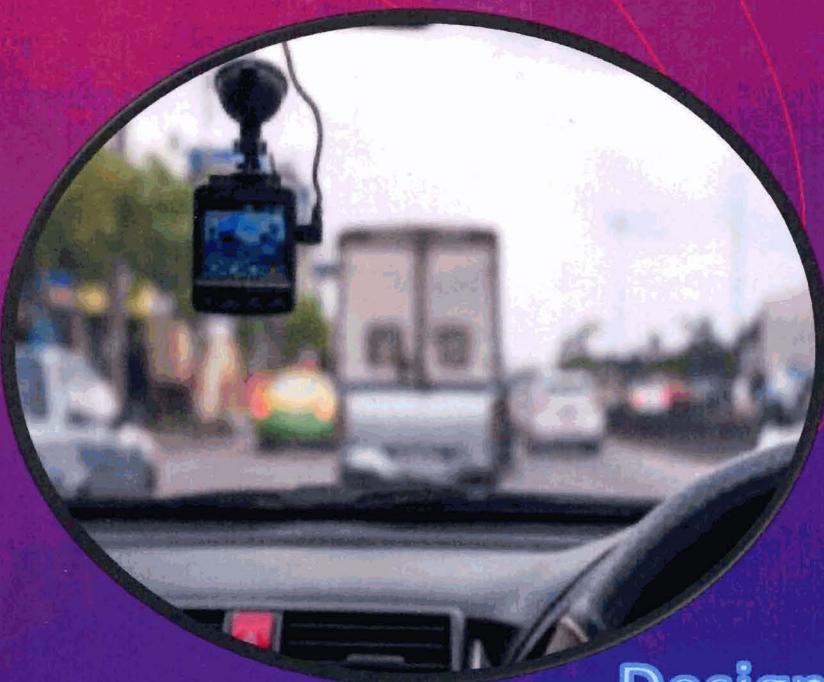


# DESIGN AND COMMUNICATION GRAPHICS LEAVING CERTIFICATE EXAMINATION 2020/2021

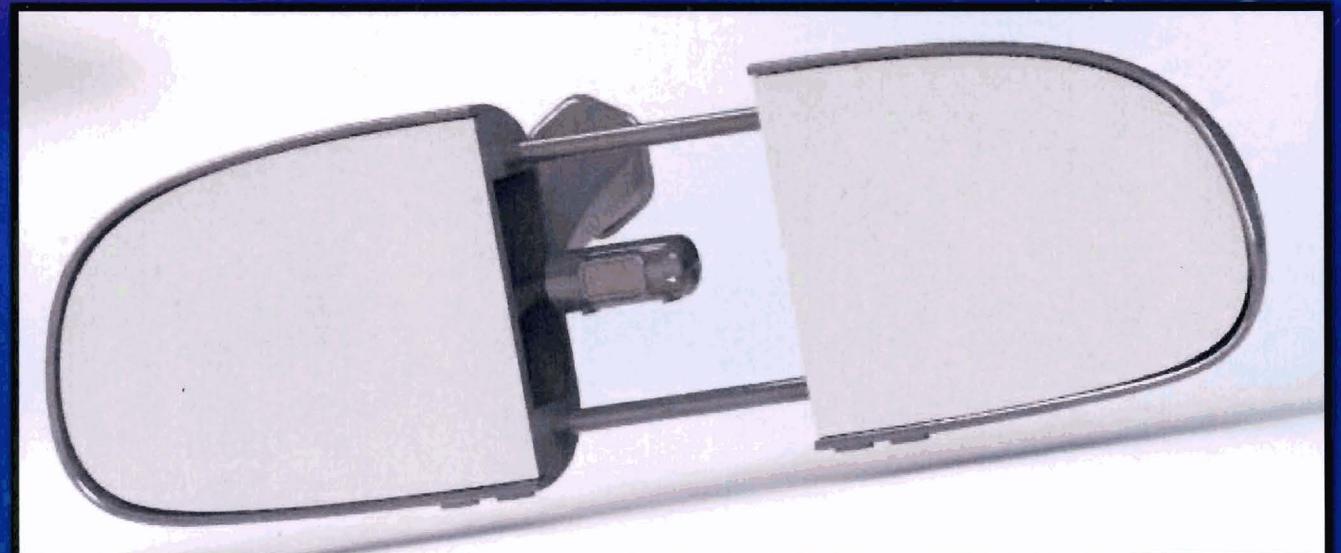
Student Assignment  
Higher Level  
40%  
Dash Cam



NextBase 211



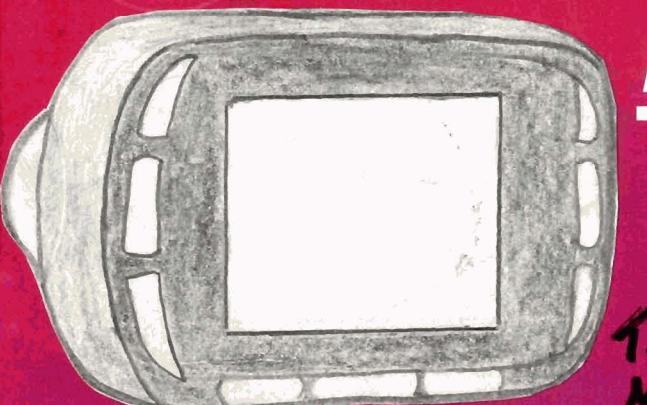
Design Of New Concept



Alan O'Donnell  
DOB 01/08/2002  
Exam No. 114417

A dash camera is an onboard driving recorder that continuously captures the exterior and interior of the car and its surroundings.

### Typical DASH CAMERA SCREEN



## Key Features

### Visuals

Replace old Stereo/Radio with a new tablet, which displays the camera feed and transfer data  
Motion Sensor Security  
Reversing Camera Assistance (Parking Assistance)  
View Google Maps  
Answer Calls  
Siri Virtual Assistant  
Playing Videogames  
Nighttime – Infrared Camera  
Resolution – 4k

### Assistive

Protects drivers from false insurance claims  
Raises awareness of unlawful actions in crime investigations  
Police Reality TV shows used these videos - Shows real events from the perspective of law enforcement officers



### Legal Requirements

Became legal for citizens in 2009  
Clearly visible notice on car  
Footage should be routinely removed – Privacy by design  
Publication - Buivid's case (C-345/17) – posting footage can infringe on data protection rights  
Should be placed in the centre of the windscreen



### Primary Research

For my Primary Research, I did my own investigation of different dash cameras at different price points at Argos and Harvey Normans as well as on Amazon to compare the different shapes, functions and different variables that separates them in the market.

I then measured the physical features of the dash cam before taking it apart and observing the components placed inside the shell exterior.



Internal Cut Section



# Design Research



### Best Dash Camera of 2020

The Nextbase 522GW was reported to be the top dash camera on the market. It has 140 degree viewing angles for optimal coverage'



1440p video quality and has a GPS tracker built in. The front screen is touch screen along with Alexa compatibility to help drivers on the move. The shape is a beveled cuboid with an exterior lens that connects to the window via a suction arm.



### Data Management

4G – Upload automatically to cloud  
Originally analogue - VHS Cassette tapes (slow and bulky)  
Also records:  

1. acceleration/deceleration
2. g-force
3. speed
4. steering angle
5. GPS data

### Connectivity

Dash cameras attach to the wind screen via a suction-based grip that's attached to a detachable arm for easy use to remove the camera and review it.

## Timeline

### 1980s

Texas Police Force, placed on tripods – bulky



### 1998

World's wildest police videos, American reality TV Show



### 2009

Popularity grew, Russia made them legal for citizens



### 2013

Russia hit 1 million users



### Feb 2013

Recorded meteor crash on outskirts of Chelyabinsk



### 2014

Sales increase of 918% in the UK and 200% in the US



### Aug 2014

Footage of missile landing in Donetsk Ukraine



### Feb 2015

Footage of TransAsia airways flight GE235 hitting a Taipei highway and crashing into the river



### Next Base 122

2019, Cad A, 720 HD @30Fps, 120 Degree Lens, 54.99 Euro



Connective Arm Stand



# DESIGN RESEARCH

## SECONDARY RESEARCH

### How they work

The dash camera is mounted onto the windshield and automatically starts recording the road when the ignition key is turned on, this records as a continuous loop, every 3min clip is then segmented onto a Micro SD card or uploaded onto the Cloud.

Typical sticky pad unit



### Ergonomics & Anthropometric

\* How efficient is it in a working environment.

\* Electronic Toll tags are used to automatically pay the bill, also placed on top center of windscreens – combine the two?

\* It's important that the camera is placed in the center of the windscreens up by the mirror



### Environment

The New Cameras Elevate an old car into the new age of technology yet not having to replace and damage the environment



### Functionality

A dash cam is mounted onto the windshield and records the road when you are driving.



The dash cam starts recording automatically when the ignition key is turned. It records on a continuous loop, with each clip filmed on a short 3-minute segment onto a micro-SD card

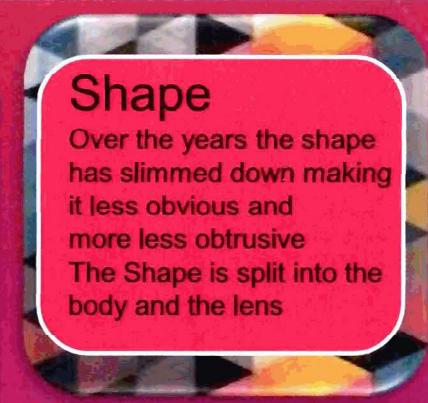
### Common Problems

- Run out of power
- File corruption
- WIFI issue – data sending
- Full SD card
- Camera out of focus/blurry
- Video to dark



### Shape

Over the years the shape has slimmed down making it less obvious and more less obtrusive. The Shape is split into the body and the lens



### Production

3D Printing  
Vacuum Forming



### Materials

Dash cameras are made from various materials from soft plastics to metal rims. The base is typically made from a 20% glass fiber polycarbonate compound this is light and durable material making it cheap for manufacturers yet still durable to humidity, shock absorption and temperature change. The lens is made from optical glass



Output 1 Pg:2  
Components



### Screen Display

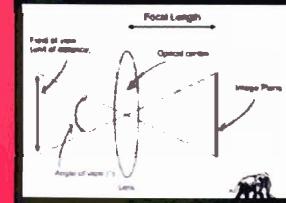
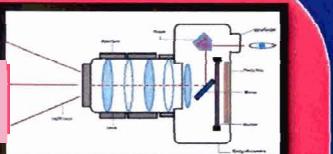


### How A Camera Works

Wide distance angles are obtained when the focal length of the lens is smaller than the focal strength of a lens from a given film plane.

