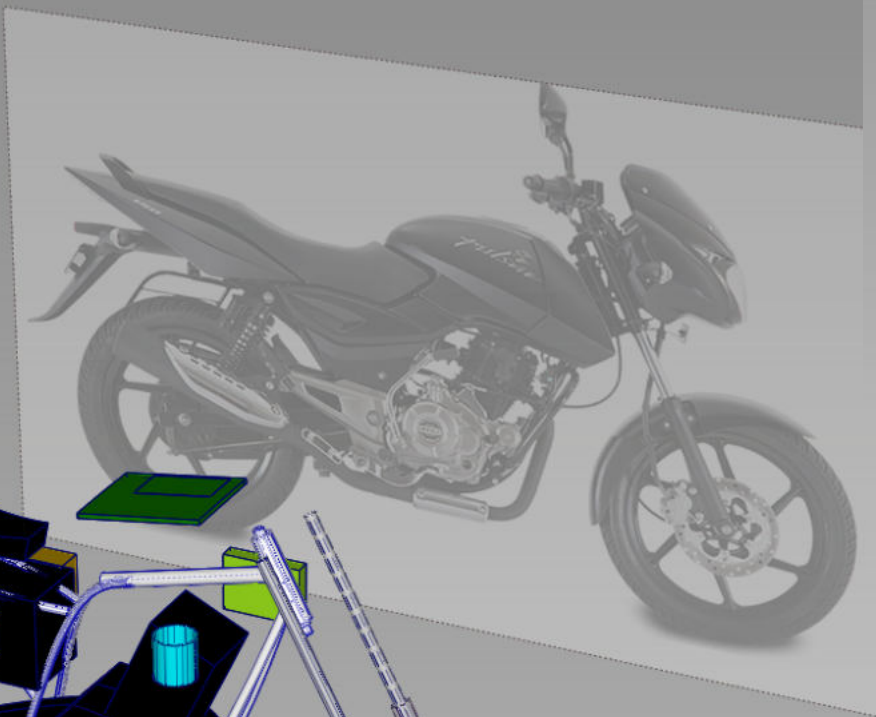
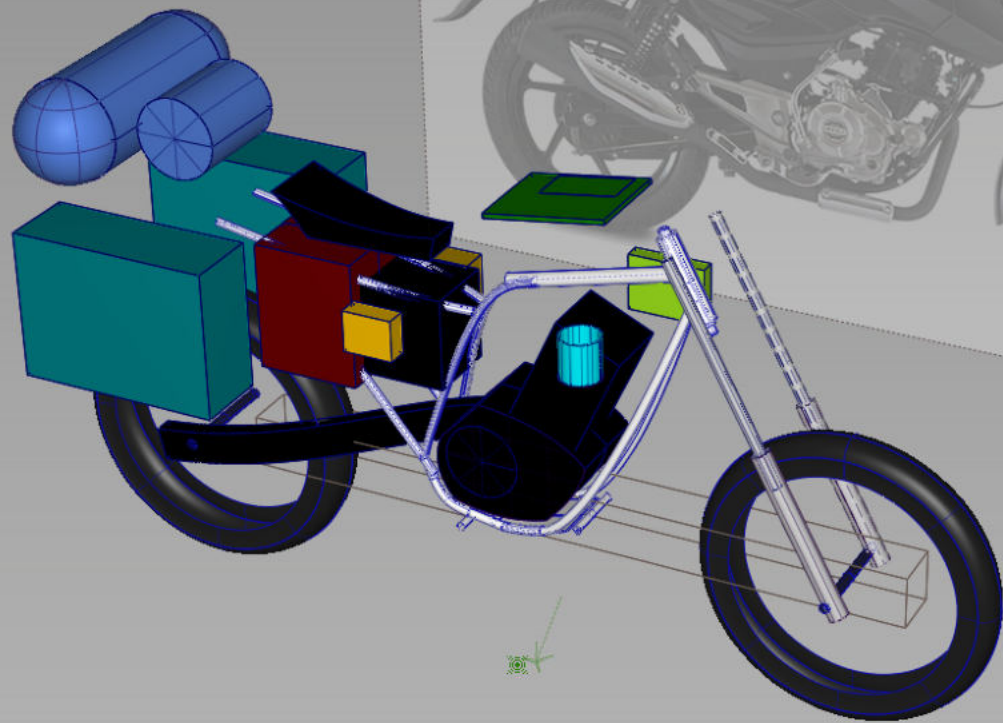
Package 1



