



## Design of Two Wheeler for Traffic Police

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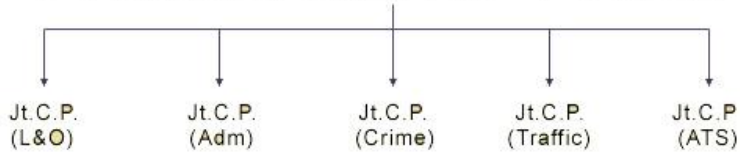
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Mumbai traffic police has been using a number of vehicles to perform their daily duties. The two wheelers are very important part of this fleet.

After a brief study on the existing system of the vehicles used, it was realised that the present two wheelers used could not satisfy the functional and identity needs of this department. Hence, a need was felt to design a two wheeler which addresses the duty requirements of traffic police and also enhances an distinctiveness of the department and the person using it.

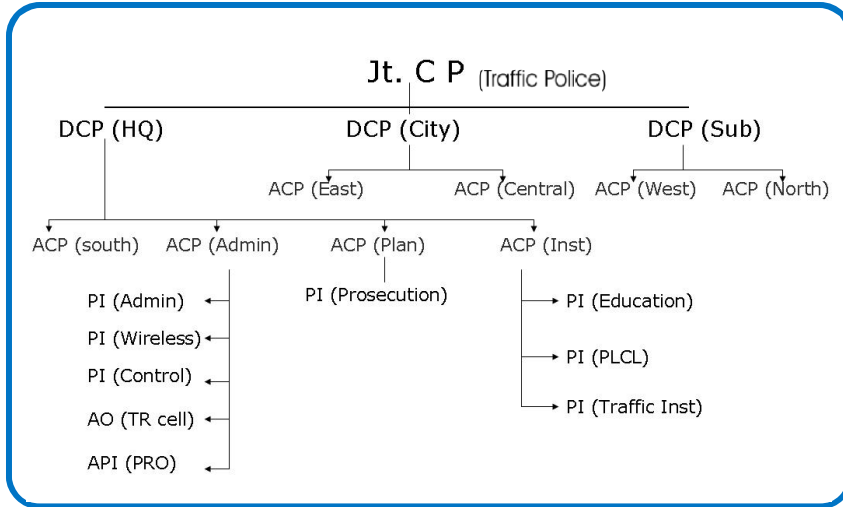
1. Initial Study.
2. Detail User Study and analysis.
3. Study of bikes and their Identity.
4. Idea Sketching.
5. Concept renderings.
6. Concept selection.
7. Mock Up model.
8. 1:1 rendering
9. CAD Modelling.
10. Final 1:5 Scaled Model.

### COMMISSIONER OF POLICE



The Traffic Police Department is divided into five zone, they are, North, South, East, West and Central. Each zone is headed by an ACP.

Along with this five ACP's there are three ACPs each heading the Administration, Planning and Instruction. The overall organisational structure is as shown in the organisation chart.



Organisation Structure

## DUTIES OF TRAFFIC POLICE

Overall duties of traffic police include the following:

**Traffic enforcement:** enforcing laws and regulations intended to improve traffic safety, such as speed limits.

**Emergency response:** securing the scene of a traffic accident by using cones and flares as well as providing first aid to the injured

**Accident investigation:** gathering evidence to determine the cause of a roadway accident

**Commercial vehicle enforcement:** enforcing laws related to commercial transport, including weight limits and hazardous materials rules

**General law enforcement:** assisting local police, especially at traffic signals.

**Education:** providing public information, handouts and displays to encourage safe driving and usage of the roads

**Monitoring the road conditions,** diverting the traffic during repair.

In order to perform the assigned duties efficiently the department is provided with a fleet of vehicle, which include 4 wheelers and 2 wheelers. These vehicles carry the Mumbai Police logo and graphics of yellow and blue strips. The vehicles are allotted to various Chowkies based on the area that they cover.



In order to understand how the vehicles are purchased and used, visits were made to the various department and the officials were interviewed.

### Traffic Police Headquarter

#### Motor Transport Section(MT)- Nagpada

This department is in charge of entire vehicular fleet of Mumbai Police responsible for keeping all vehicles in roadworthy conditions. It also provides the pilot, escort and other vehicles during the visit of VIP's in Mumbai.

All the vehicles required for Mumbai Police are purchased under *Rate Contract*, by the Director General of Supply and Disposal. Vehicles are purchased at special government prices, directly from the manufacturing company. Proposals regarding a particular model are made by the Motor Transport section. Final decision on the purchase of a particular model is made by senior officers, like Jt. CP and DCP.





### Area Chowki

Further the department is divided into smaller area chowkies which takes care of the traffic flow and enforce traffic law and order in their designated areas. Offenders penalised for minor law break have to deposit the fine amount and collect their documents.

### Traffic Junction Cell

These are small units at major traffic junctions from where the officials control the traffic flow at the junctions.



### Learning from the visits:

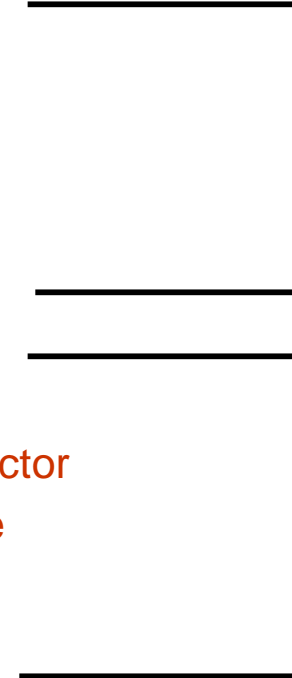
The vehicles are purchased under rate contract directly from the manufacture. The type of vehicles to be purchased is decided by Jt. CP and DCP. Modification in terms of accessories and graphics is done by the Motor transport Section. A prototype vehicle with modifications are made and approved for changes from the DCP

# VEHICLES USED



## Design of Two Wheeler for Traffic Police

1. Jt. C P
2. DCP (3)
3. ACP (8)
4. Sr. PI
5. PI
6. Asst. PI
7. Sub Inspector
8. Asst. Sub Inspector
9. Head Constable
10. Police Naik
11. Constable



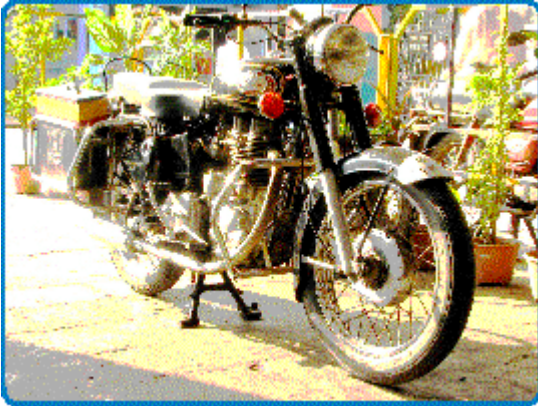
Use Four wheelers

Use Two wheelers

Number of two wheelers used:

Enfield	204
Bajaj Caliber and Pulsar	800
Fiero	100
Yamaha	80
Hero Honda	75

Total number of two wheeler in use : **1259**



**Model:** Enfield Bullet 350.

Engine type: 346 cc, air cooled, single cylinder, 4-stroke, 18 hp.