This lens allows a greater amount of the scene to be included in the recording.

Which allows a photographer to capture an entire scene without having to step far back to cover everything.



### Exploded View

Focal Lengths*	Lens Type	Lens Usage
Less than 20mm	Ultra Wide Angle	Architecture
21mm - 35mm	Wide Angle	Landscape
38mm - 70mm	Normal	Street and Documentary
80mm - 135mm	Medium Telephoto	Portraiture
135mm - 300mm	Telephoto	Sports and Wildlife
More than 300mm	Super Telephoto	Wildlife

### Connection Component Type

A common type of connective arm is a suction cup cam lever



A second common type is the ball clamp, works by clamping down with a circle cut out.



A third common type of arm connector is a mirror mount, these can either be built in or external latch clamps



### Types Based On Features

#### Basic

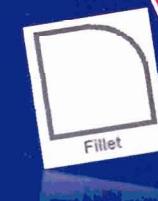
Cheapest  
Simple and easy to setup,  
No advanced features  
No Interior



#### 1 2

#### Advanced

More Expensive  
GPS, audio and sensors  
No Interior

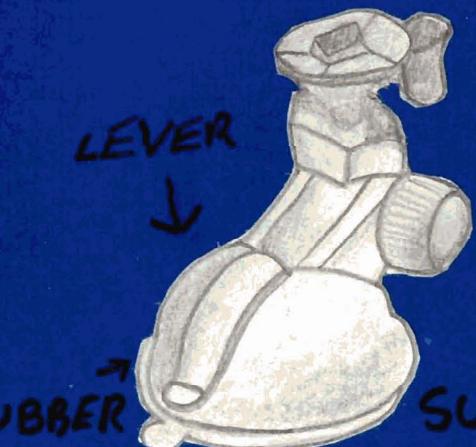


#### 3

Most Expensive  
Might not have advanced features  
Interior

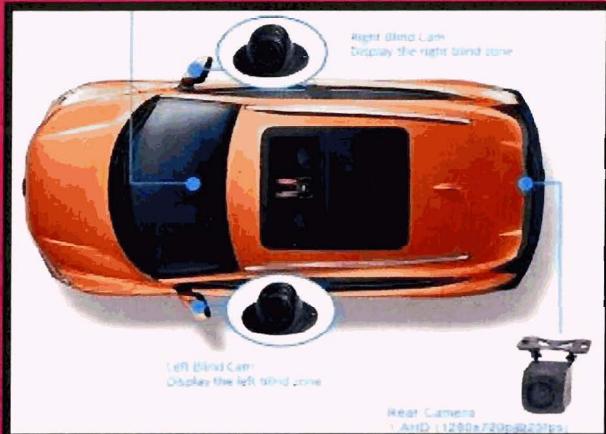


### Cable Types

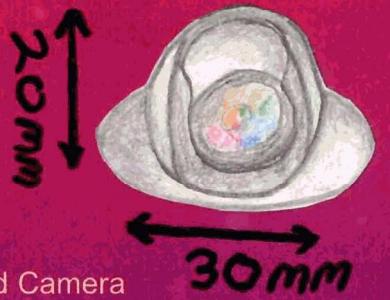


# Design Feature Comparison

## Compare and Contrast



Blind Camera sketch



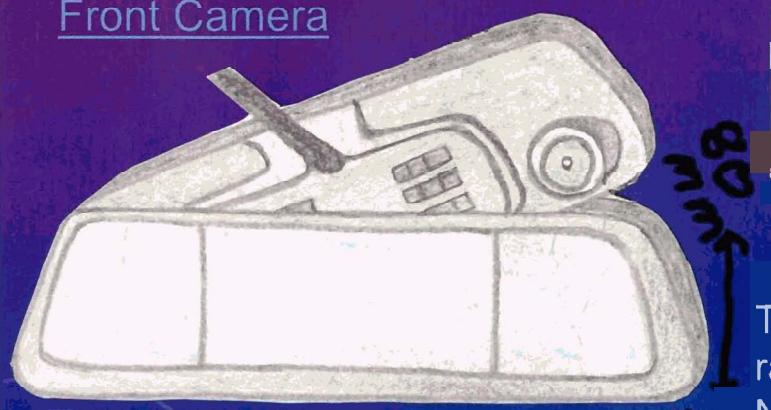
Blind Camera  
1. Displays left and right blind zone

Rear Camera Sketch



Rear Camera  
1. AHD 1280 x 720p @25fps  
2. Record back view of vehicle, reverse parking.

Front Camera



Front Camera  
1. Full HD 1920 x 1080p @25fps  
2. Record front view of vehicle

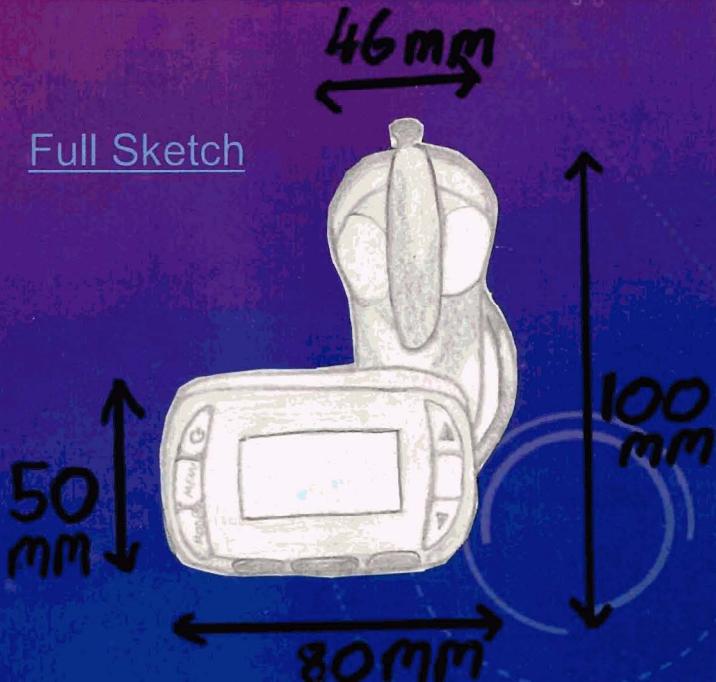
HUATINGRHDC Intelligent Mirror Dash Cam	Specifications	NextBase 122
€76.44	Price	€54.99
Small and hidden	Size	Medium size, bulkier
Extrude, Revolve, guide curves	Solid works Features	Filletted Rectangles, Extruded boss/base, revolve boss/base, guide curves, lofted boss/base
Mirror attachments and boot clip	Mounting	Suction cup, sticky pad unit
All small cameras imbedded in certain locations	Physical Form	Combination of cylinders, cuboids and curve edges, smooth, extruded buttons
Spherical Cylinder, Cones	Shapes	Filletted rectangle, circle, rectangles
Triple wide rear view, F2.0, stationary	Camera	Single front dash view
(4) Front Camera Right, Left Blind Spots – Side Mirrors Rear view placed on boot.	Facing Cameras	Single front dash view
Hard Plastic Casing, Glass (Mirror Profile)	Materials	Hard Plastic Casing, Glass (Mirror Profile)
3D Printer	Manufacture Method	Vacuum / Mould forming Or 3D Print
Touch Screen, Display		50.8 mm LED Screen
Loop Recording	Data Management	128 GB microSD
Motion Detection, G Sensor	Sensor	G Sensor for impact
150 degrees, from single, 360 total	Camera Angel	120° wide-angle lens
Hidden until requested	Ergonomics	Designed and manufactured to fit into the palm of your hands with rounded edges

## Summary

The Huantingrhdc dash camera was the more expensive option but offered a great range of functionality and camera angels in comparison to the one camera angel of the NextBase. Both cameras were designed with a hard plastic casing with built in G sensors. Along with the Huantingrhdc's multiple camera locations its main lens angel is also greater by 30 degrees. The NextBase camera can be seen as bulky and in the way, whereas the Huantingrhdc is hidden and discrete, people are less likely to hide their intentions/face when they don't see a camera.