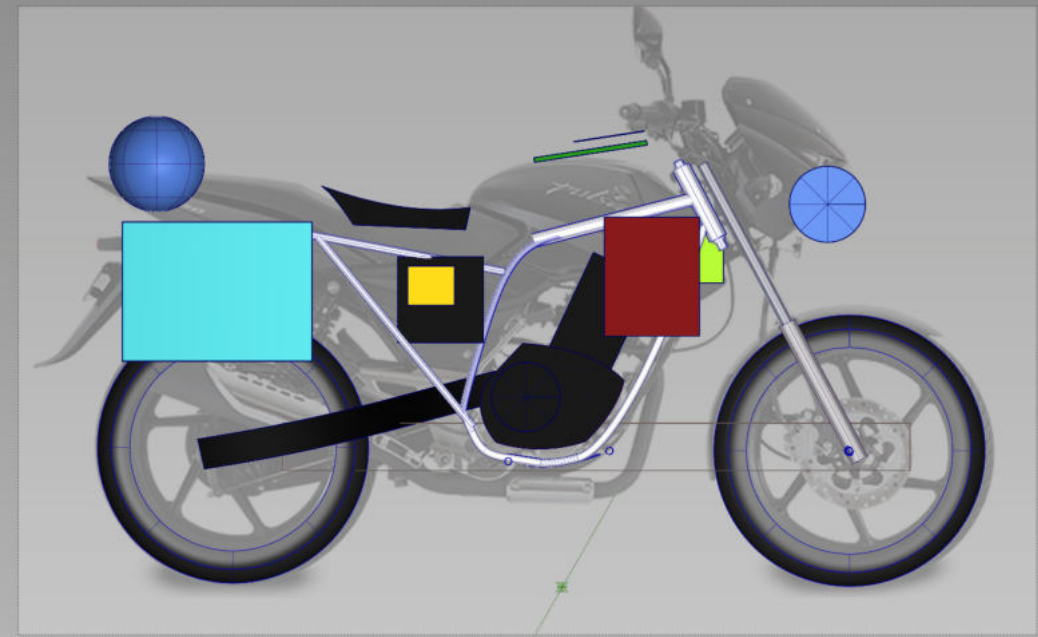
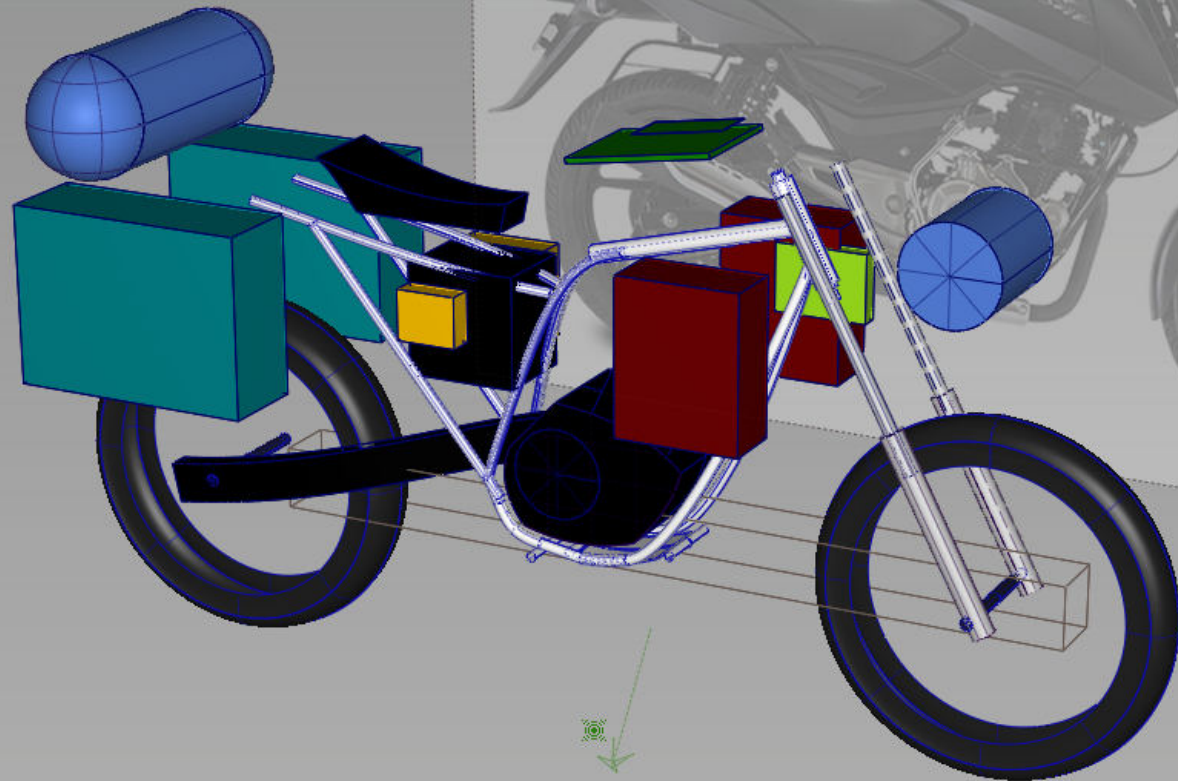
Package 2



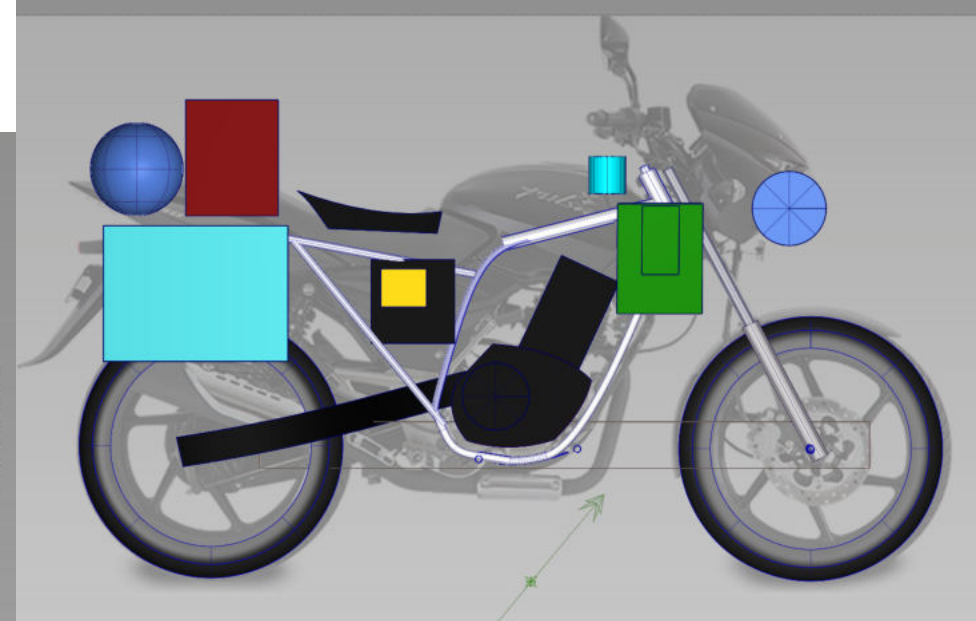
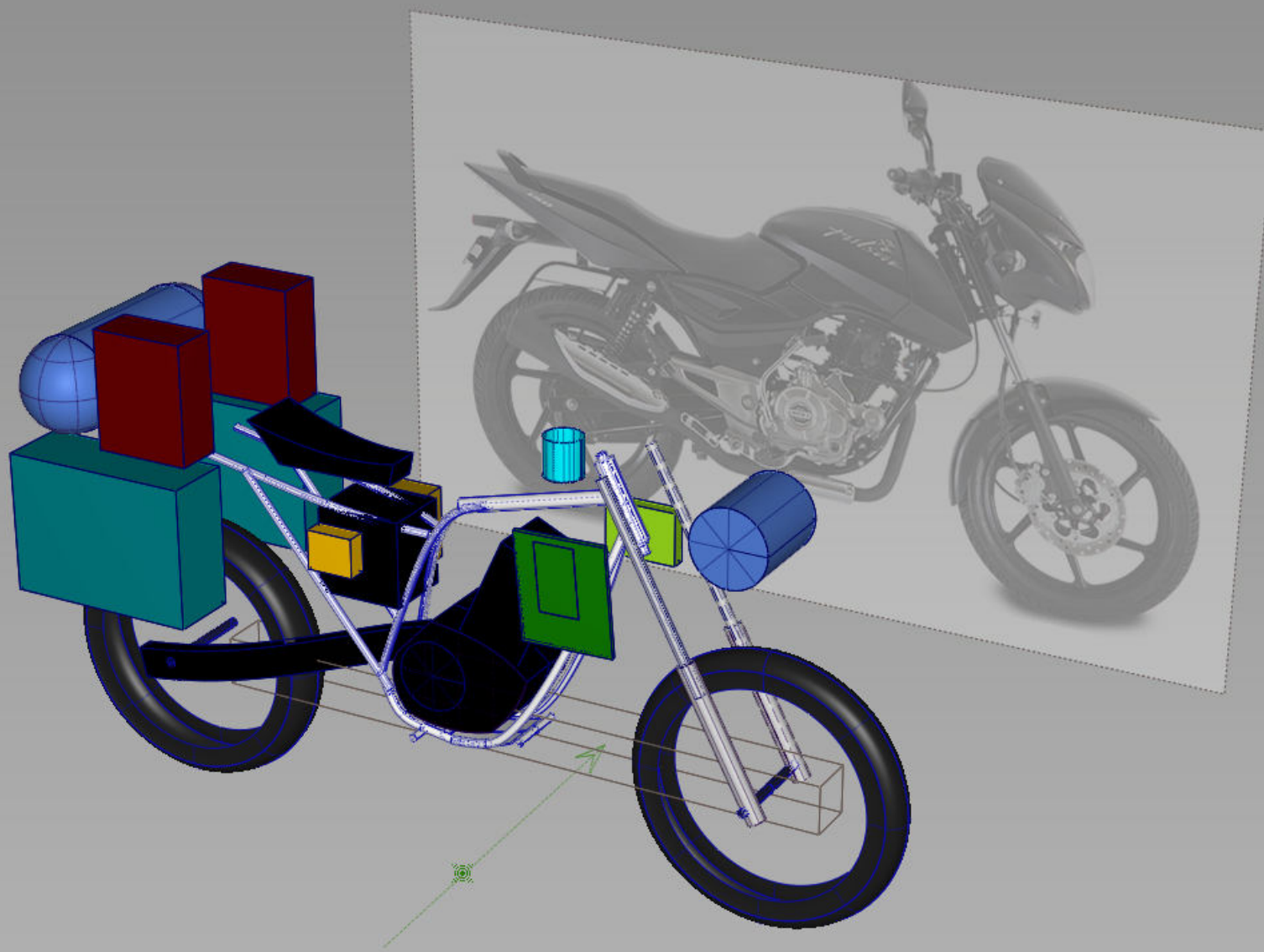
Package 3



