

Design project II

INTERIOR OF THE POLICE PATROLLING COMBAT VEHICLE

Rajkumar Kewat
156390005 (2015-17)

Mobility and Vehicle Design
IDC, IIT Bombay

Guide - Prof. NISHANT SHARMA



IDC School of Design
Indian Institute of Technology, Bombay

DECLARATION

I declare that this written report represents my own idea in my own words, and where others, ideas or words have been included, I have mentioned the original source. I also declare that I have adhered to all principles of academic honesty and integrity and have not falsified, misinterpreted or fabricated any idea, data, facts or source in my submission.

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Signature -

Name - Rajkumar Kewat

Roll No - 156390005

Date -

APPROVAL SHEET

This Mobility & Vehicle Design project report entitled “Interior of the police patrolling combat vehicle”, by Rajkumar Kewat is approved in partial fulfillment of the requirement for Master of Design degree in Mobility and Vehicle Design.

Project Guide - Prof. Nishant Sharma

Chair Person -

Internal Examiner -

External examiner -

Date -

ACKNOWLEDGMENT

I have taken efforts in this project. However, it would not have been possible without the kind support and help of many individuals and organizations I would like to extend my sincere thanks to all of them.

I am highly indebted to Prof. Nishant Sharma for his guidance and constant supervisions as well as for providing necessary information regarding the project & also for his support in completing the project. I also thank Prof. Sugandh Malhotra for his inputs on the project.

I would like to express my gratitude to the member of IDC School of Design, IIT Bombay and Powai Police for their kind co-operation and encouragement which help me completion of this project.

Last but not the least, my thanks and appreciations also go to my colleague in developing the project and people who have willingly helped me out with their abilities.

Rajkumar Kewat
Date

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INTRODUCTION

Law enforcement in India is performed by numerous agencies. These agencies are controlled by central and state governments. There are Special Forces to handle particular circumstances.

Police help to maintain law and order in public 24x7. Which involves patrolling specific areas as a daily routine. In addition to this they act as first responders in case of emergency. Patrolling troops with different vehicles are used based on the situation. These troops have different needs and carry specific equipment. But the vehicles provided to them are not specific which in our case mostly passenger vehicles are. As they spend more than 12 hours while patrolling there is necessity to address their needs.

Even though troops use different vehicles for different tasks there is a need to full fill their specific requirements. This makes the problem challenging.

1. PRE RESEARCH

1.1 LAW ENFORCEMENT IN INDIA



Law enforcement in India is performed by numerous law enforcement agencies. Like many federal nations, the nature of the Constitution of India mandates law and order as a subject of the state, therefore the bulk of the policing lies with the respective states and territories of India.

At the federal level, the many agencies are part of the Union Ministry of Home Affairs (MHA), and support the states in their duties. Larger cities also operate metropolitan police forces, under respective state governments.

Law enforcement in India is performed by numerous law enforcement agencies and it's majorly divided into two groups.

1. Police organization under central government
 - 1.1 Central Para military forces
 - 1.2 Unarmed police organizations
2. Police organization under State government



[Image 1]

1.1.1 POLICE ORGANIZATION UNDER CENTRAL GOVERNMENT

CENTRAL PARA MILITARY FORCES



[Image 2]

Border Security Force

The Indian Border Security Force (BSF) is responsible for policing India's land borders during peace time and preventing trans-border crimes. It is a central police force operating under the Union Ministry of Home Affairs. It is performing a variety of duties ranging from VIP security to election duties, from guarding of vital installations to the counter-naxal operations.



[Image 3]

Central Industrial Security Force

The primary task of CISF is providing industrial security. The Central Industrial Security Force (CISF) is used to guard industrial installations around the country owned by the Central government as well as securing seaports and airports. CISF also provides security to certain NGOs.



[Image 4]

Central Reserve Police Force

The Central Reserve Police Force (CRPF) is one of the largest Central Police organizations in the world. Its main objective is to assist and help states and union territories' law enforcement agencies in maintaining law and order and to contain insurgency. It is also deployed as anti-terrorist unit in various regions.



[Image 5]

Indo-Tibetan Border Police

The Indo-Tibetan Border Police (ITBP) is one of the five main Central Armed Police Forces, responsible for security along the Indo-Tibetan Border, covering 2115 km. The ITBP personnel are trained in the fields of law & order, military tactics, jungle warfare, counter insurgency and internal security



[Image 6]

National Security Guards

The National Security Guards (NSG) is a commando unit originally created for counter-terrorism and hostage rescue missions. Raised in 1986, it is popularly known as the “Black Cats” for the uniform worn by its operators. Like most military and elite security units in India, it is media-shy and the general Indian public is largely unaware of its capabilities and operational details.



[Image 7]

Special Protection Group

The Special Protection Group (SPG) is the executive protection agency of the Government of India. It is responsible for the protection of the Prime Minister of India, and his/her immediate families. The force was established in 1985 after the assassination of Indira Gandhi. It provides the security 24x7 all over India to Prime Minister including ex prime Ministers and their Family Members at any location across India.

UNARMED POLICE ORGANIZATIONS



[Image 8]

Central Bureau of Investigations

The Central Bureau of Investigation (CBI) is India's premier investigative agency, responsible for a wide variety of criminal and national security matters. It is often cited to have been established from the The Delhi Special Police Establishment (DSPE) Act, 1946. However it must be noted that it was formed not by the Delhi state government but by the Central Government (Home Ministry) which controls the police in Delhi.



[Image 9]

Bureau of Police Research & Development (BPR&D)

The Bureau of Police Research and Development (BPR&D) was set up on 28 August 1970 in furtherance of the objective of the Government of India for the modernization of Police Forces. It is involved in a research, relating to problems confronting the Indian police, the training of different ranks of Police in India, and the introduction of technology at both federal and state levels.



[Image10]

Intelligence Bureau

The Intelligence Bureau (IB) is India's internal intelligence agency. The IB is used to garner intelligence from within India and also execute counter-intelligence and counter-terrorism tasks. The Bureau comprises employees from law enforcement agencies, mostly from the Indian Police Service (IPS) or the Indian Revenue Service (IRS) and the military



[Image 11]

National Crime Records Bureau (NCRB)

The National Police Commission in 1979 recommended the creation of a “Nodal Agency” which suggested the maintenance of criminal records at all the police stations in the country and to create shareable databases at police stations and districts and at state and federal Level.



सत्यमेव जयते
[Image12]

Central Economic Intelligence Bureau

The Central Economic Intelligence Bureau (CEIB) is an Indian intelligence agency responsible for gathering information and monitoring the economic and financial sectors for economic offenses and warfare.

1.1.2 POLICE ORGANIZATION UNDER STATE GOVERNMENT

Criminal Investigation Department

CID is constituted in each district under a Deputy Inspector General of Police for the purpose of collating and distributing information regarding organized crimes.

State Armed Police Forces

The State Armed Police Forces are organizations which provide the state with policing in particularly violent or serious situations. Such forces are often involved with combating banditry and Naxalites. Like the Central Armed Police Forces, they are sometimes known unofficially as “paramilitary forces”. Each state police force maintains its own State Armed Police Force (known by names such as Provincial Armed Constabulary (PAC), Special Armed Police, etc.) Which is responsible for emergencies and crowd control issues.

Traffic Police

Highway Police and Traffic Police in the small towns come under the state police, but Traffic Police in the cities come under the metropolitan police and state police. The Traffic Police are responsible for maintaining the smooth flow of traffic and stopping offenders in the city or town, Highway Police are responsible for securing the highways and for catching speeding offenders.

Metropolitan police

In addition to the state police, major Indian cities have their own police forces which follow the Police Commissionerate System like Barrack-pore Police Commissionerate in Kolkata. The Chief of Metropolitan Police is the Police Commissioner. Reporting to the Police Commissioner are the Joint Police Commissioner, Deputy Commissioner of Police and Assistant Commissioner of Police.

1.2 POLICE PATROLLING SYSTEM

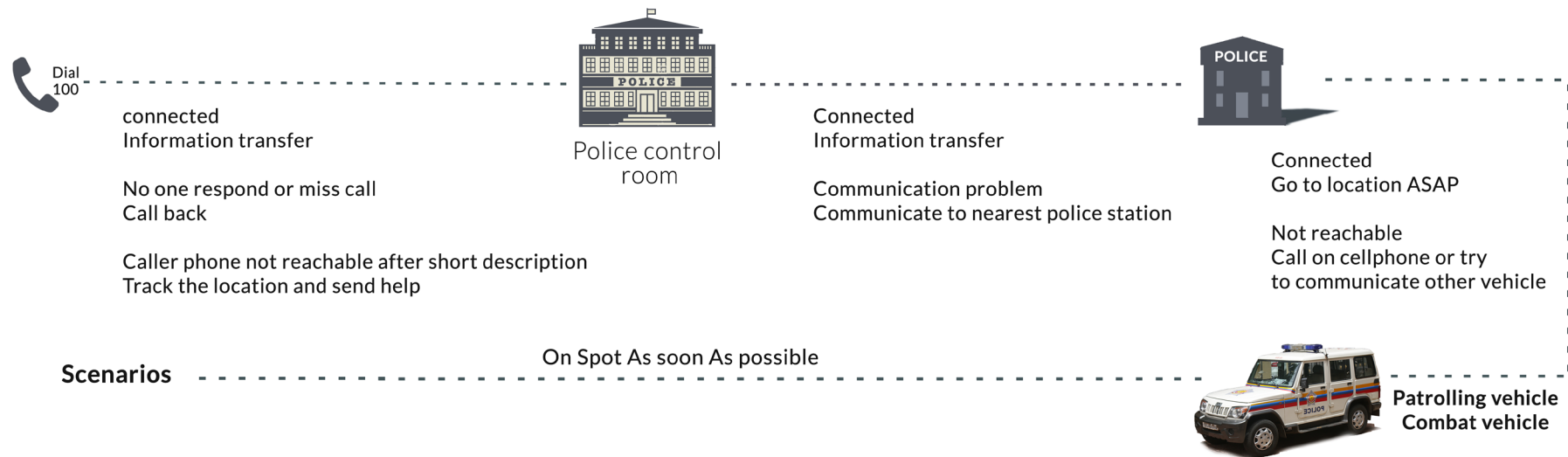
1.2.1 Police System

Each district are divided into small regions. Population and area are to factors for headquarter and police station location in a particular region. Dial 100 will directly connect user to headquarter. At some places help call also connect directly to police station, it depends on the area.

After receiving a call police ask for basic information such as place, name and incident for further actions. The information transmit to the respective police station through wireless in the entire region. Different codename are allotted to police station for ease communication.

One person from each police station is liable for answer headquarter. Particular vehicle dispatch from police station for the location after receiving message from headquarter. Vehicle selection is depend on the incident. Message pass to particular patrolling vehicle wireless if no vehicle available in the police station (When vehicle is on patrolling and not engage with a case).

Information flow chart showed in a simplified manner in next page



FLOW OF INFORMATION IN POLICE SYSTEM

Scenarios

On the requirement of the scenarios the specific vehicle dispatch from police station. The different scenarios demands different type of vehicle. How police take action in different situations and on what bases they select vehicle. How they proceed after reaching at the location of incident all are described in the table on next page.