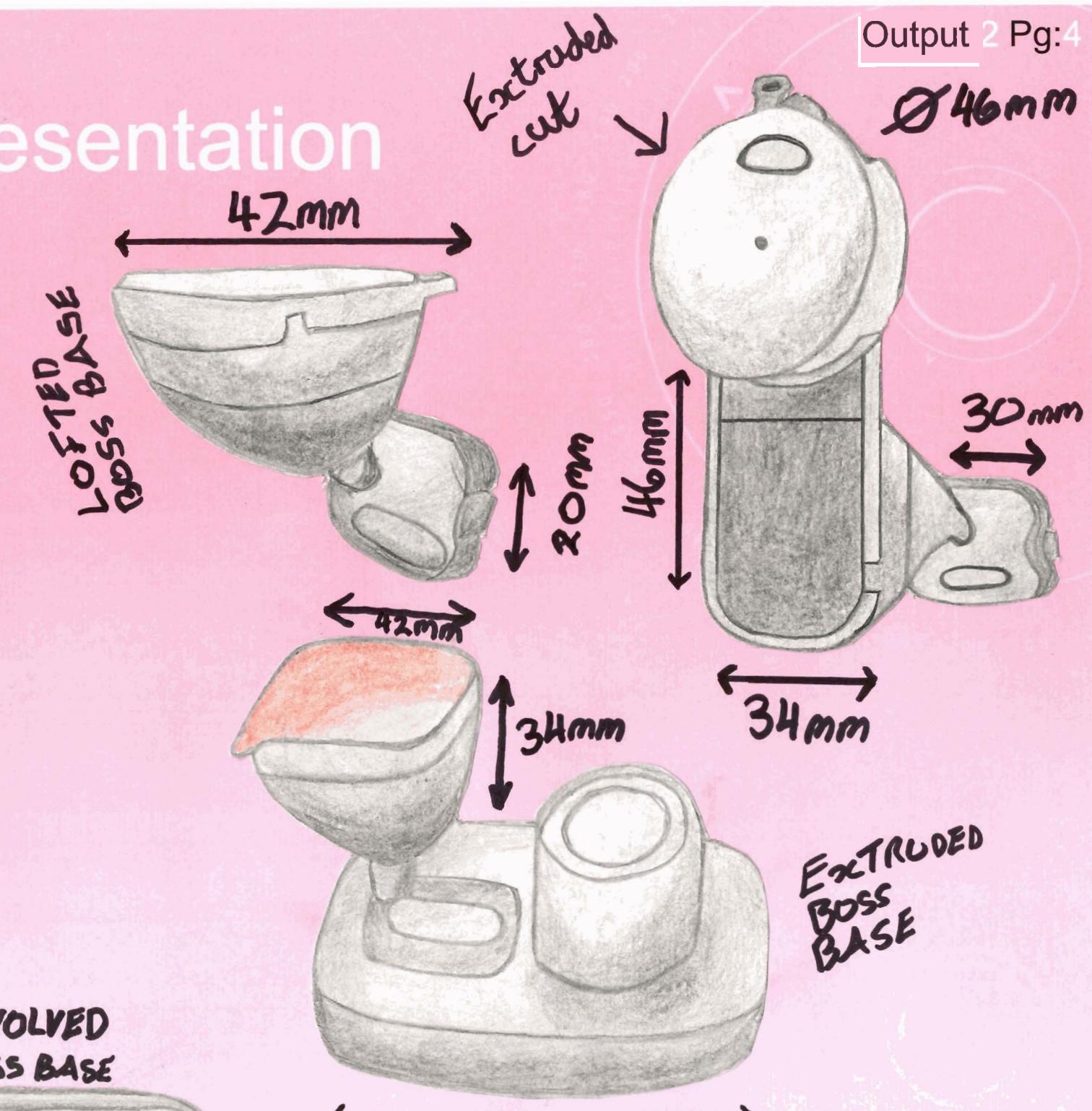
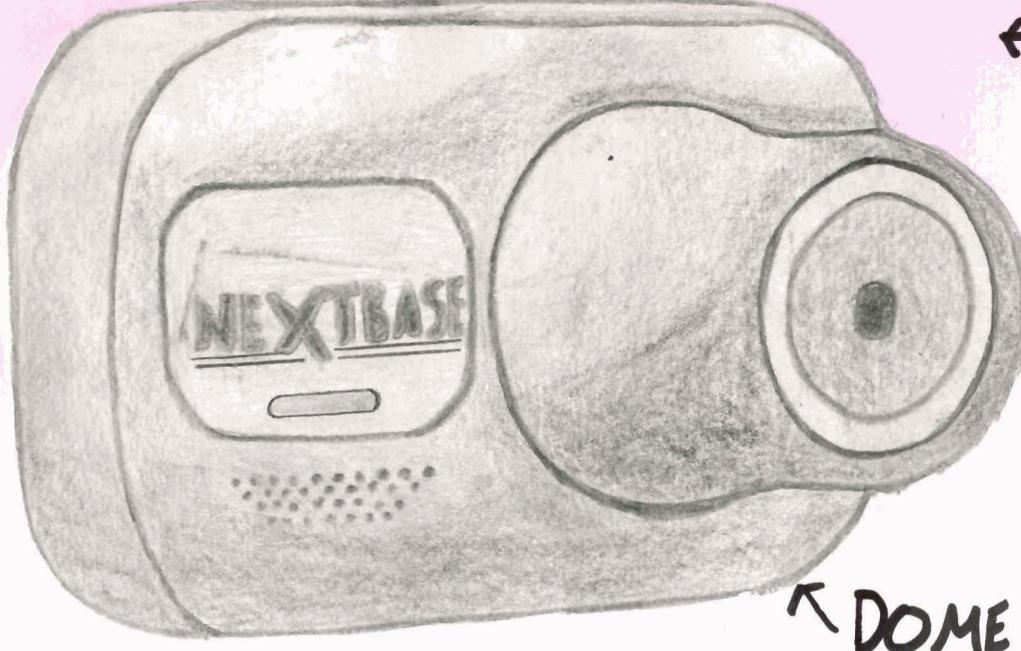
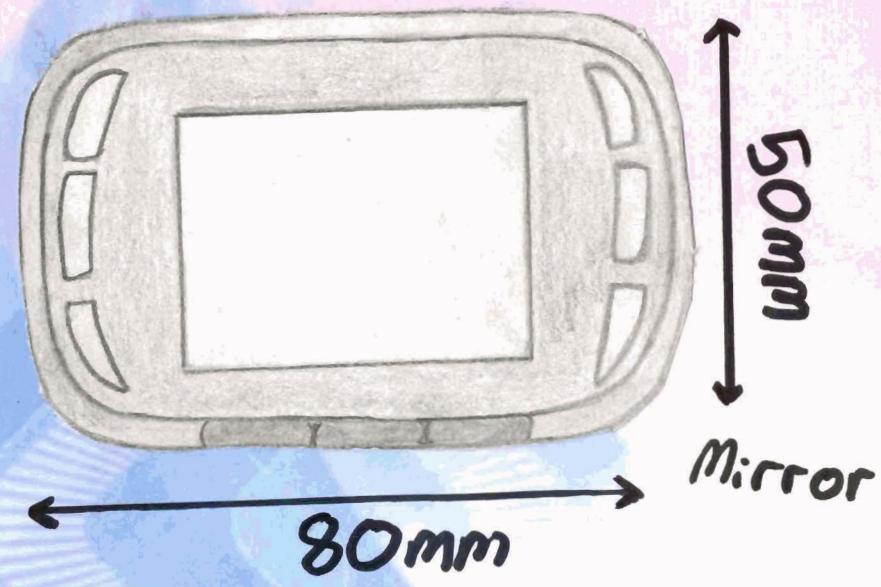
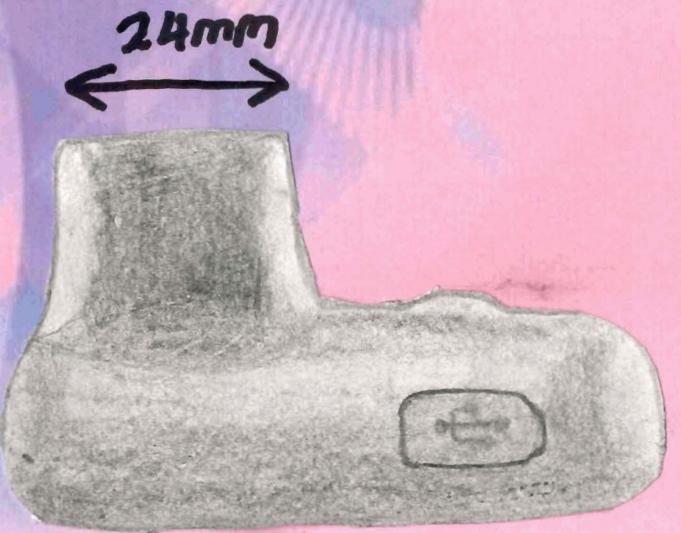
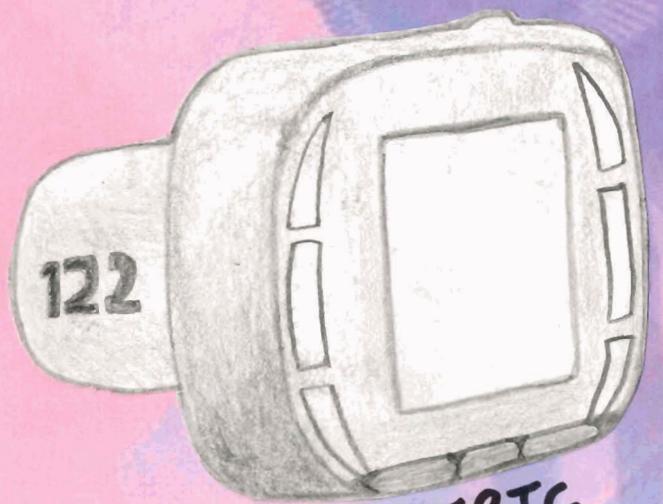
NextBase 122



## Reflection

Throughout the completion of this output, I have gained a greater understanding of the functionality of a dash camera along with its designated features. Using this information, I can proceed into the next output.