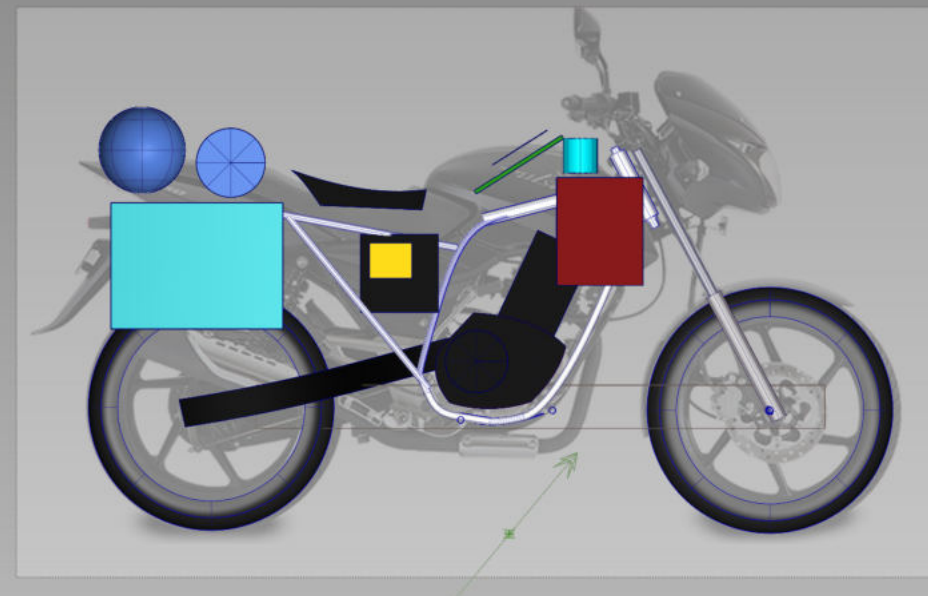
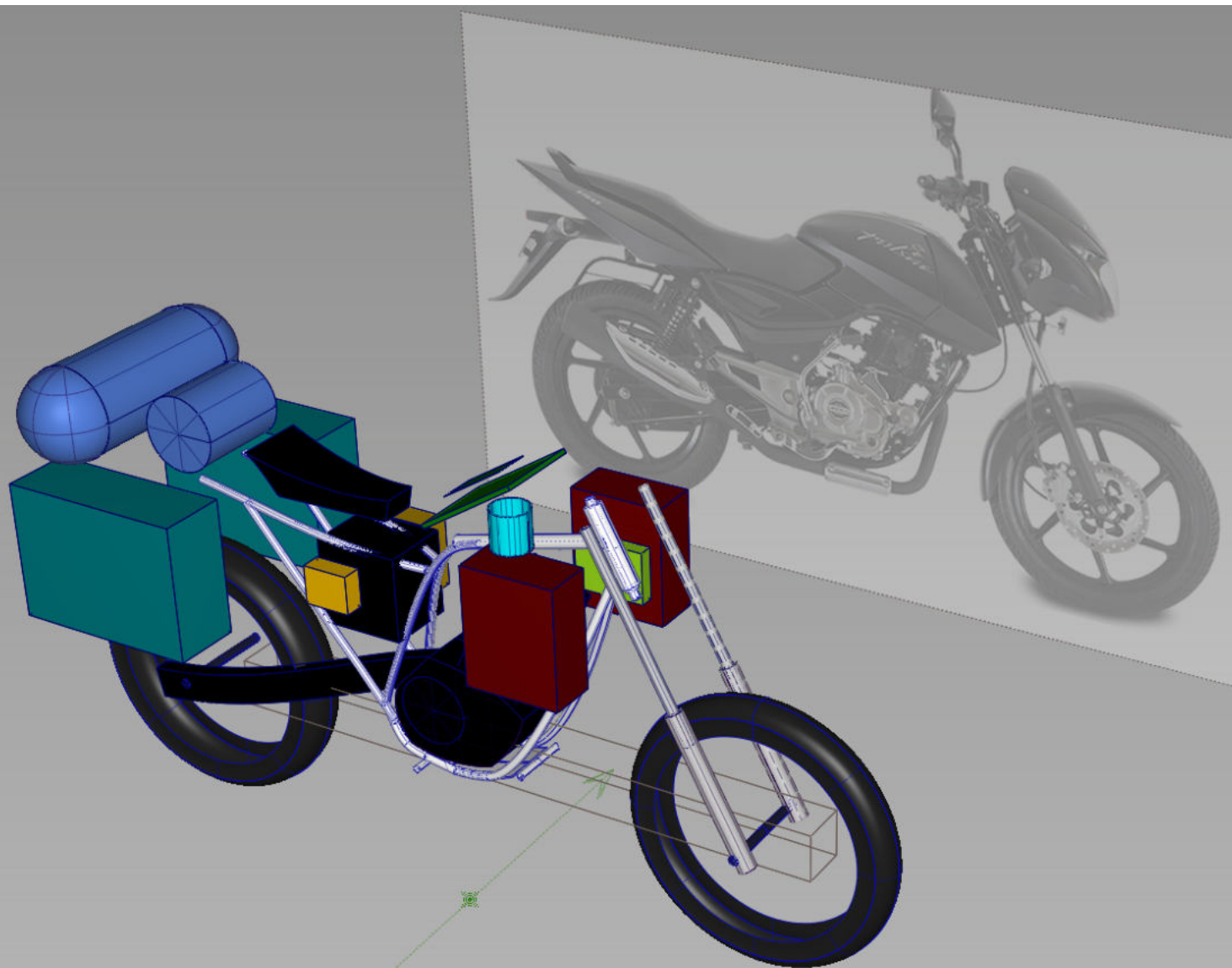
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