

# USER CENTERED DESIGN

## A helmet for two wheeler riders

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# THE CONTEXT

- Exponential increase in traffic density and the number of casualties.
- Outcry against making helmet usage compulsory.
- Life saving devices which people refuse to wear !
- Conflict of wanting to protect oneself but not wanting to wear a helmet.

# SCOPE OF INTERVENTION

- Organization of the product
- Materials
- User aspirations
- Existing ergonomics



# TYPES OF HELMETS

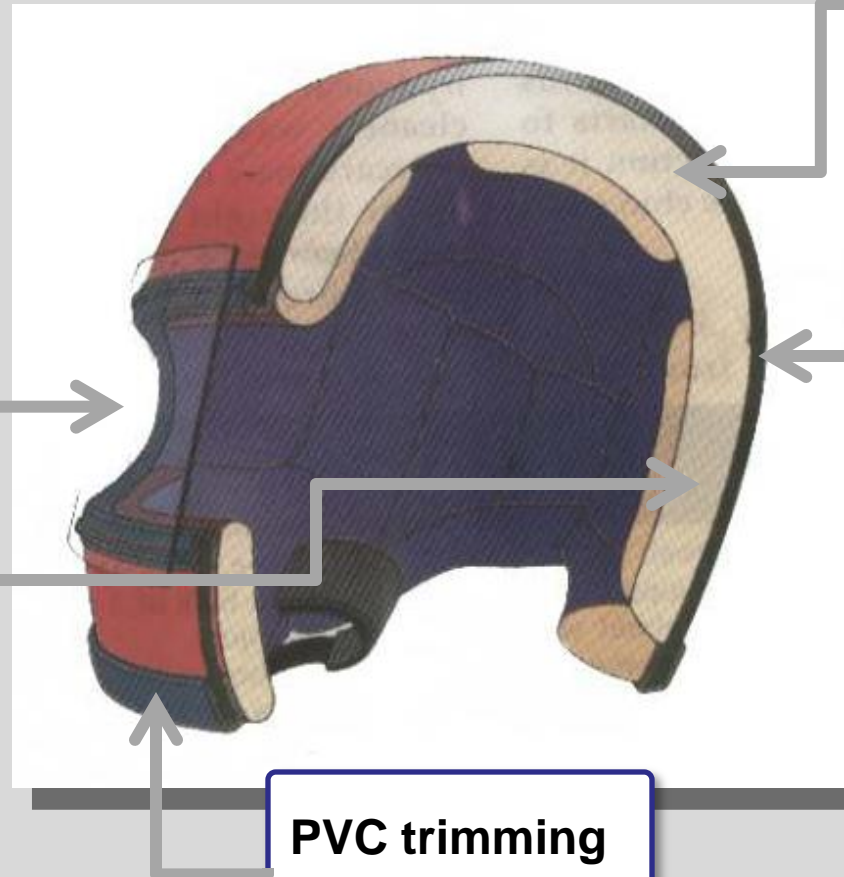
- Full face helmet
- "Convertible" or "Flip-up"
- 3/4 face helmet
- 1/2 helmet



# TYPICAL CONSTRUCTION

Acrylic visor  
Protection from  
dust and foreign  
objects

EPS foam Absorbs  
kinetic Energy,  
Reduces  
deceleration of the  
head



PU  
padding  
for wear  
comfort

Composite  
shell - pierce  
protection  
Alternate  
Material -  
Fiber glass,  
Carbon fiber,  
Kevlar

PVC trimming

# MATERIALS USED

- Kevlar
- Carbon fiber
- Lexan



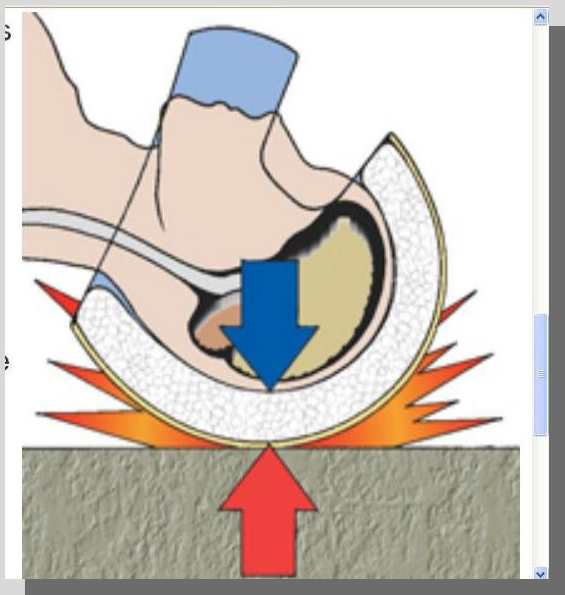
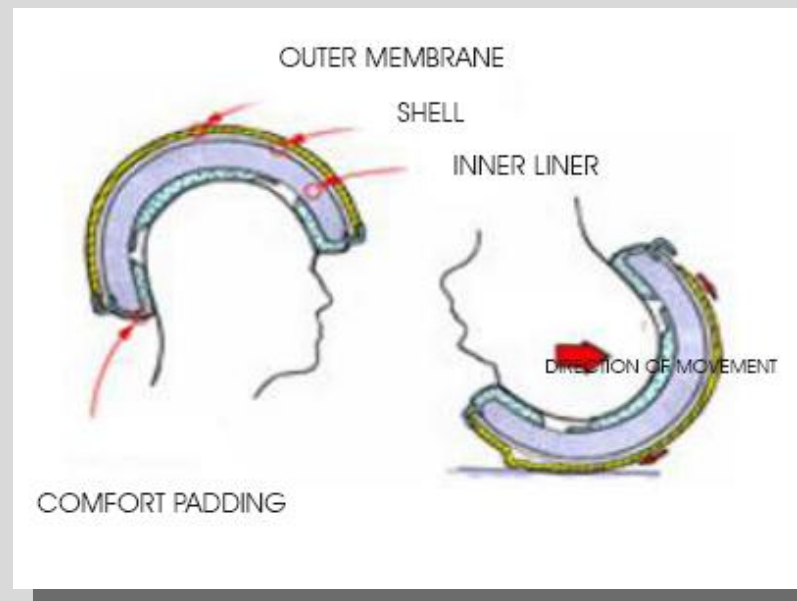


# TECHNOLOGIES

- Designed to protect the head from rotational injury.
- Polymer membrane slips in a controlled manner over the inner carbon-Kevlar shell.
- Reevu rear view system:
- Inbuilt rear view mirror through a sequence of mirrors.



# FALL



# BRAIN INJURY

Open type:

- Skull bone fracture

Closed type:

- Caused by violent acceleration of head
- Brain tissue collides with inside of the skull



# ENERGY ABSORBING DEVICE



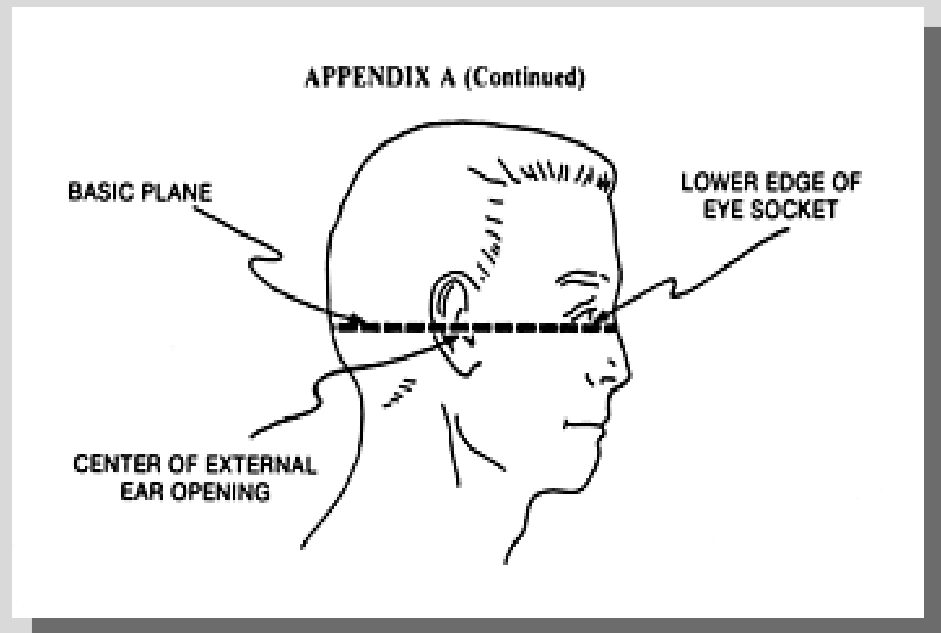
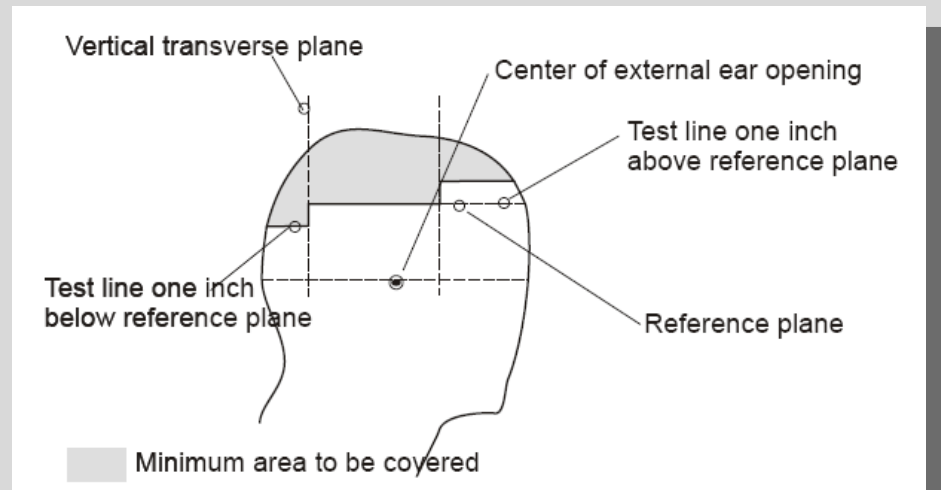
# STANDARDS

Indian standards:

- BIS - IS 4151

Test lines:

- Minimum area to be protected
- Six sizes-550 to 600mm circumference of inside band
- Constructional requirements
- Performance



# SIMILAR PRODUCTS

- Protection
- Armor
- Crumple zones
- Packaging
- Securing
- Watches
- Belts
- Caps/monkey caps



# FIELD STUDY

## Locations

- Mumbai - Powai market, Powai road, Santacruz
- Pune - Aundh, F.C road, Inner city.

## Observing Users

- Traffic lights - to understand what users do.
- Pan shops/stores- to observe behavior
- Storage habits- during stops and at office
- Journey start/end points-
  - to see ingress egress actions
- Informal discussions, gentle probing

# OBSERVATIONS

## Securing

- Helmet comes loose
- Excessive play
- Constant adjustment
- Buckle irritates skin
- Buckle difficult to operate
- Riders seldom buckle up





# COMFORT



- Becomes hot and muggy
- Higher CO2 levels
- Excessive sweating which hinders vision
- Deterioration of the helmet lining
- Bad smell
- Scarf or a balaclava underneath
- Ride with the visor up

# STORAGE

- Place it on rear view mirrors or on the fuel Tanks, done even if helmet lock is present.
- Have to dismount the vehicle and use both hands to secure the helmet to the vehicle.



# STORAGE

- Apprehensive about available helmet locks
- Some use chains and wire locks.
- Tendency to place the helmet or hook it on to something.
- Hung on rear view mirrors, kept on footboards and fuel tanks.



# PERCEPTION ISSUES

- Perceived as a barrier
- Tendency to wear it on highways
- “It won't happen to me” attitude
- “Getting into” the helmet
- Claustrophobic feeling
- Loss of identity
- “Wind in the air feeling” is lost
- Helmet is a hassle



- Interaction with the environment less
- helmet restricts the field of view
- isolation from the various sounds of the road
- talking to the pillion rider is difficult



# PRODUCT BRIEF

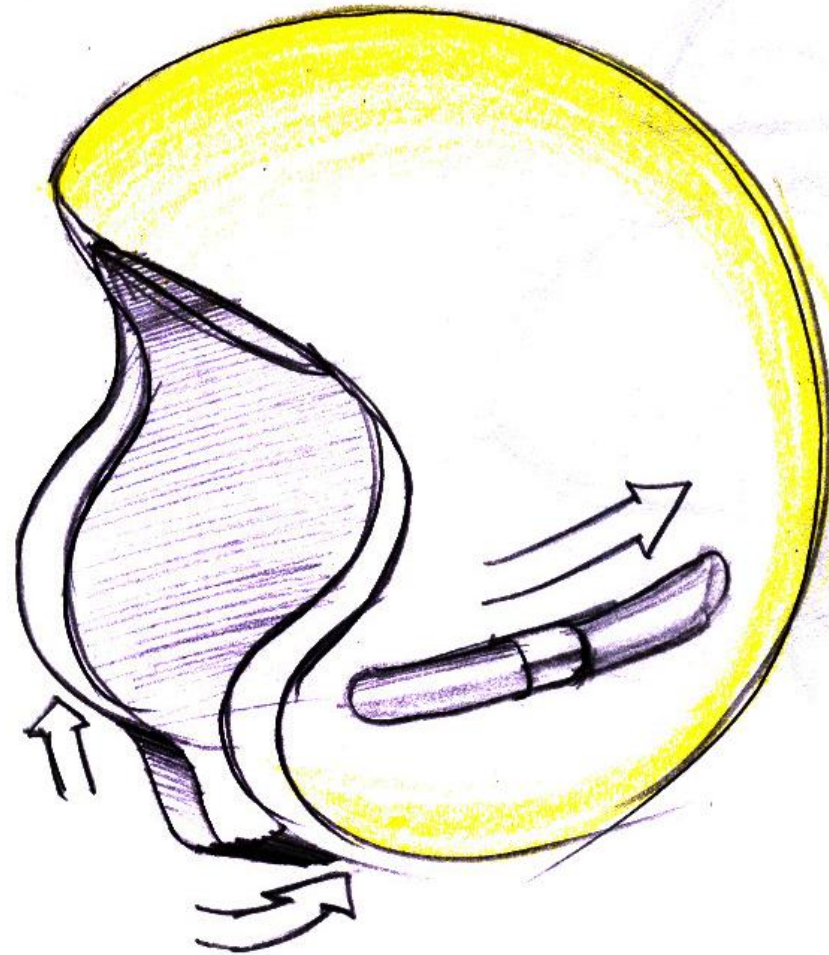
- Should encourage use
- Should look protective and safe
- Should protect the head against impact and piercing from any side
- Provide protection against environmental factors
- Have a single operation securing
- Be conducive to carry in multiple ways
- Occupy less volume when not in use
- Easy to wear and right fit for the head
- Should not wobble or shake on wearing