Royal Enfields had been sold in India from 1949. In 1955, the Indian government looked for a suitable motorcycle for its police and army, for use patrolling the country's border. The Bullet was chosen as the most suitable bike for the job. The Indian government ordered 800, 350 cc model Bullets, an enormous order for the time. These bikes do not carry much modifications on them.

Users:

This bike is mostly used by higher rank police officer such as

- Police Inspector
- Assistant Police Inspector
- Police Sub-Inspector
- Head Constable



## TYPES OF TWO WHEELERS USED

## Design of Two Wheeler for Traffic Police



**Model:** Bajaj Pulsar 180, 2006.

Engine type: 180 cc, air cooled, single cylinder, 4-stroke, 16.5 hp.

This is one of the most popular premium segment bike in the country.

Users:

This bike is mostly used by:

- Assistant Police Inspector
- Police Sub-Inspector
- Head Constable
- Police Naik
- Constable

Purpose:

These two wheelers used for road patrolling, also used as transportation vehicles by senior official to move at a junction and monitor traffic.



## TYPES OF TWO WHEELERS USED

## Design of Two Wheeler for Traffic Police



**Model: Bajaj Caliber 115.**

Engine type: 111.6 cc, air cooled, single cylinder, 4-stroke, 9.5 hp.

This bike delivered a very good mileage and had a decent capacity for city riding. The riding posture was upright and was comfortable. These bikes did not carry any modification except for the Mumbai police graphic on the head light fairing.

Users:

This bike is mostly used by:

- - Head Constable
- Police Naik
- Constable

Purpose:

These two wheelers used as transportation vehicles by the traffic police personals. Mostly used by head constable and police naik as transportation vehicle. These are rarely used for patrolling.



## TYPES OF TWO WHEELERS USED

## Design of Two Wheeler for Traffic Police



**Model:** SUZUKI Fiero.

Engine type: 147.5 cc, air cooled, single cylinder, 4-stroke, 12 hp.

Launched in 2000, presently traffic police use 100 bikes with customized front panel and body paint. These also has a attached side trunk to carry the equipments needed during patrolling. This was one of the best selling bike from TVS Suzuki.

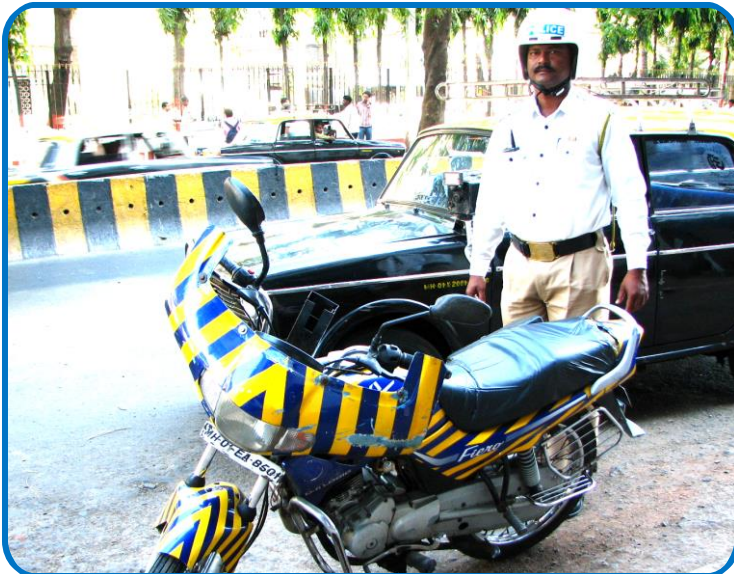
Users:

This bike is mostly used by:

- Head Constable
- Police naik
- Constable

Purpose:

These two wheelers are used specifically for patrolling.





**Model:** TVS Suzuki Fiero

Front fairing with Visor

The standard fairing has been replaced by a wider one with body matching paint work of blue and yellow strips. This fairing initially carried a front visor with Mumbai Police Logo on it. The fairing gives a identity to this fleet of bikes belonging to traffic police, and is clearly visible from a long distance.

Inference:

1. The front fairing should not hinder the maneuverability of the vehicle.
2. It should carry an identity of the departments to which it belong.
3. The visor fitment should be stable





Metal bracket to carry walkie talkie



walkie talkie is carried in the upper pocket



Metal bracket to carry walkie talkie and LTM book.



LTM book is carried in a

### *Metal bracket on steering handle.*

*A metal bracket is mounted on the steering handle to carry the walkie talkie and LTM book. This is made of MS sheet.*

### *Inference:*

- 1. The LTM book holder and Walkie Talkie holder should be within reach.*
- 2. The holders should hold the walkie talkie securely and should give the rider a sense of safety.*

# MODIFICATION

## Design of Two Wheeler for Traffic Police



Graphic on Bajaj Pulsar 180 DTSI



Mumbai police Logo on the rear wheel mud guard



Mumbai Traffic police Logo on the fairing



Blue and yellow stripes on Tail.



Blue and yellow stripes on the side trunk



Blue and yellow stripes on the tank with Help line number



Model: Royal Enfield Bullet 350

Inference:

1. The bike to be used for city patrolling should be easy to maneuver.
2. The bike need to have sufficient power to catch up with the law defaulters.



During turning the broad front fairing hits the knees.



Rider has to move around the vehicles to access the side trunk.

### Inferences:

1. The design changes should not interfere with the normal riding usage of the vehicle.
2. Things used frequently during patrolling should be accessible.
3. The vehicle should be easy to handle.



Getting the bike on main stand requires effort.



Have to park the bike in confined spaces.



Pillion rider faces problem due to the large side trunks.

### Scenario 1: Getting on the bike



Rider lifts his trouser to cross over the rear seat and the



Rider lifts his right leg and crosses over the rear seat and



Rider changes the gear and moves ahead

### Inferences

1. Side trunk to be made smaller or eliminated.
2. Trousers of the uniform to be stitched loose.
3. Electric start to be provided.

### Scenario 2: Crossing the junction at Stop signal



Stop signal ON, rider takes the narrow passage on the left side of



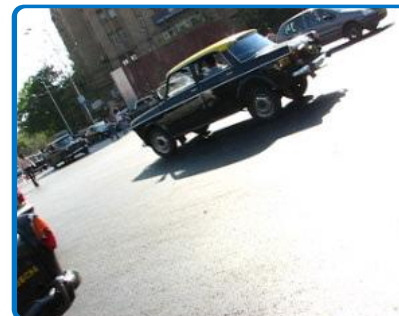
Rider has to take care not to hit the stand still vehicles with the handle and side trunk



Rider needs to attend an emergency and hence jumps the signal



Rider tries to cross the flowing traffic, other road users are not aware of rider intent.



Rider finds it difficult to cross the flowing traffic.



The pedestrians crossing the signal are also unaware of rider's emergency.

### Inferences:

1. Attachment designed should not be greater than the handle bar dimension.
2. Light and sound signaling system to be provided.