SCENARIOS

Scenarios	Action by police
Small Fight	
Small Group (2-3 people)	Send two wheeler or marshal 2-5
Family fight	Send two wheeler or marshal 2-5 If need support then one more vehicle dispatch
Drunk person disturbance on road	If need support then one more vehicle dispatch
Group fight	Vehicle no 1 will go
	If not available then two marshal will go
	Take people in custody directly and take them directly to police station
	If someone injured then take him to hospital and other vehicle called to take other people to police station
Firing or attack situation	Combat vehicle respond first
	If cross firing happens then police called extra force/armed special police force. Special force(NSG, armed police force etc)
	To bring some one in custody marshal will go
Dead/Murder	Vehicle 1 take the body to hospital for postmortem
	Call the family members, after all paper work family members allow to take body

Scenarios	Action by police
Robbery, loot, Domestic violence, eve teasing, etc	Marshal will respond first
	Take person in custody
	In case of loot/robbery Investigating team will do further process
Accident	Vehicle 1 respond
Not injured	Note down the information and the details - take the vehicle (by Toe vehicle) to police station and the person in custody.
	Call family members in necessary.
Injured	Take statements and details
	Call family members if nearby and then go for hospital
	If no one respond then directly go to hospital, then take the person to police station for statement and then call family members form police station.
	If phone is not reachable or not responding then one policeman will go to the persons address.
	If injury is serious then without delay person taken to nearest hospital.
Hit and run	Blockade all routes of area
	Some police vehicle patrolling possible places for hiding in the area
	Take vehicle and person in custody

Scenarios	Action by police
Terrorist /lethal attack	Combat vehicle will respond first
	Engage in cross fire if needed
	Buy some time till backup reach the location
	Other vehicles also dispatch for location in severe cases

1.3 POLICE PATROLLING VEHICLES

Patrolling Vehicles



Patrolling vehicles used to do patrolling in a specific area in some intervals. They have to check in into all bit chauki's regularly. Whenever they get any command from the police station through the wireless they move to stated location directly. They also check people if they look suspicious.

Patrolling vehicle used 24x7 by police. These vehicle have to serve various activities in which patrolling is the major one. Few example of vehicle use are Transportation of victim, address group fight, transportation of dead body or injured person in case of emergency. Specific vehicle like combat vehicle and vehicle number one only address some specific situations.

Vehicle number 1 is majorly address following problems

- Severe accidents
- Group fight
- Small riots
- It also address small problems if all other vehicles are engage

Combat vehicle specially address the terror attack as a first responder. Policeman in combat vehicle used to carry rifles and individual pistols. They are also facilitated with bullet proof jacket and helmets.

The basic of specifications and their purpose given in next page

Types of Patrolling vehicles



BEAT MARSHAL

2 + 1 (One officer and two constable)

Daily Patrolling (Check in beat cahuki's), First responder.

Address problems – group fight, domestic viaolence, Robbery etc. Check people if they look suspicious, Chase if someone try to run. Enough space to take 4 to 5 people in custody, not deal with body Transfer or very severe cases.

Run - 600-800km/day

Number of vehicle per police station - 4 to 5



COMBAT VEHICLE

4 + 1 (One officer and two constable)

First responder for severe cases like armed attack or hostage case. Address problems – Attack by armed people, Armed combat etc. One vehicle for one division, not use to take people in custody.

Entirely for combat purpose.

One Vehicle per police station



VEHICLE NO 1

4 + 1 (One officer and four constable)

Daily Patrolling, Deal with severe cases

Address problems – group clashes, Accidents, murder etc.

Enough space to take 6 to 7 people in custody, Carry stretcher to

Transfer injured people or dead body

Number of vehicle per police station - only one



PATROLLING VEHICLE FOR LADIES

2 + 1 (One officer and two constable)

Daily Patrolling (Check in beat cahuki's), First responder.

Address problems – Crime by females

Space to take 1 or 2 people in custody, not deal with body

Transfer or very severe cases.

Number of vehicle per police station - Only one



TWO WHEELER BEAT MARSHAL

1 + 1 (One officer one constable)

Daily patrolling

Address traffic crime, small fights etc.

Number of vehicle per police station - 4 to 5

EQUIPMENT IN VEHICLES

All vehicle carry some equipment according to their assigned job. Some items like walky talky and pistol (Carried by officer mostly) essential to carried in all vehicles. Below is the chart show what kind of vehicle carry what.



Equipment/vehicle	Vehicle number 1	Combat vehicle	Patrolling vehicle	Ladies patrolling vehicle	Two wheel BEAT Marshal
Walky Talky	1	1	1	1	1
Pistol 9mm	1	5	1	1	1
Helmet	5	5	-	-	1
AK-47	2	2	-	-	-
Carbine	-	1	-	-	-
Bullet proof jacket	5	5	-	-	-
First Aid kit	1	1	-	-	-
Lifebuoy	1	-	-	-	-
Shield	4	-	-	2	-
Stretcher	1	-	-	-	-
Stick	5	-	3	3	-

Equipment



AK - 47



Sterling L2A3 (Carbine)



Pistol 9mm



Walky Talky



Bullet proof jacket



Lifebuoy



Bullet proof helmet



First Aid kit



Lathi



Stretcher



Shield

2. RESEARCH

2.1 OBSERVATION STUDY OF CURRENT VEHICLES

Observation study done on patrolling vehicle no 1, combat vehicle and ordinary patrolling vehicle show the basic problems in the current vehicles. Current vehicle is have lot of problems which needs to address and also challenging.

As the vehicle are not designed particularly for the police because of that it have some basic problems such as ingress egress, space, equipment mountings etc.,

The observation study shows the problems in the current vehicles.

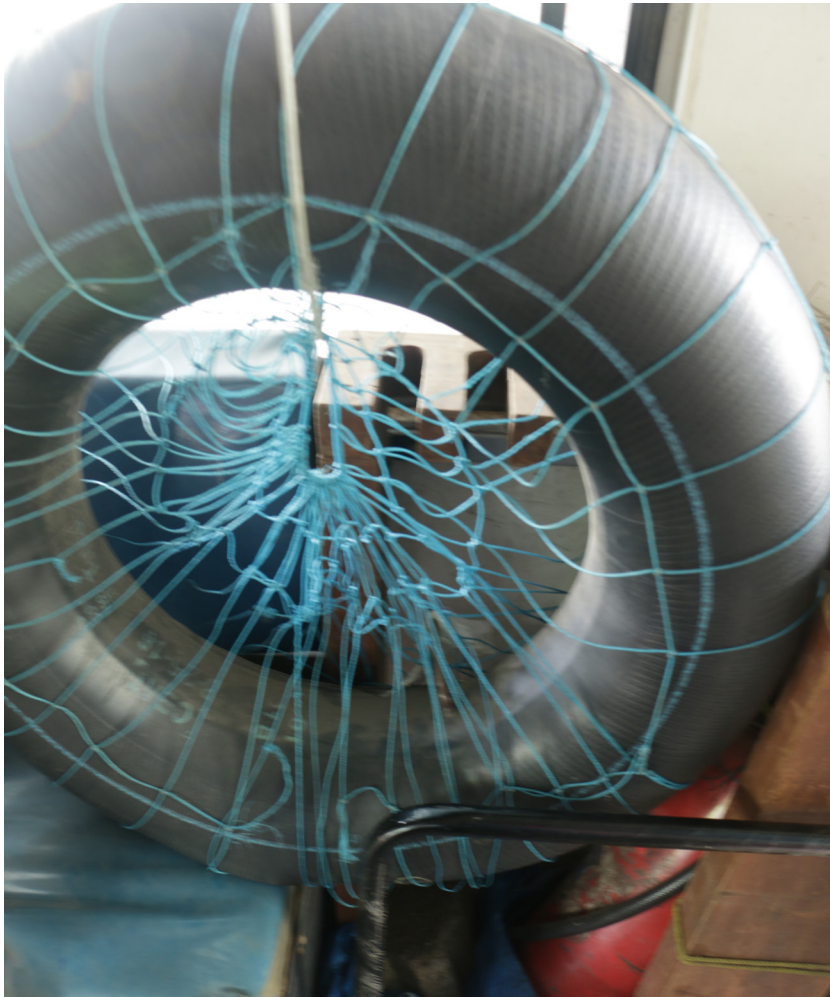
STUDY OF VEHICLE NUMBER 1



No proper mounting for water bottles



No proper mountings for the placement of equipment like shield, bullet proof jacket



No standard lifebuoy and also not a proper mounting



Uncomfortable seating arrangement and very compact space for movements inside the vehicle.

Insights from the observation study of vehicle no 1

After the observation study and user review of the vehicle, following problems identified in the current vehicle number 1

- All the important equipment (Rifles, helmet etc.) are kept below seats in a packet box which require lot of time to excess.
- Seat arrangement is bad.
- Seat material is bad it become too hot and not also comfortable for long duration.
- No space for keeping user backpacks
- Only one excess door which is unsafe in case of emergency (User said from his past experience).
- Space problem while using stretcher, no space left to walk after keeping stretcher in the middle of the seats.
- No proper mountings for the equipment.

STUDY OF ORDINARY PATROLLING VEHICLE





No proper casing for walky talky.



Sticks are thrown randomly on the floor because of the absence of the mountings.



Stick below the seat lied down which is hard to access in short period of time.



Walky talky stand mounted on the floor which act as a obstruction on the way.

Insights from the observation study patrolling vehicle

Most of the current ordinary patrolling vehicle used by the mumbai police are Mahindra bolero, TATA sumo or Maruti Ertiga (Patrolling vehicle for ladies).

Generally only 3-4 people use to travel in this vehicle the major problems in the vehicle are the mountings of the walky talky and seat comfort. In the summer season its really get hot inside the vehicle where policemen have to spend near about 12 hours.

Vision problem at the time of night patrolling as there is no option to look around in the dark.

STUDY OF COMBAT VEHICLE





All the bullet proof jacket and bullet proof helmet are packet in the wooden box due to which it requires lot of time to access them and its worst if policeman have to access them from inside of the vehicle while its moving.



Helmet is kept above the box without proper mounting and its extremely difficult to take position inside the vehicle if the get surrounded by enemies.

Rifles are tied up from the seats with the help of cycle tire tube.

Third row of the vehicle is used as a luggage space which makes the equipments accessible form the rear only. Middle row of the vehicle does not provide sufficient space to policemen to dress up with jacket and helmet while moving



Insights from the observation study combat vehicle

Combat vehicle meant for first responder in case of emergency. It require quick access to all the equipment and policemen should also be able to dress up with bulletproof jacket and helmet while vehicle is in motion.

But the current vehicle have lot of problems which makes it very less efficient for combat scenarios. As seen in the photographs all the bullet proof jacket and helmet are kept inside a wooden box. To access the equipment from inside the box require to open rear gate and need to stop the vehicle for doing that. The equipment are not accessible from inside of the vehicle.

Rifles are kept vertical with the front seat. The rubber tube of motorcycle is used to hold the rifle which makes accessibility tough in the emergency cases. The ammunition boxes are also kept inside the wooden box which only accessible from rear in current vehicle.