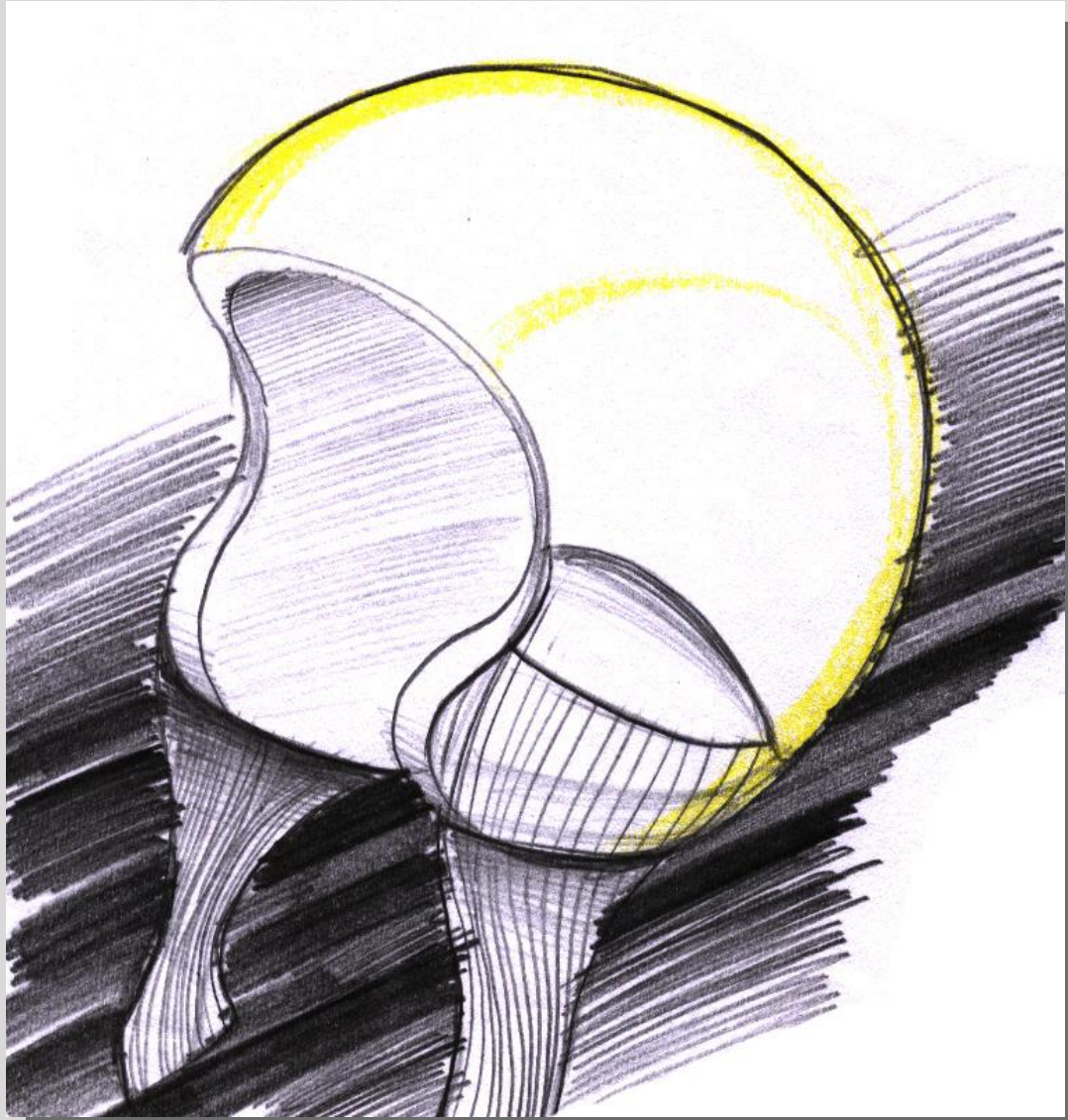


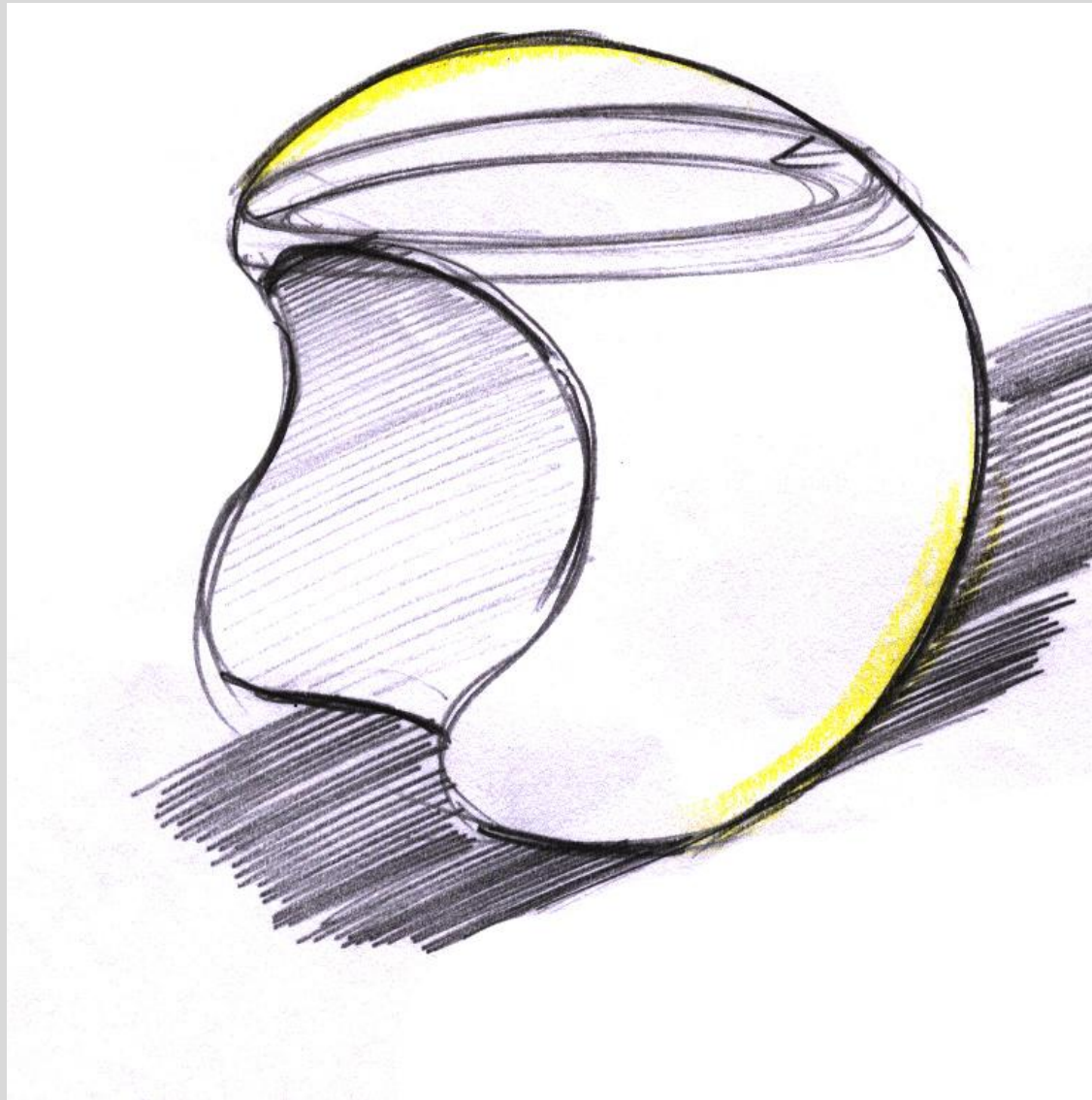
# IDEATION

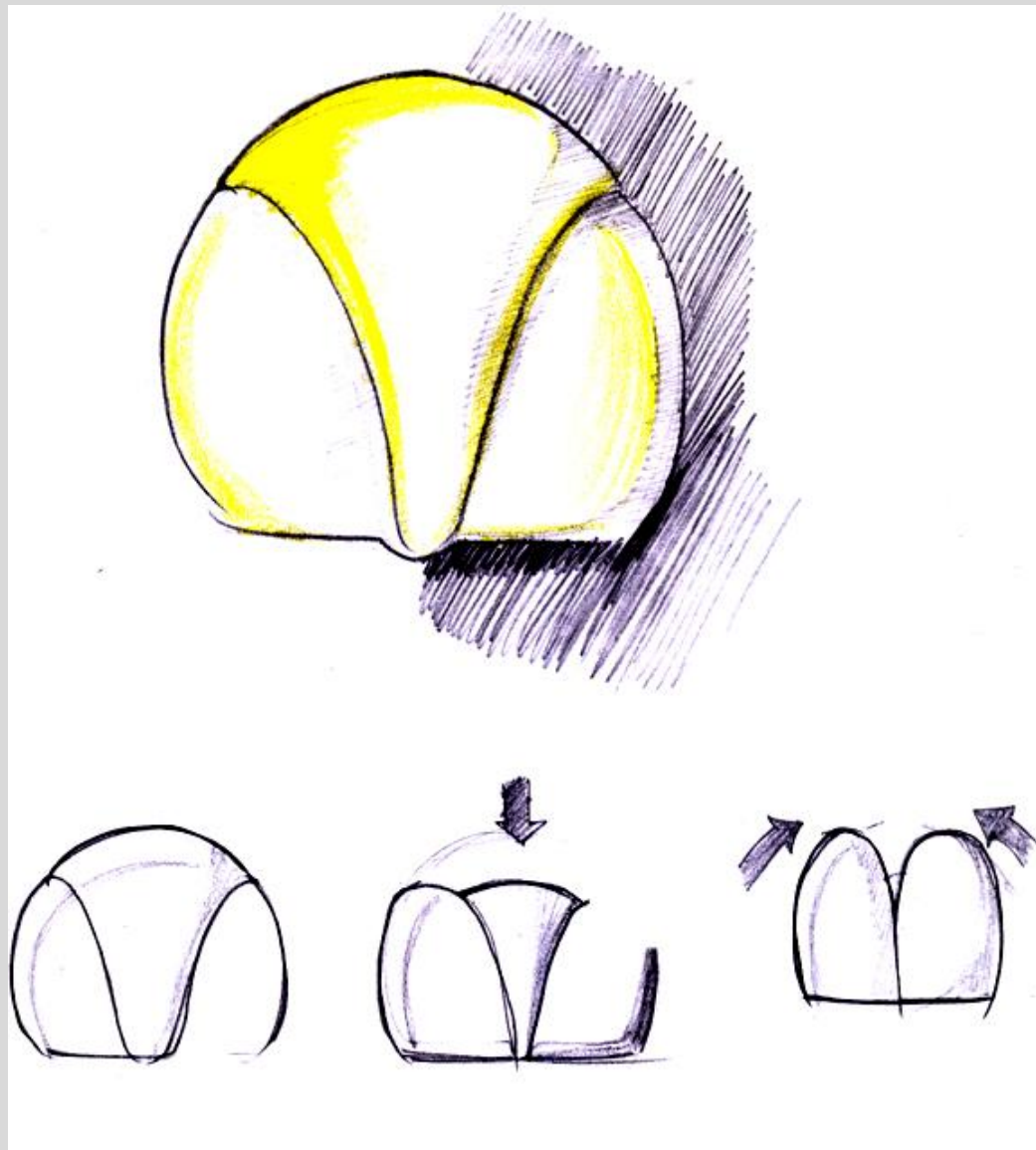






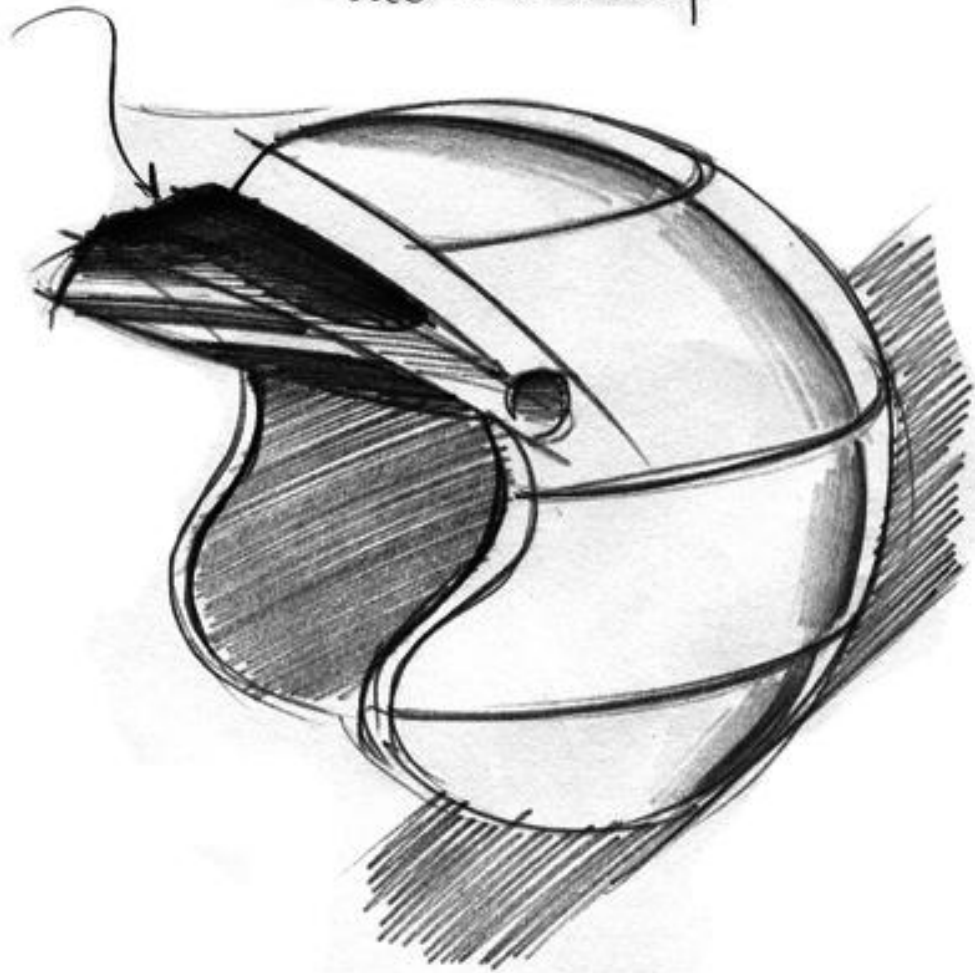


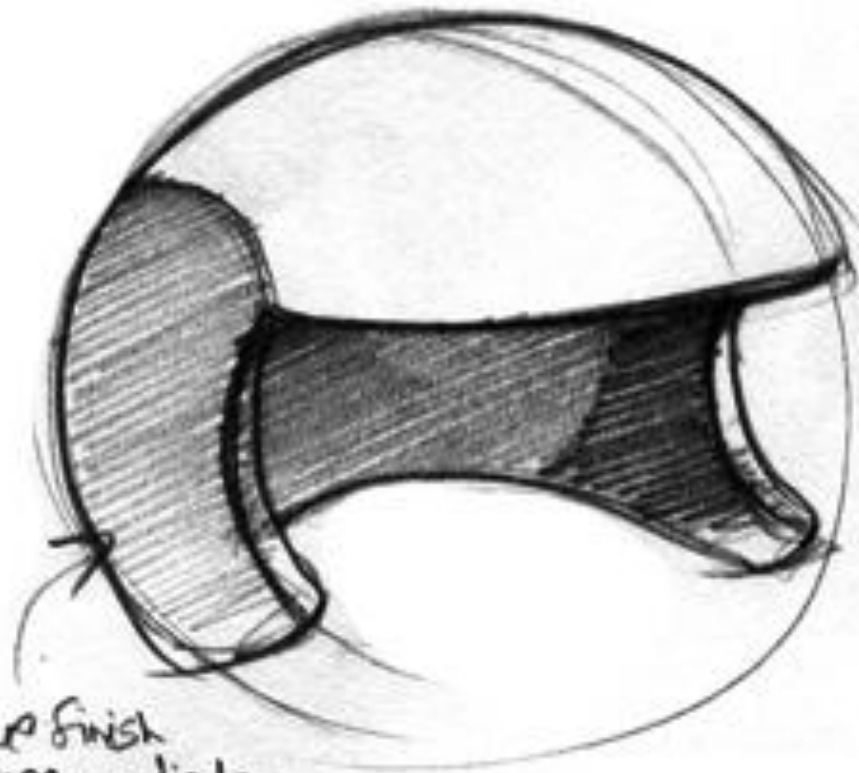




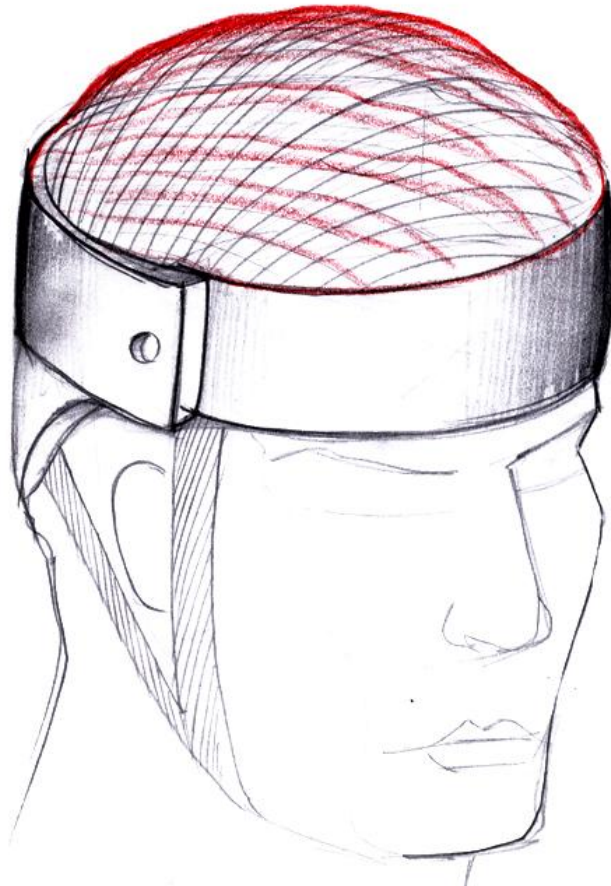
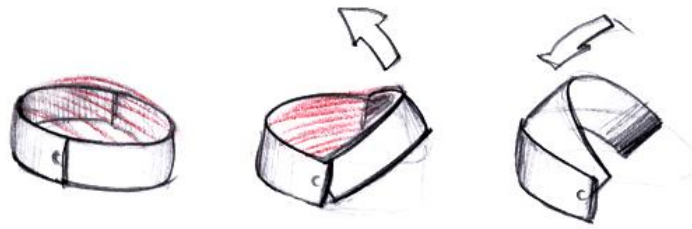


Wear it like a cap'