### Scenario 3: Taxi parked in 'No Parking' area



Rider spots a taxi parked in no parking area and waiting for passengers.



Rider moves closer to the rear of the taxi. Taxi driver spots the rider in rear view mirror.



Taxi driver starts the vehicle and moves out from that area.

#### Inferences:

1. The front head light and fairing needs to have a distinctive identity.
2. The vehicle should be recognised even during night or low light condition.

### Scenario 4: Moving through 'No Entry' road



Road ahead is congested with traffic. He needs to move ahead and clear the traffic congestion.



To move ahead rider takes a side route which is a no entry road.



The oncoming vehicles find it difficult to give way to the unexpected entry in the one-way route.

### Inferences

1. Proper sound signaling system should be provided to alert other vehicles on road.

### Scenario 5: Chasing law defaulter



Stop Signal ON at a junction.



Rider spots a signal Violater.



Rider jumps the signal and chases the defaulter.



Rider speeds up to catch up with the defaulter.



Rider overtakes the defaulter and uses hand signal to stop him.



He gets off his bike puts it on the stand call the defaulter and remove the LTM Book from the side trunk.



Use the rear seat surface to write the temporary licence form



Collects the license of the defaulter and keeps it in the top pocket.

### Inferences:

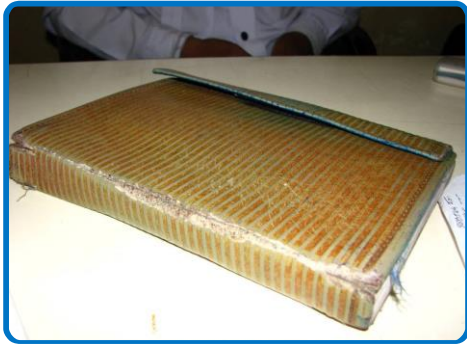
1. proper indication system in terms of sound should be provided on the bike.
2. Light signal should be provided indicating the defaulters to stop.
3. Bike should have a good pick up and speed to catch with rule defaulter.

### Scenario 4: Writing Temporary License for law defaulters.



In one scenario we had seen that the rider uses the rear seat surface to write the LTM book. Another similar scenario was observed when the rider uses the tank surface.

1. The rider keeps sitting on the bike and calls the defaulter to him.
2. He removes the LTM book from the waist pouch and the pen from the top pocket.
3. Keeps the LTM book on the tank surface.
4. writes the temporary license for the defaulter and collects his permanent license.



1

From the user study it was found that the rider usually carries the following things along with the on the bike:

1. Temporary Licence Book (LTM Book)
2. Walkie Talkie
3. Tiffin Box, soap, bike spare etc
4. 1 litre water Bottle
5. Civil Shirt in a packet
6. Bike Log Book



2



3

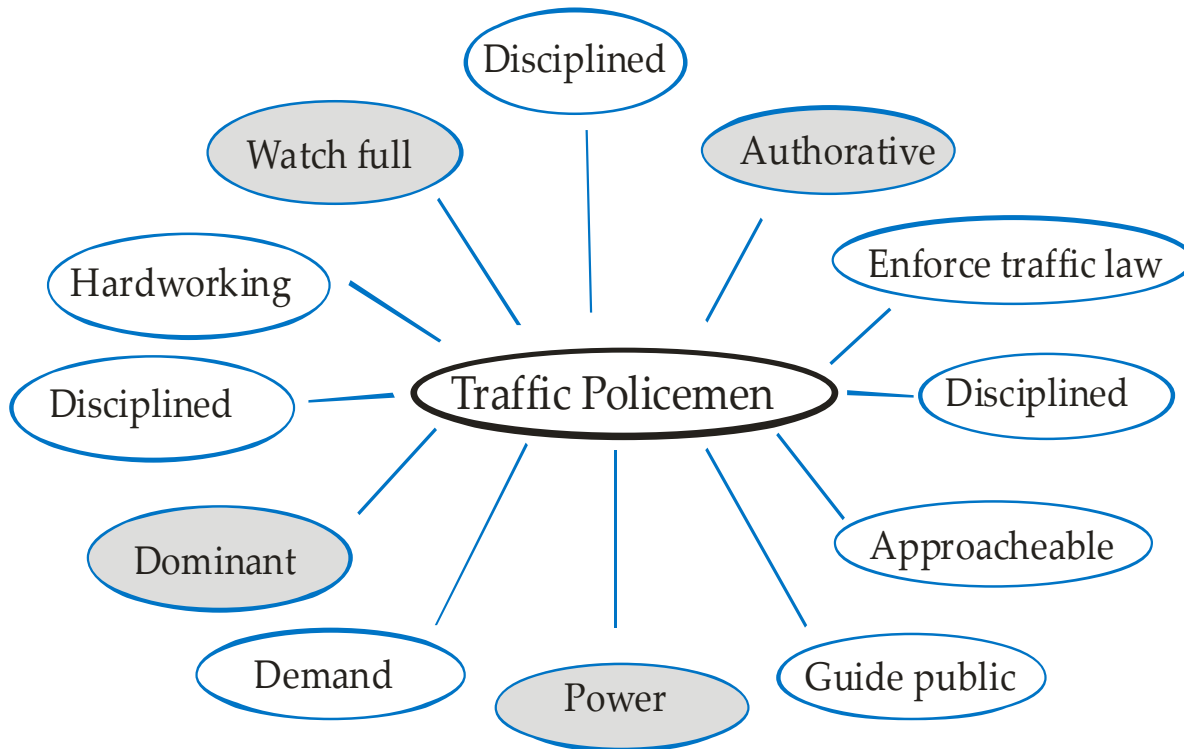


4



5

### CHARACTERISTICS OF TRAFFIC POLICEMEN





Harley Davidson (NYPD)

### Harley Davidson

- Exposed engine shows the Power possessed by this vehicle and the owner.
- Upright cruiser sitting posture gives the owner a feel of authority.
- Chrome parts speak about the strength and display a expensive look.
- Round head light cluster gives the feel of dominance.
- This vehicle has got a unique sound.



Royal Enfield

### Royal Enfield

- Exposed engine shows the Power possessed
- Here too the upright seating posture give a feel of authority and control
- The bigger diameter front shock absorbers give the feel of strength
- Round head light cluster gives the feel of dominance.
- The Thump sound is unique for this vehicle



Ducati Monster

### Ducati Monster

- Broad Tank resembles the shoulder strength of a male
- Chromed front shock absorbers with larger diameter gives the feel of stability.
- Naked exposed engine give the feel of raw power possessed by the engine.
- Round head light cluster gives the feel of dominance and seriousness.
- The Head Light is lower than the tank and in side profile the bike looks like an animal ready to pounce on its prey.



YAMAHA R1

### YAMAHA R1

- Covered engine panels with the sharp lines give a speedy look to this vehicle.
- Pointed head light also display the piercing speed of this vehicle.
- the Twin Head light cluster have a very focused and aggressive expression.
- Dual coloured body give a sporty feel to the vehicle



FRP fairing for a bike modification



Sheet metal tank being worked for painting

Design of a two wheeler for the Traffic Police of Mumbai City for City Patrolling Duty, and should meet the following requirements.