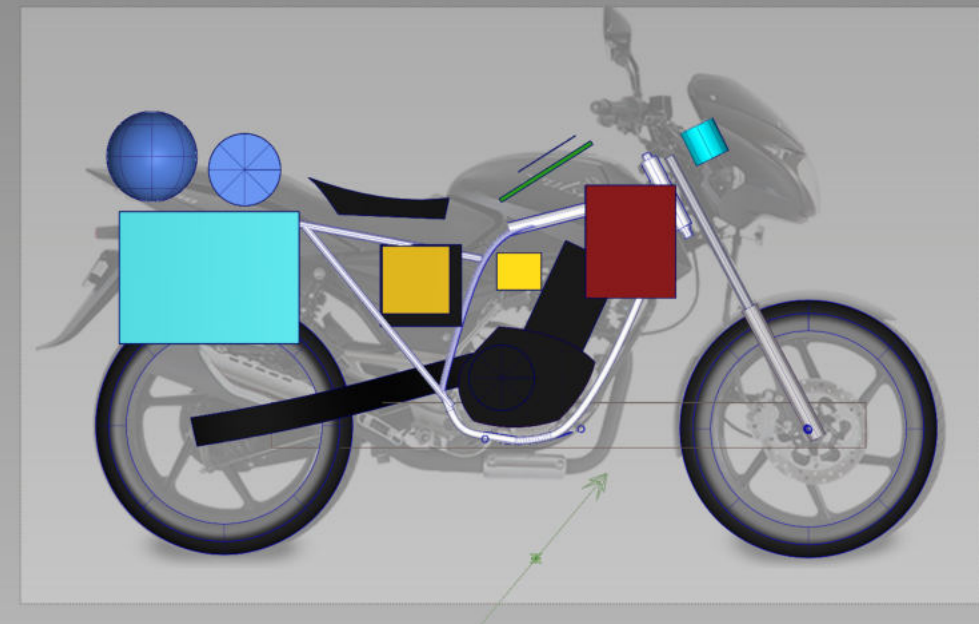
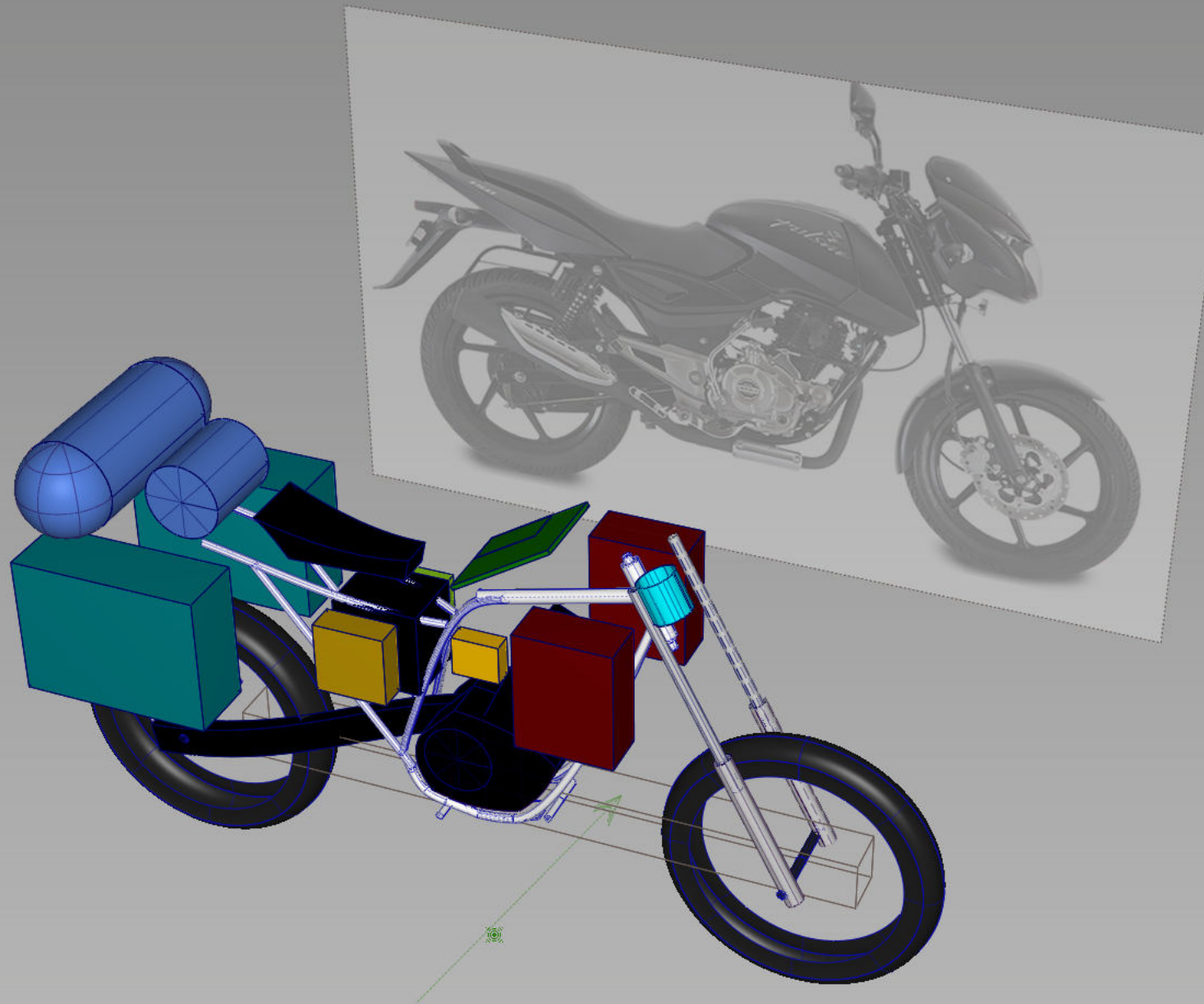
Package 5