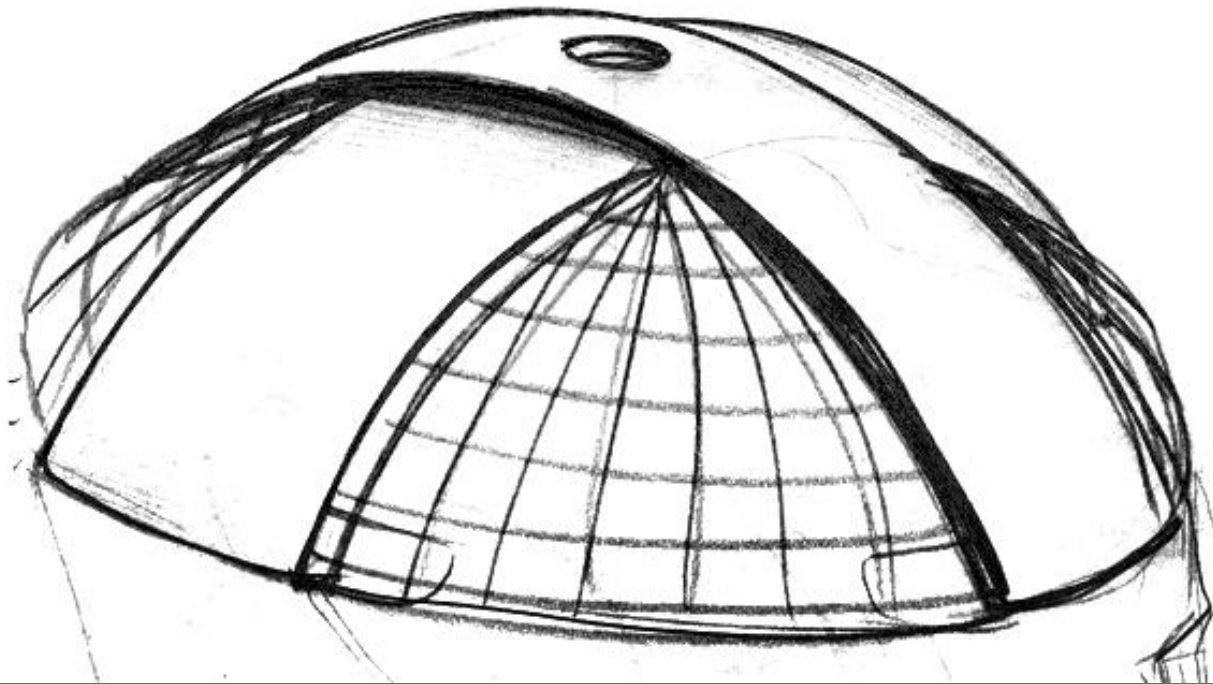


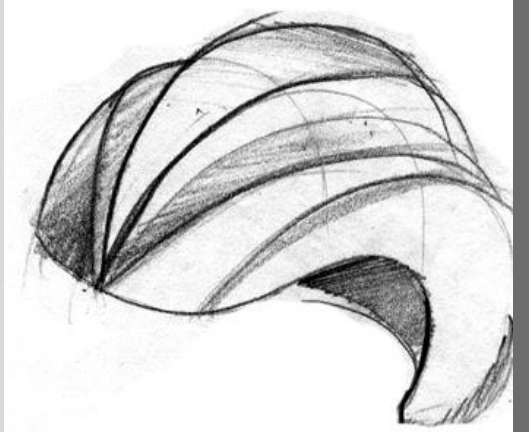
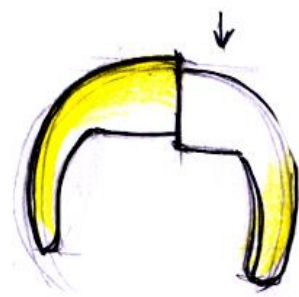
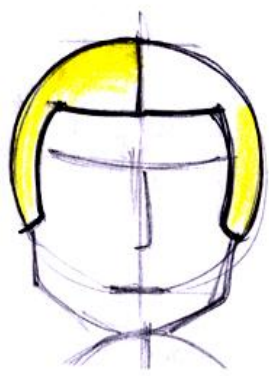


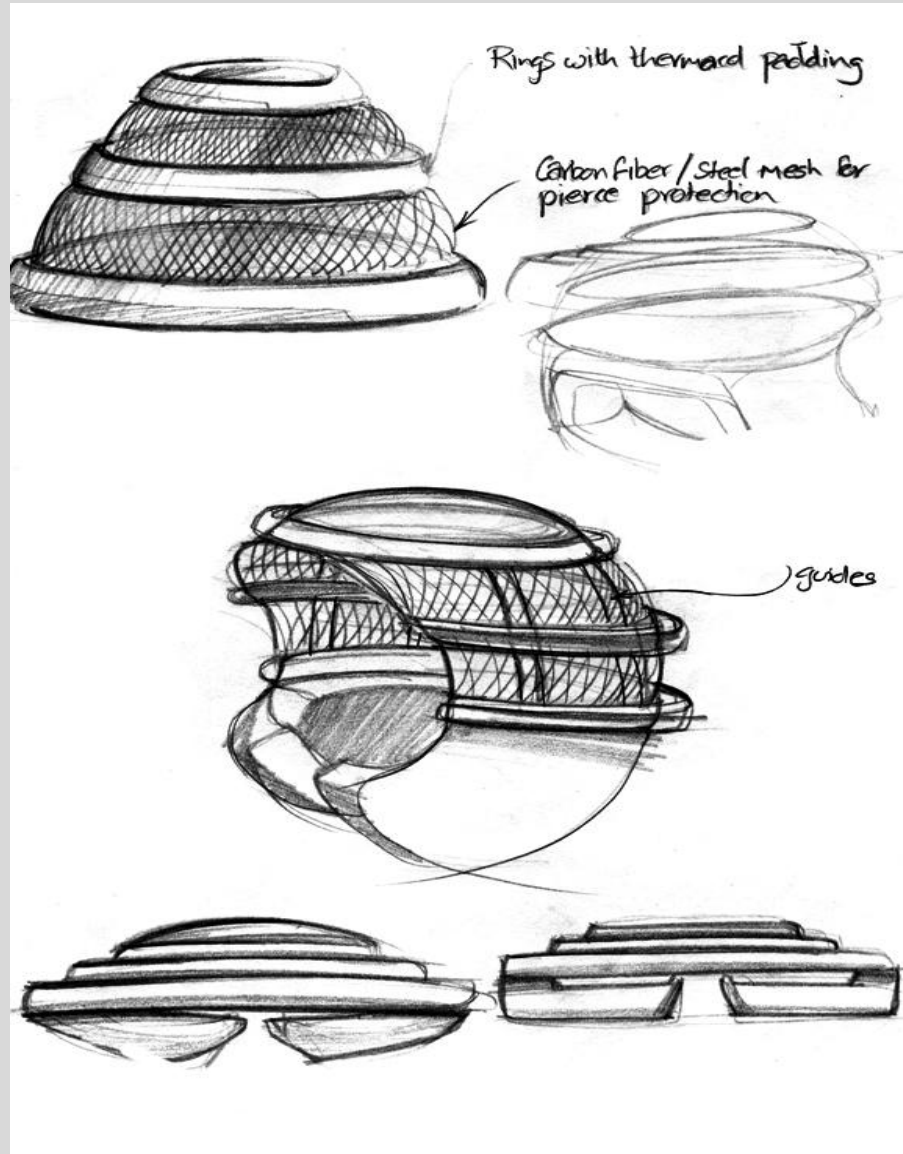
Unique finish  
to differentiate  
folding part