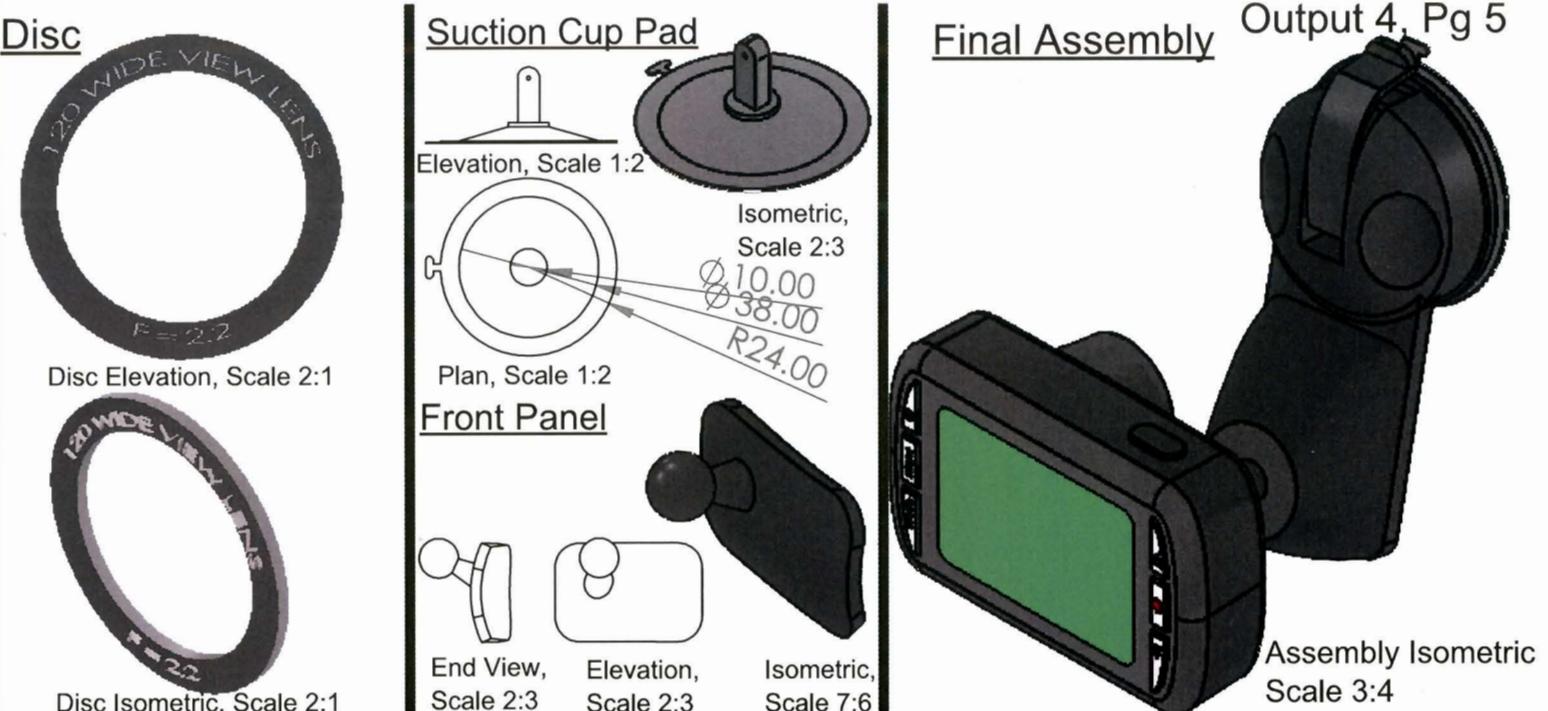
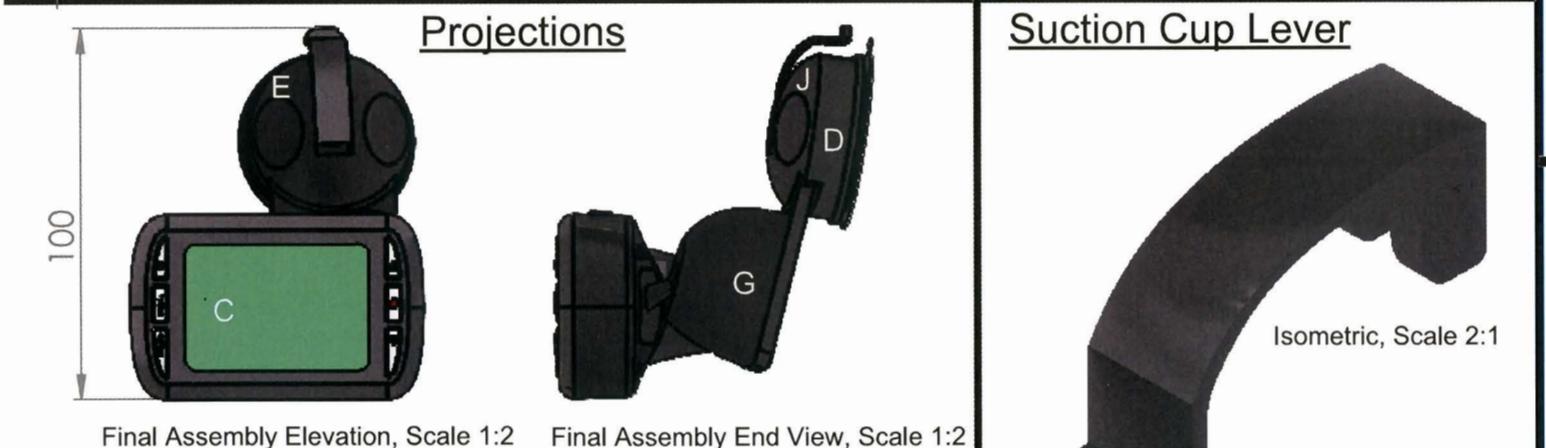
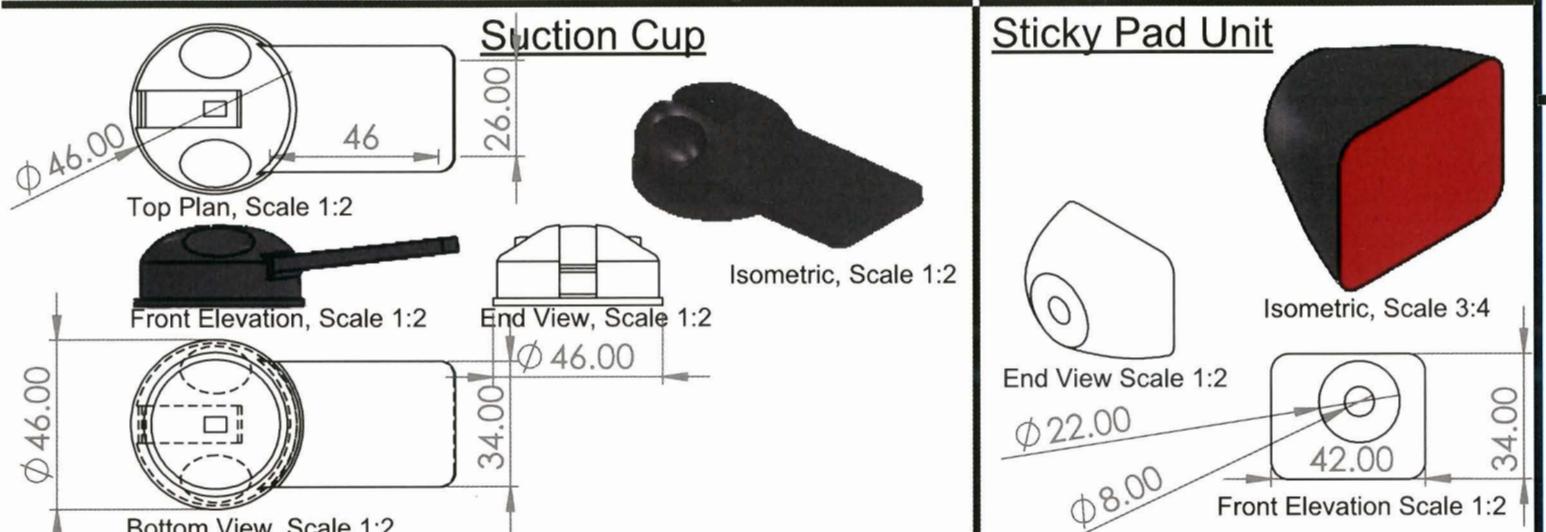
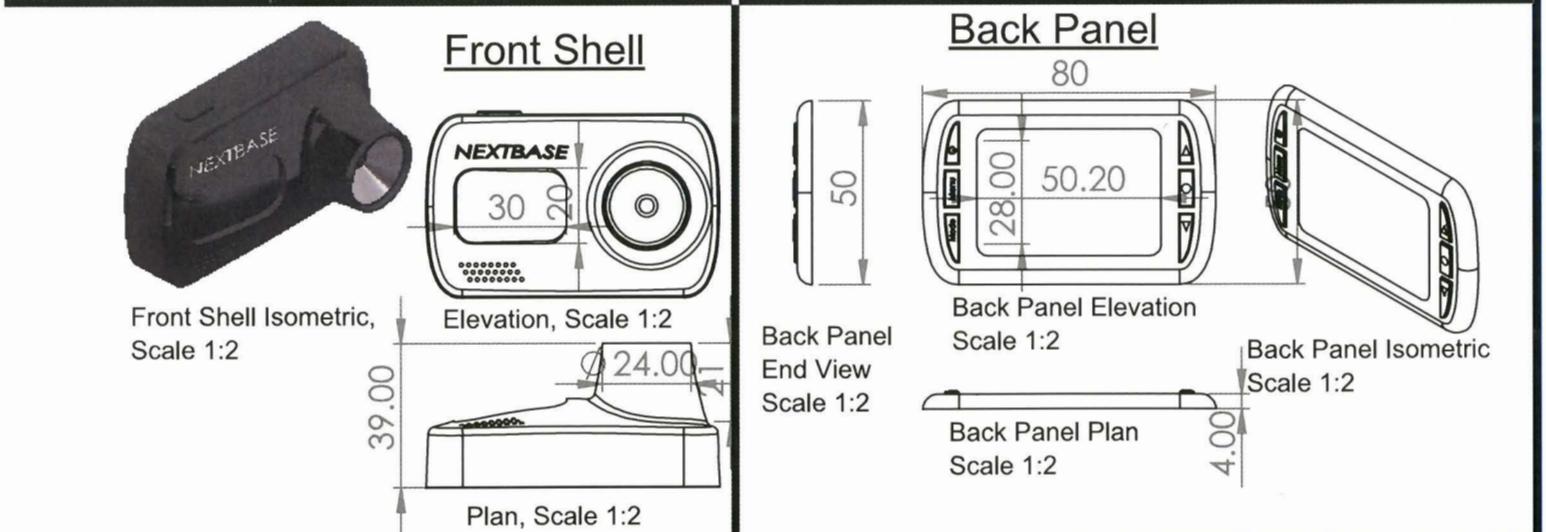
# Freehand Graphical Representation