Package 6

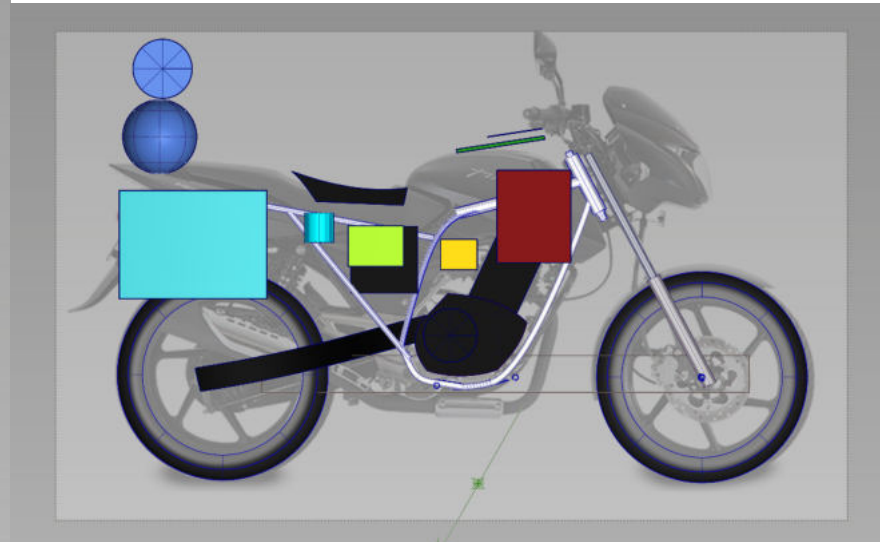
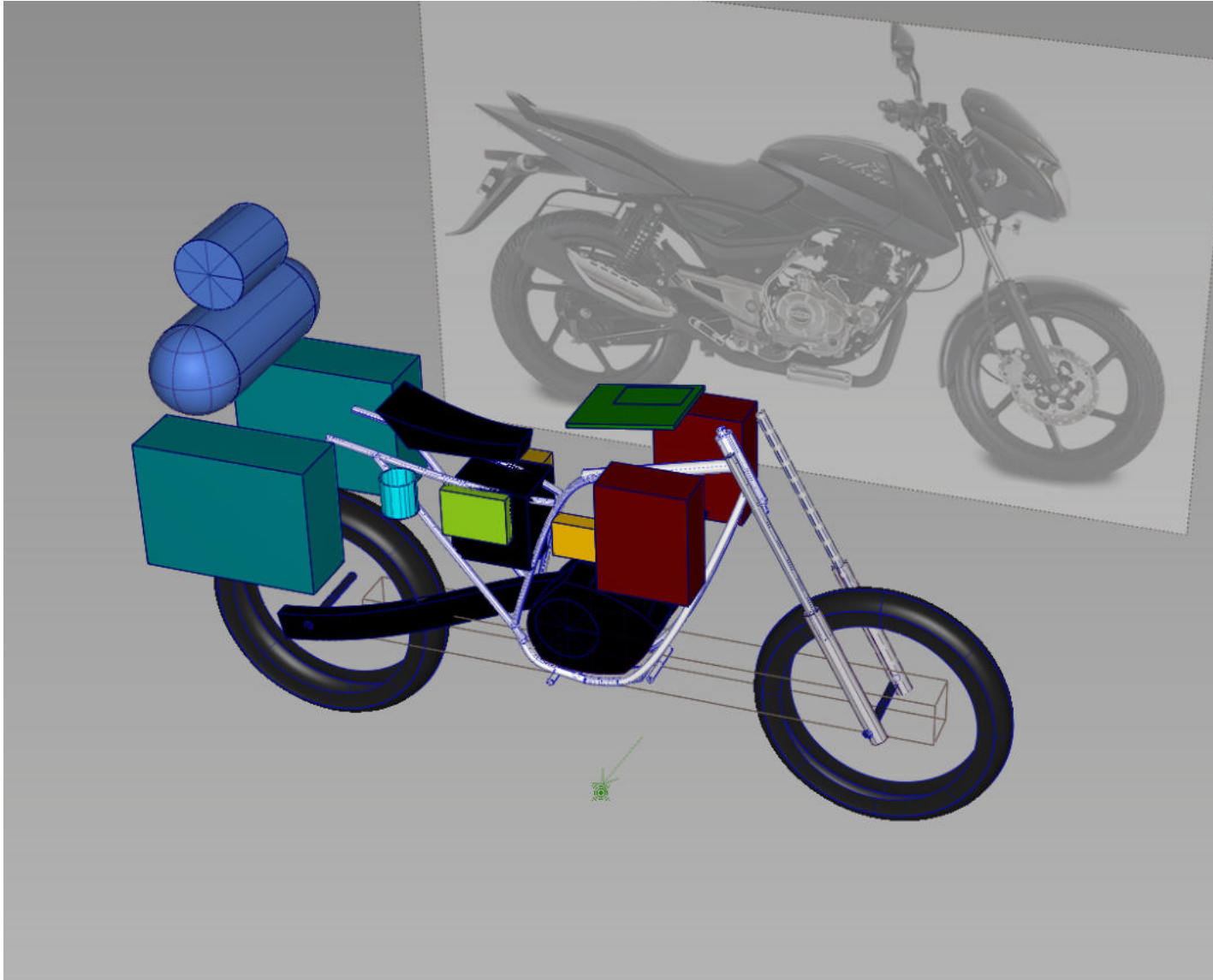