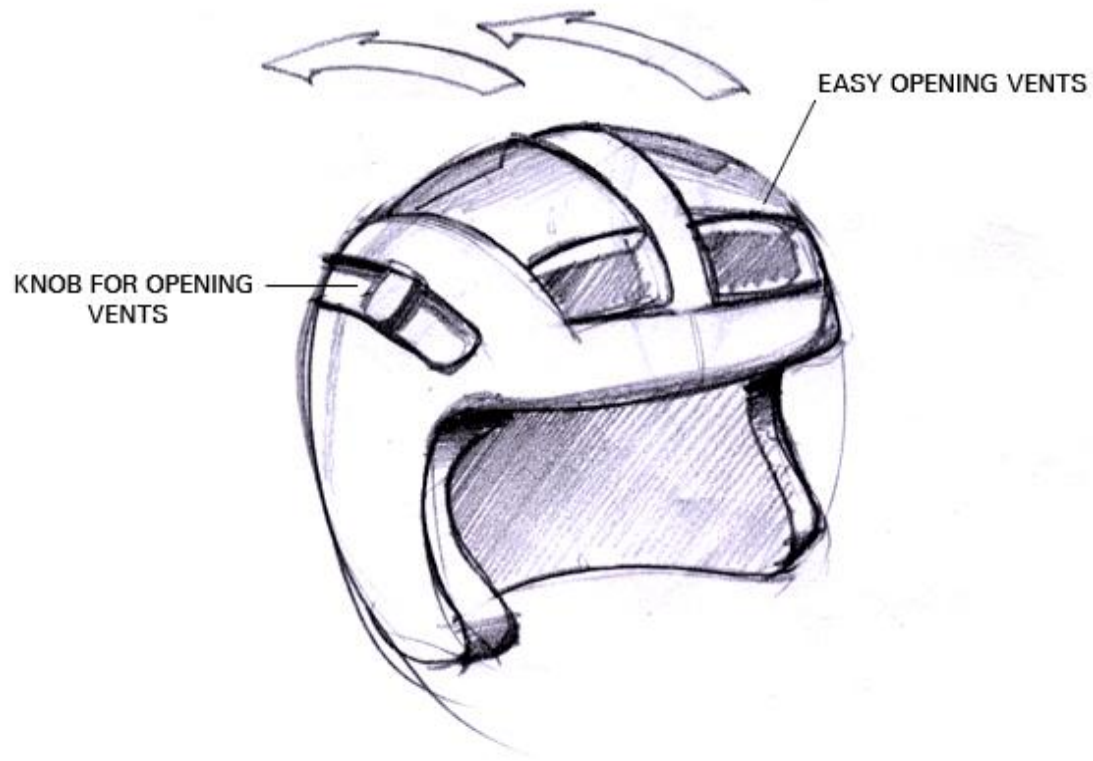


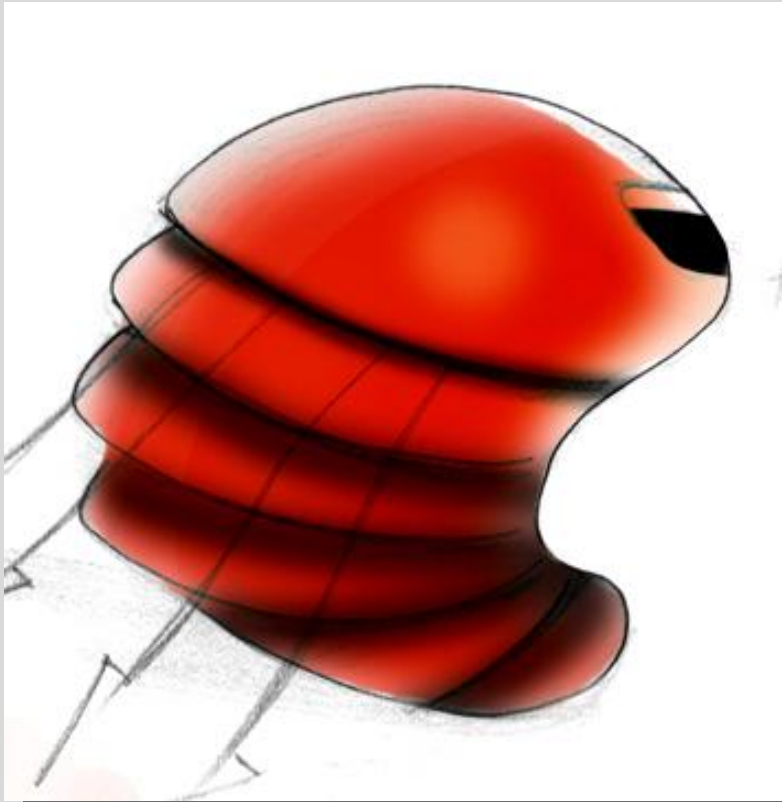




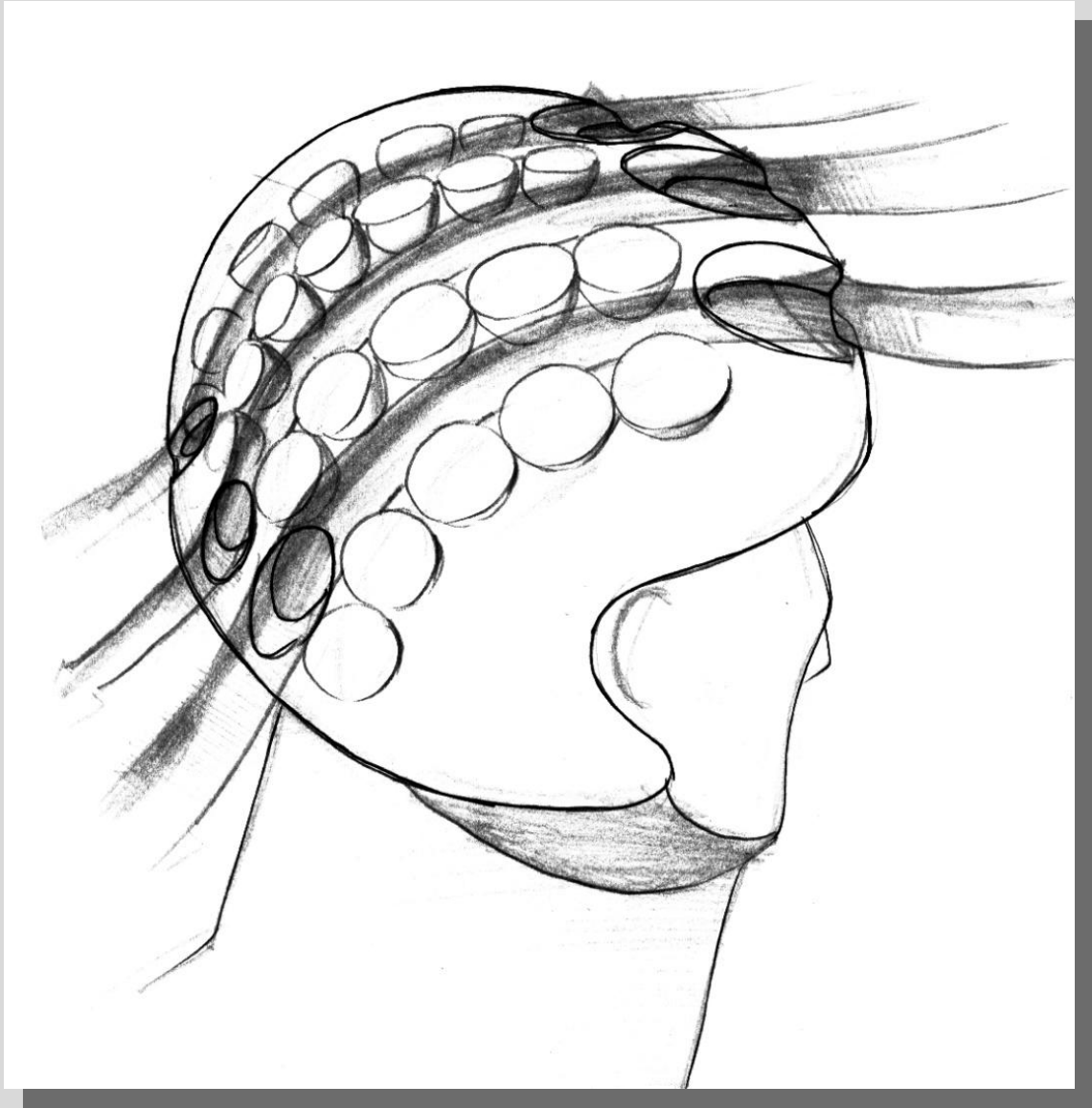




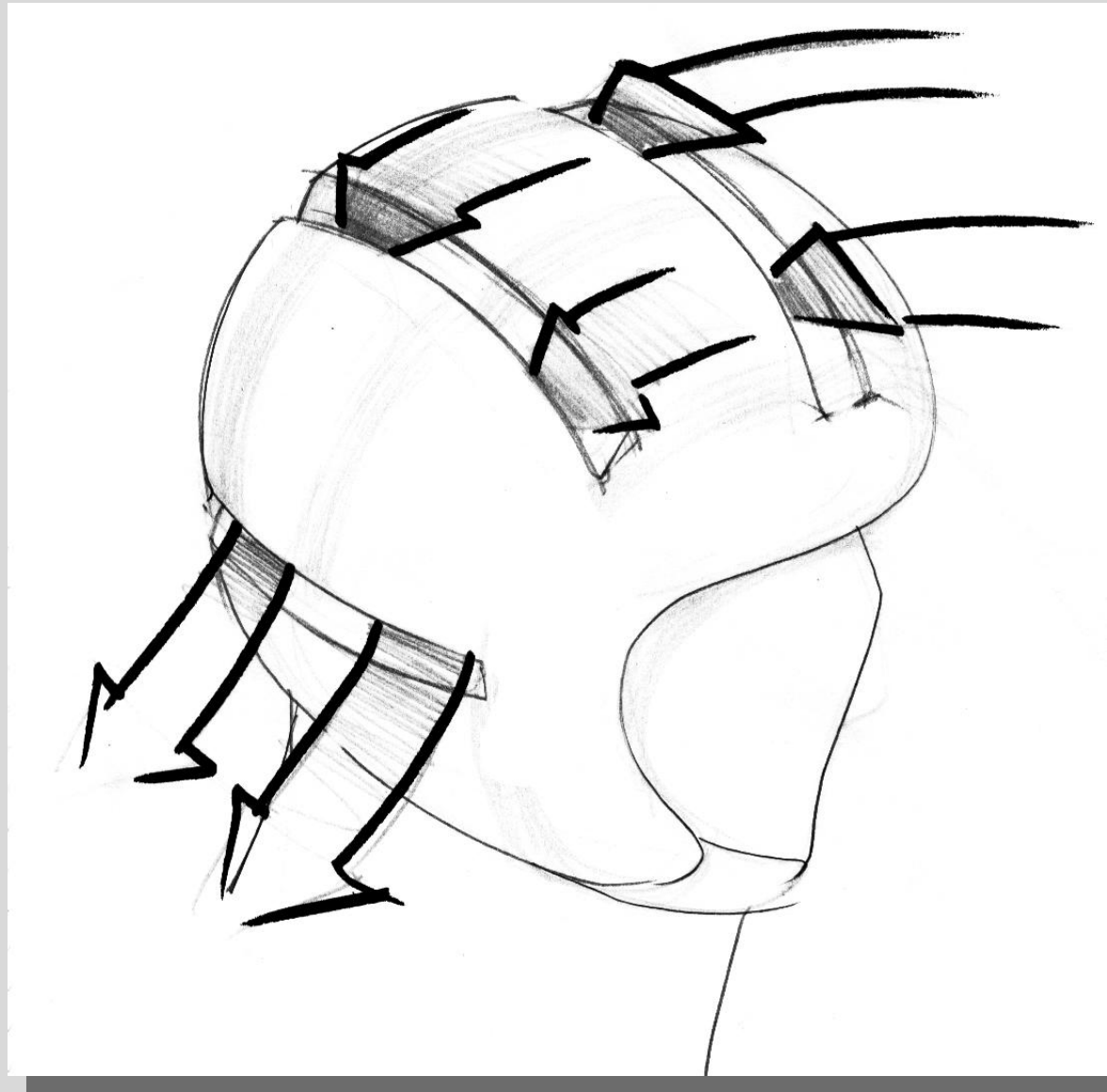




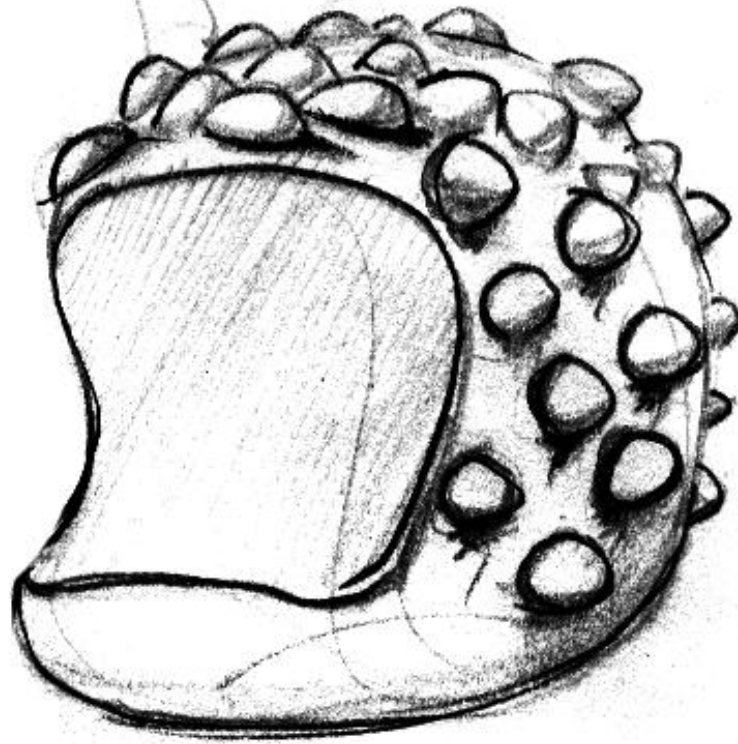






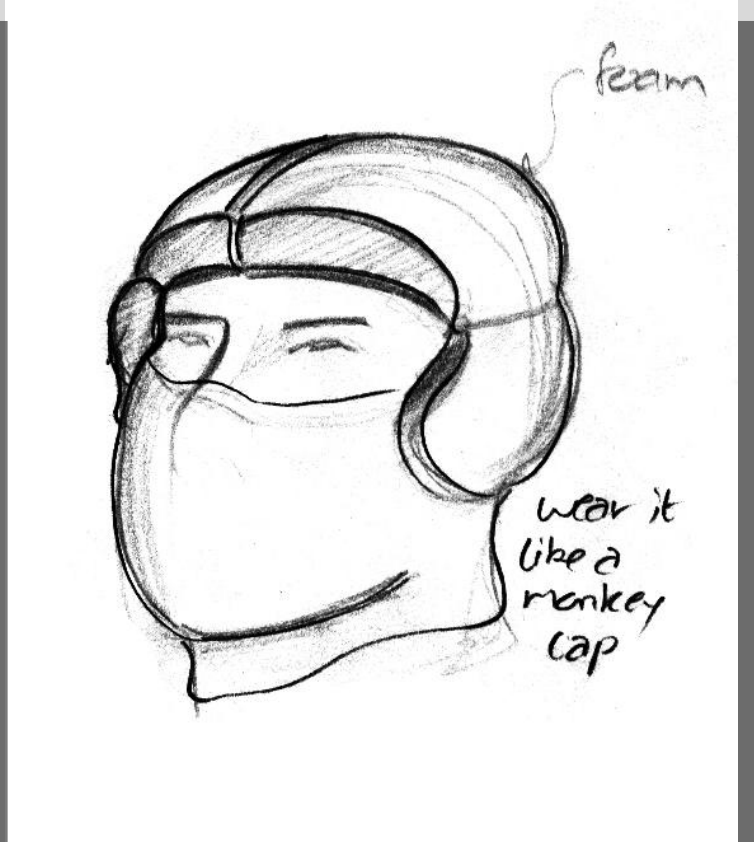


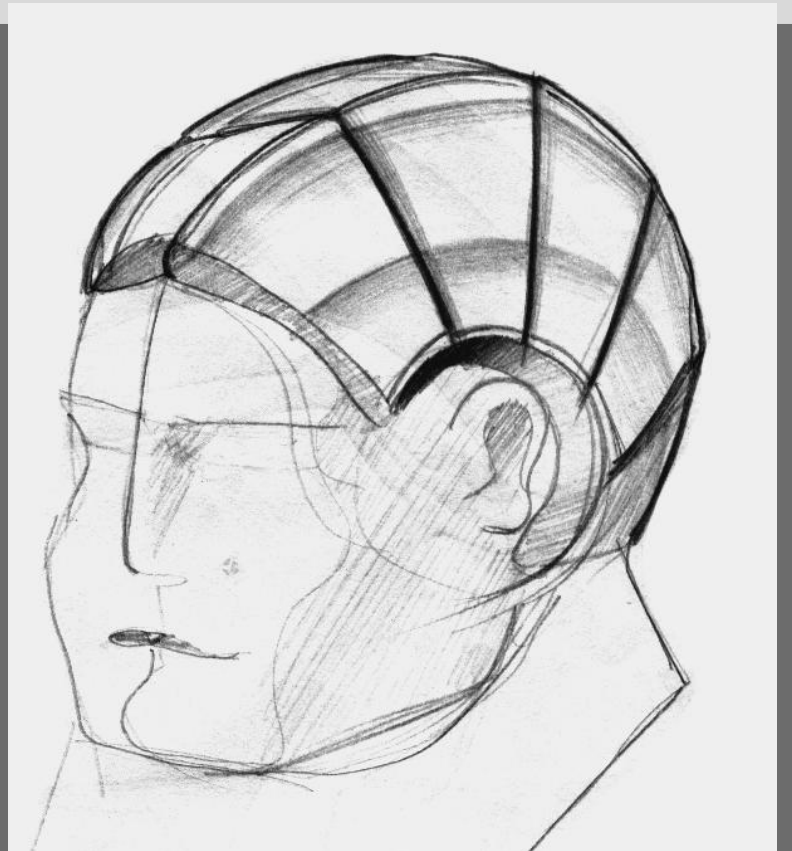
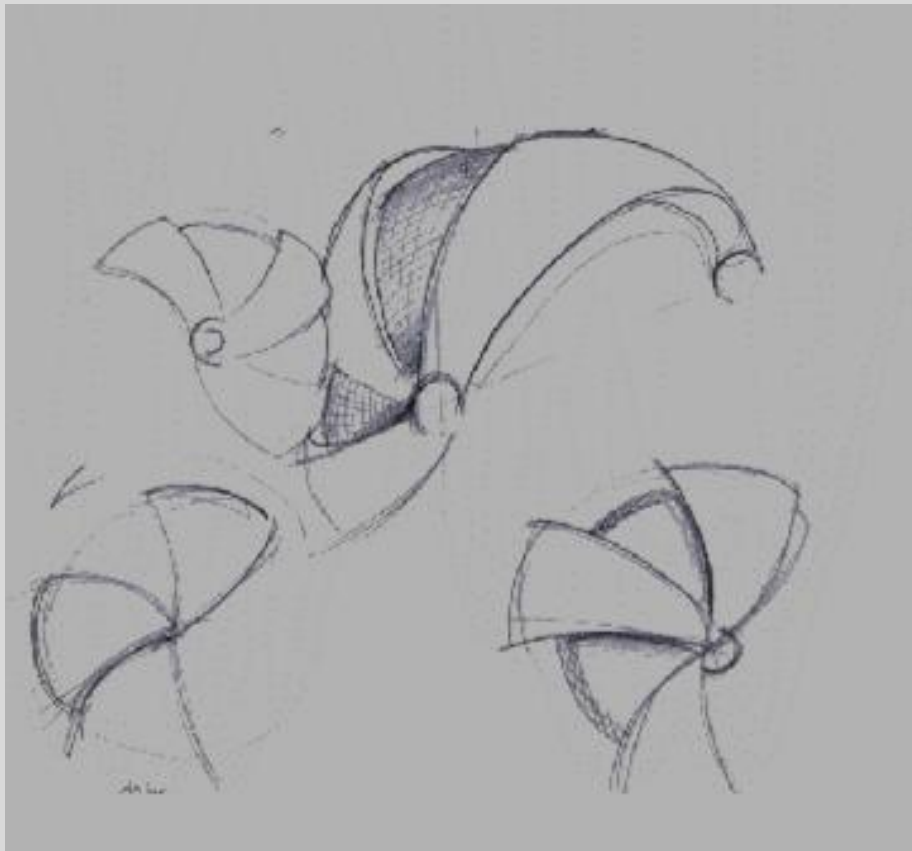
dimple padding for  
impact protection





Balaclava  
with  
padding  
stuck





# IDEA CLUSTERS

Grouping according to the core functionalities.

Ventilation cluster:

Comfort when in use.

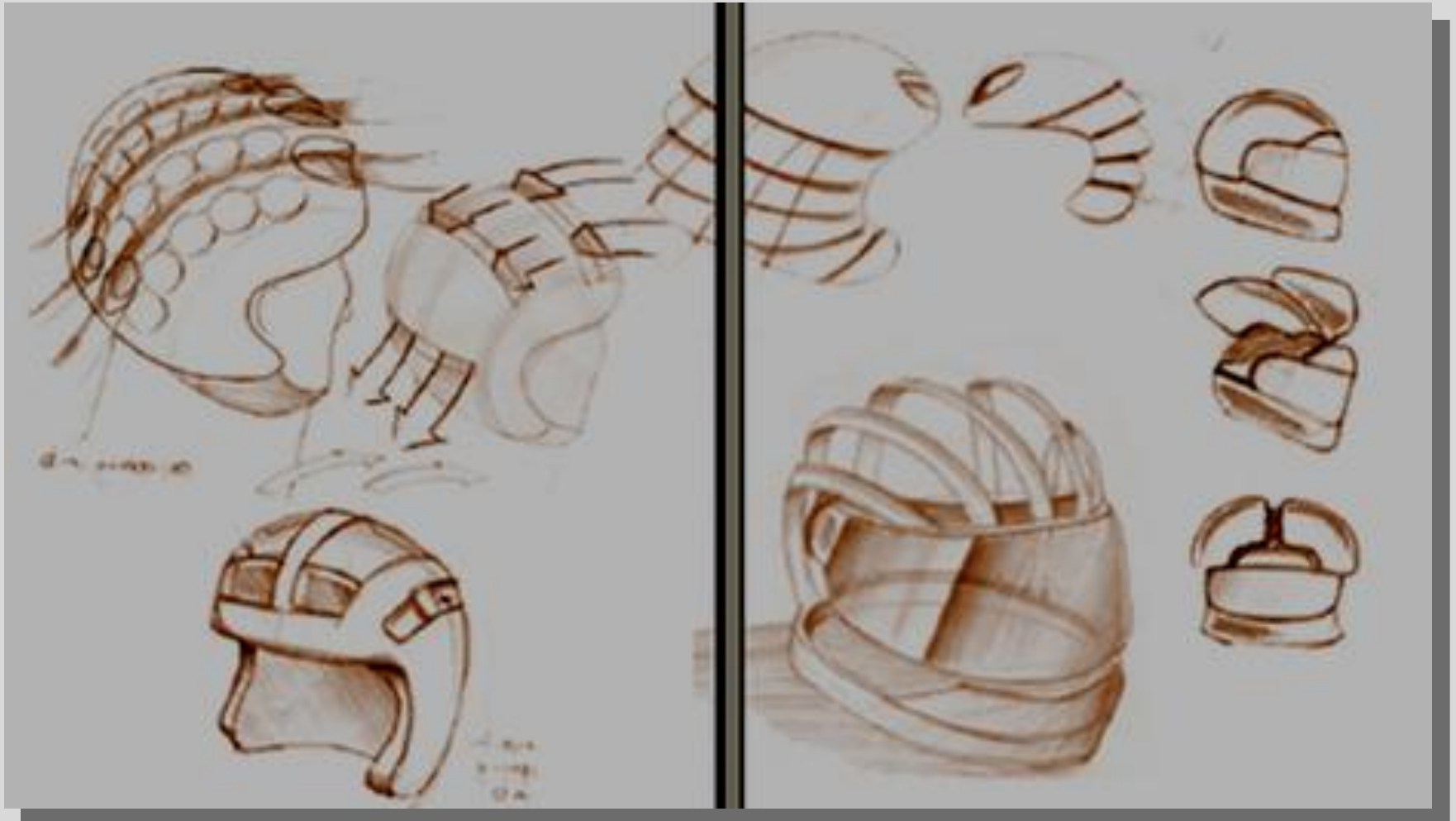
Storage cluster :

Short term and long term.

Wearing cluster :

Convenient wearing and removing of the helmet.