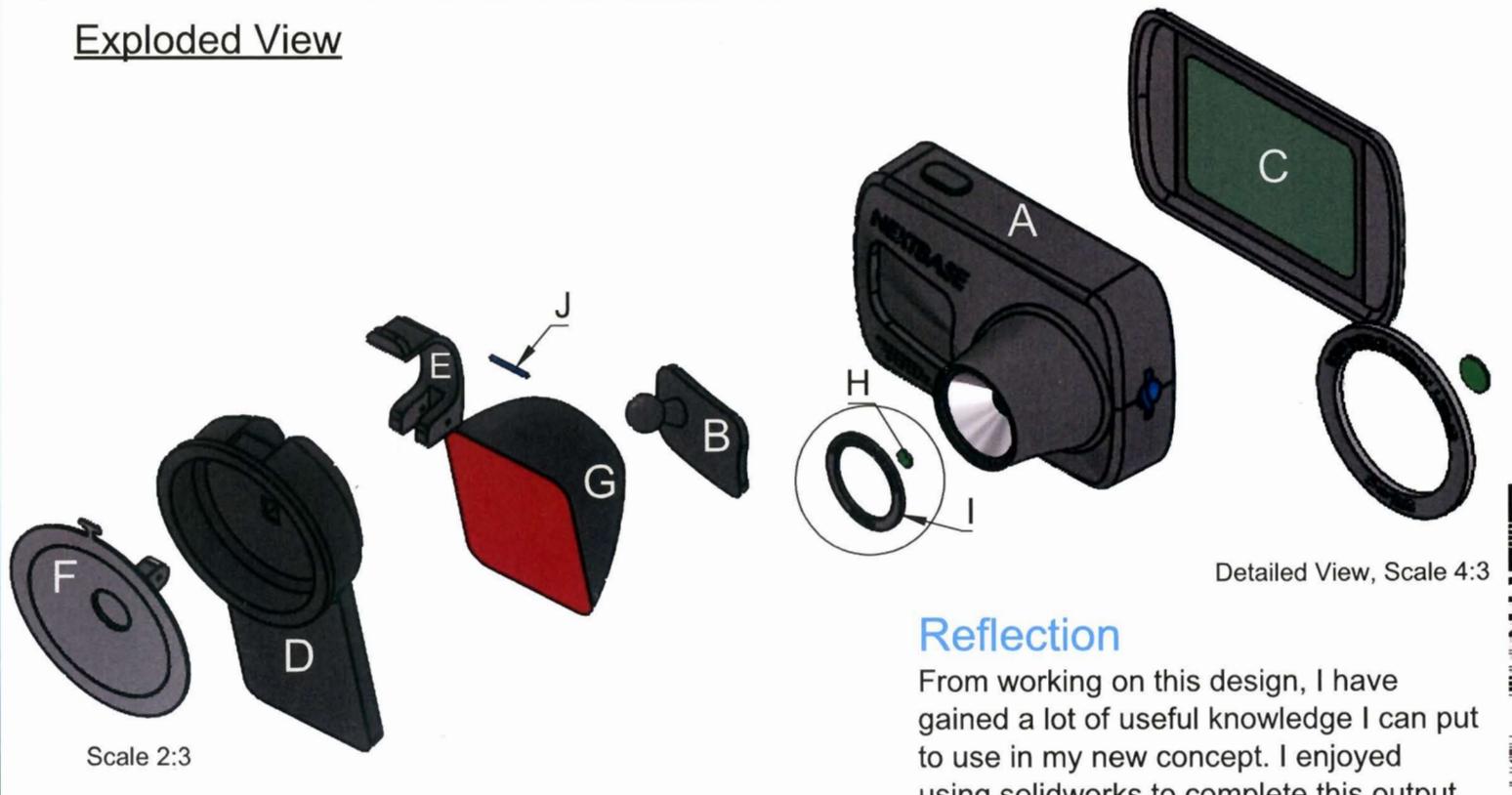
## Reflection®

After working through these drawings, I have gained a greater understanding of the different elements I wanted to include but also exclude when it came to designing my own concept as I progressed through this project.

# Detailed Orthographic Views and Exploded View



Symbol Part	Factor Of Difficulty	No.
A Front Shell	Guide Plane, Extruded Boss Base, Extruded Cut, Revolved Boss Base, Revolved Cut, Wrap, Shell, Dome, Fillet Surface Knit, Surface Trim, Surface Thicken, Move Face, Indent	1
B Front Panel	Guide Plane, Guide Line, Extruded Boss Base, Revolved Boss Base, Move Face, Indent	1
C Back Panel	Guide Plane, Extruded Boss Base, Surface Knit, Surface Thicken, Surface Trim, Move Face, Text, Fillet, Shell	1
D Suction Cup	Guide Plane, Extruded Boss Base, Extruded Cut, Revolved Boss Base, Revolved Cut, Fillet	1
E Suction Cup Lever	Guide Profile, Extruded Boss Base, Extruded Cut, Revolved Boss Base, Revolved Cut, Fillet, Mirror	1
F Suction Cup Pad	Guide Profile, Extrude Boss Base, Extruded Cut, Surface Revolve, Surface Thicken, Fillet	1
G Sticky Pad Unit	Guide Plane, Guide Profile, Guide Curves, Lofted Boss base, Revolved Cut	1
H Lens	Guide Profile, Revolved Boss Base	1
I Disc	Guide Curve, Extruded Boss Base, Extruded Cut, Text,	1
J Pin	Guide Profile, Extrude Boss Base	1



# GRAPHICAL EXPLORATION OF DESIGN SOLUTIONS

Output 5 Pg:6

## Mood Board.

### What is a new concept?

#### New Abstract Idea

"The difficulty lies not so much in developing new ideas, as in escaping from old ones." – John Maynard Keynes

#### Theme

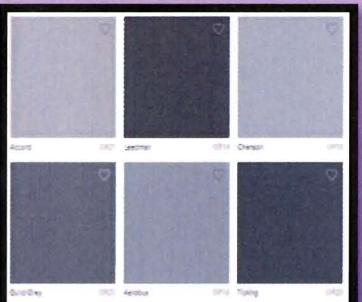
Subject / Topic of the product.

Reoccurring Idea in a piece of work.  
My Theme was inspired by Secrecy, Watching from the Shadows and the Secret Service.



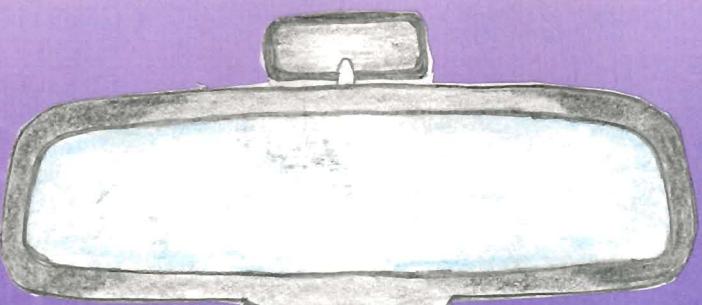
#### Colour Pallet

For the colours I decided to stick with a dark colour pallet as it will blend in with typical car interiors, this assists with the theme of secrecy and shadows. When looking at some real-life references, I was fond of the Viola 'Molly Sanderson' flower



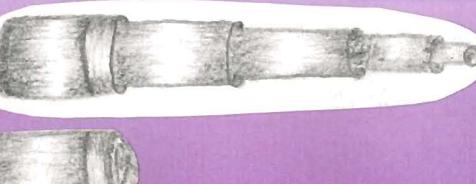
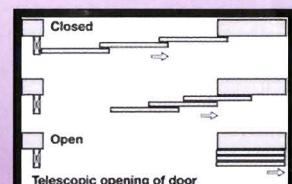
#### Mirror Shape

After researching car interior mirrors, I have seen various forms of ellipses being squashed and pulled to create unique shapes. I like the idea of having the top side being longer than the bottom creating a curved trapezoid allowing for space for buttons underneath and to the side.



#### Mirror Mechanism

This diagram shows how when the extension retracts itself, it then gets contained within itself, which is a similar concept to what I'm trying to utilise.



The only difference between this concept and mine, is that it's closed at both ends, having the pole being stored as a whole, inside the opposite compartment.

A real-life example is this Telescopic System (Click System).

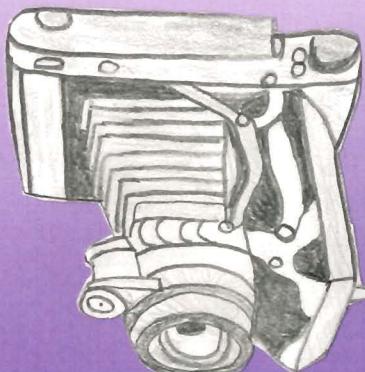
One piece remains stationary, the other side goes in and out, revealing and covering the stationary camera hidden within. Often seen with hydraulic cylinders

For my dash camera the main connection joint is between my dash camera and the mirror. For this connection, I decided to go with a magnetic system utilising an opposite pole attraction.



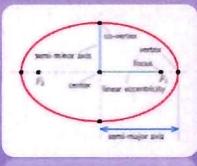
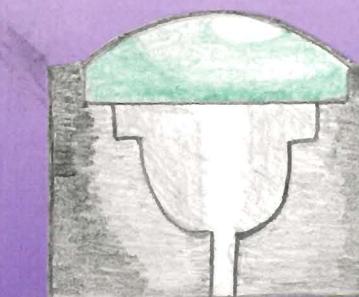
#### Camera Separation

For my dash camera I decided it will separate/open revealing the camera, I then went and researched similar cameras from the past, to gain an understanding on the mechanisms used in such equipment.



#### Lens Shape

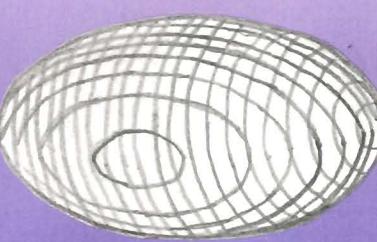
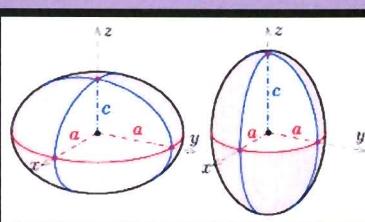
For the lens shape, I explored different variations after looking at real life examples. For this I quite liked the stepped approach of a Cannon camera. When looking at the steps there is either step up, or step down. Step up rings allows for use of threads 3 times bigger while step down rings are 3 times smaller.



For a dash camera a step-down ring would be more useful as it doesn't cause a vignette effect and a bigger angel views.