Package 7

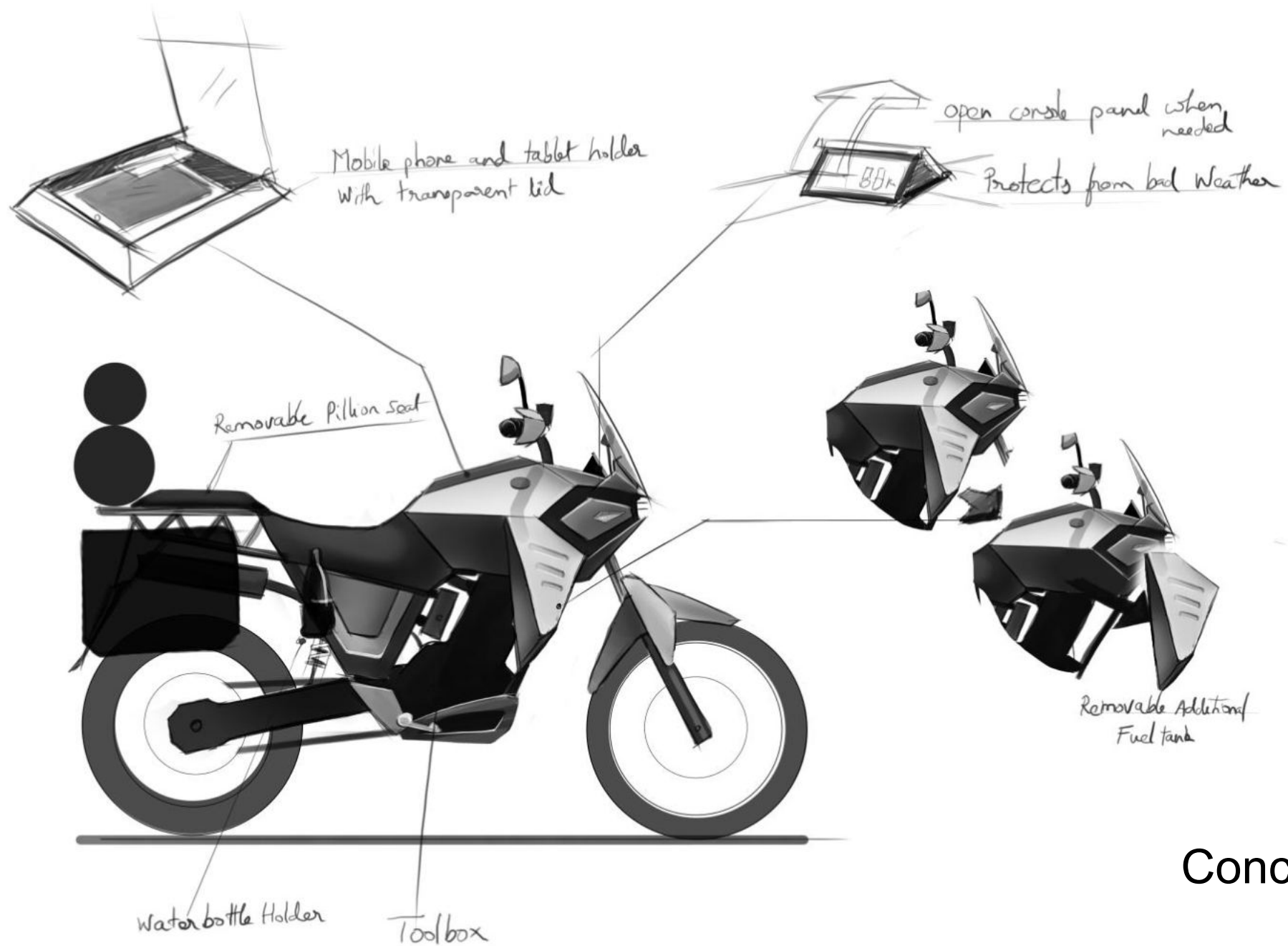


Package 8

Finalized Luggage layout



Concepts



Concept 1

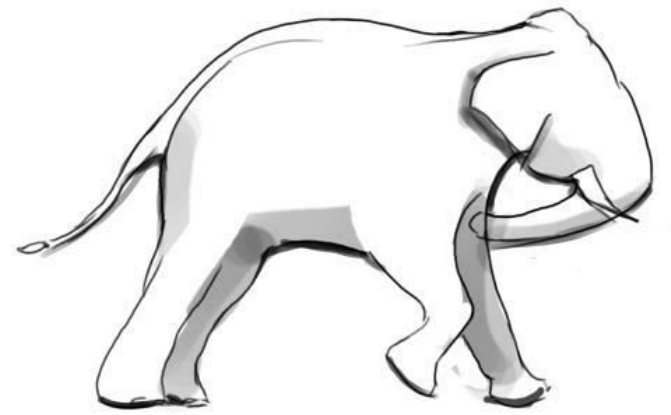


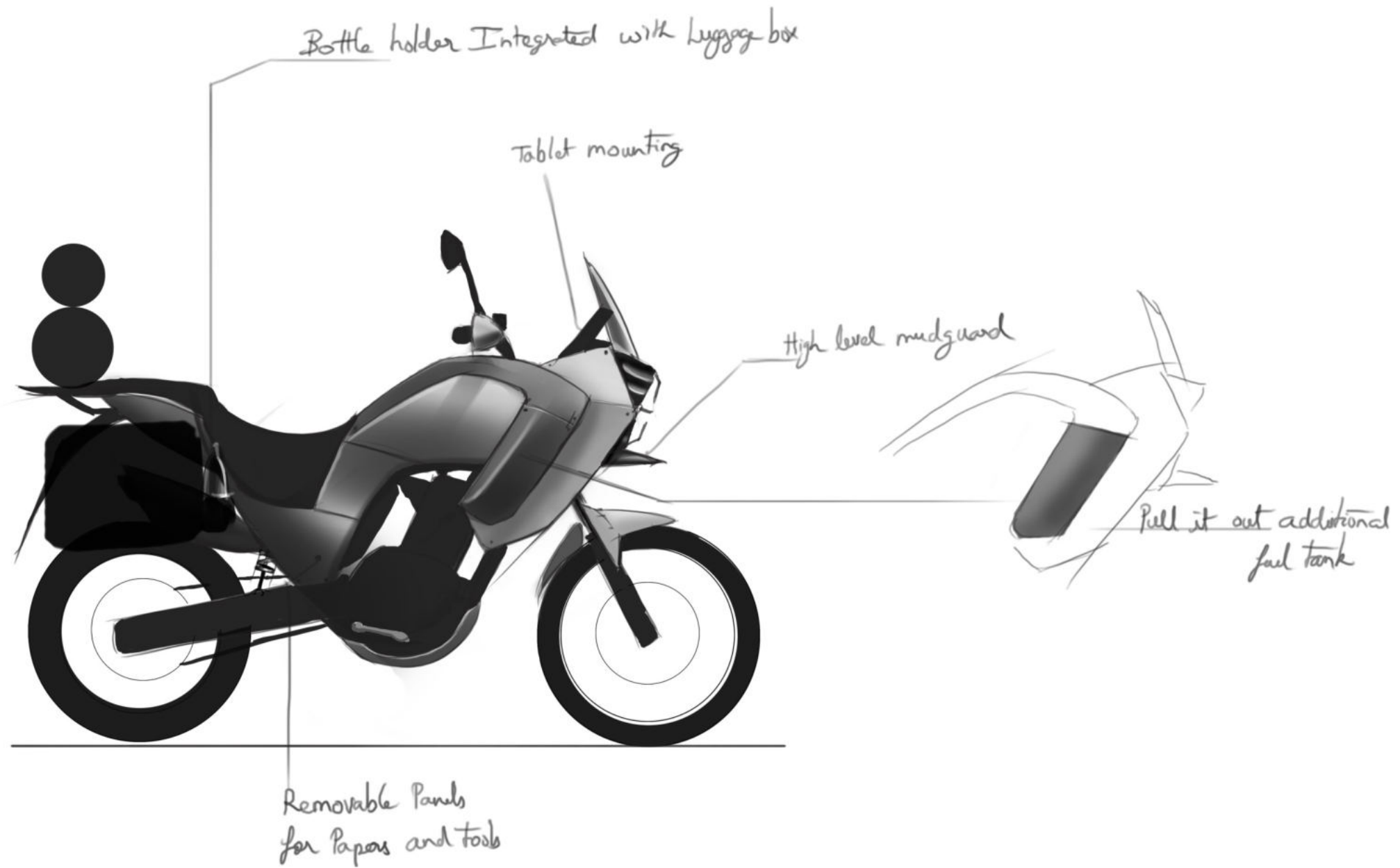
Concept 2






Pull out additional Fuel tank

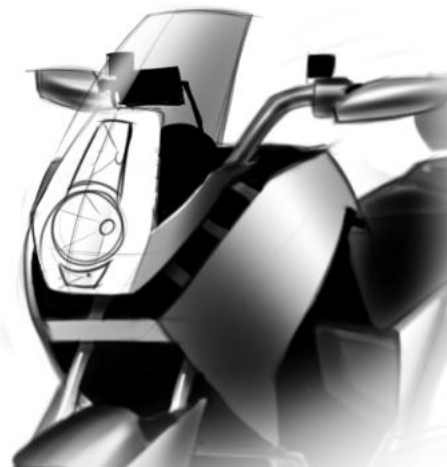
Concept 3



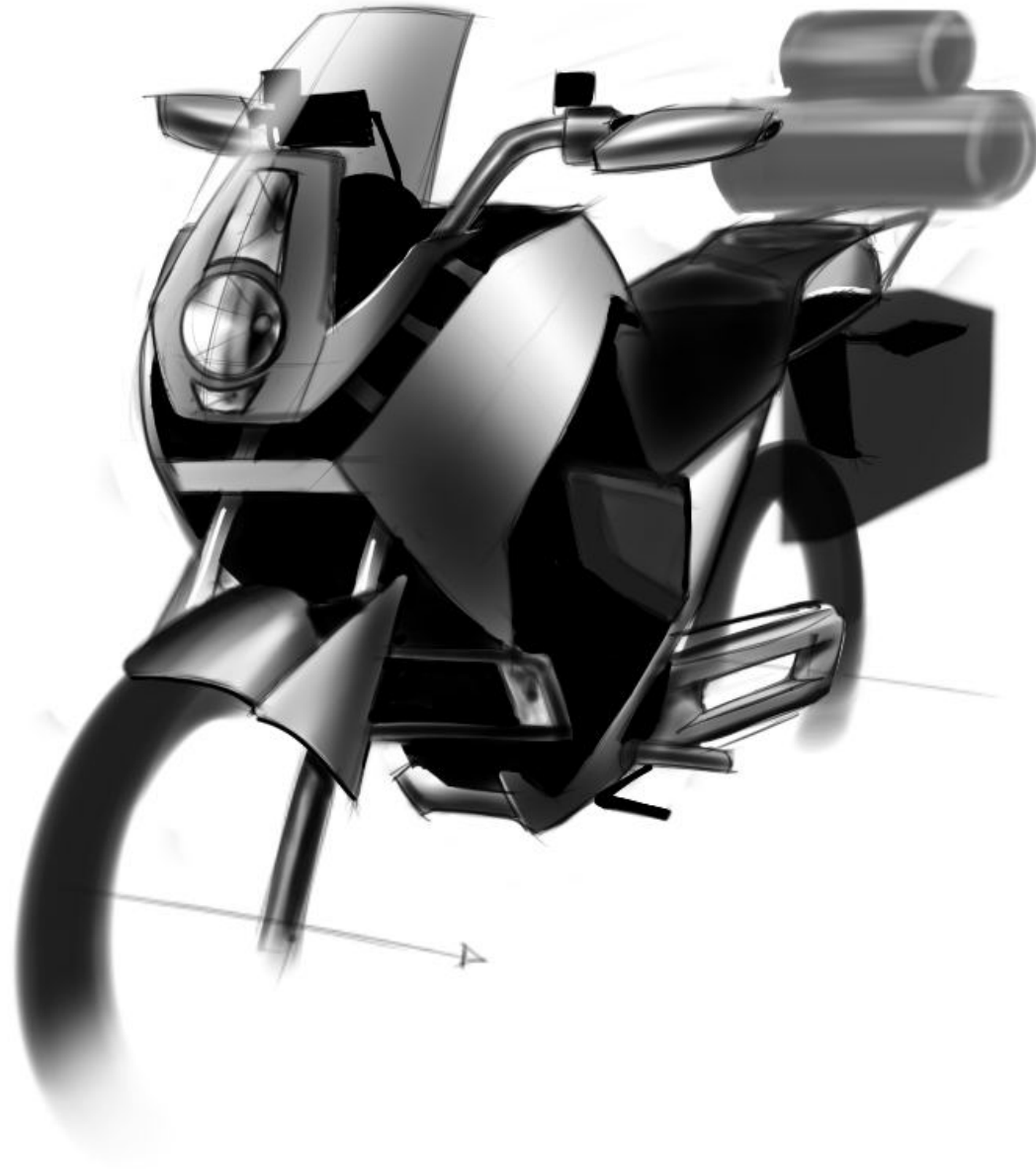


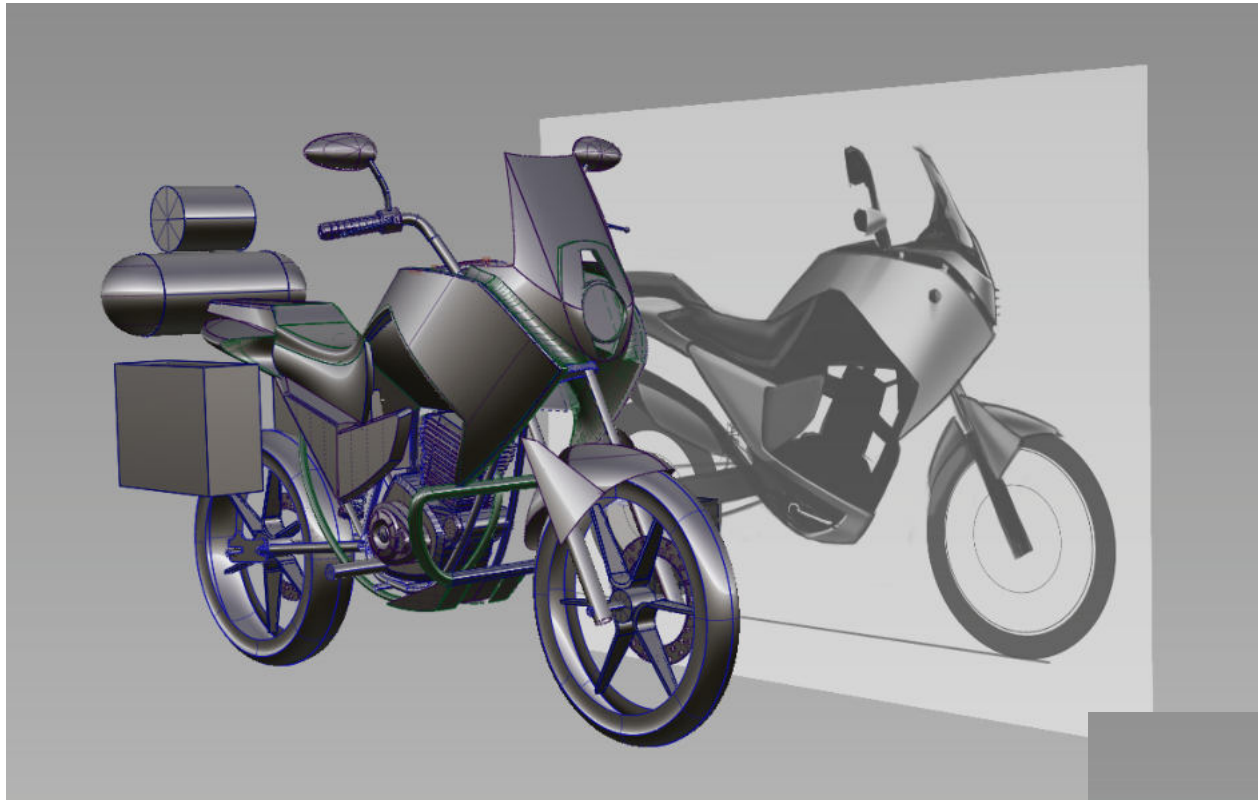
Concept Evaluation

| | |  |  |  |
|--------------------|-----------|--|---|---|
| Criteria | Weightage | | | |
| Ruggedness | 3 | 129 | 90 | 96 |
| Versatileness | 3 | 114 | 132 | 84 |
| Comfortness | 3 | 63 | 123 | 84 |
| Touring appeal | 2 | 58 | 84 | 68 |
| cruising appeal | 1 | 18 | 37 | 34 |
| Off roading appeal | 1 | 42 | 27 | 33 |
| One with nature | 1 | 15 | 40 | 37 |
| Total | | 439 | 533 | 436 |