# VENTILATION CLUSTER

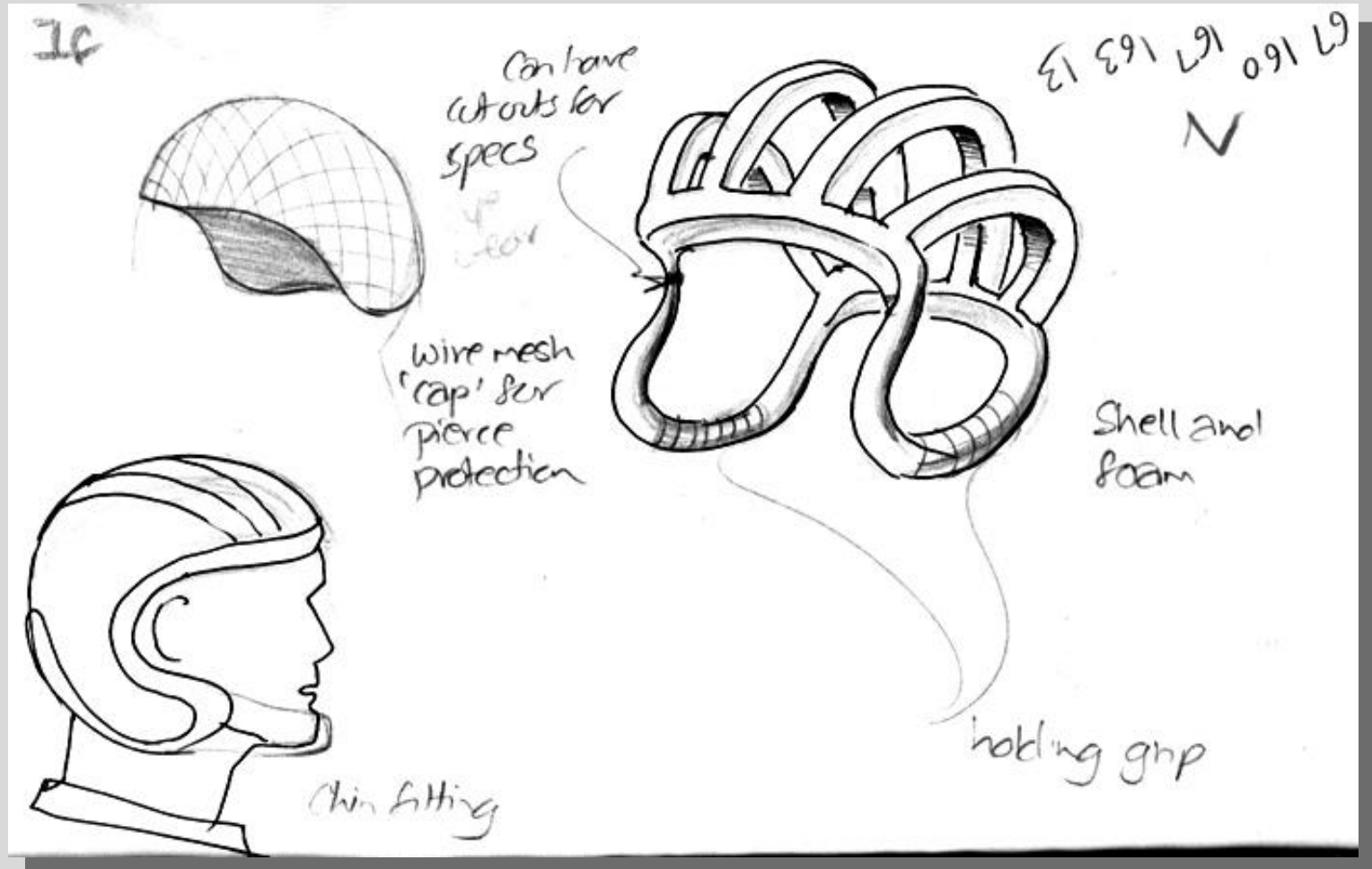




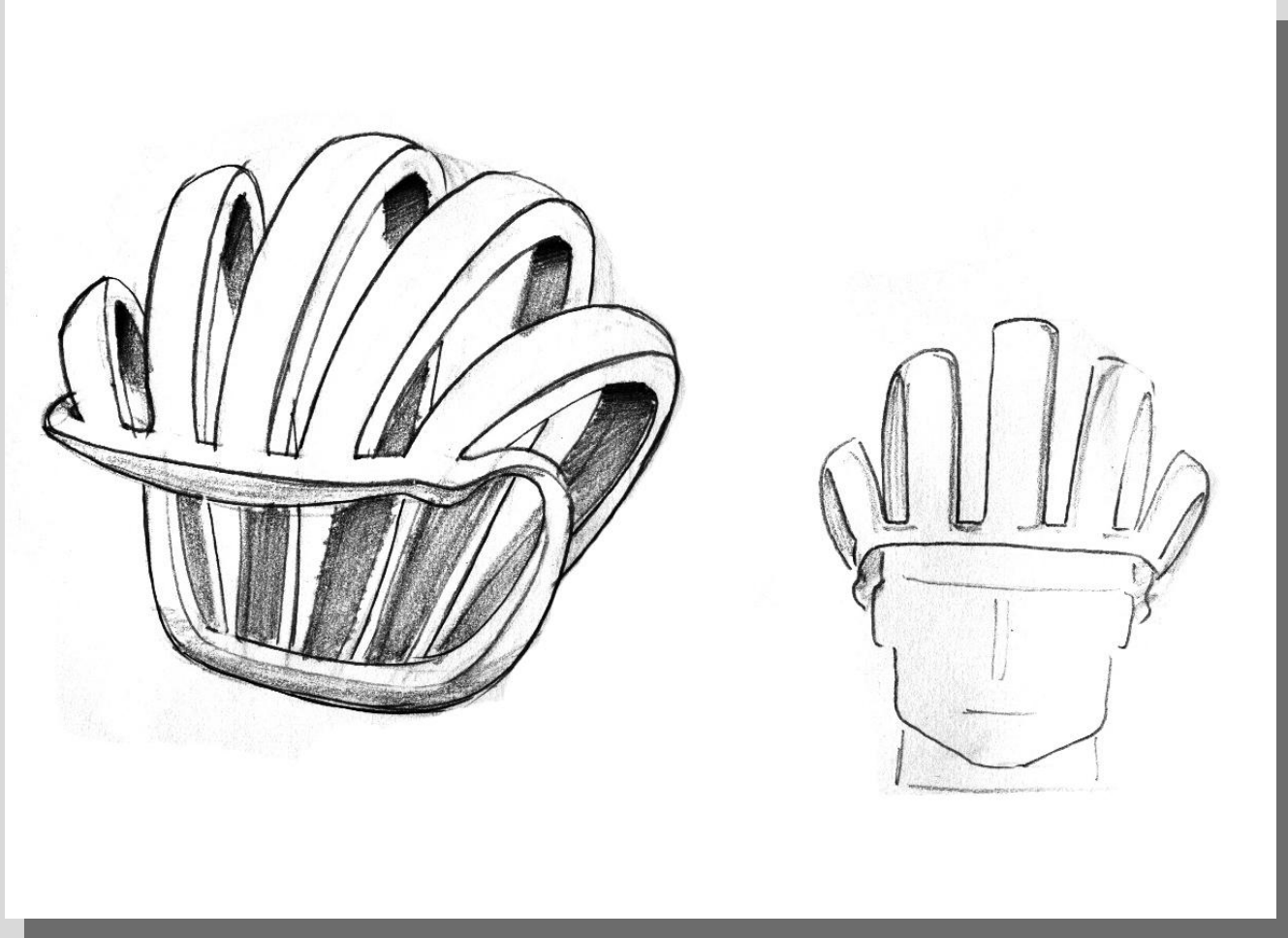
# REPRESENTATIVE



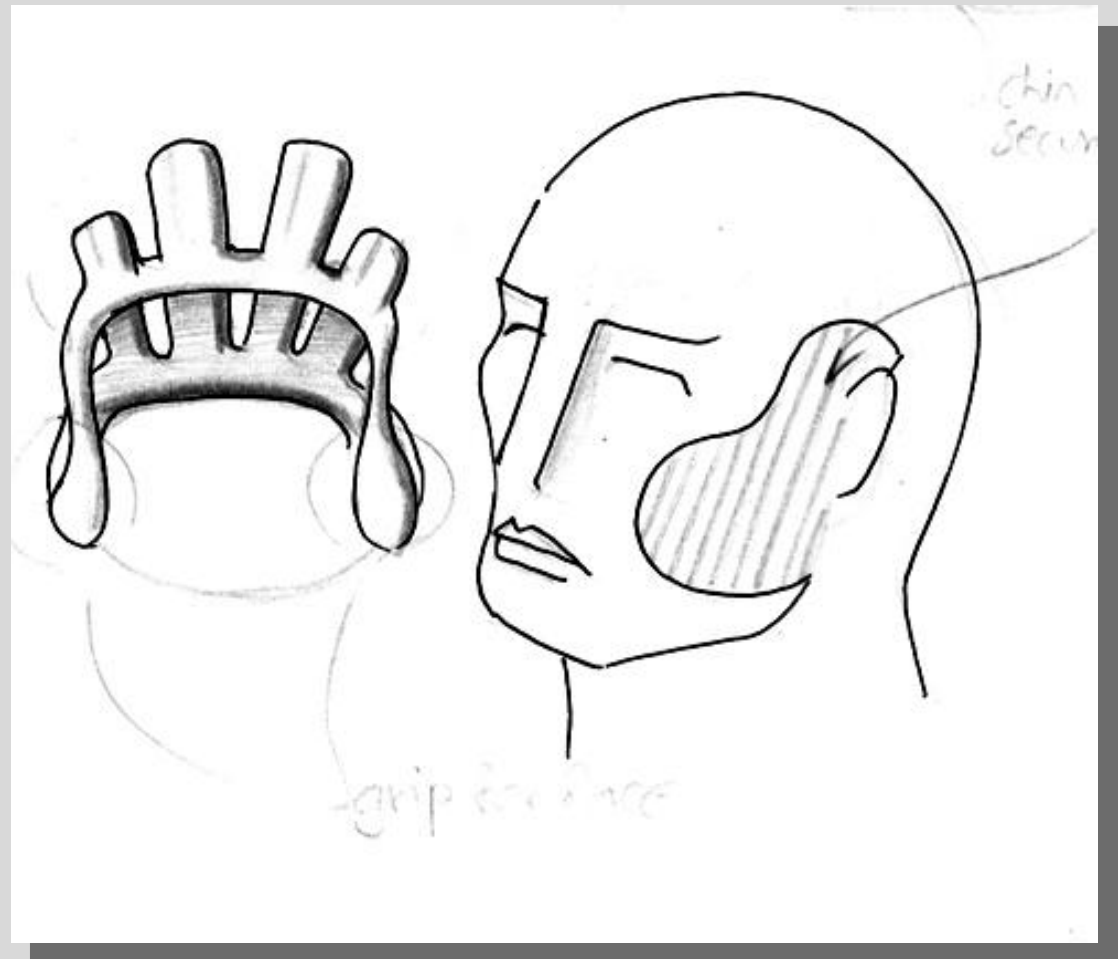
# LARGE GAPS REDUCED



# CONTOUR CHANGED TO EAR PROFILE



# PROFILE CHANGED FOR BETTER GRIP



# CONCEPT A - VENTILATION

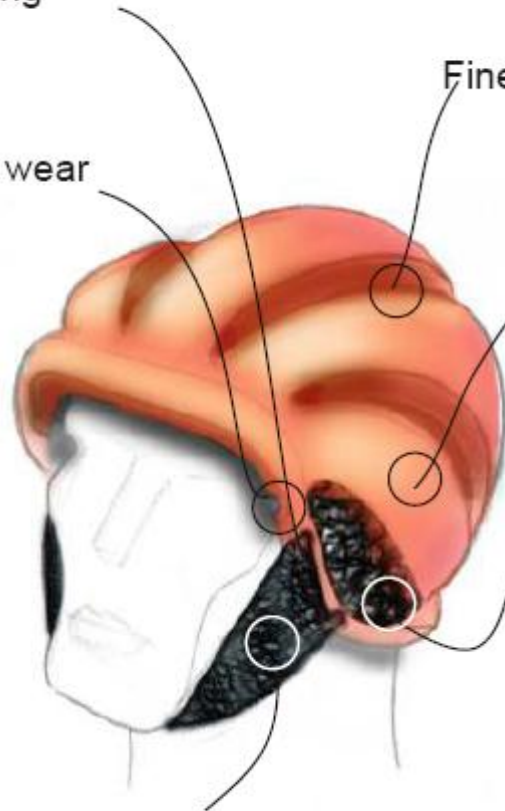
Handle grip for holding

Fine slits for ventilation

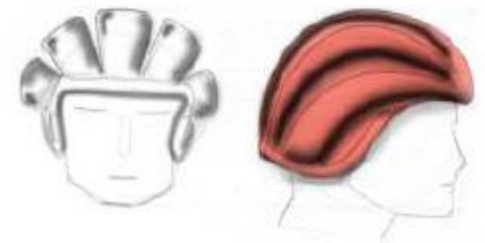
Cut outs for eye wear

Additional element to cover the sides

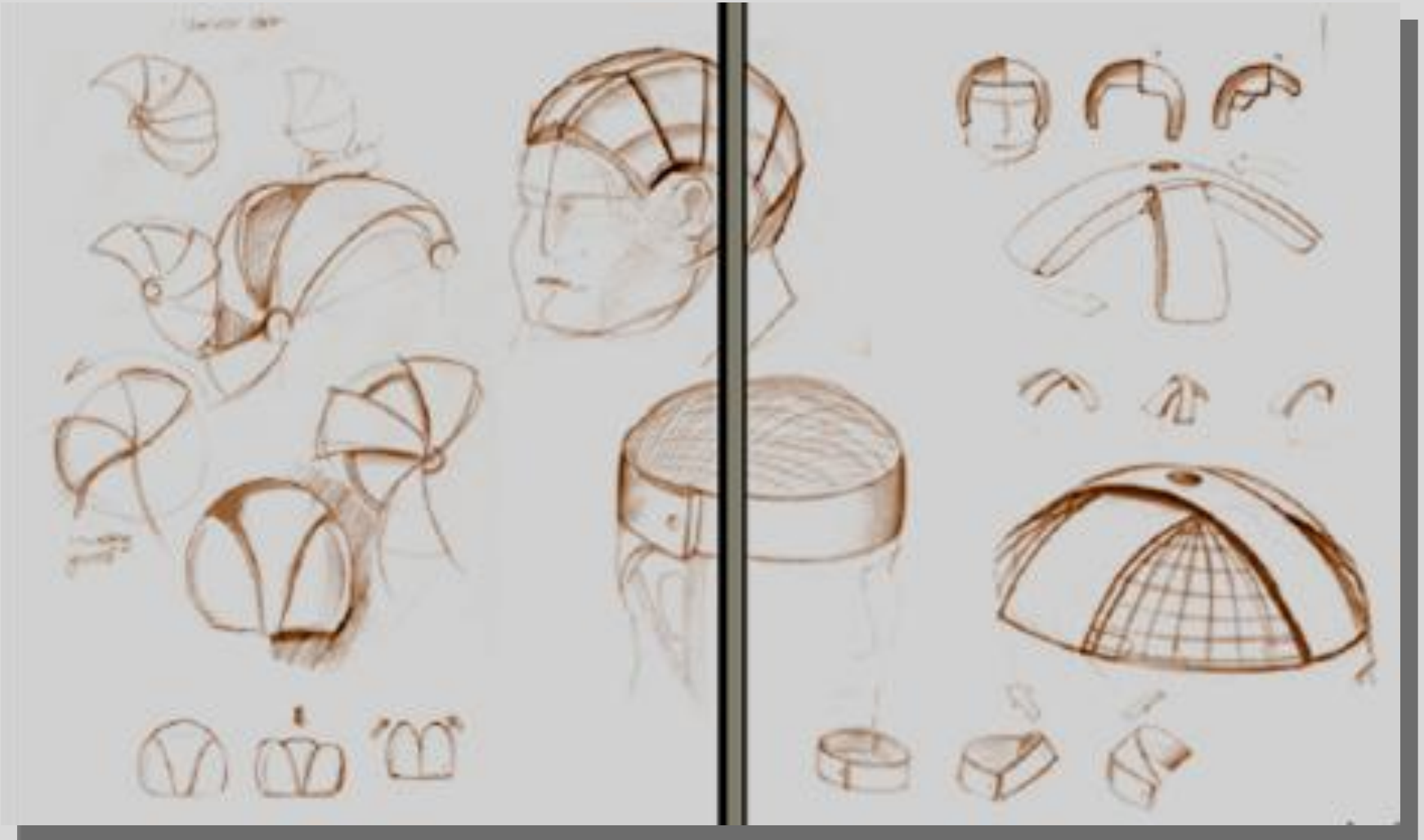
Nylon net to cover the ear, protects against dust, dirt without hindering hearing



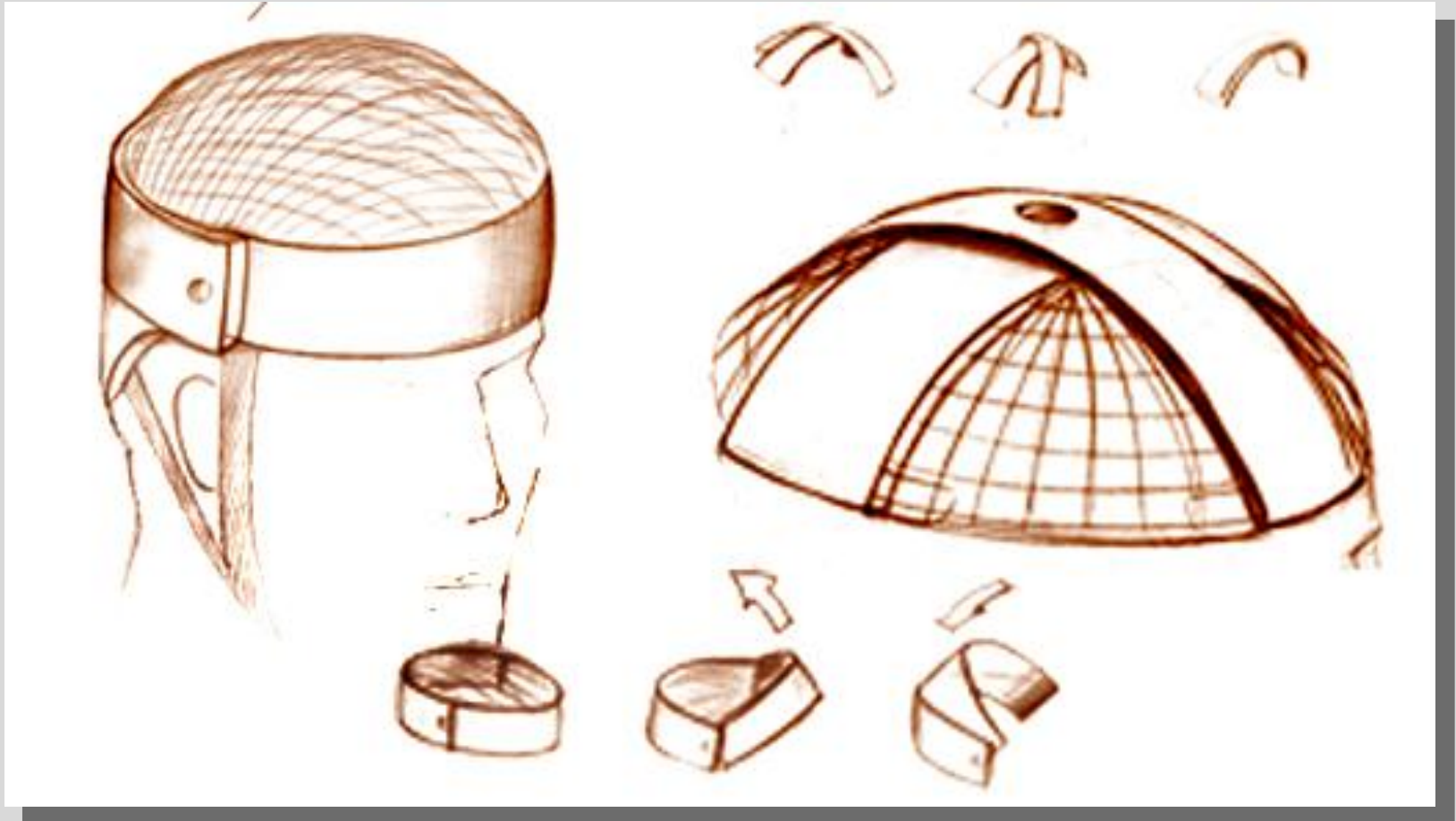
elastic nylon band for securing  
comfortable to use and single hand