1. Space created to carry the items required for their duty need during patrolling

LTM book

Walkie Talkie

Confiscated Licenses

Bike log book

Reflector jacket

1 litre water bottle

Tiffin box

Raincoat

Civil clothing

2. Should have indication systems in terms of sound and light to warn the traffic during emergency.

3. Should carry a strong visual identity of 'dominance' in traffic during day as well as in night.

4. Design changes should not hinder existing maneuverability in congested traffic conditions.

5. The graphic should clearly display the emergency contact number.

6. It could be a single seater or can carry one pillion rider for short distance.

7. These design requirements would be done on a existing motorcycle.

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# SHORTLISTING

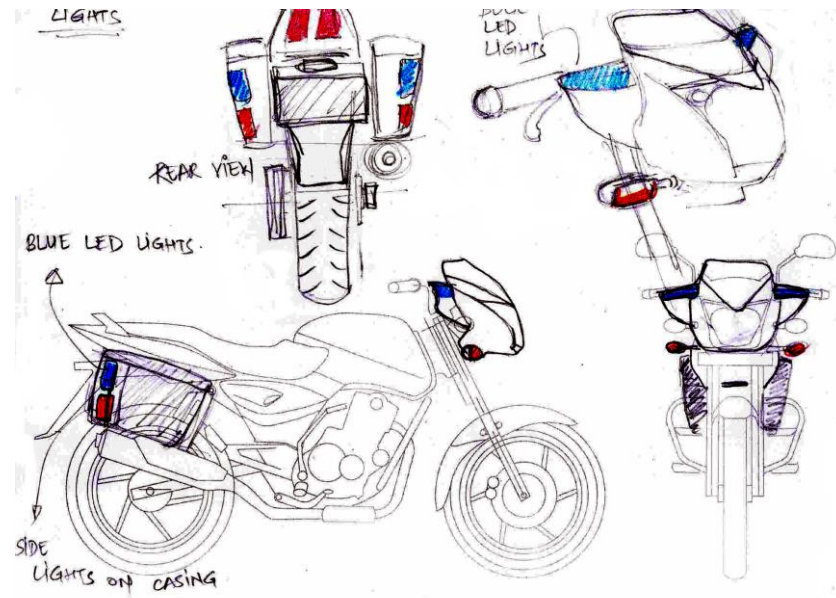
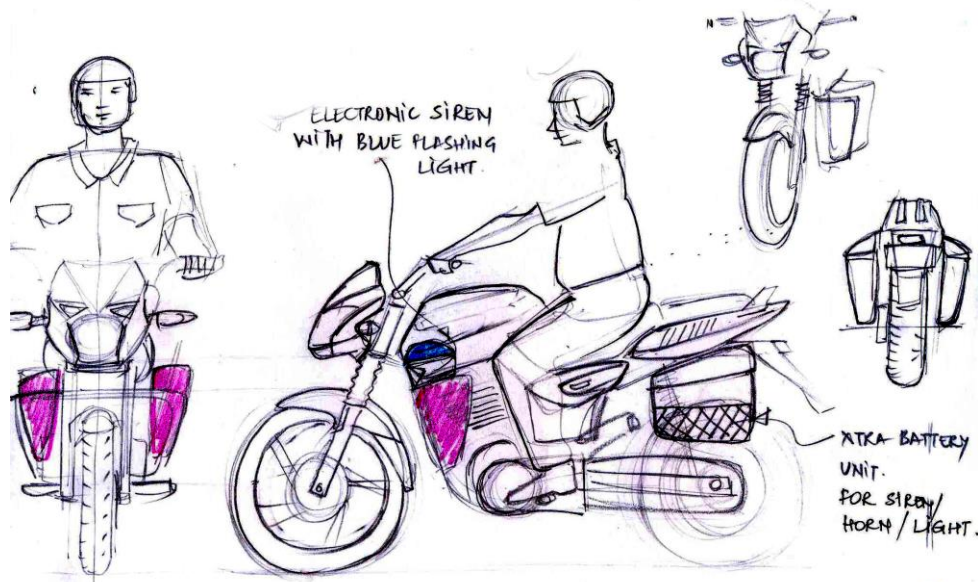
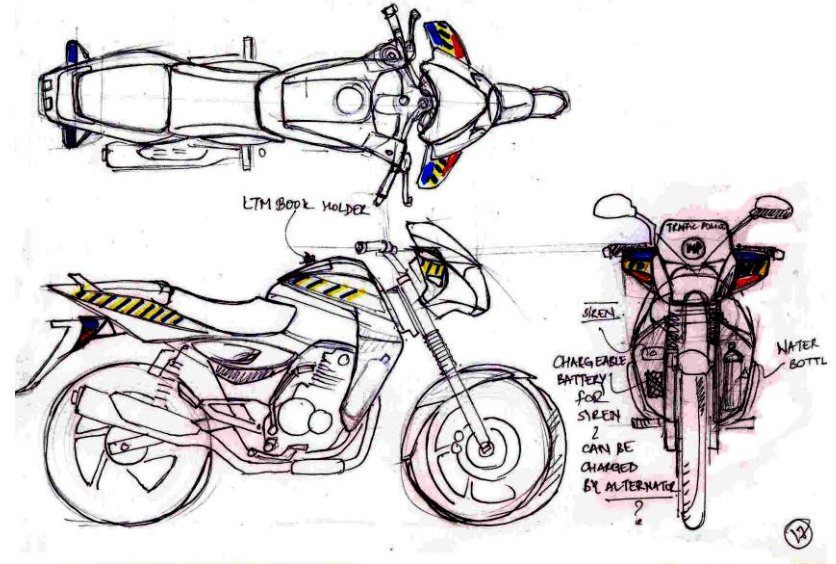
## Design of Two Wheeler for Traffic Police