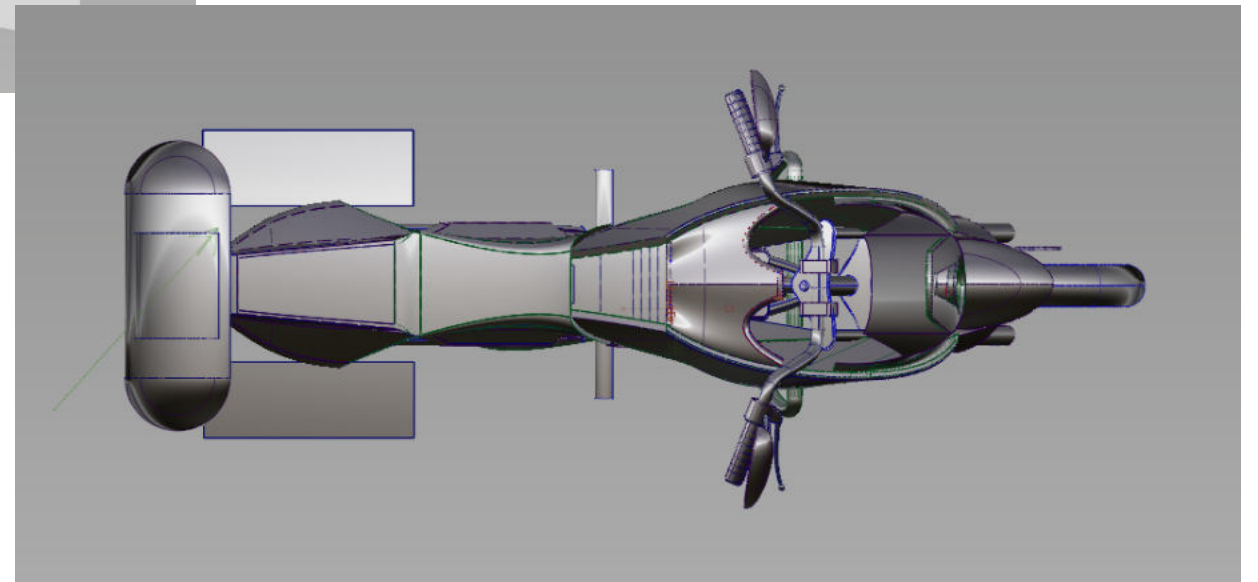


Final concept

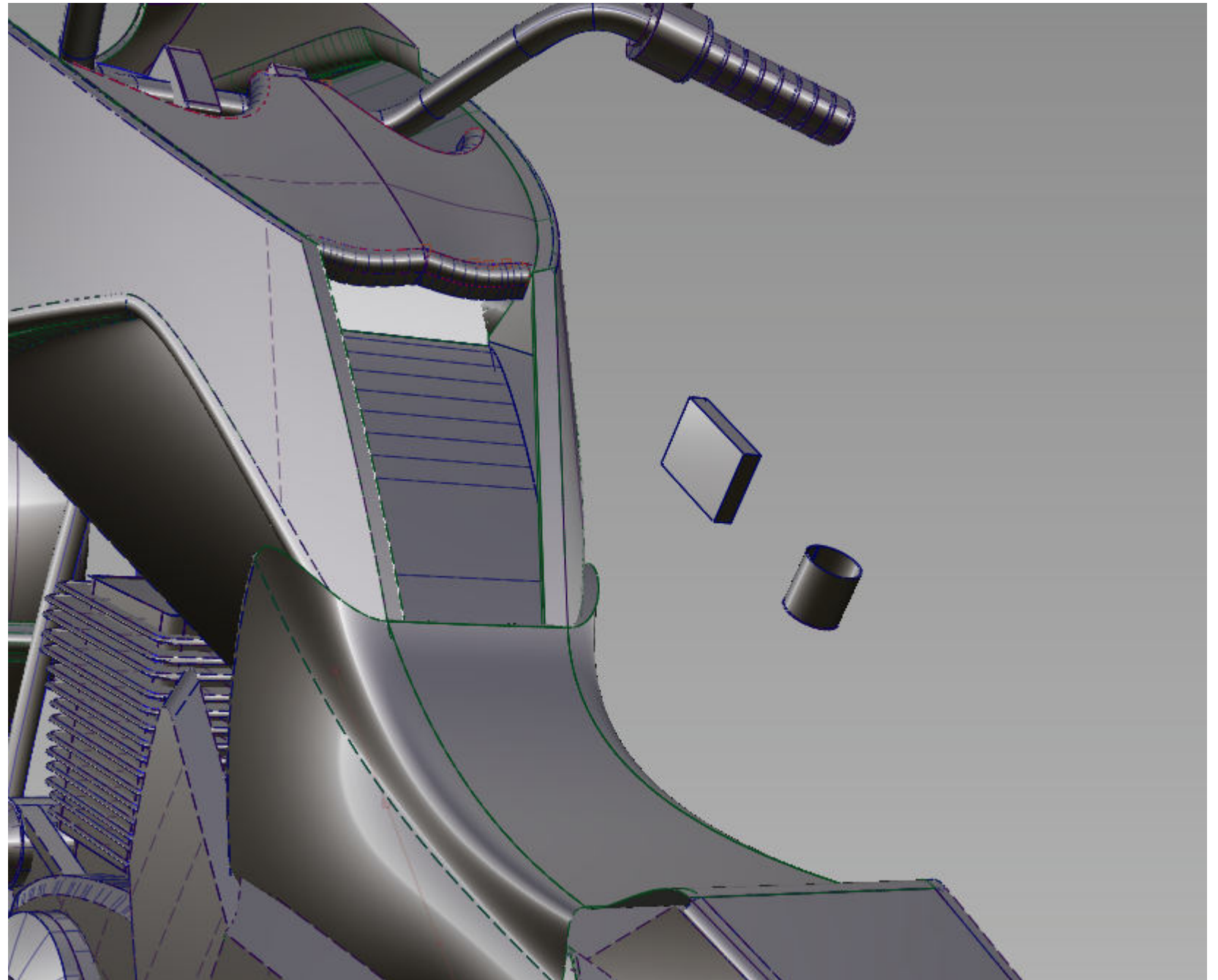




Surface Model



The tank space



Physical Model



Thank you