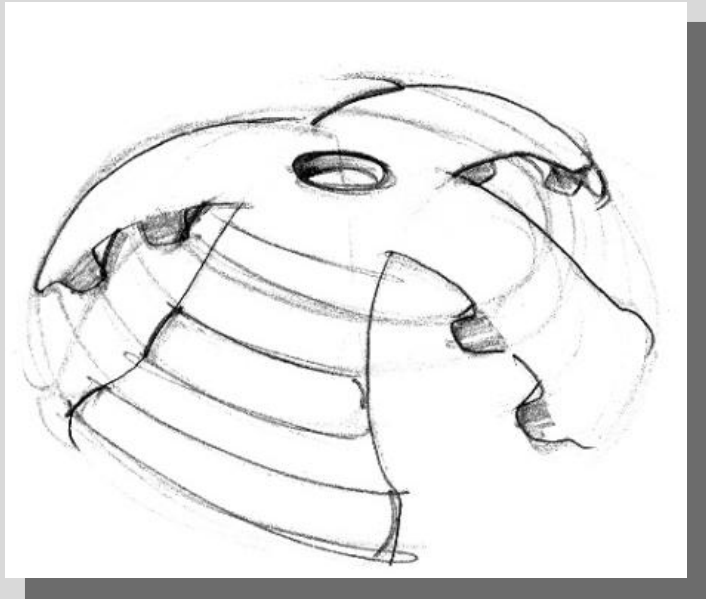
# STORAGE CLUSTER



# REDUCTION IN STORAGE VOLUME



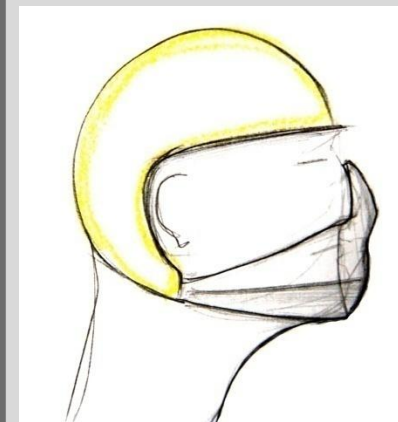
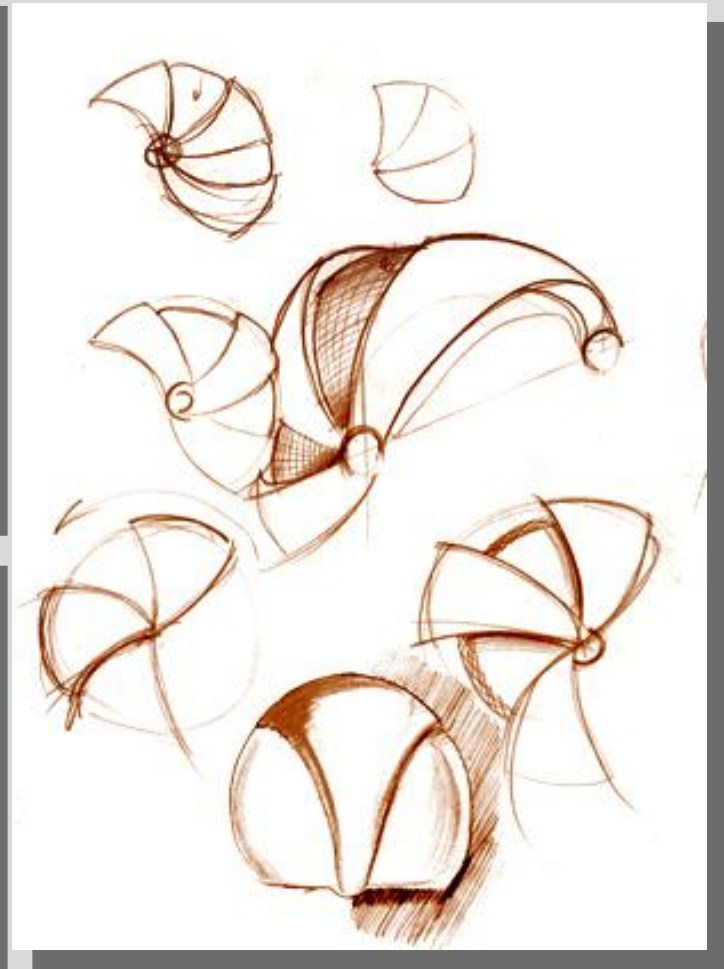
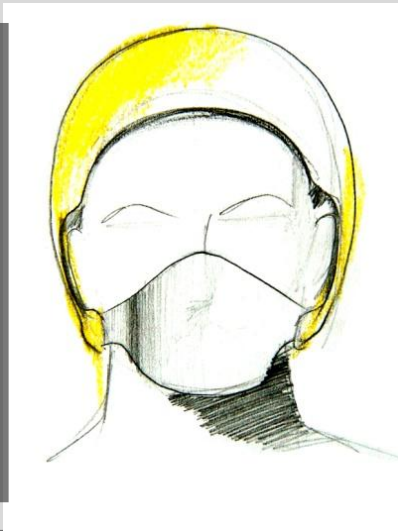
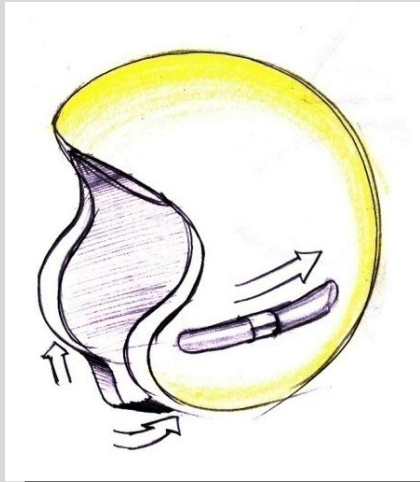




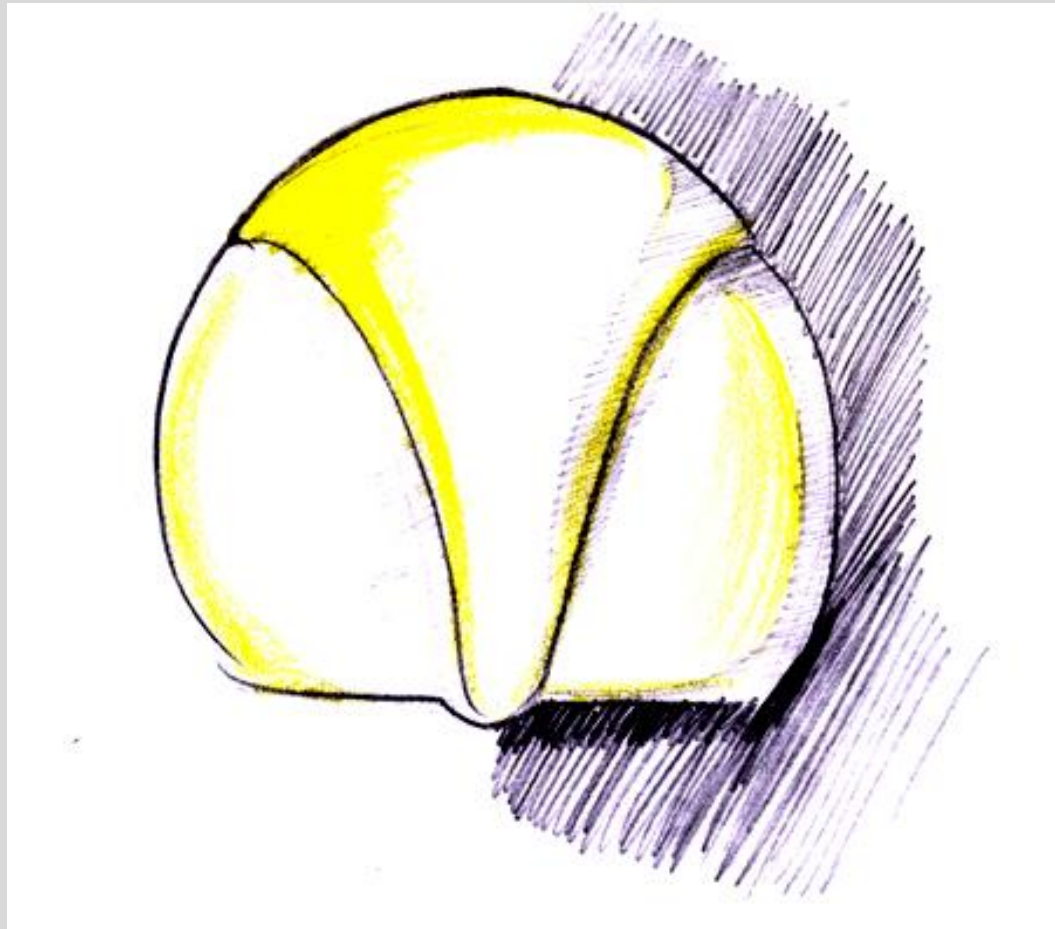
# CONCEPT B - EASE OF STORAGE

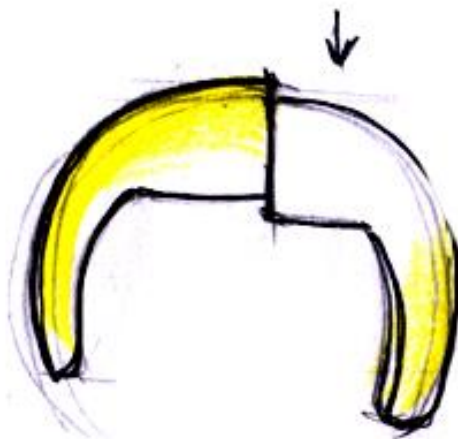
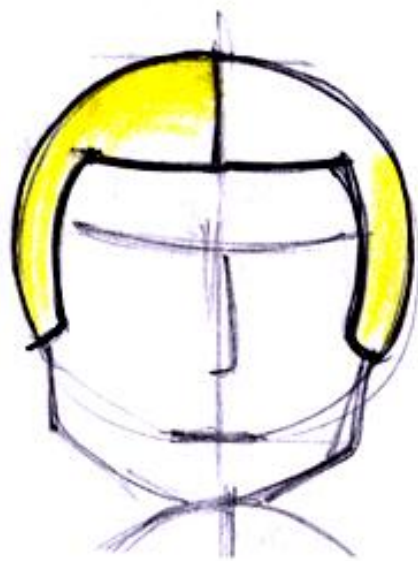