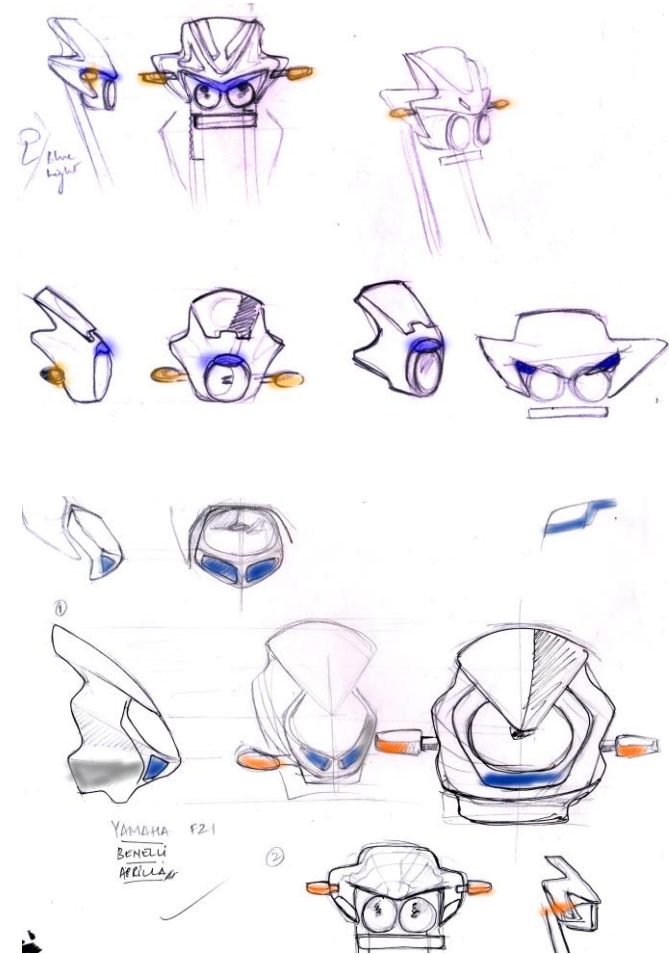
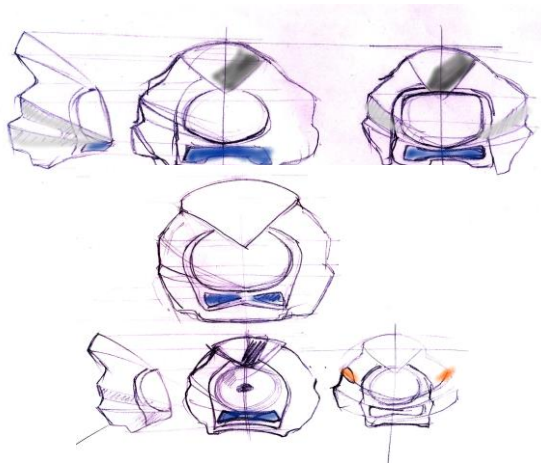
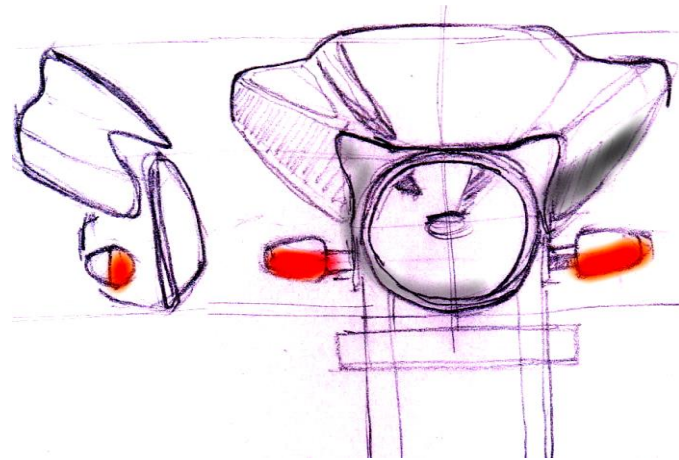