#### Shape of new Concept

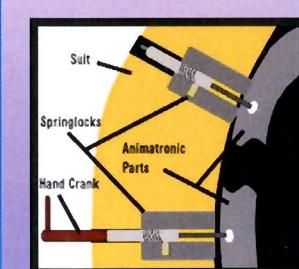
For the shape of my new concept, I wanted to keep in fashion with other popular designs so that they don't stand out too much from the norm. I looked at different examples and liked the look of an ellipsoid for the base. For the shape of the connection, I was influenced by a hexagon with sketch fillets on all its vertices.



#### Mounting

For my dash camera there are two main mounting systems

1. Mirror → Arm
2. Arm → Windshield



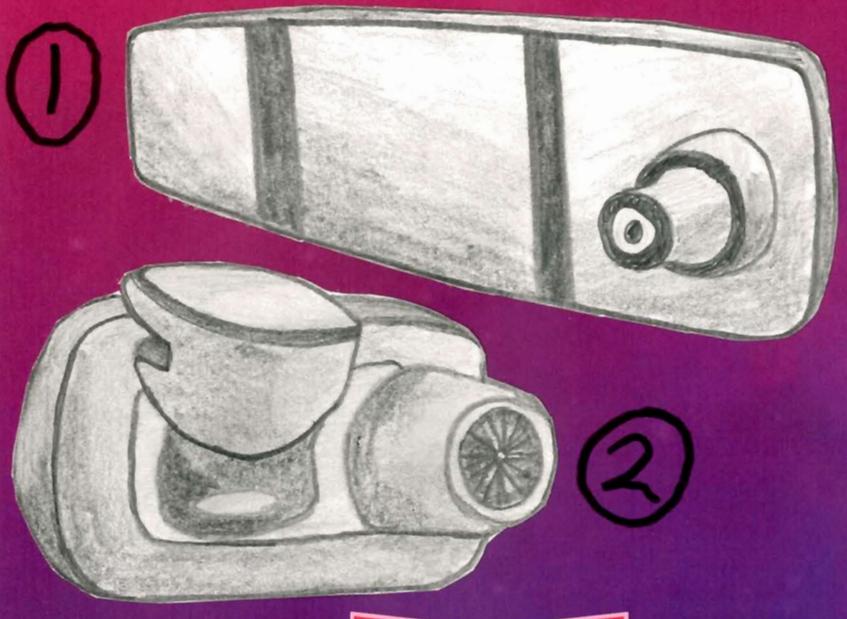
Real Life Example: Ball and socket kitchen catch

For the mirror to arm connection, I went with a sphere spring lock system and for the arm to windshield connection it requiring some contact adhesive. I needed to ensure for both systems, that they would work efficiently and stay sturdy, so that they don't come apart. I was influenced by the spring lock used in machinery to tighten bolts on a threaded spring using a hand crank and by a ball and socket kitchen catch

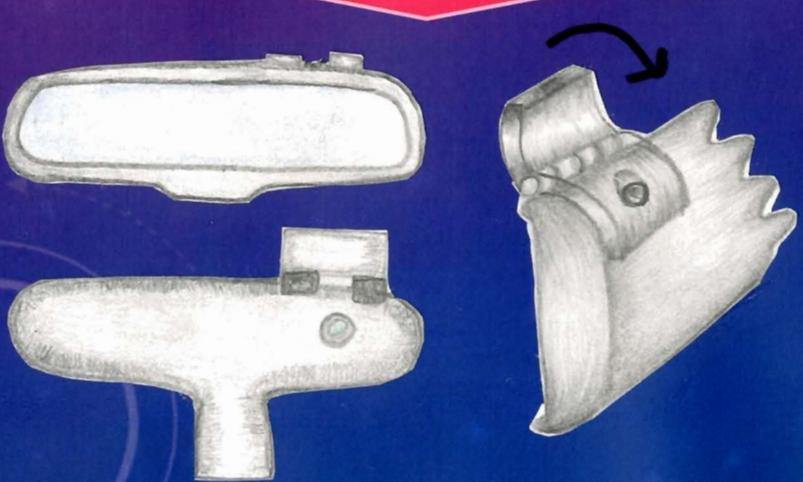
# Graphical Exploration Of Design Solutions - Metamorphosis

## Aesthetics

For my new design I am looking for something that looks modern, yet not over the top, something that can blend in yet still look appealing to the eye. For a colour scheme I'm looking for a mix of light and dark greys to fit in with most interior colour pallets. I went with a light colour on the mirror to represent its glass mirror and reflective properties.

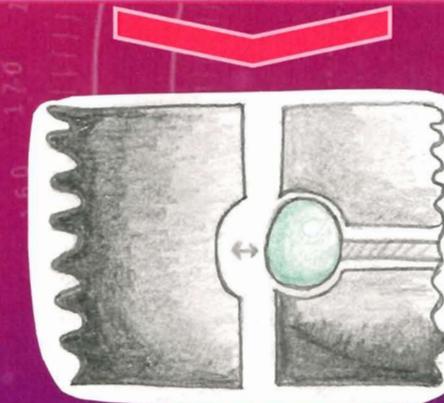
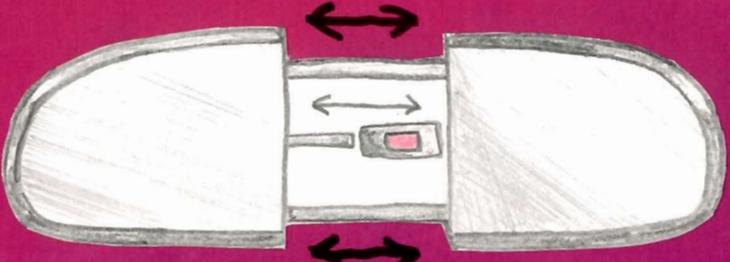


For my first design I tried looking at having a hinge flap that covers the camera until necessary to uncover. After completing this design, I decided that it was too flimsy and didn't look very professional. I then decided to explore the idea of a separating base like the old vintage folding cameras.

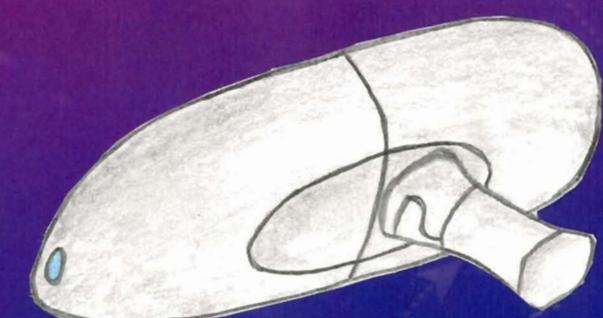


## Functionality

Dash cameras in general function by capturing events that are detected via G-Sensors. The problem with this is the mass extent of files that can accumulate. To combat this, I included a record button to start and stop recordings for when the driver chooses to make use of the features. The camera itself has two functions auto-zoom or manual via buttons provided.



For my final design, I accumulated all the past steps I went through in the design process, deciding on what I liked and didn't like, to finalise my design idea, to then create it on Solidworks.



# Area Of Focus

The diagram illustrates the 'Area Of Focus' for car development. A large central red cloud contains the text 'Area Of Focus'. Surrounding this central focus are seven smaller red thought bubbles, each representing a specific feature or component:

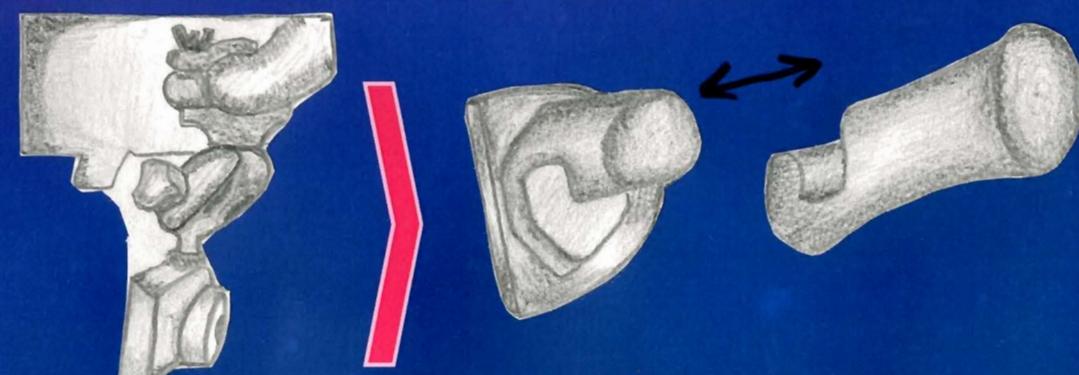
- Legal Requirements
- Inputs & Outputs
- Hidden Camera
- Joining / Separating Mechanism
- Touch Screen Functionality
- Viewing Angle
- Window Connection
- Connection Lock

## Justification

I believe that my new concept satisfies the brief, with its new modern design. My new design focused on the cars reverse mirror, that can separate to reveal a camera and can close to hide it afterwards. I completed my aim of creating a new modern design which remained aesthetically pleasing and functional. Ensuring that it remains easy to use. I stuck with my theme of secrecy and watching from the shadows. In production I would make use of ABS's recycled plastic to not harm the environment.



For the dash camera's connection piece, lots of popular designs are very bulky and intrusive. I decided I wanted to go for something more hidden, from the shadows. Different ideas I had included, a small lens cover that flicks up and down, but decided it was too flimsy. Another concept I considered was having the lens pop up, like antique pop cameras. The final idea I settled on was a detachable arm, that will have a spring lock to stay in place.