# EASE OF USE OF CLUSTER

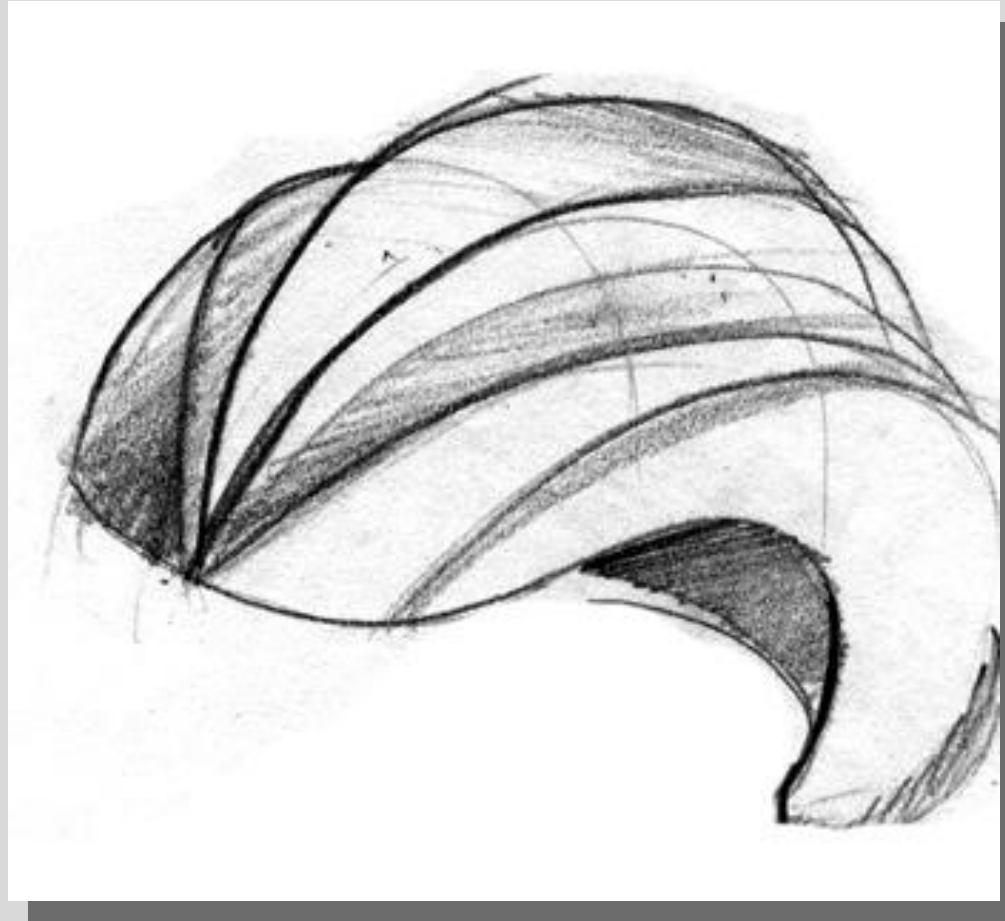


# OVERLAPPING PARTS



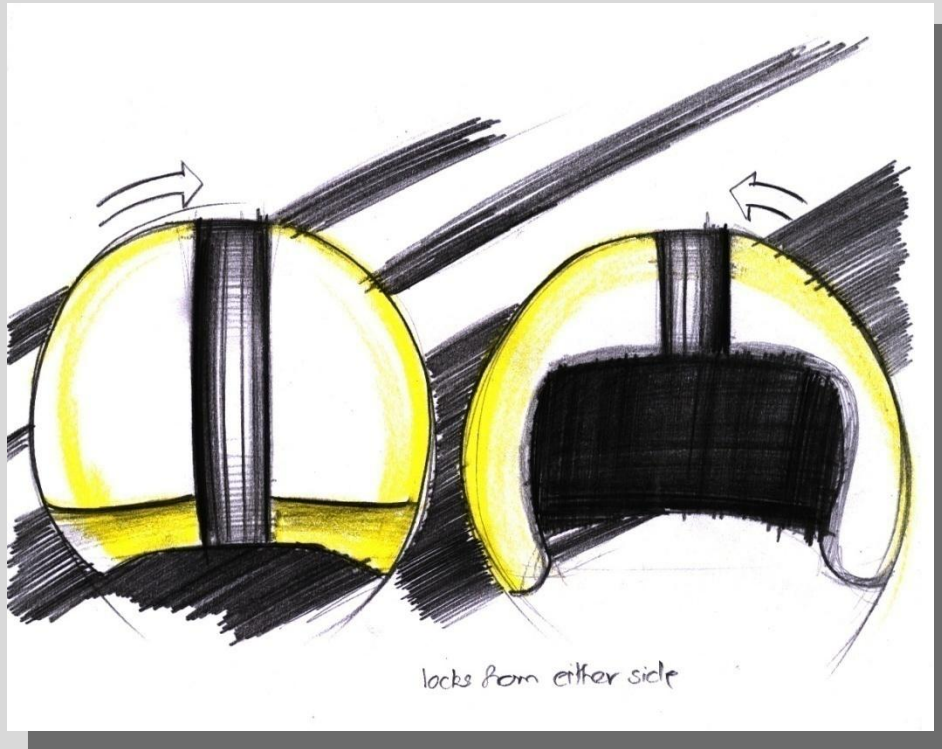


# REDUCE CONTACT AREA WITH SKIN WHILE WEARING



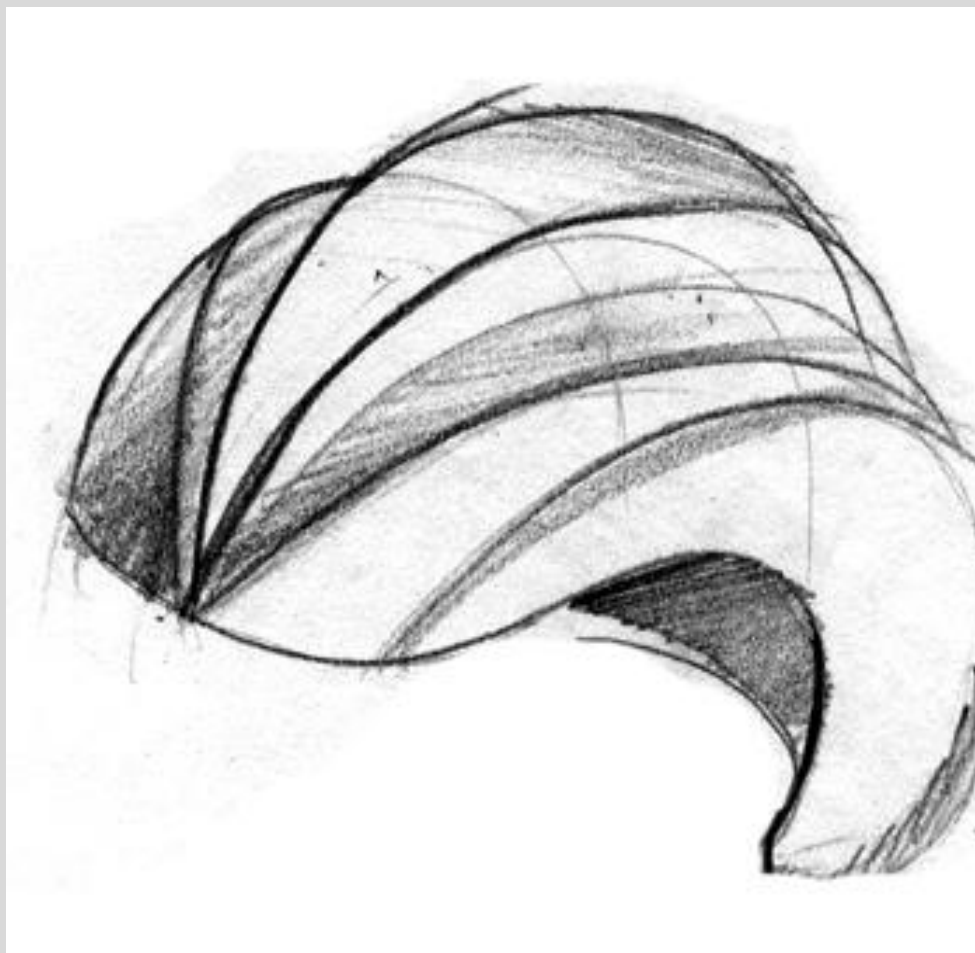


# SECURING CAN BE INTEGRATED WITH THE HELMET

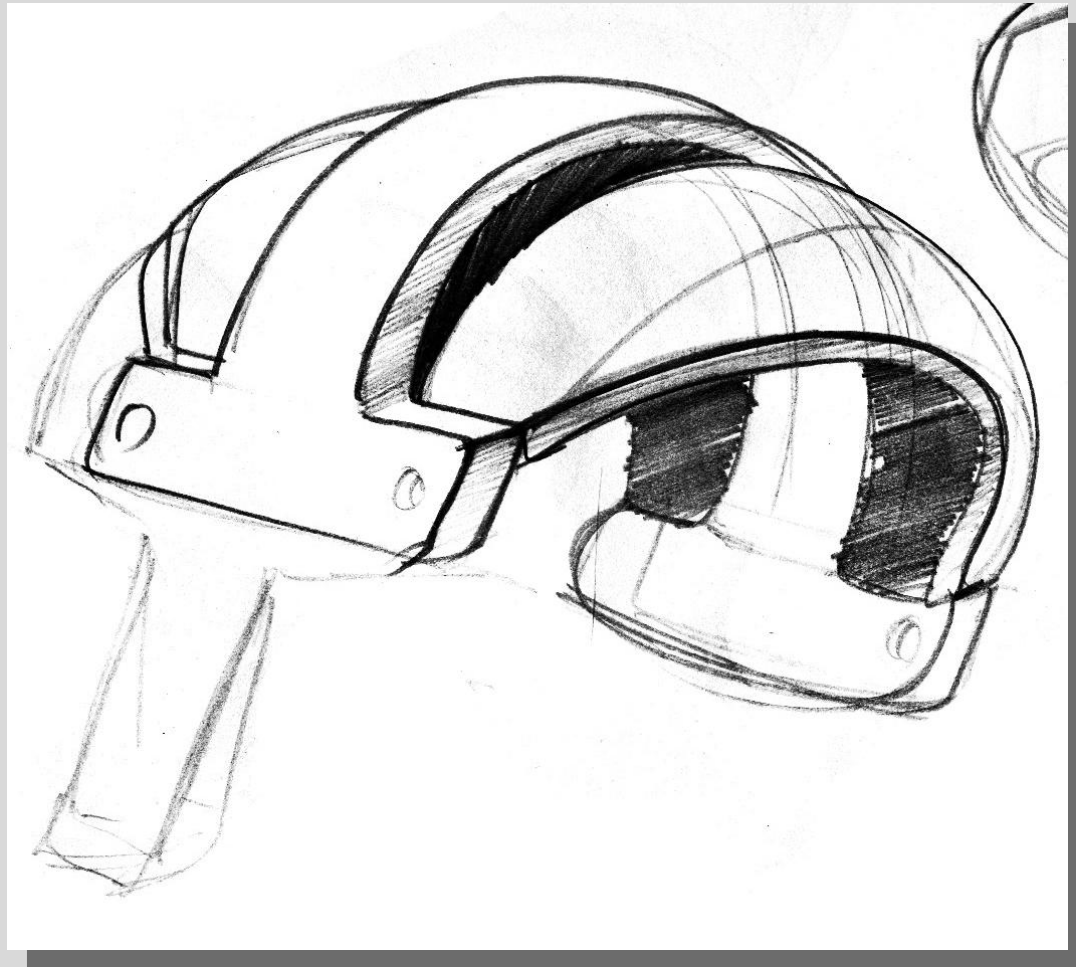




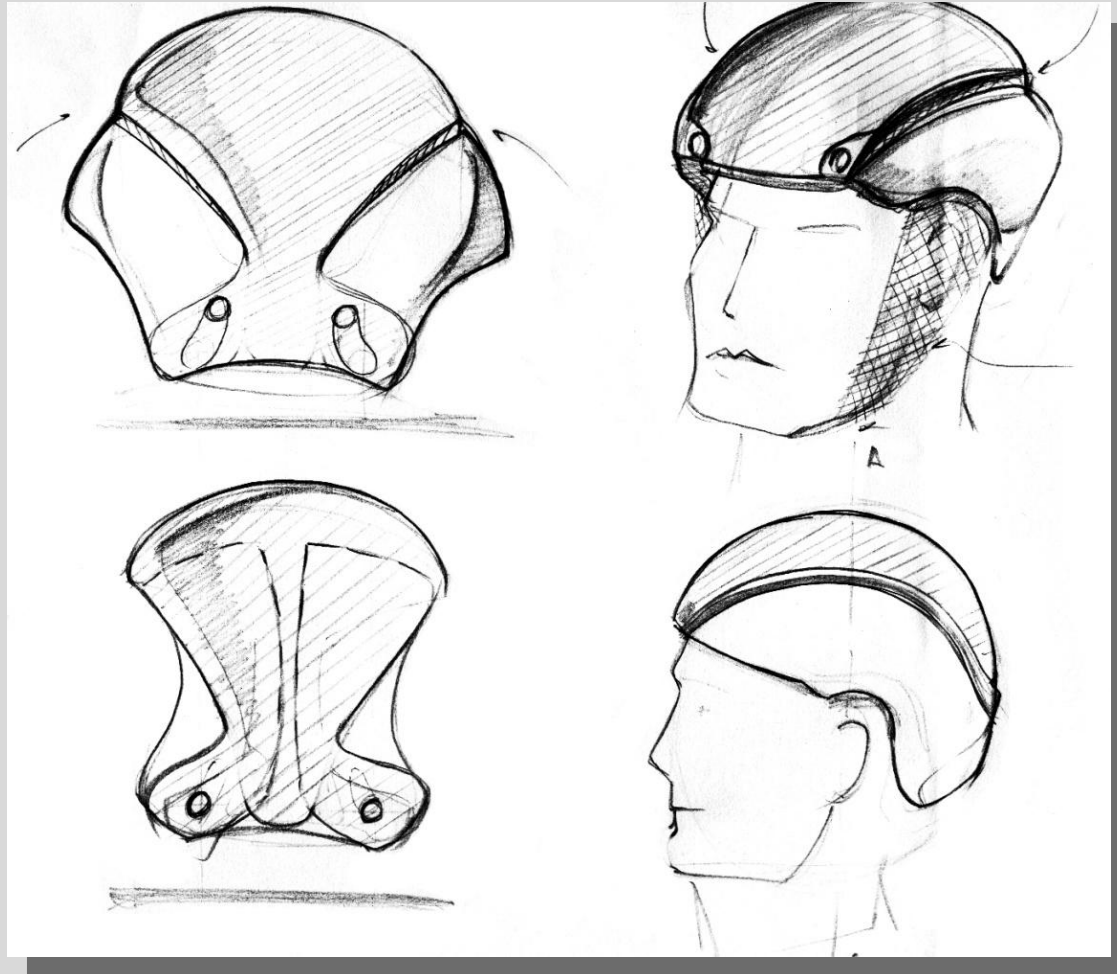
# INITIAL SKETCH



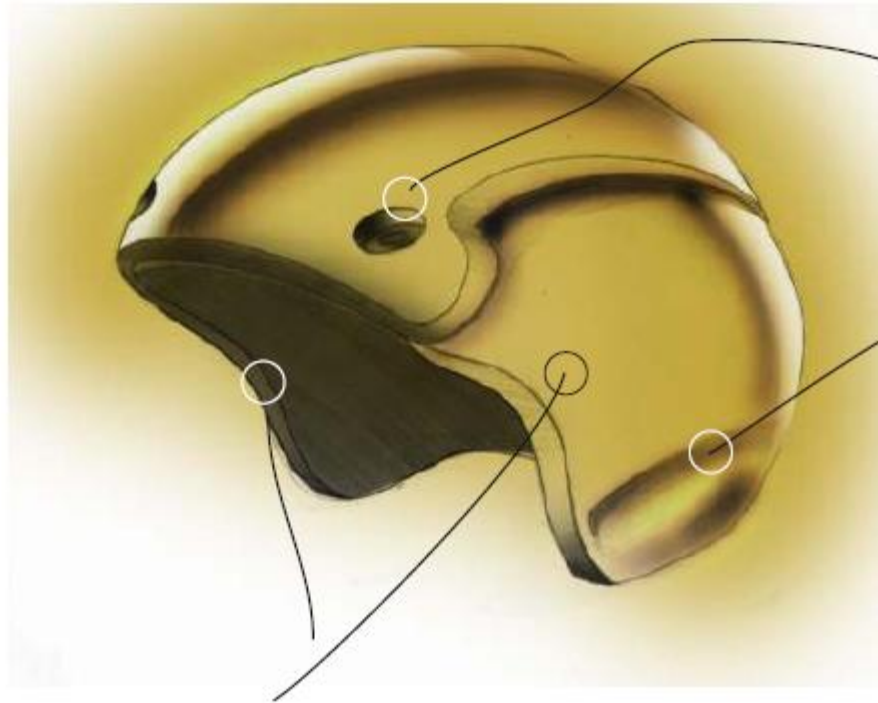
# SINGLE HINGE CHANGED TO TWO



# LATERAL MOVEMENT ACCOUNTED FOR



# CONCEPT C - EASE OF USE



Hinge points

Grip for easy holding

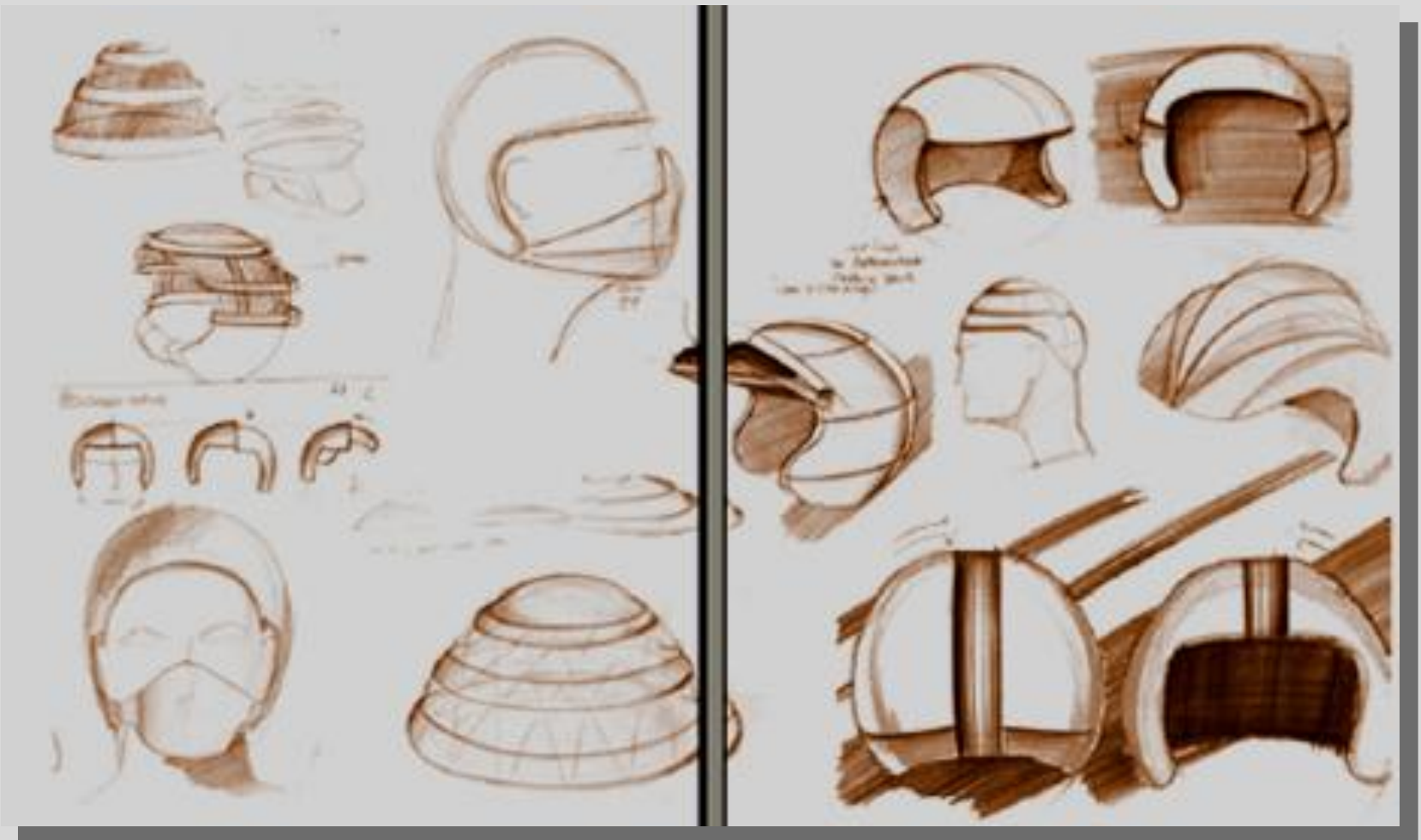


Securing band passes through grooves in the side panels and is attached only to the top portion.