The seat arrangement is also a problem. Middle row is used by three passengers and in case of emergency the person seating in the center are not in a condition to do anything in such a compact space.

The Combat vehicle interior have lot of challenging problems which need to resolve for quick access to the equipment and help policemen for quick deployment.

TO DESIGN THE INTERIOR OF THE POLICE PATROLLING COMBAT VEHICLE

Primary function of the interior package of the vehicle

- Quick access to body armor and weapons.
- Positioning of equipment to facilitate quick and easy access.
- Quick deployment of policemen from the vehicle.
- Transformability of interior in case the policemen have to fight from the inside of the vehicle.

Considerations for packaging of the interior

- Can accommodate five policemen.
- Can accommodate the following equipment -

Primary equipment -

AK-47	- quantity 3
Bullet proof helmet	- quantity 5
Bullet proof jacket	- quantity 5

Secondary equipment -

Ammunition box	- quantity 2
Water bottles	- 1L x 10
Fire extinguisher	- 1
First aid kit	- 1

- All primary equipment should be immediately accessible.
- Placement of equipment and fixtures which doesn't hinder the ingress, egress and free movement of the occupants.
- Policemen should be able to put on bullet proof jacket and helmet inside the vehicle itself.

Considerations for the safety and deployment of policemen

- All doors should be accessible in short time period for all policemen.
- Providing 360 degree visibility and weapon reach for the policemen without compromising safety.
- Allow for different deployment patterns depending on the situation at hand.
- To create space inside the vehicle so that all policemen can take a proper position inside the vehicle itself.

Constraints for the vehicle

- Current Mumbai police vehicle (Mahindra bolero) dimensions for the interior packaging.

4. IDEATION

IDEATION FOR SEATING LAYOUT

Current vehicle have very compact seating layout. To give unrestricted movement space and also create some space inside to vehicle is the goal for the ideation of interior layout. Seating arrangement should allow the user to move freely.

In this ideation process equipment placement and mounting are also considered for quick access. The accessibility of maximum exit for quick deployment and if the one side blocked in any situation then other door also be accessible.

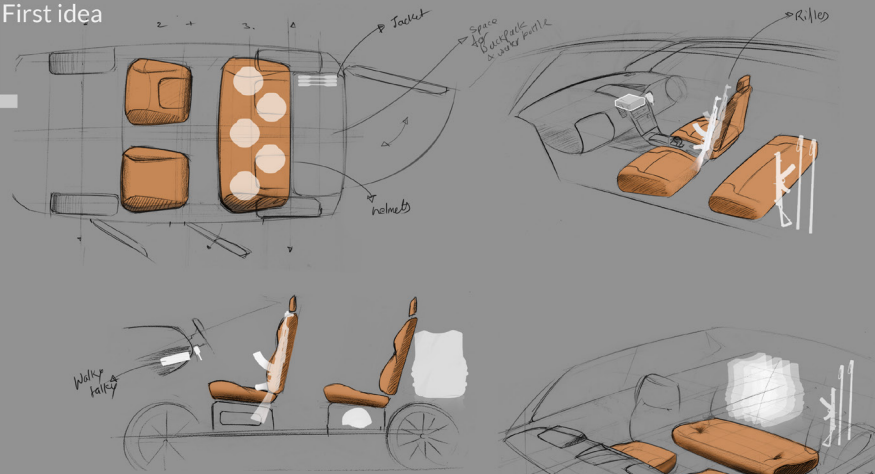
Layout Ideation One

The first ideation is done on current layout of the patrolling vehicle. In attempt in this ideation is to create the space and provide better pancaking with the minimal changes in the current patrolling vehicle layout.

For each concept layout three different packaging ideation's are made and analyzed. In the first layout the unused rear seats are removed which create more space where bullet proof jacket or other equipment mounted properly.

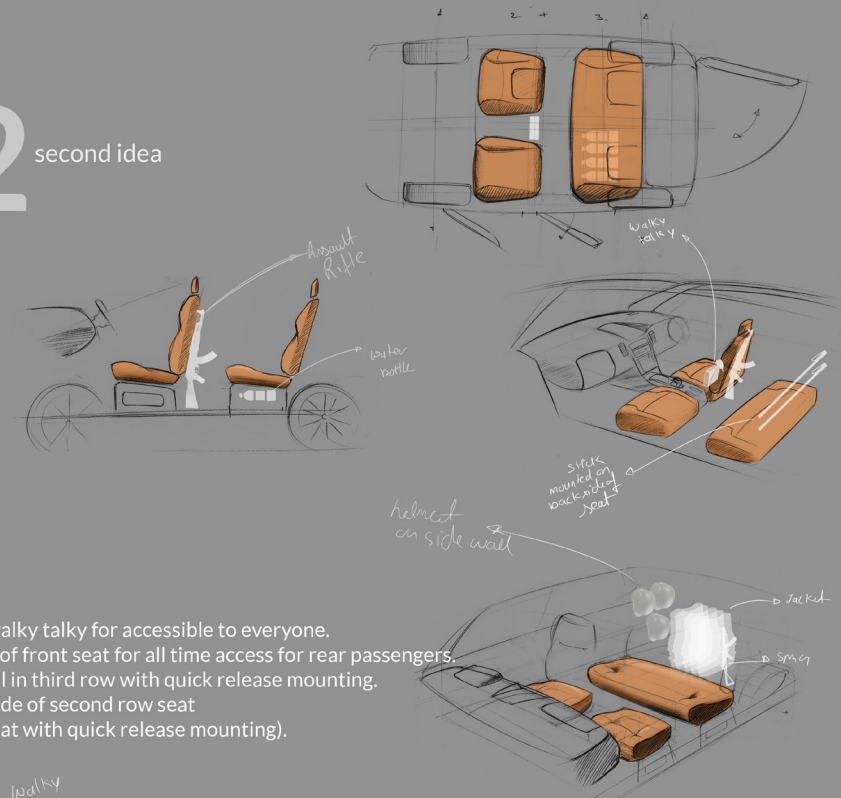
PACKAGING IDEATION FOR FIRST LAYOUT

1 First idea



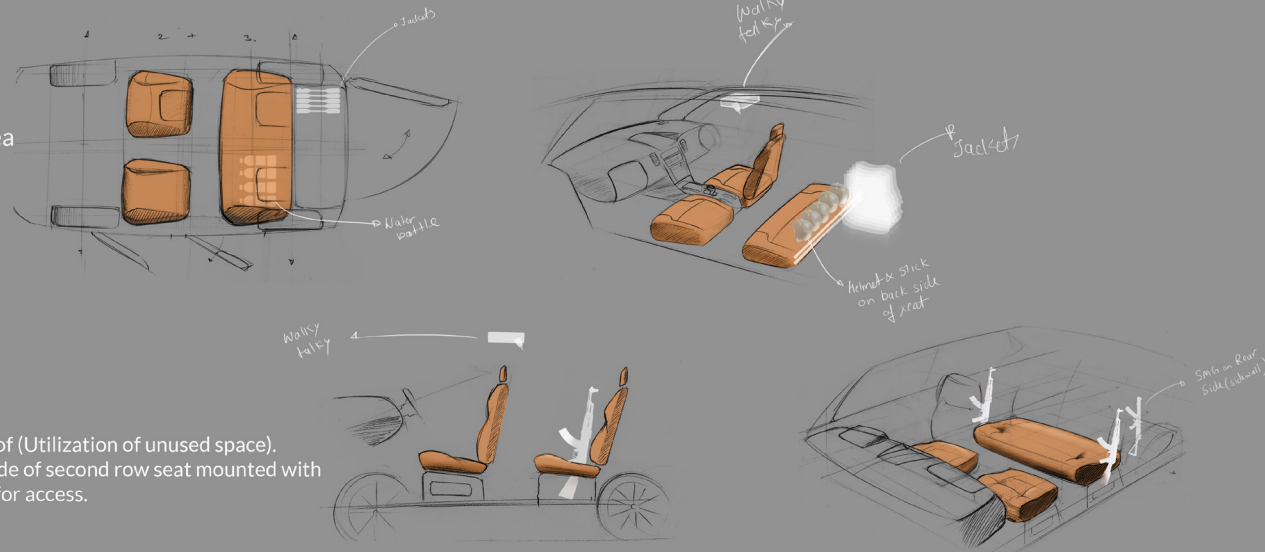
Ease to access front assault rifles.
Systemic arrangement of Bullet proof jacket for ease access.
Ease access to helmet.
Lot of space on the third row for backpack and water bottles.
Inaccessible walky talky for rear passengers.

2 second idea



Centre placement of walky talky for accessible to everyone.
Rifles on the back side of front seat for all time access for rear passengers.
Helmet on the side wall in third row with quick release mounting.
Stick are on the back side of second row seat
(Integrated with the seat with quick release mounting).

3 Third idea



Walky talky on the roof (Utilization of unused space).
Helmet on the back side of second row seat mounted with quick release system for access.

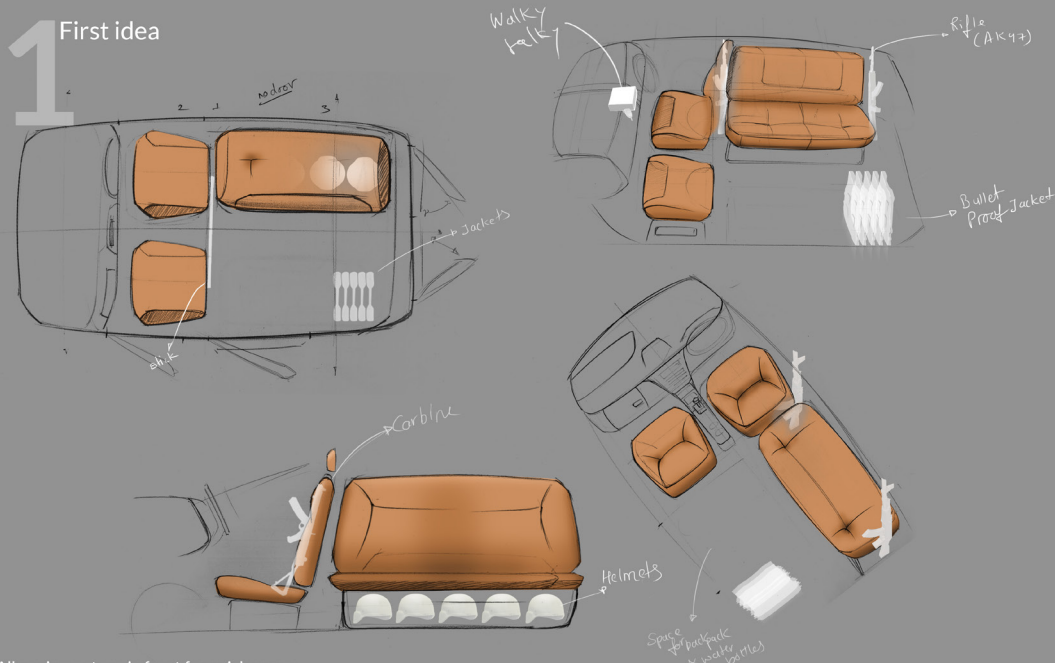
Layout Ideation Two

The second and third row of seats are replaced by the single longitudinal seat. Sufficient space for three passengers and also provide quick access to rear door.