## **Environmental Sustainability**

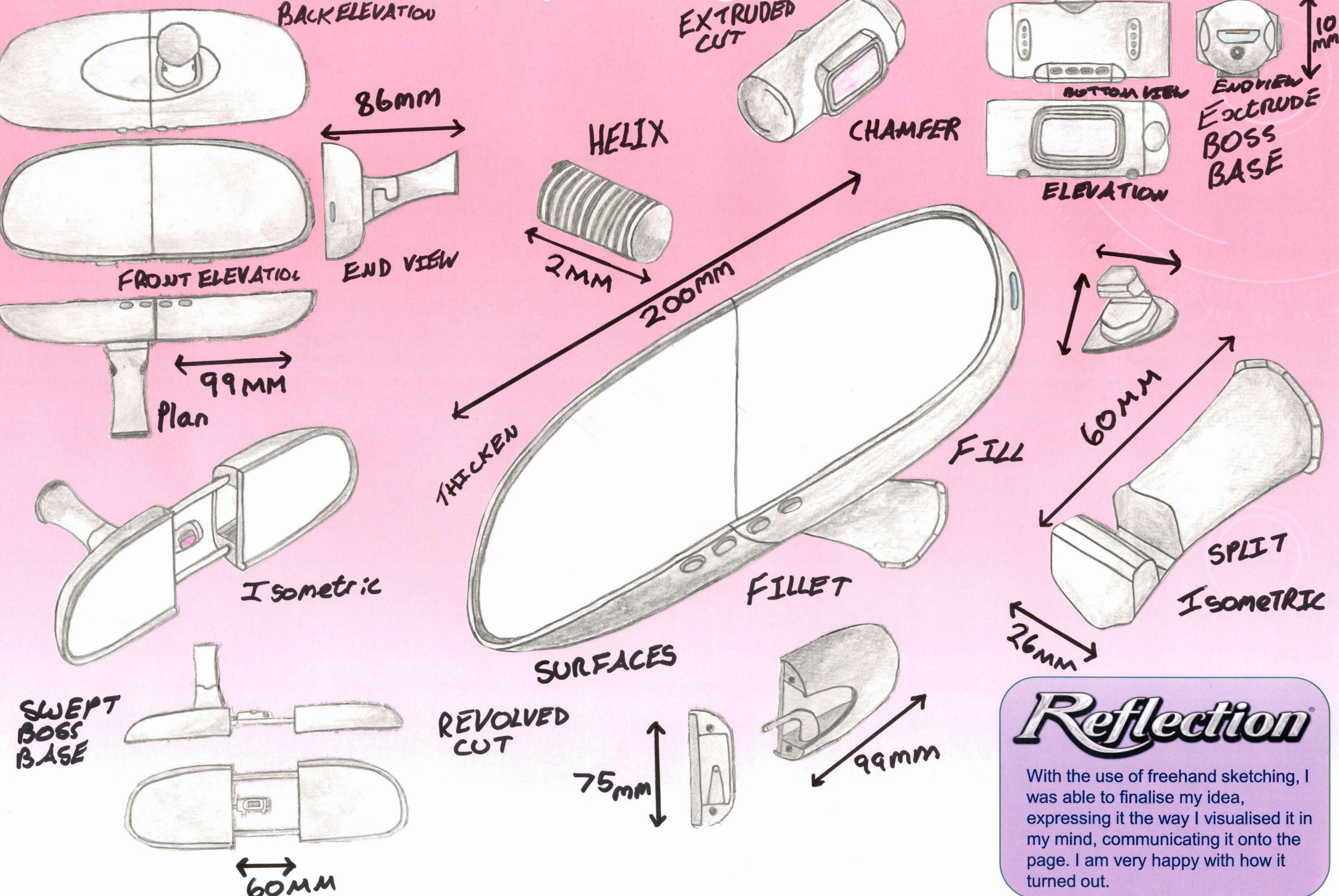
If I took this design to market, I would want to make use of as many environmentally friendly materials as possible, to reduce the negative affect of the industry on the environment. I would ideally work with ABS plastic for the main frame due to its recycled nature, which reduces the amount of waste going to landfill.



# *Reflection*

I am delighted with my new concept design, as I believe it satisfies the brief, utilising my new design of a mirror separating to expose a hidden camera lens that then captures its surroundings. My aim throughout this project, was to execute a new design that acts as a modern yet aesthetically pleasing design. My theme was selected as Secrecy and Watching from the shadows, which focuses on recyclable materials to help the environment in this time of crisis, which is also user friendly.