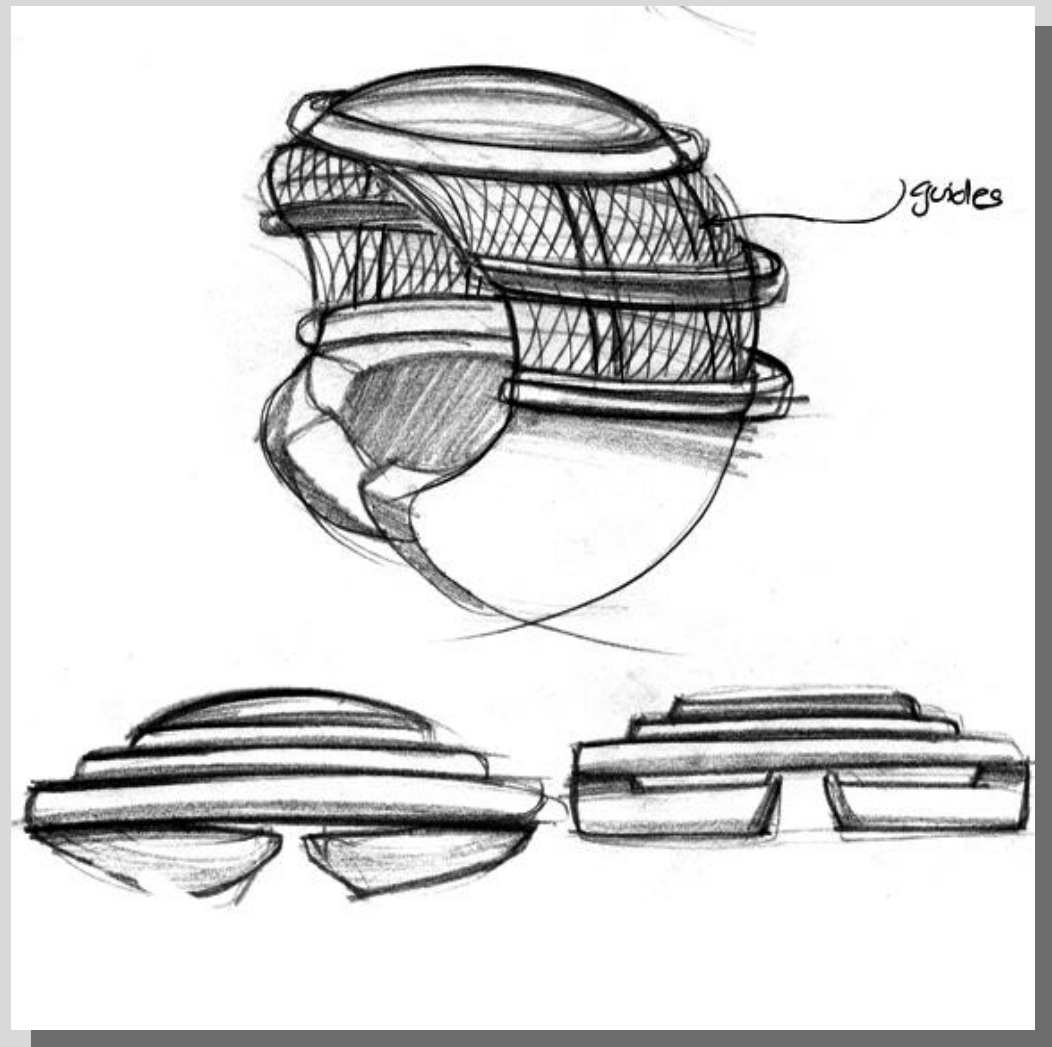


Side panels can be pushed up when stationary for better ventilation

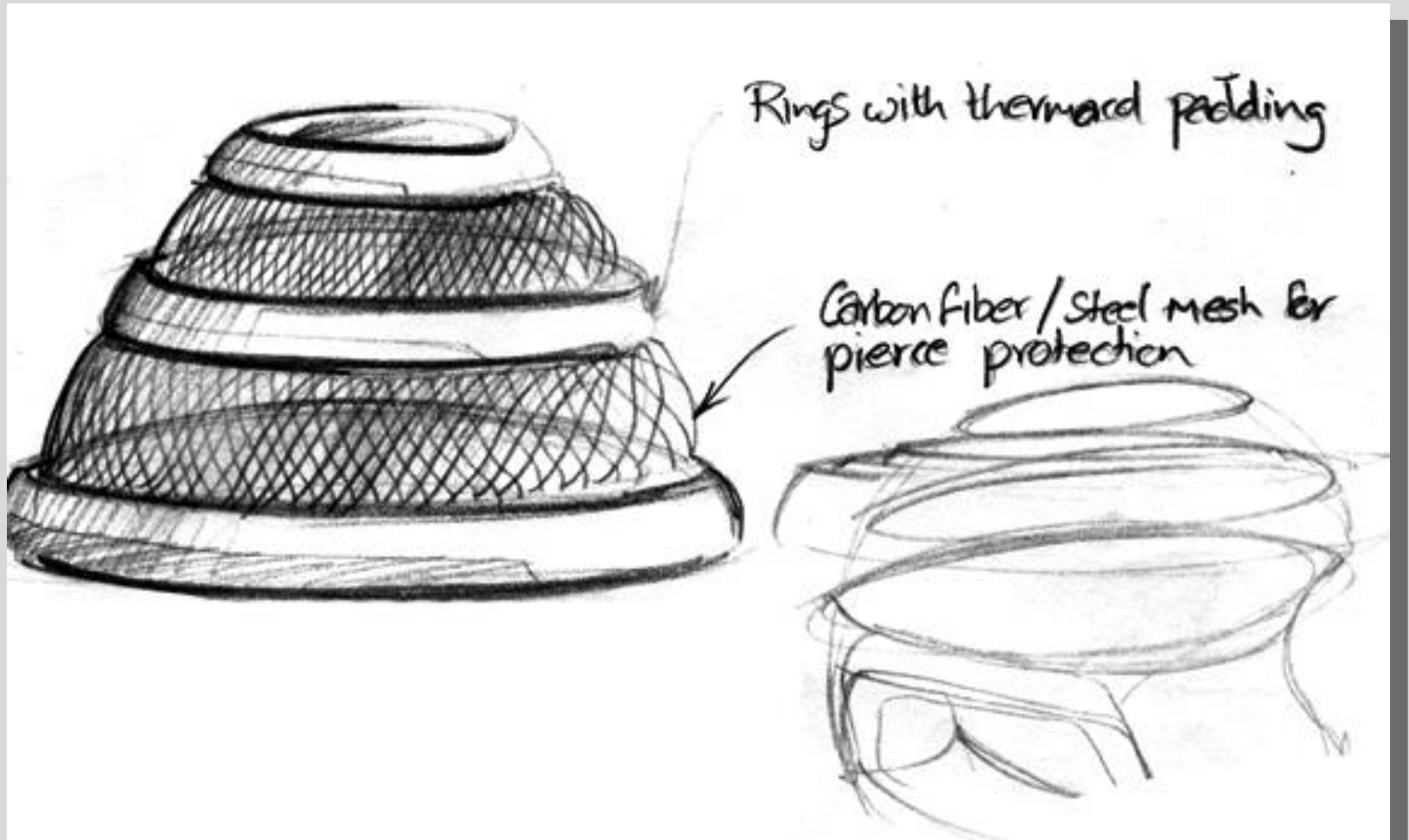
# CONCEPT D - EASE OF WEARING



# REPRESENTATIVE EASE OF WEARING



# USE NATURAL WEARING ACTION





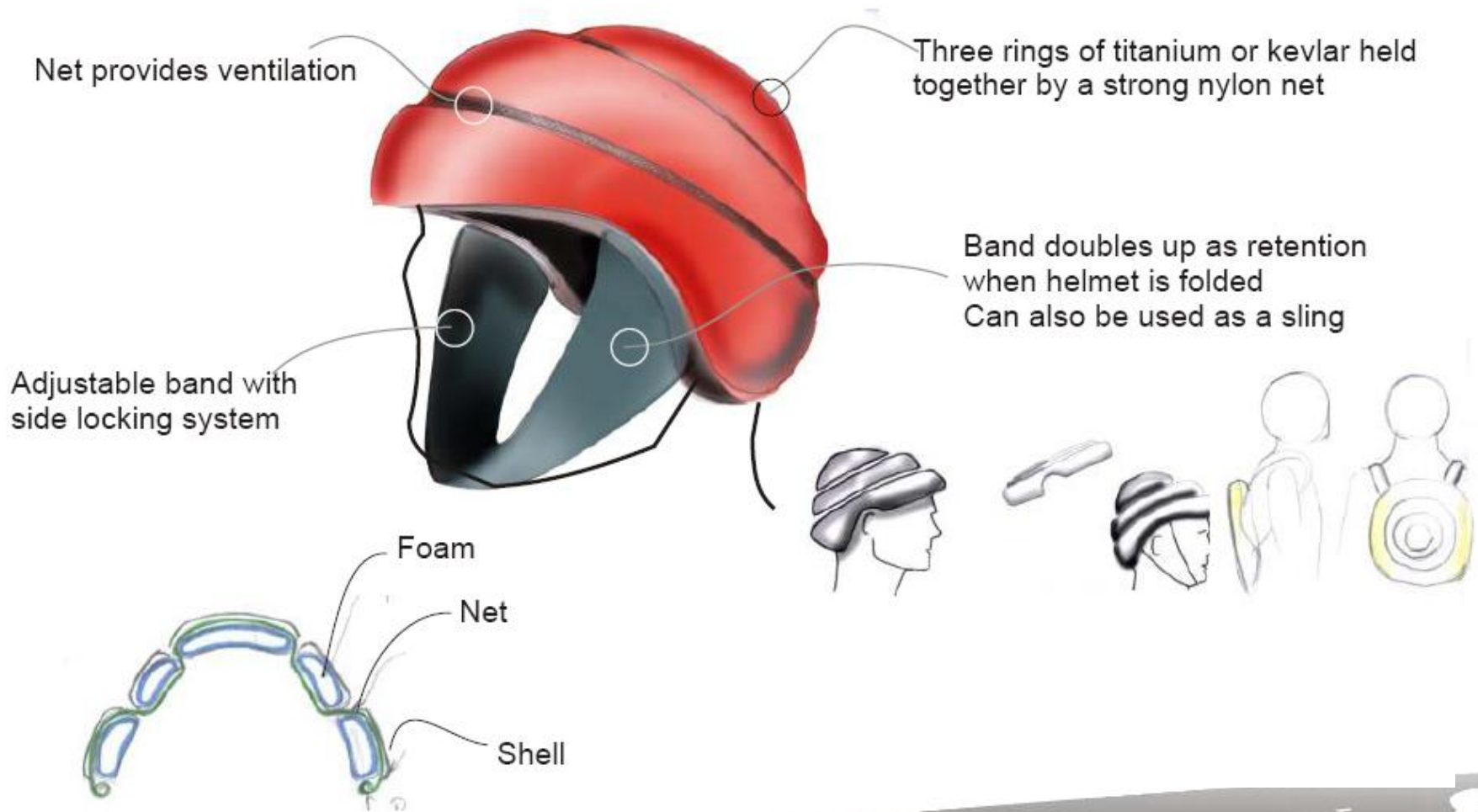
# SURFACE AREA EXPOSED REDUCED



# RINGS MADE BIGGER AND WIDER



# CONCEPT D - EASE OF WEARING



# EVALUATION OF CONCEPTS



# evaluation of concepts

## Concept



## Advantages

Good air circulation  
Multiple ways of gripping  
Light weight  
Strong style statement

## Disadvantage

No reduction in volume  
Difficult to manufacture in frp  
Rare chance of pierce injury  
Problem of dust



Reduction in volume  
Ventilation on sides  
Easy to carry and hold

Moving parts add to complexity  
Projects a weak image



Reduction in volume  
Good ventilation all around  
Convenience of

Three part manufacture  
Does not look robust  
Loose parts

# FINAL SELECTED CONCEPT





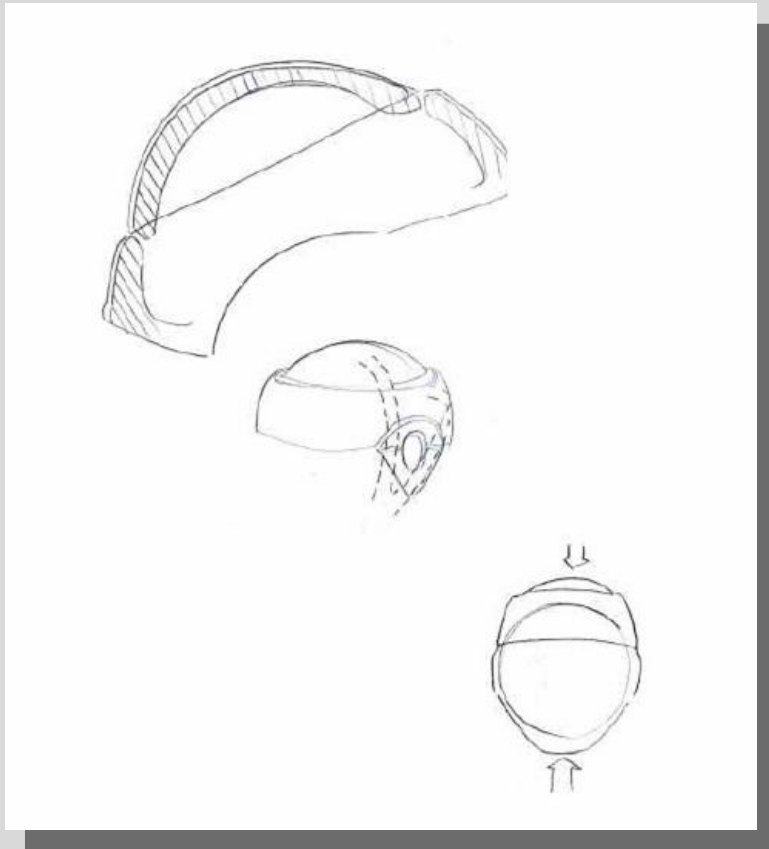
# VALIDATION

- Dr. Dinesh Mohan (IIT - Delhi) an expert in the areas of impact and bio-mechanics.
- Design changed to a 2 part configuration.
- Gap between the shell reduced to min of 4 mm.
- Integral height adjustment provided for snug fit on the head .



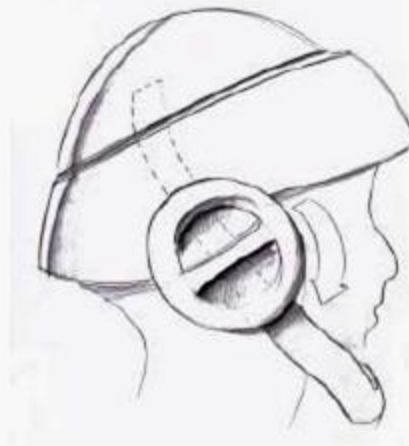


# REFINEMENT

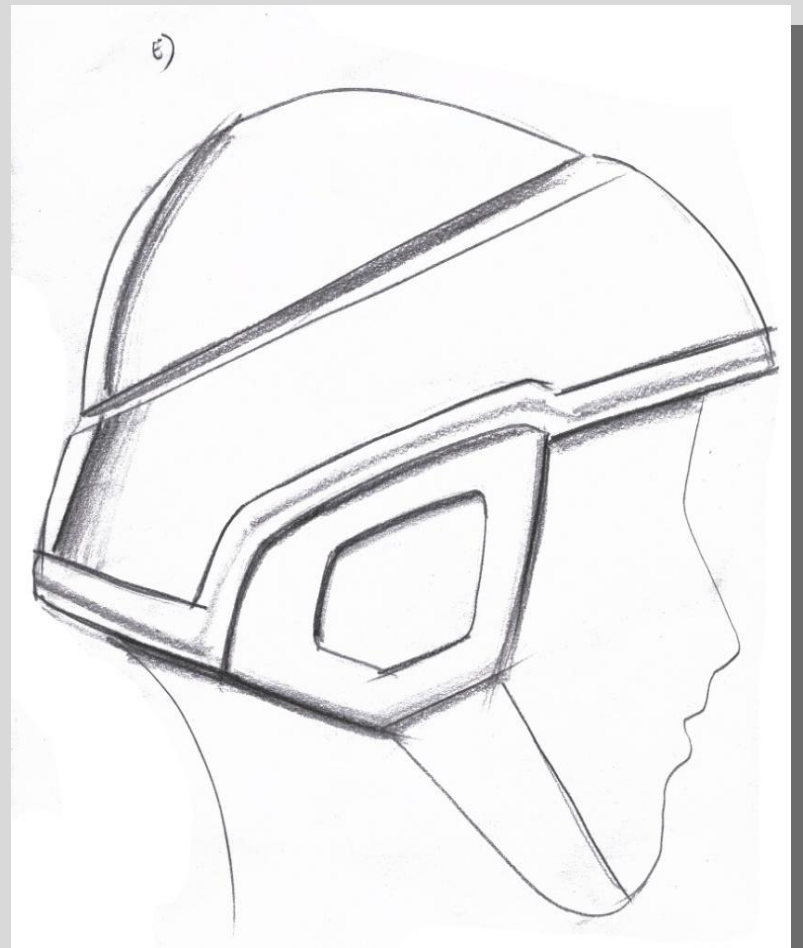
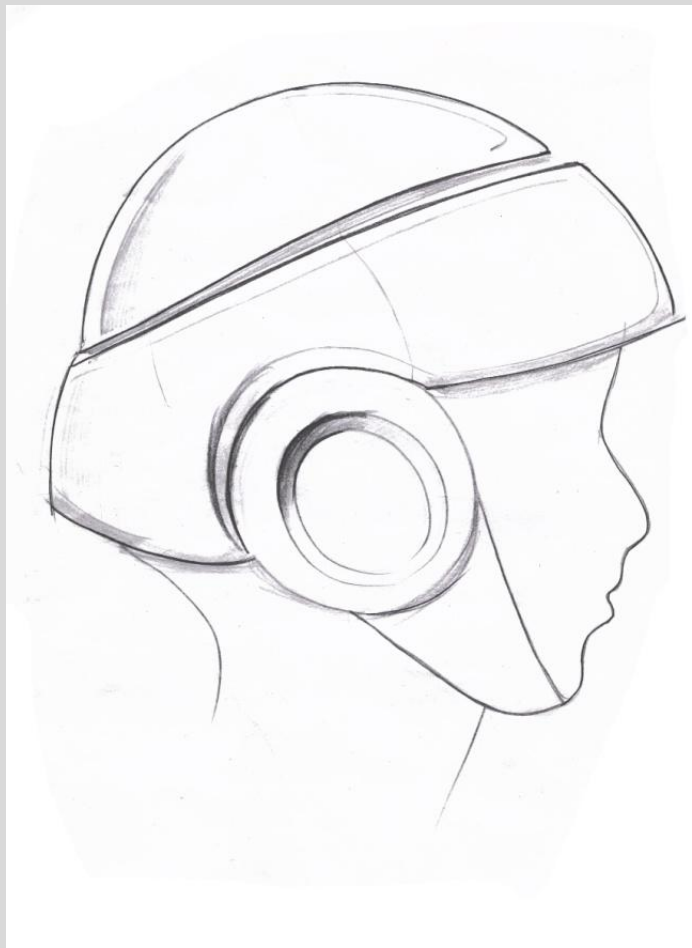


- Three ring to two ring shift.
- Exploration of relative proportions of the rings.
- Detail of foam cross section to enable sliding.
- Detail of upper ridge for locking.
- Rain protection.

# SECURING



# FORM OPTIONS





# FORM REFINEMENT



# MANUFACTURING DESIGN

- Shells made of engineering plastics
- Liners and ear guards made of Elastomers
- Silicon gasket at partition to prevent water ingress



# PROTOTYPE TESTING





# INNOVATIVE DESIGN

- Collapsing helmet
- Ventilation through partition
- Smart looking
- Excellent wear comfort
- Easy to store
- Easy to wear
- Fits all head sizes



**THANK YOU**