The equipment mounted in the opposite side of the seat in rear partition. Lot of space to move inside the vehicle because of single sided seat.

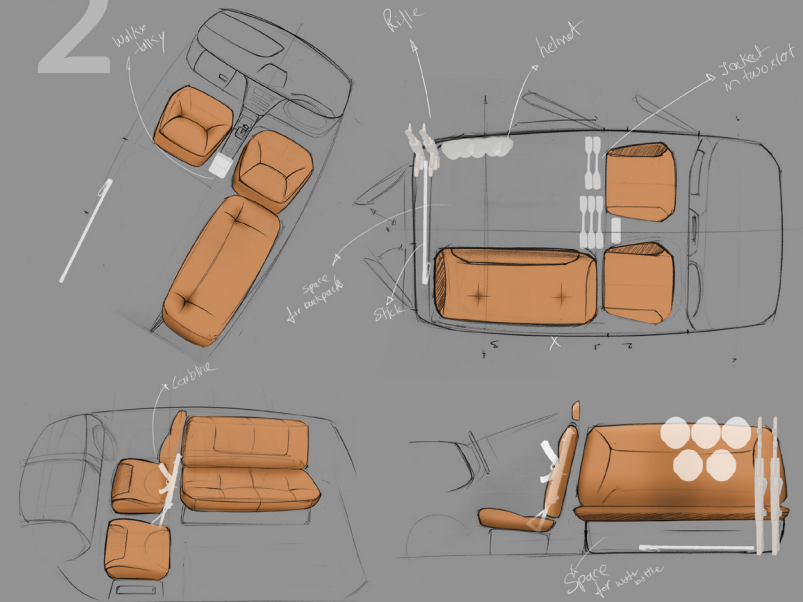
PACKAGING IDEATION FOR SECOND LAYOUT

1 First idea



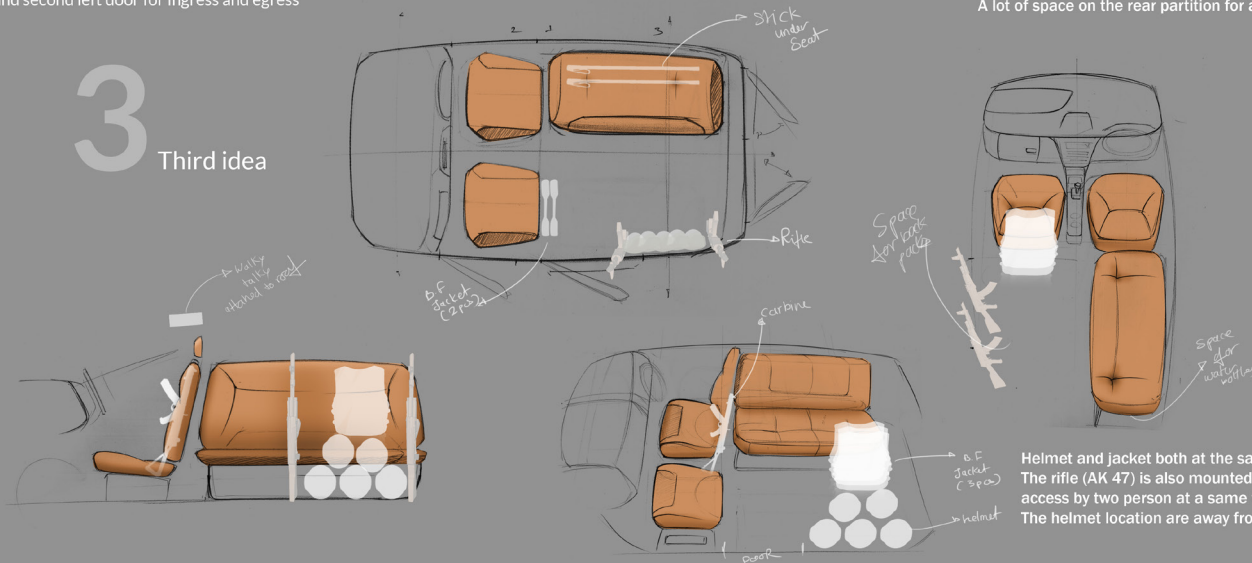
All equipment are in front for quick access.
 Lot of space inside to take position inside the vehicle itself in case of attack.
 No second door on the right side, rear and second left door for ingress and egress for rear passengers.

2 second idea



Bullet proof jacket placed in two slots so that front passenger also get easy access to them.
 Even one rifle placed between front row seats and other two near to rear seat passengers.
 A lot of space on the rear partition for activities.

3 Third idea



Helmet and jacket both at the same place so they can be approached at same time.
 The rifle (AK 47) is also mounted beside them in such a way so that both can be access by two person at a same time.
 The helmet location are away from the front passengers.

Layout Ideation Three

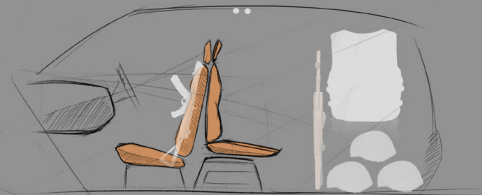
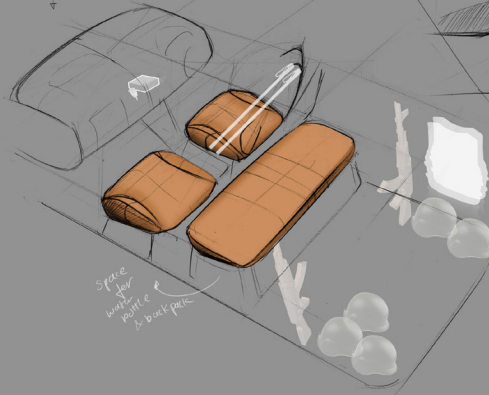
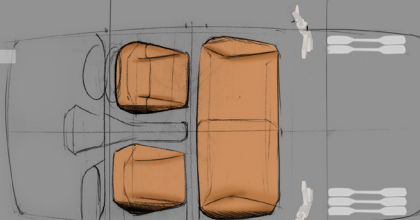
The second row is facing towards rear direction of the vehicle. Which allow the police men to deploy from all directions. The rifles and helmets are in hand reach easily.

They have to benefit of all direction visibility here. The space allow them to take position inside the vehicle in case. The space below the seats are also utilized to carry equipment.

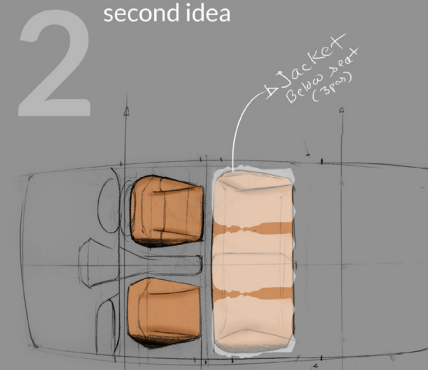
PACKAGING IDEATION FOR THIRD LAYOUT

1 First idea

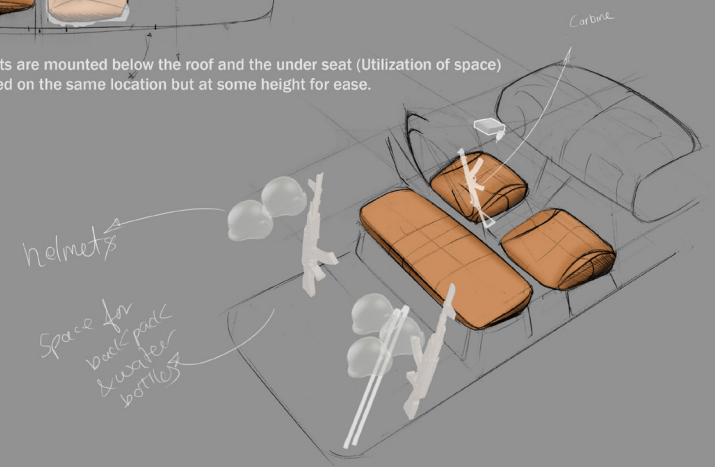
Most of the equipment are mounted on side wall leaving a lot of space in the center. Jackets and helmet are in two slots on both the sides for ease distribution.



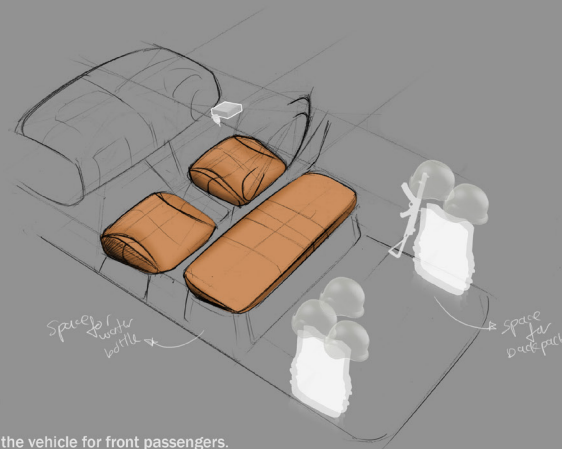
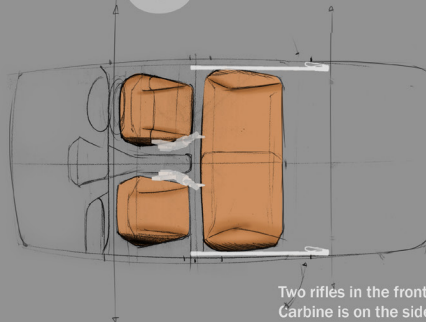
2 second idea



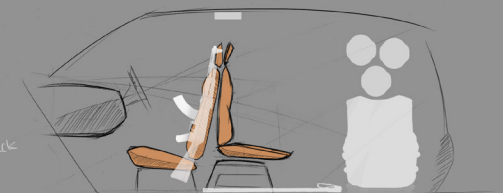
Bullet proof jackets are mounted below the roof and the under seat (Utilization of space) Helmets are placed on the same location but at some height for ease.



3 Third idea



Two rifles in the front of the vehicle for front passengers. Carbine is on the side of rear compartment with other equipment. Hard to transfer the rifles from the front to rear in such case.