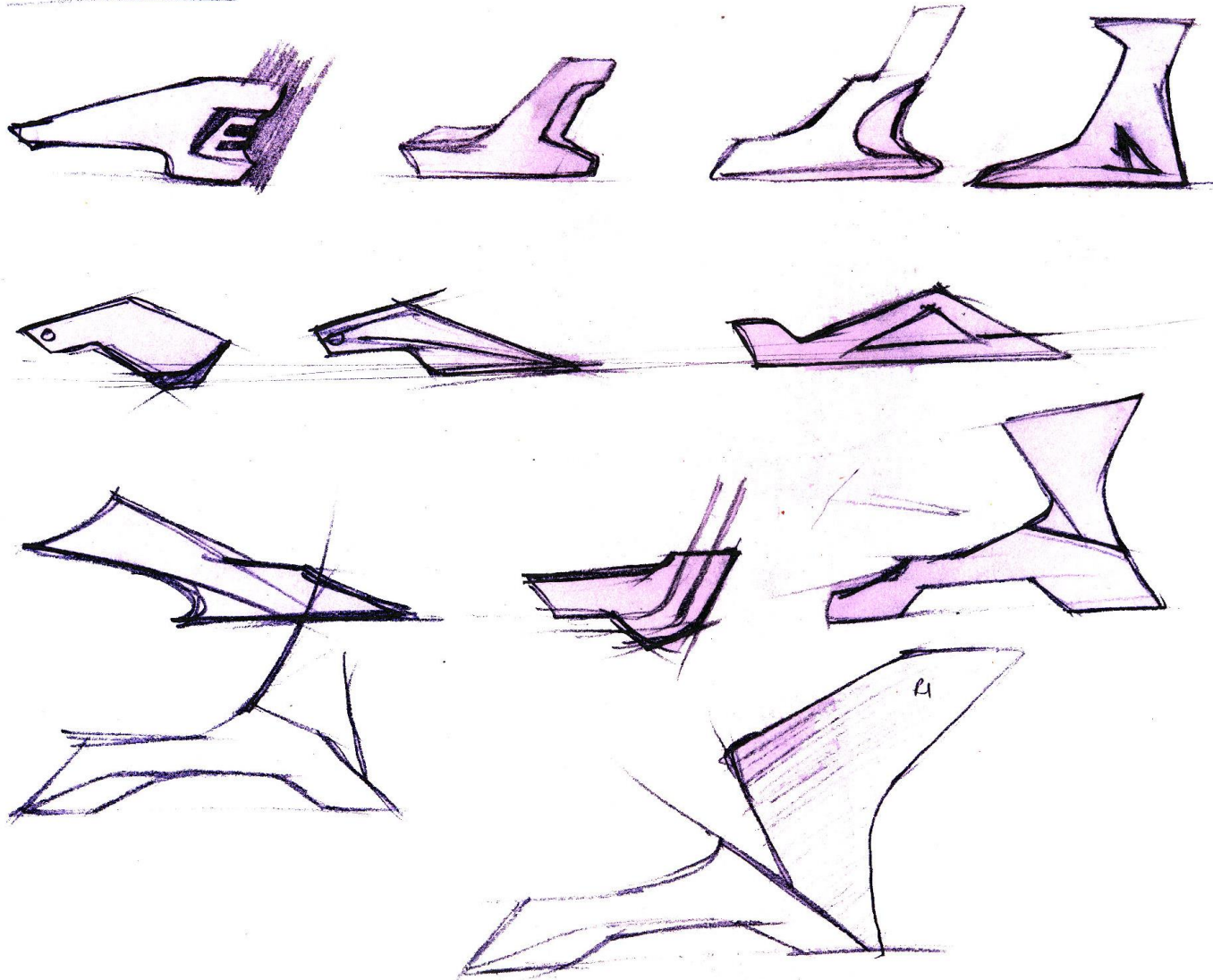
# IDEA SKETCHING

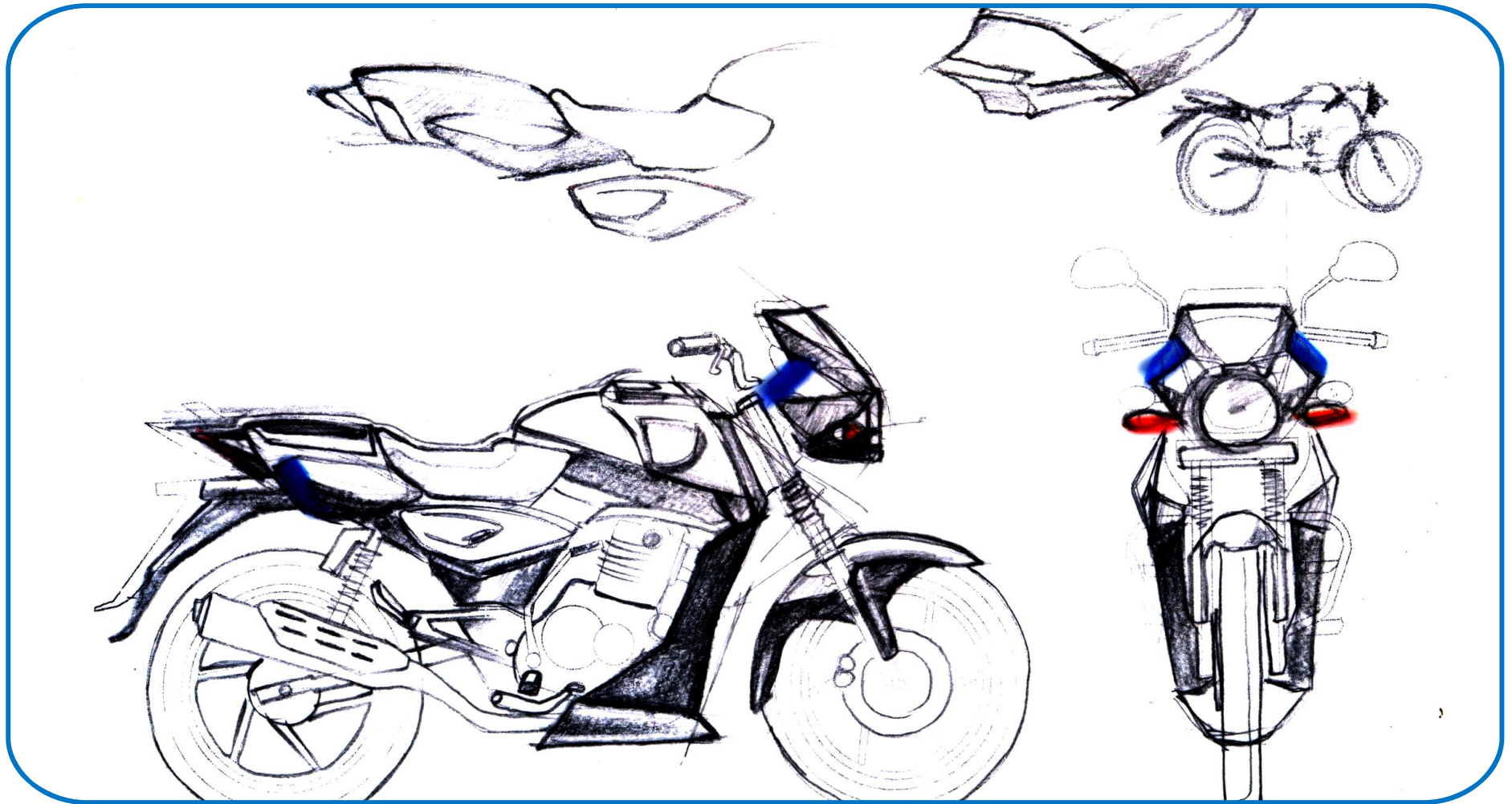
## Design of Two Wheeler for Traffic Police





AIR SCOOPS







### CONCEPT ONE

Single seat, rear seat space utilised for equipment storage

White body paint with graphic carrying helpline number

Larger front fairing, with flashing LED lights



1. Carriage created on tail to carry LTM Book and other equipments.
2. Blue and yellow radium graphics.
3. Carries Blue Flashing LED light.



### CONCEPT TWO

Split seat with space under the pillion seat  
Pillion seat can be opened without disturbing the rider seat.

1. White body paint with graphic carrying helpline number
2. Tank carries plastic cladding with pouch for LTM book and walkie talkie

Front fairing carries Traffic Police Logo and blue lights.



1. Carriage created on tail to carry LTM Book and other equipments.
2. Blue and yellow radium graphics.
3. Carries Blue Flashing LED light.



### CONCEPT THREE





### CONCEPT FOUR



Top surface is covered with rubber padding to act as writing surface.

- 1. Tank cowl with space to carry LTM book and confiscated licenses.
- 2. Radium graphics with helpline number.
- 3. Tank covered with rubber to act as writing surface

Double head light to give a dominating look.

- 1. Carriage created on tail to carry water bottle and other items.
- 2. Blue and yellow radium graphics.
- 3. Carries Blue Flashing LED lights.

- 1. Cowl on tank carrying blue LED lights visible from side and front.
- 2. Has 12 V DC electronic siren.

Air scoop to give a speedy look



### CONCEPT FIVE



# CONCEPT SELECTION



User: Tea Stall owner at Traffic Chowkie

	Concept 1	Concept 4	Concept 5
Dominating	4	5	8
Power	4	4	8
Different	1	8	5
Graphics	6	6	4
	15	23	28

Comments: Should have sound like bullet.

From the five rendered concepts, three concepts were selected for further user study. This include three general public and four traffic police officers. Concept coloured print outs along with the feature explanation were show to the users and their ratings were recorded on a scale of 1 to 9.

This user study helped to finalise the concept for further development.

User: Restaurant owner

	Concept 1	Concept 4	Concept 5
Dominating	4	9	4
Power	3	9	5
Different	5	8	4
Graphics	6	5	7
	18	31	20

Comments: Stickers should be different

User: Tea Stall owner at Traffic Chowkie

	Concept 1	Concept 4	Concept 5
Dominating	2	7	2
Power	3	6	3
Different	3	6	4
Graphics	4	4	3
	12	23	12

Comments: Could be like a cruiser.

User: Head Constable

	Concept 1	Concept 4	Concept 5
LTM Book	2	8	5
Walkie Talkie	2	2	7
Others	6	7	9
Dominating	4	8	7
Power	5	7	7
Different	4	8	5
Graphics	6	6	4
	29	46	44

Comments: Need side trunk

User: Rider 1

	Concept 1	Concept 4	Concept 5
LTM Book	1	9	3
Walkie Talkie	2	2	9
Others	6	8	8
Dominating	4	9	3
Power	3	9	6
Different	3	7	5
Graphics	2	7	6
	20	51	40

Comments: Need side trunk, Helmet Lock, Safety Lock.

User: Police Inspector

	Concept 1	Concept 4	Concept 5
LTM Book	3	9	2
Walkie Talkie	3	3	6
Others	2	7	9
Dominating	5	9	6
Power	5	6	4
Different	2	8	4
Graphics	2	6	5
	22	48	36

Comments: Need side trunk for more equipment storage  
Need pillion seat

User: Rider 2

	Concept 1	Concept 4	Concept 5
LTM Book	3	7	1
Walkie Talkie	4	4	8
Others	5	8	8
Dominating	3	8	6
Power	4	7	6
Different	6	9	4
Graphics	6	6	6
	31	49	39

Comments: need pillion seat, secure walkie talkie lock



Concept 4 was selected for further refinements.