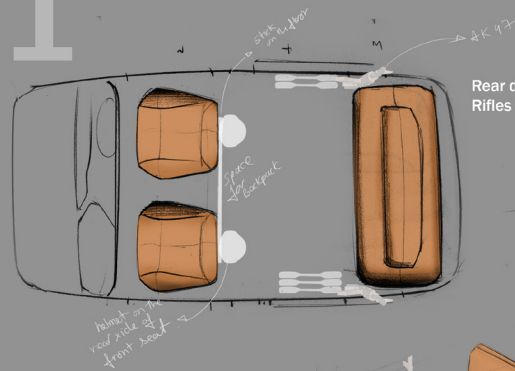


Layout Ideation Four

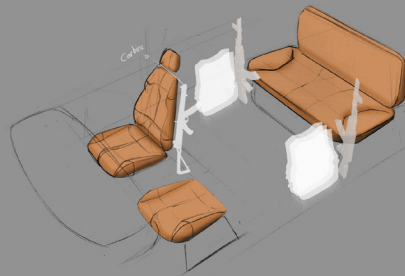
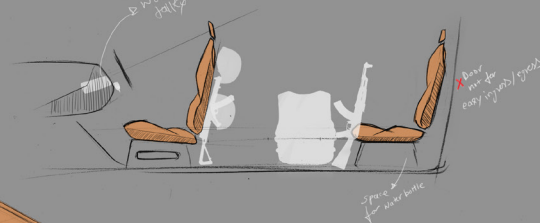
The second row pushed in rear end of the vehicle. In this idea comfortability of the policemen is considered. More comfortable ride on rear seat. If any attack happens from rear direction, rear seat work as a protection for policemen.

PACKAGING IDEATION FOR FOURTH LAYOUT

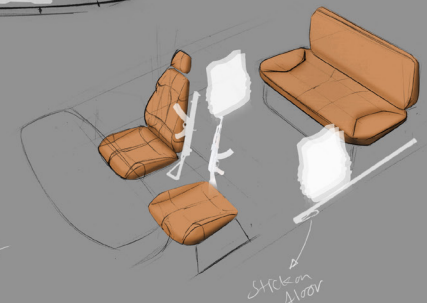
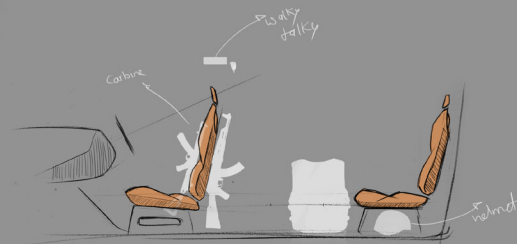
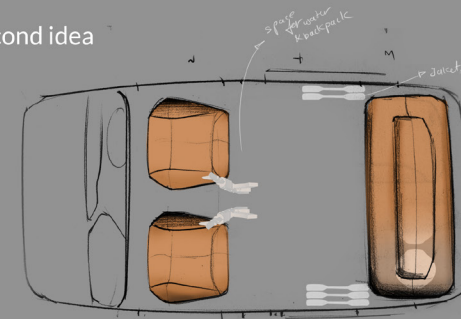
1 First idea



Rear door can't be used for quick ingress or egress.
Rifles and helmets are reachable easily for both front and rear passengers.

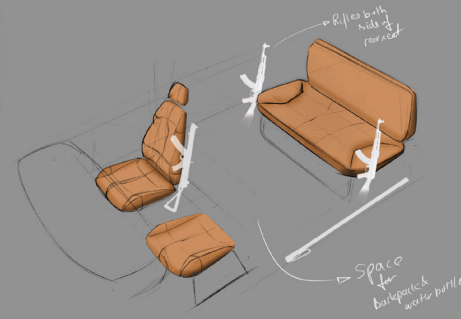
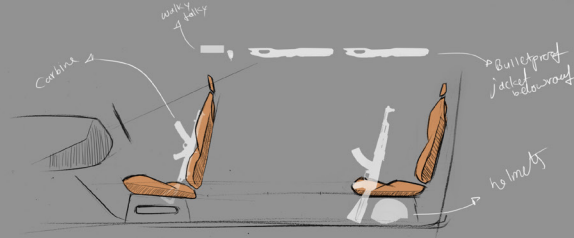
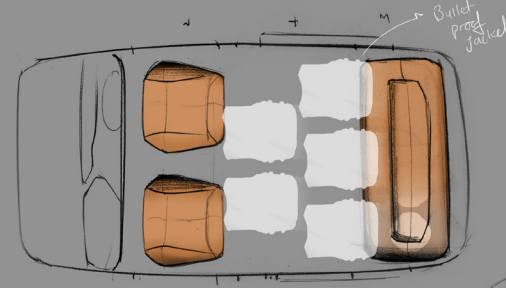


2 second idea



All major weapons are in the center of the vehicle for access to everyone.
Jackets and helmets are close to rear passengers.

3 Third idea



Bullet proof jacket mounted on the roof which gives a lot of space in the center.

Layout Ideation Five

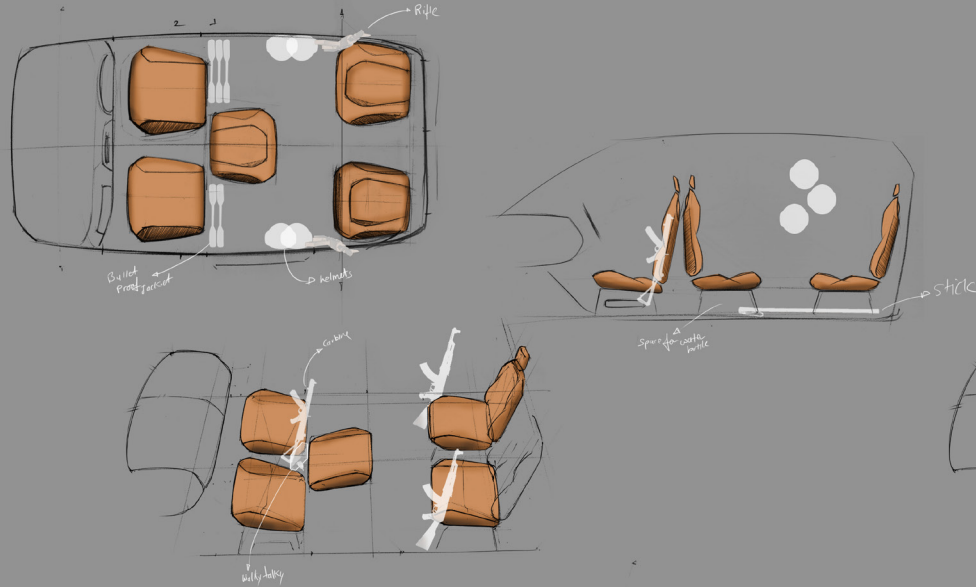
All policemen have individual seats. The individual seats allows policemen to move easily inside the vehicle and able to dress up inside the vehicle without any space constrain.

Individual person have his equipment neat to his seating location for quick access. Because of seating layout policemen get visibility in all directions. The access to all doors is also possible quickly as each person can egress form one door no one need to wait for other guys to exit first.

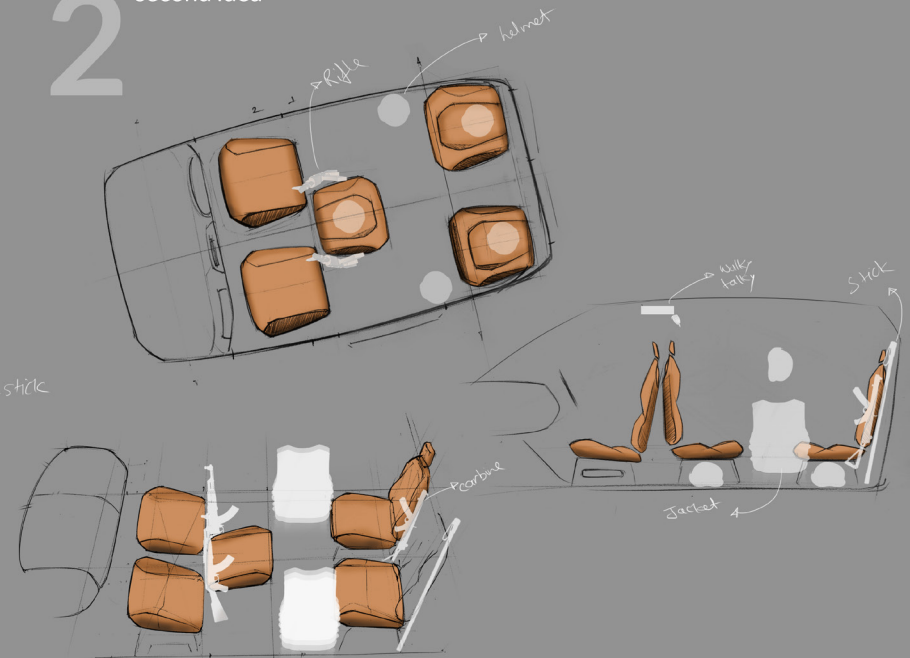
PACKAGING IDEATION FOR FIFTH LAYOUT

1 First idea

All individual seats of every one to give comfort all the time (gives a free space around to them). Helmets are on side wall may obstruct the path/ and visibility of rear passengers.

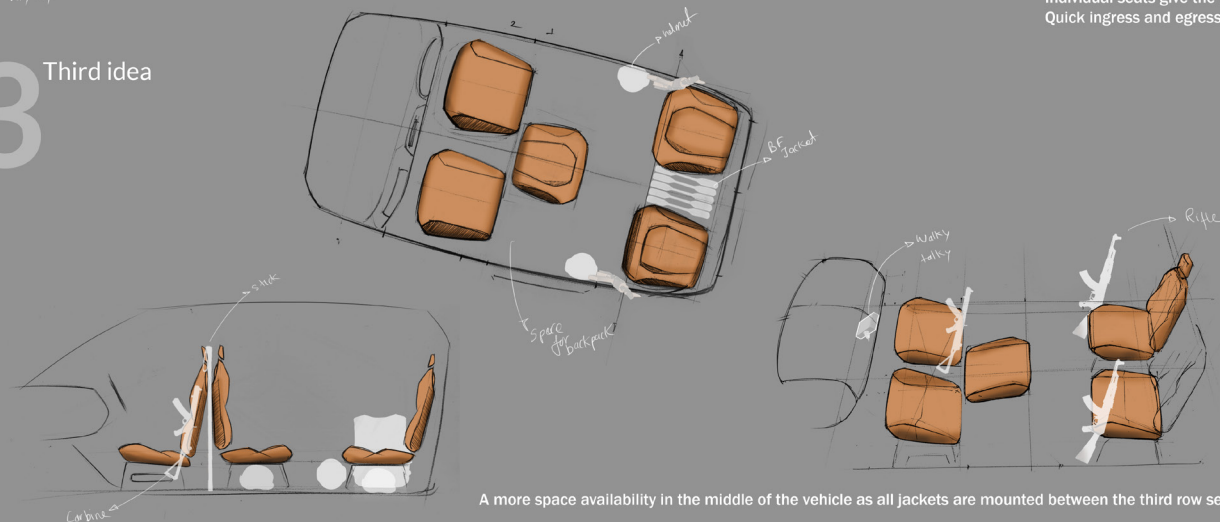


2 second idea



Individual seats give the freedom to the passengers to move quickly in the space. Quick ingress and egress is not possible from rear door.

3 Third idea



A more space availability in the middle of the vehicle as all jackets are mounted between the third row seats.

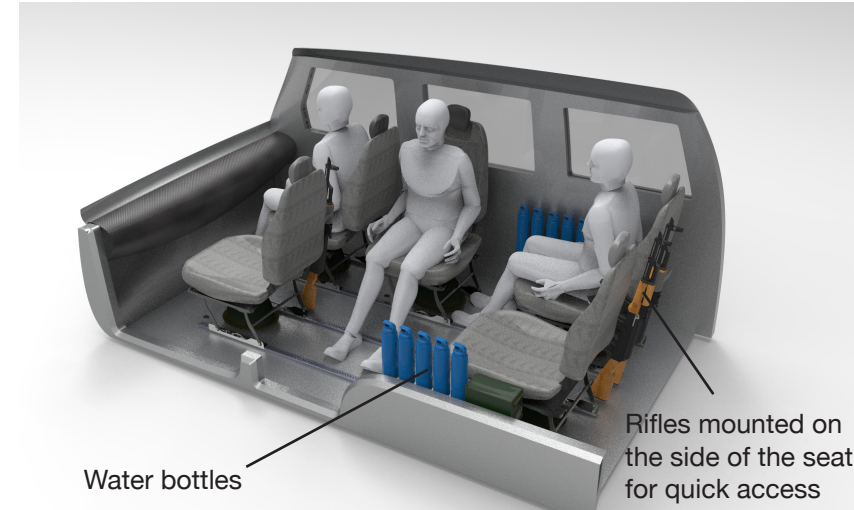
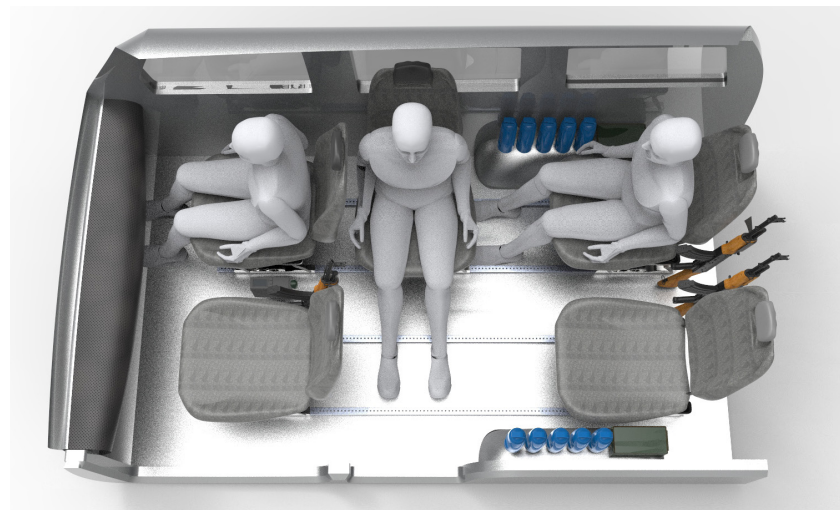
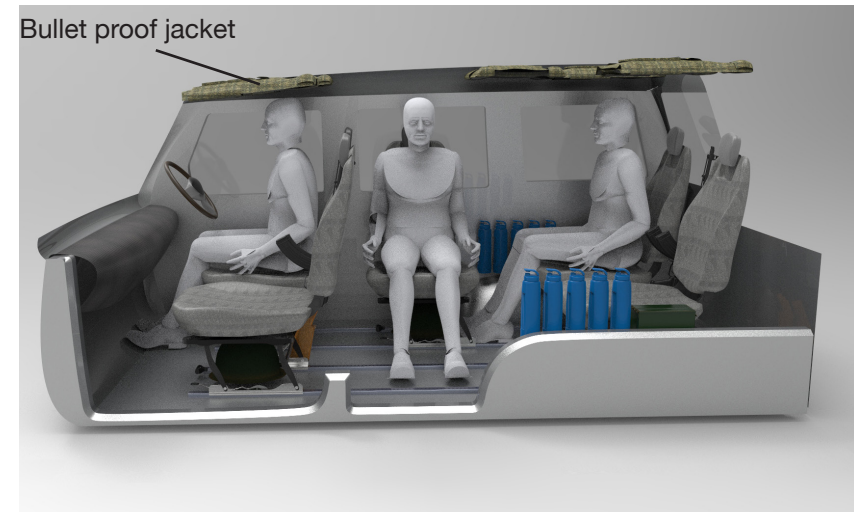
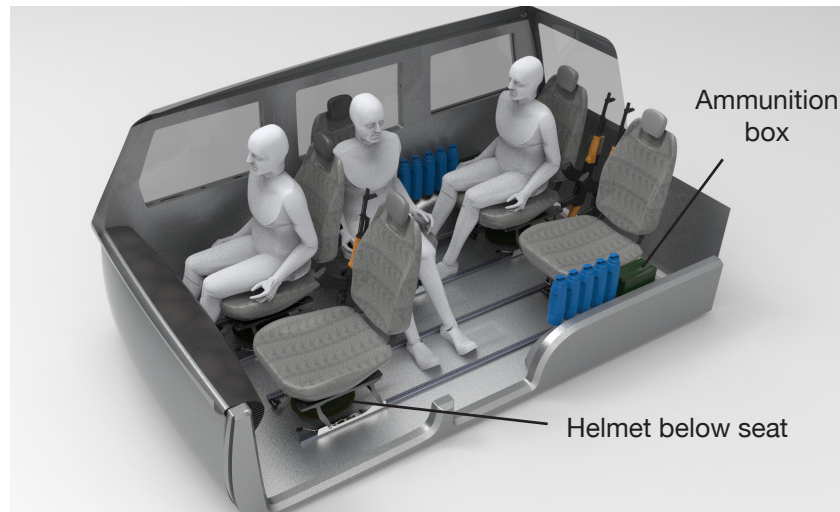
INSIGHT OF LAYOUT IDEATION

In the fifth layout Individual seats and mountings of rifles and helmet are good for the quick access. Individual seat also provide unrestricted movement to the policemen. Layout fifth is taken forward for further modification.

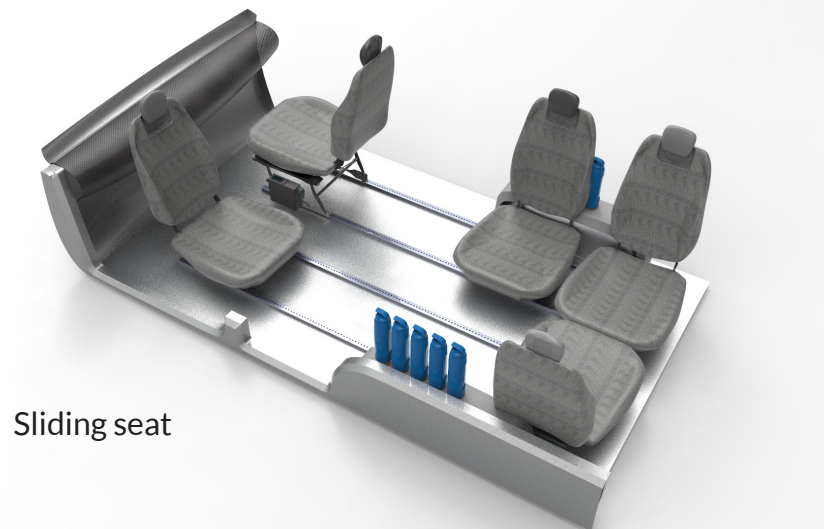
If policemen have to fight from the inside of vehicle itself then interior space also be reconfigurable to make space and also provide 360 degree view.

Further ideation is mainly focused on the reconfiguration of the interior and the mechanism involve in it.

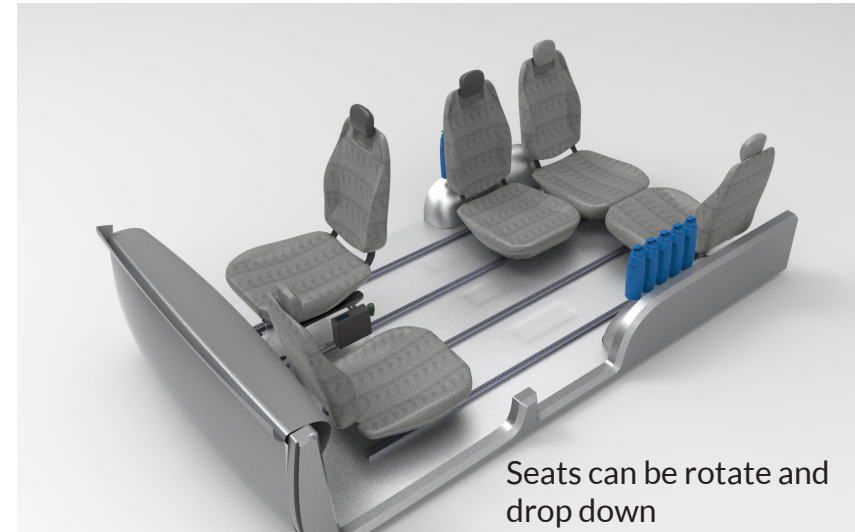
Ideation for the interior packaging (Taking layout fifth from the ideation for further explorations)



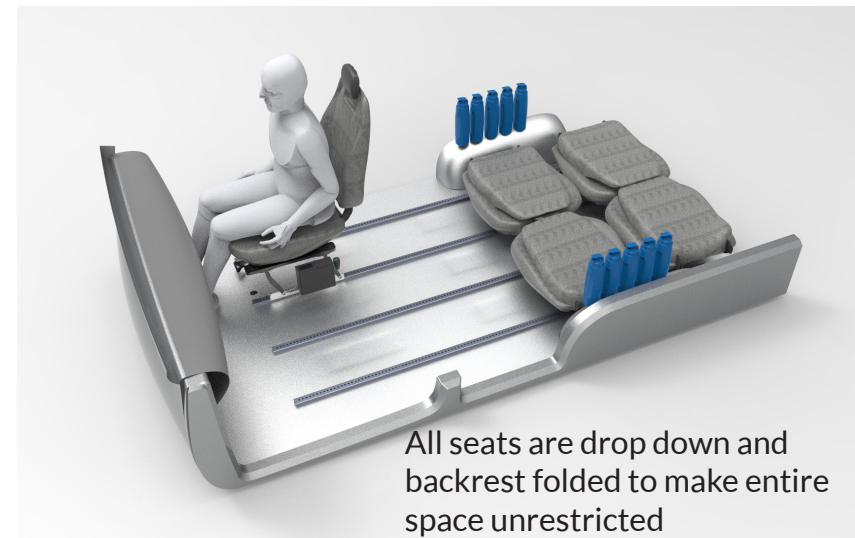
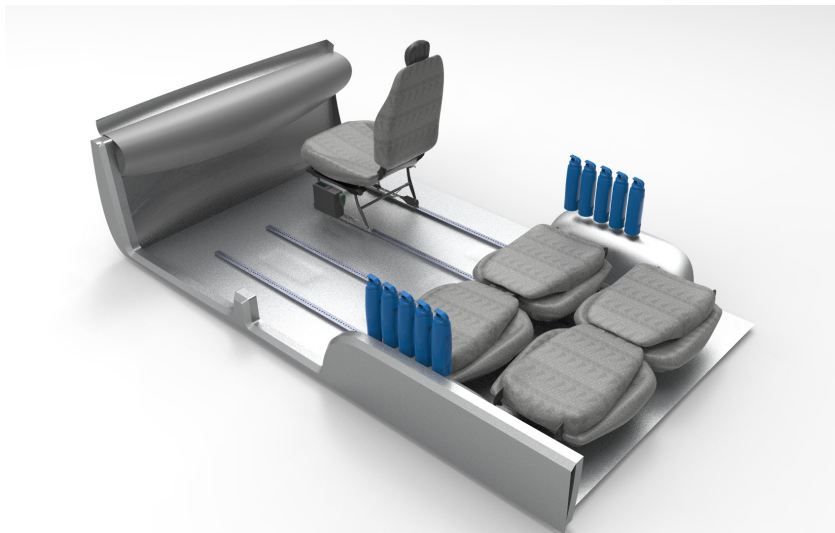
Possible reconfigurable layouts