**VOLUME REQUIREMENTS:**

In order to allot space for the for various equipments carried during during patrolling volumetric calculation was done. LTM book, defaulter License area and walkie talkie area would be within the easy reach of the rider. Bike Log book, reflector jacket, water jacket, tiffin box, rain coat and civil clothing would be placed within the space created in tail. The volumetric calculations are give below.

1. LTM Book	(22 x 15.5 x 2.5)cms	853 cubic cm
2. Walkie Talkie	(5.6 x 5.6 x 130)cms	408 cubic cm
3. Bike Log Bk.	(30 X 21 X 1.5)cms	950 cubic cm
4. Reflector jacket		4250 cubic cm
5. Water bottle	(1 ltr)	1200 cubic cm
6. Tiffin Box	(dia 14 x 6) cms	30 cubic cm
7. Rain Coat	(25 x 17 x 10) cms	4250 cubic cms
(A) Volume required		11941 cubic cm
(B) Volume required for packing(20% of A)		2388 cubic cm
<b>Total (A+B)</b>		<b>14329 cubic cm</b>

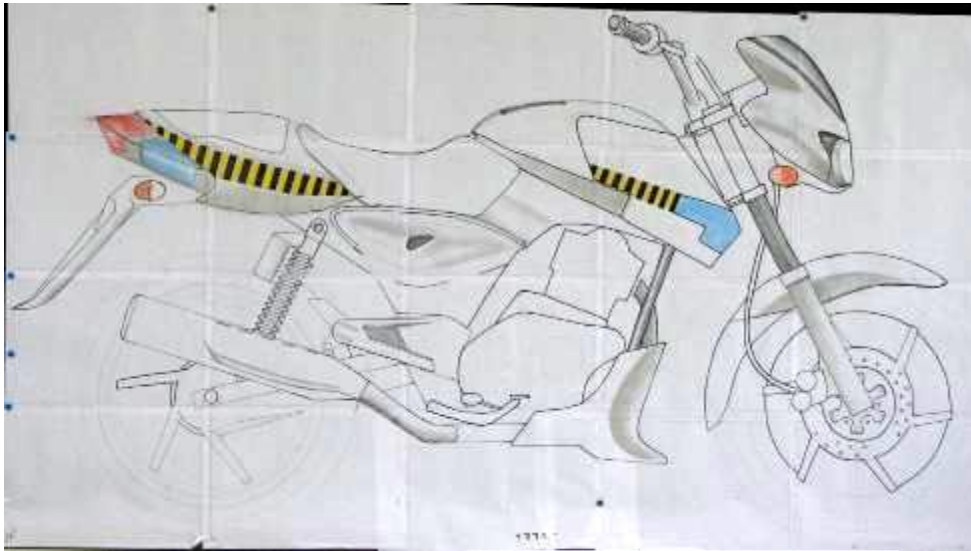
Volume available in rear tail (40 X 25 X 15) cms                      **15000 cubic cm**

As seen from the above calculation total volume actually required is less then the volume available.



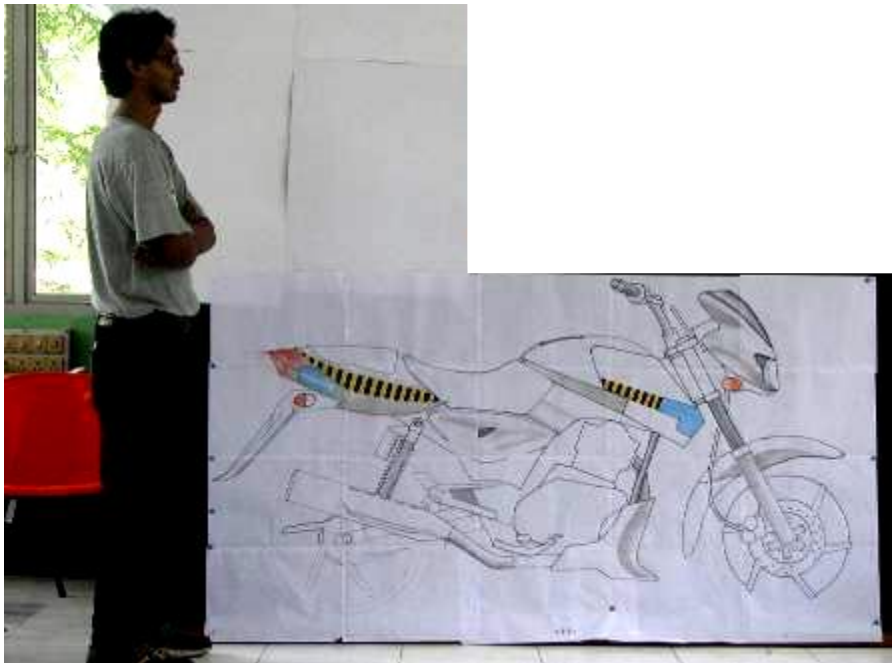
2D Mock up panels were made and attached on an existing vehicle to study the form proportions.





1:1 scale rendering was made after the refinements in the lines and form.

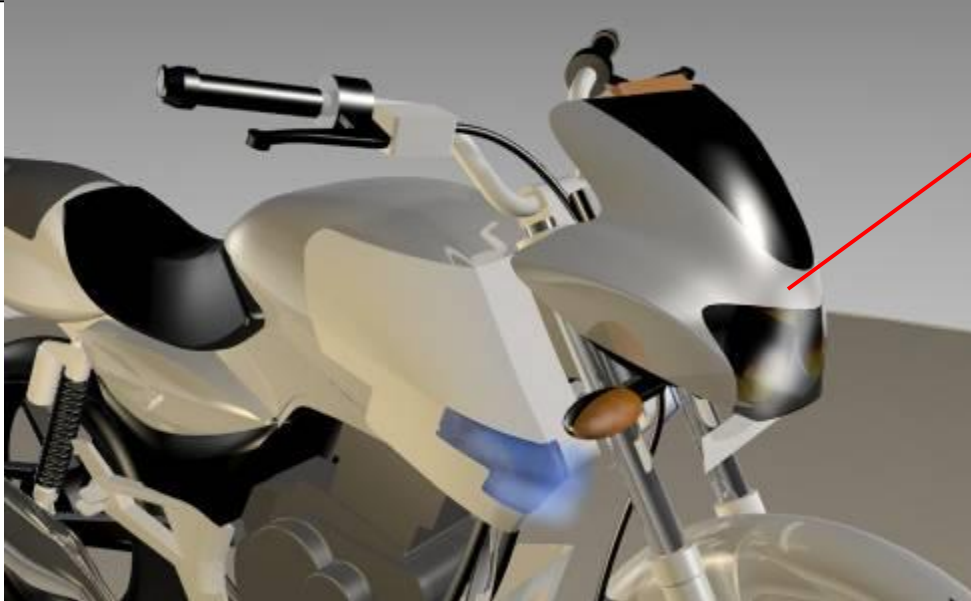
Number of changes happened at this stage in the lines of the front fairing and the tank cowl.



### CAD Modelling in Rhino.

*Inputs such as the changes in front fairing and the side cowl, from the mock up model and 1:1 rendering were then incorporated in the final model.*

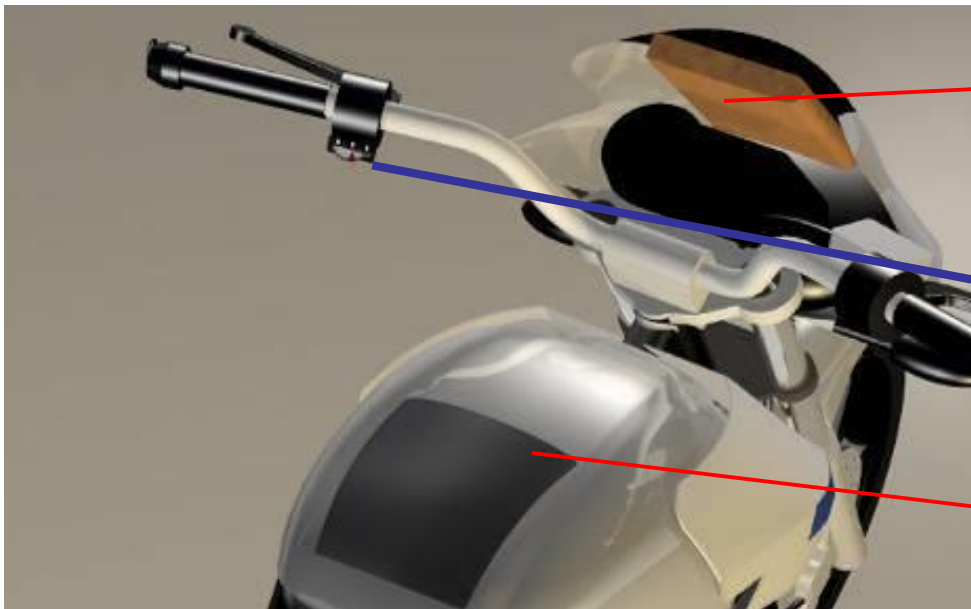




Head fairing with double head light to give a **dominant** and **focused** look.

Wider fairing helps to create a dominating feel and has a road presence among the single head light vehicles.

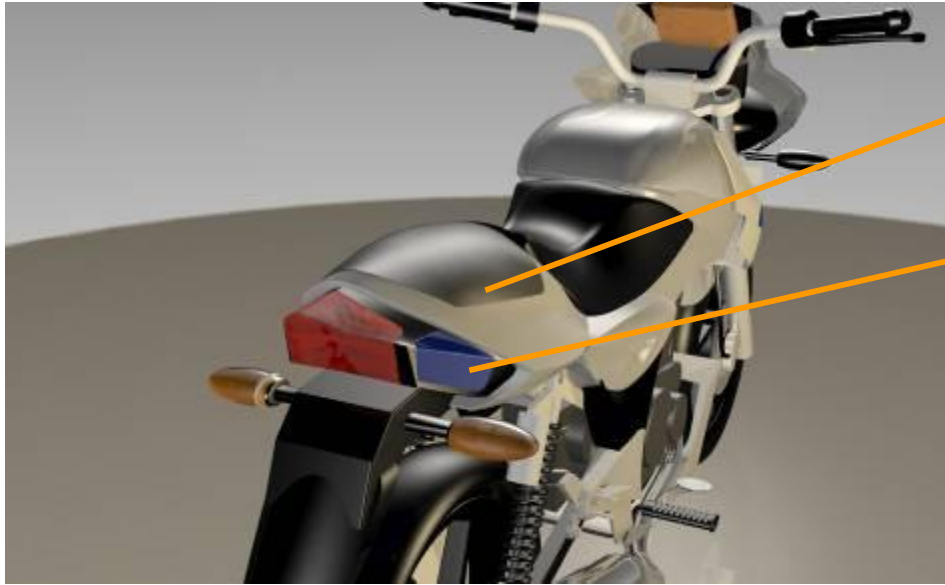
Visor carries Mumbai Police Logo.



Space for LTM Book in the fairing. This will enable the user to reach the Book without having to get off the vehicle.

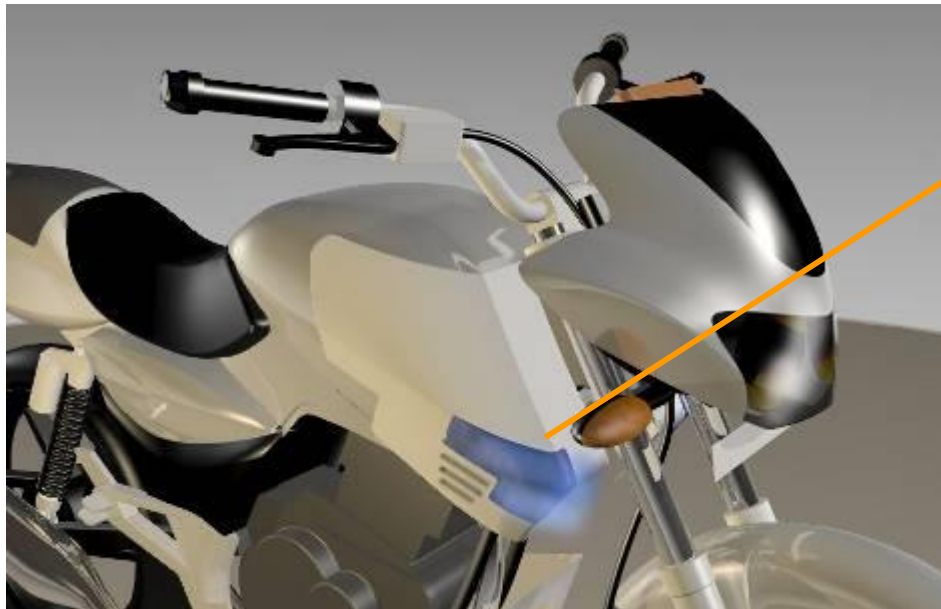
3 way switch (OFF, Emergency light ON, Emergency light and Siren ON)

Rubber cladding on the tank surface which will be used as writing surface for the LTM Book.



Single seater with Tail carriage unit at the rear for carrying water bottle, civil shirt, raincoat etc.

The tail light unit carries Blue LED lights that will be used in emergency.



Side tank cowls increases the dominating feel of the user.

Space for carrying graphics and emergency contact number.

Blue LED lights provided on the tank side cowl.

Emergency indicator.

Siren Slots on the tank cowl



Air Scoop.

Gives a sense of movement and power.



Fairing



Tail Carriage unit



Tank Cowl

- FRP Panels

FINAL MODEL

Design of Two Wheeler for Traffic Police



FINAL MODEL

Design of Two Wheeler for Traffic Police



FINAL MODEL

Design of Two Wheeler for Traffic Police



FINAL MODEL



Design of Two Wheeler for Traffic Police



FINAL MODEL



Design of Two Wheeler for Traffic Police



FINAL MODEL



Design of Two Wheeler for Traffic Police



FINAL MODEL



Design of Two Wheeler for Traffic Police