Sliding seat

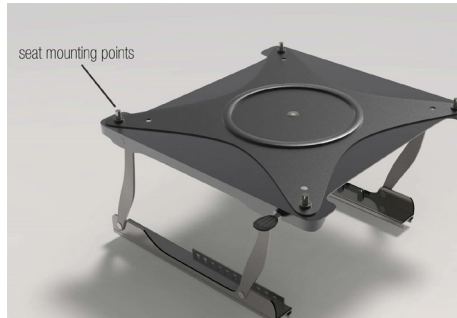


Seats can be rotate and drop down

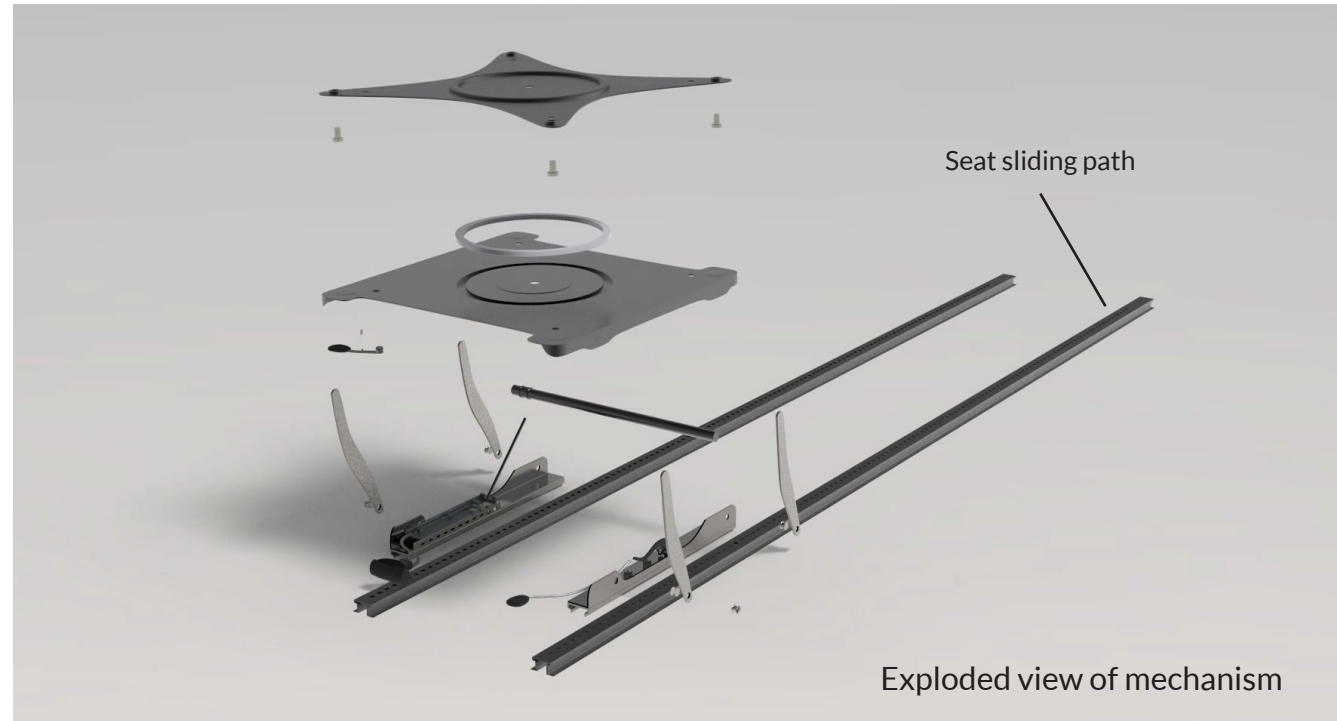
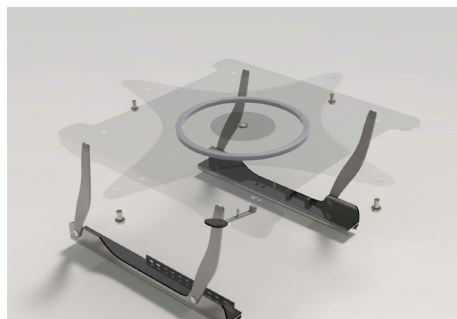


All seats are drop down and backrest folded to make entire space unrestricted

SEAT MECHANISM CONCEPT



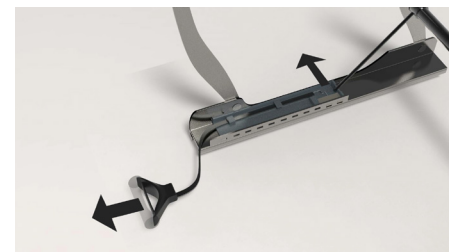
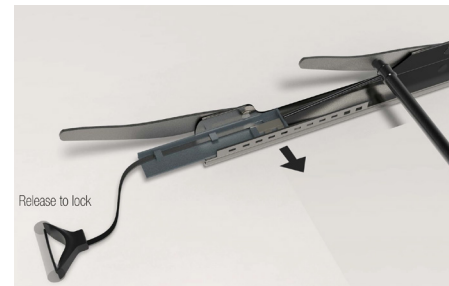
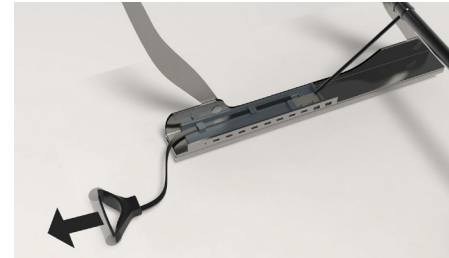
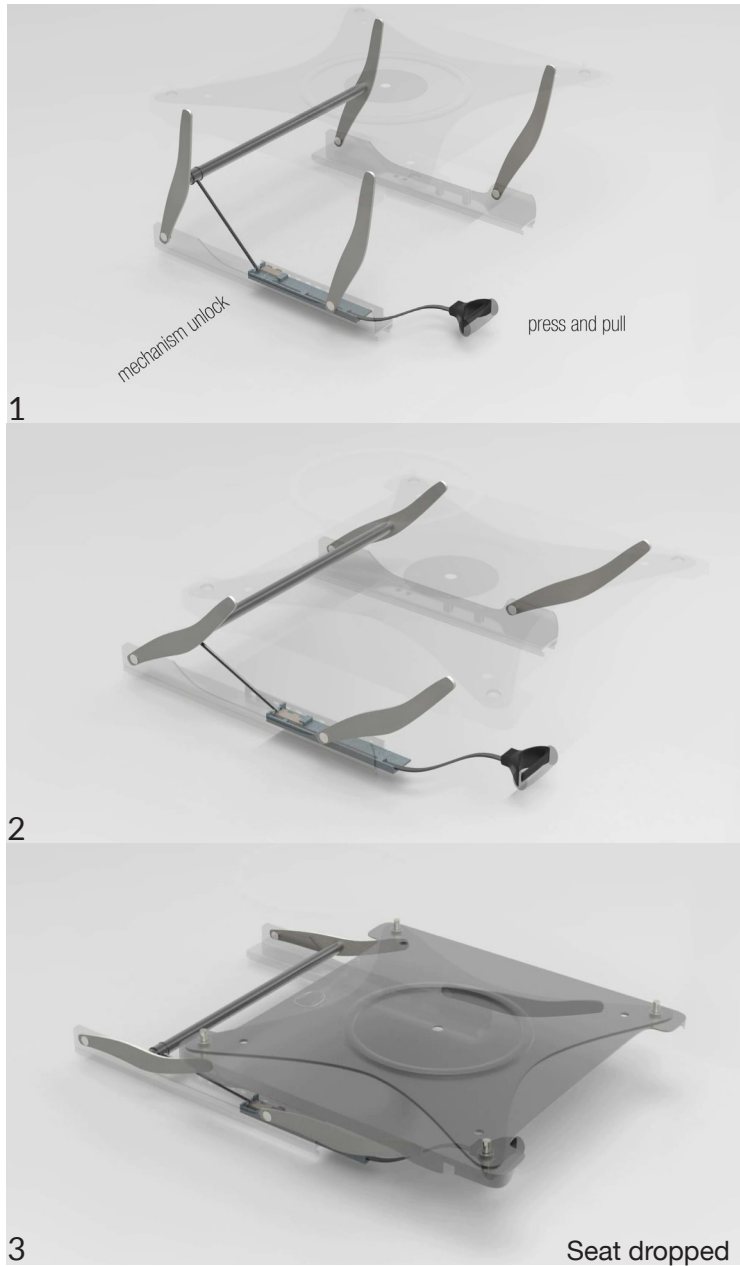
Seat rotation mechanism



This mechanism idea shows how the seat can be rotate on its own axis with very less efforts and how it can be slide, drop down quickly to create space inside the vehicle.

One single liver push which release the lock and then the plate on which seat is mounted can be easily rotate above the base plate. There is a nylon ring between both the plates for reducing the friction and effortless motion.

Seat Drop Down Mechanism



Close up view

This part of the mechanism show how the drop down part works in the mechanism.
The handle is integrated with the pull trigger which unlock the seat holding members and entire sliding portion can be locked at any location according the need of condition.

Ideation II

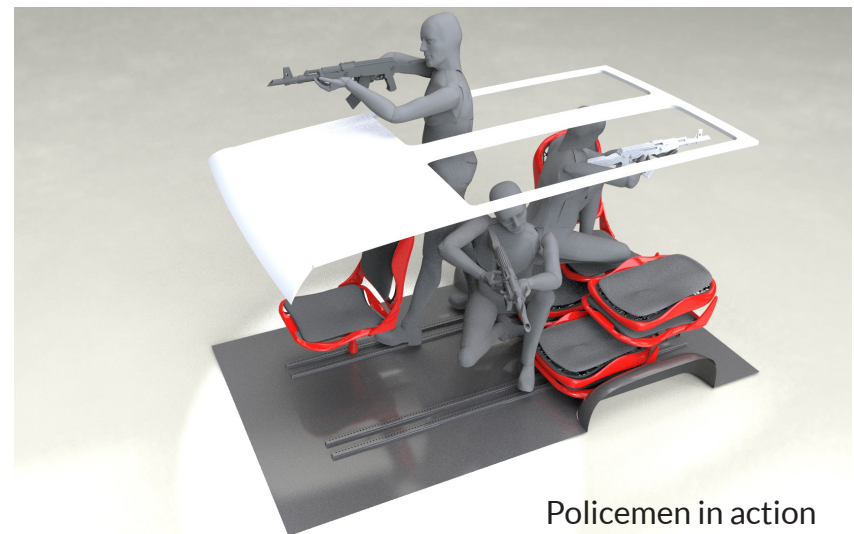


Seats are fixed with a single support from the floor which provides more space and because of single support they can be easily moved inside other seats to create more space. The backrest in this concept is also foldable in the new manner. The backrest will slide in such a way that passengers do not need to get up entirely from the seat which also makes it quick for reconfiguration of layout.

Possible arrangements



Seats moved under other seats

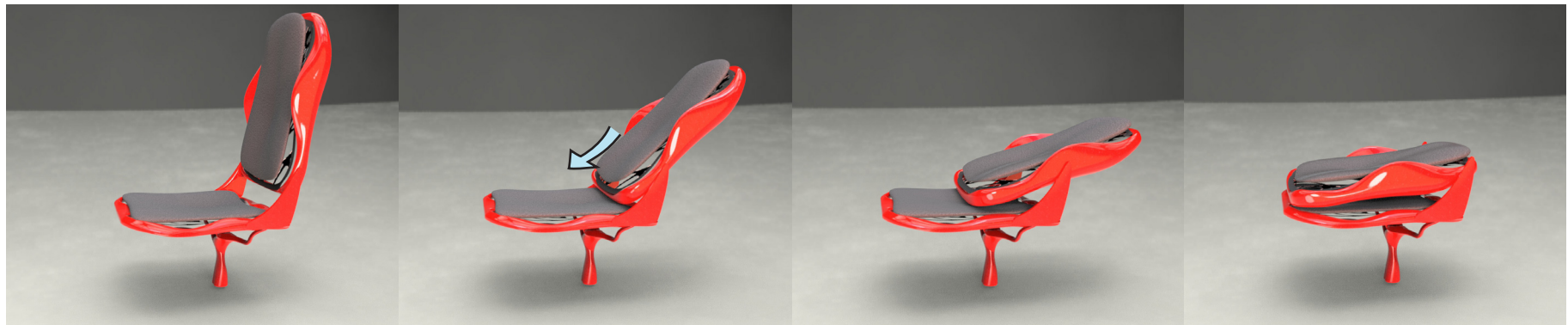
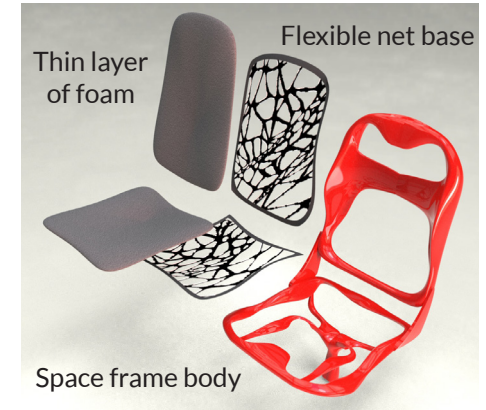


Policemen in action

Seat construction and transformation mechanism

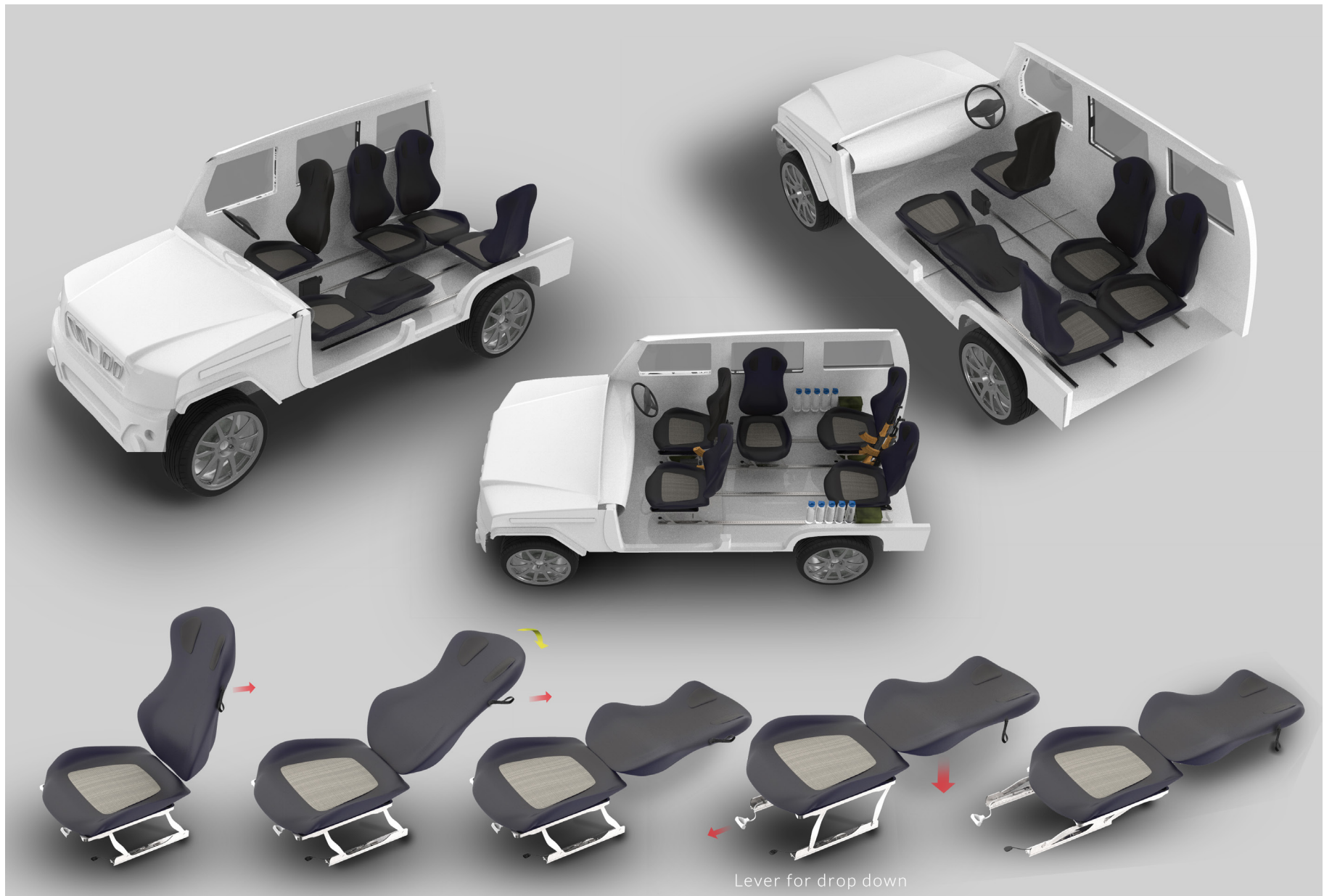


Seat Construction



Backrest transformation

Idea III for seat backrest



1:1 Rough model test for packaging



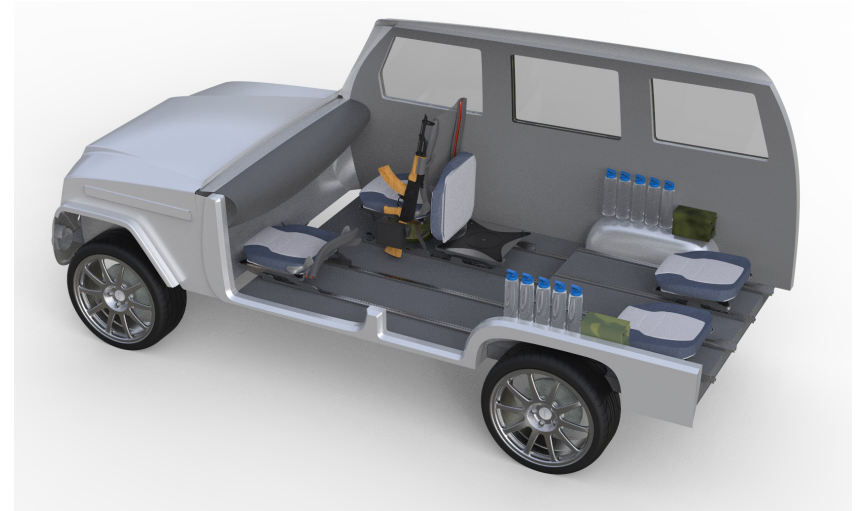
FINAL CONCEPT



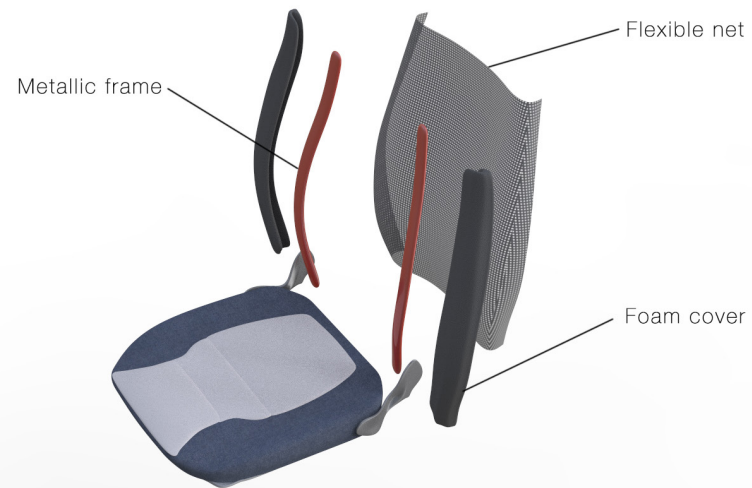


Reconfiguration layout





SEAT BACKREST CONCEPT



Seat structure



Flexible fabric for back rest release from the one frame and wrap around the other frame in one trigger.



Both the back rest frames drop down to make space in there.



Final situation after fold

5. Scale Model

Bibliography

Image references

Image 1 - https://en.wikipedia.org/wiki/Law_enforcement_in_India

Image 2 - https://commons.wikimedia.org/wiki/File:BSF_Logo.svg

Image 3 - http://indiatradefair.com/uploads/editor_images/CISF_Logo.jpg

Image 4 - https://en.wikipedia.org/wiki/File:Central_Reserve_Police_Force_emblem.svg

Image 5 - http://itbpolice.nic.in/itbpwebsite/images_website_new/itbp_logo.jpg

Image 6 - <https://upload.wikimedia.org/wikipedia/en/c/cd/NSG-India.png>

Image 7 - https://upload.wikimedia.org/wikipedia/en/4/4e/Special_Protection_Group.jpg

Image 8 - <http://sarkarinaukrisite.com/wp-content/uploads/2015/07/cbi-logo.png>

Image 9 - <http://www.recruitmentform.co.in/wp-content/uploads/2016/07/BPRD-Recruitment-1.png>

Image 10 - https://qph.ec.quoracdn.net/main-qimg-6924edb2176966f1491748d2dd1934a2-c?convert_to_webp=true

Image 11 - <http://www.mysarkarinaukri.com/files/images/LOGO.jpg>

Image 12 - https://en.wikipedia.org/wiki/Central_Economic_Intelligence_Bureau

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<http://www.bprd.nic.in/WriteReadData/userfiles/file/8888873336-Table%20of%20Contents%20%20Overview.pdf>

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