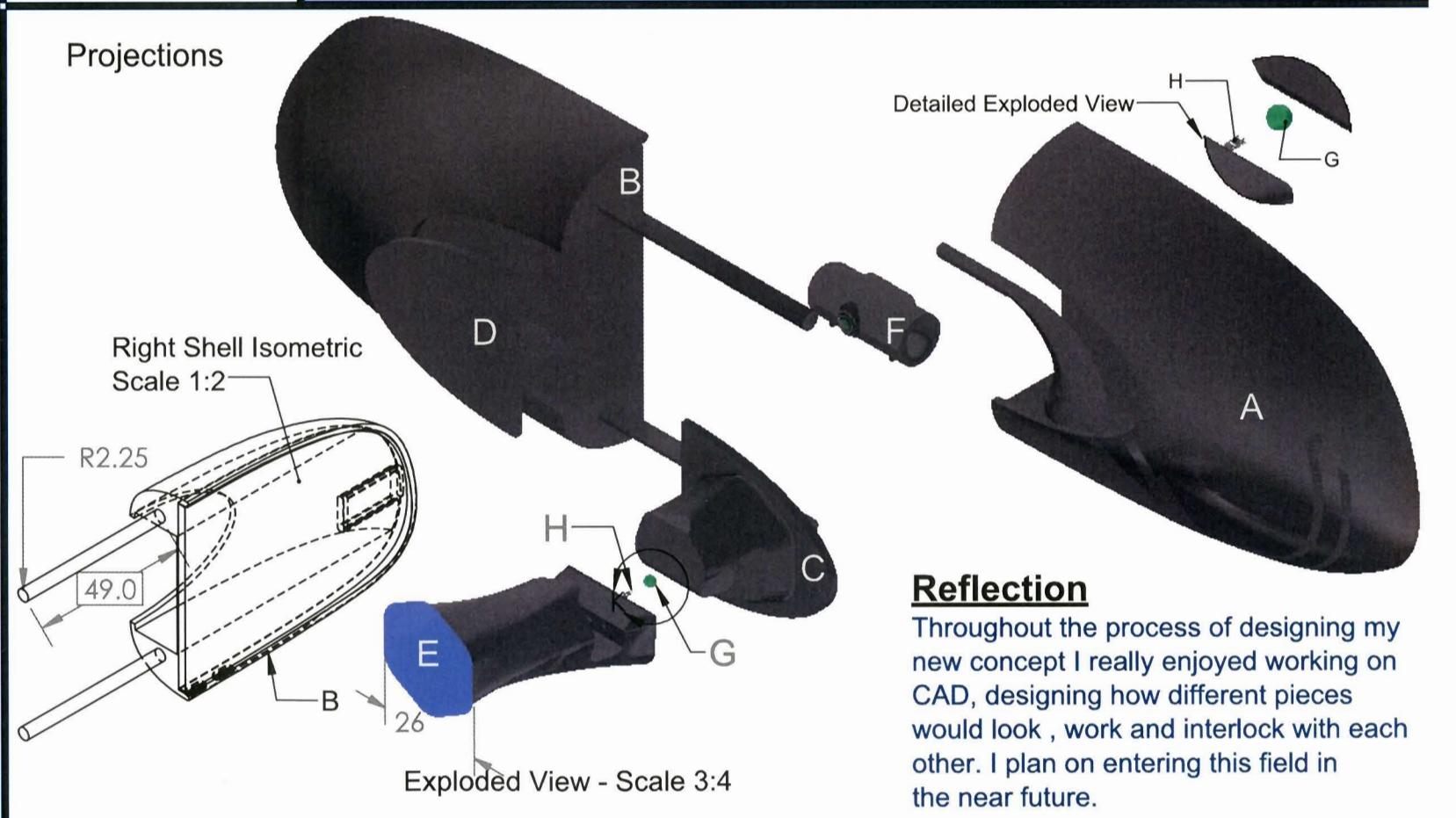
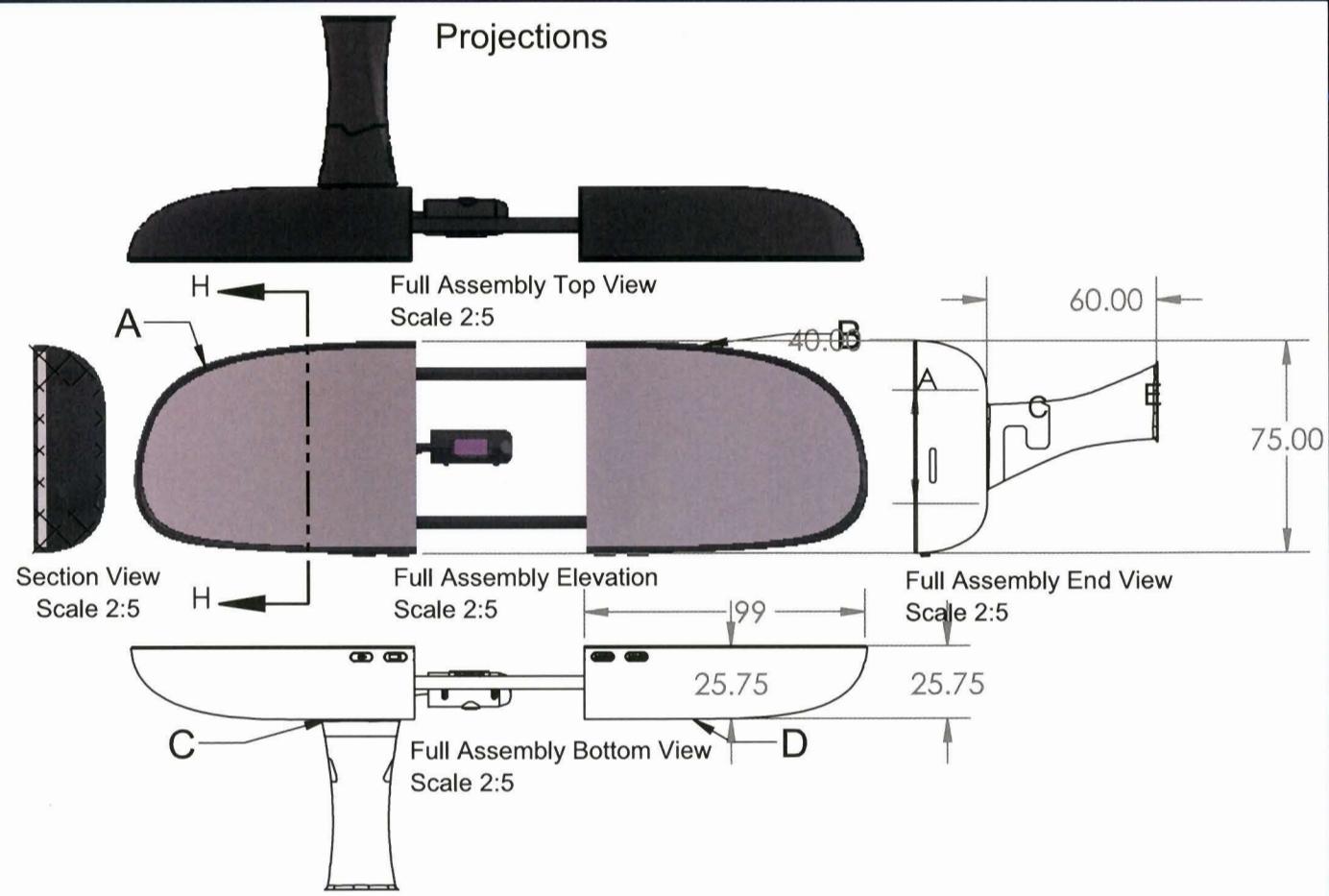
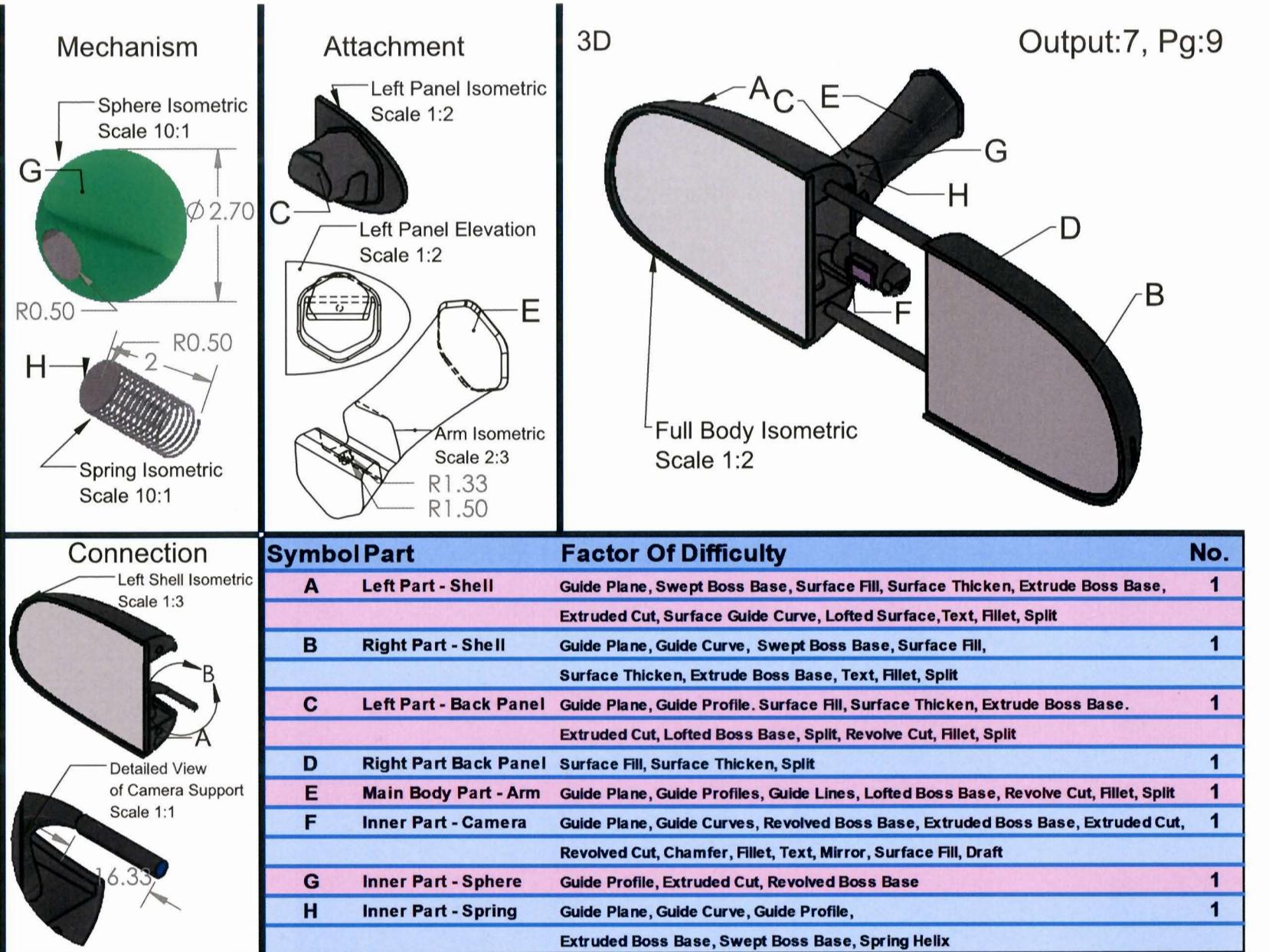
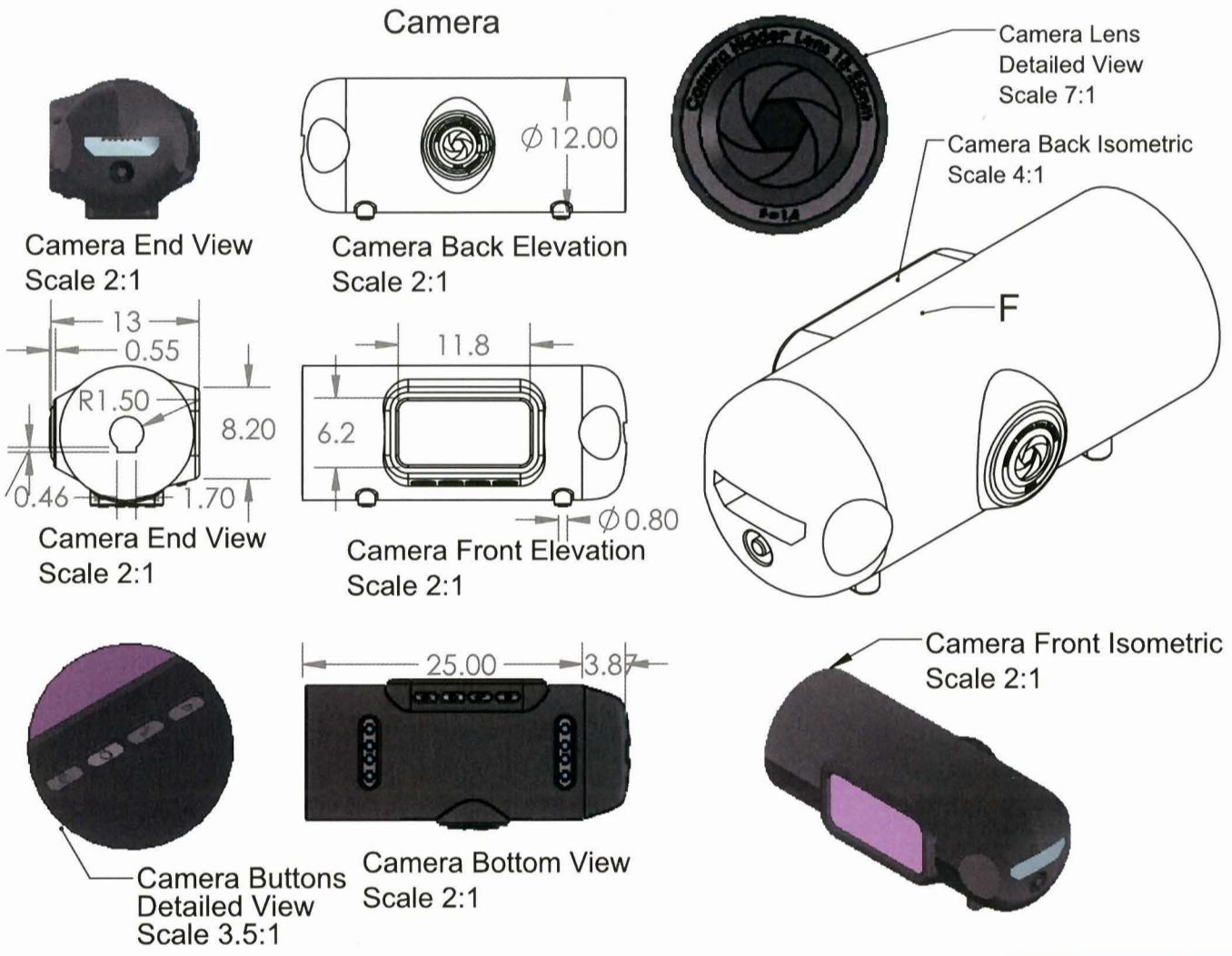
# Presentation Of Concept Design



## Reflection

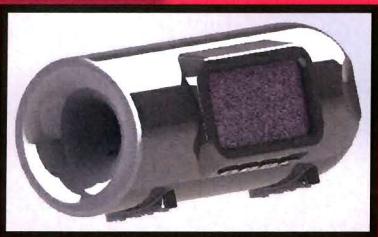
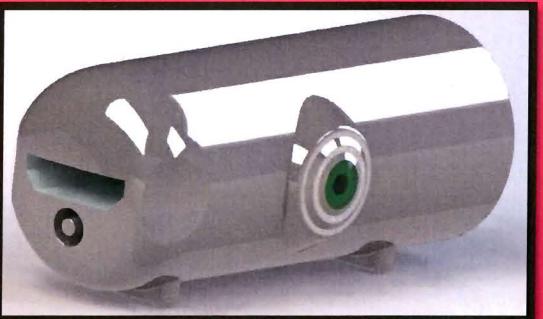
With the use of freehand sketching, I was able to finalise my idea, expressing it the way I visualised it in my mind, communicating it onto the page. I am very happy with how it turned out.

# Detailed Orthographic Views and Exploded View of new Concept Design



# Photorealistic View

Dash Camera



Left Back Panel



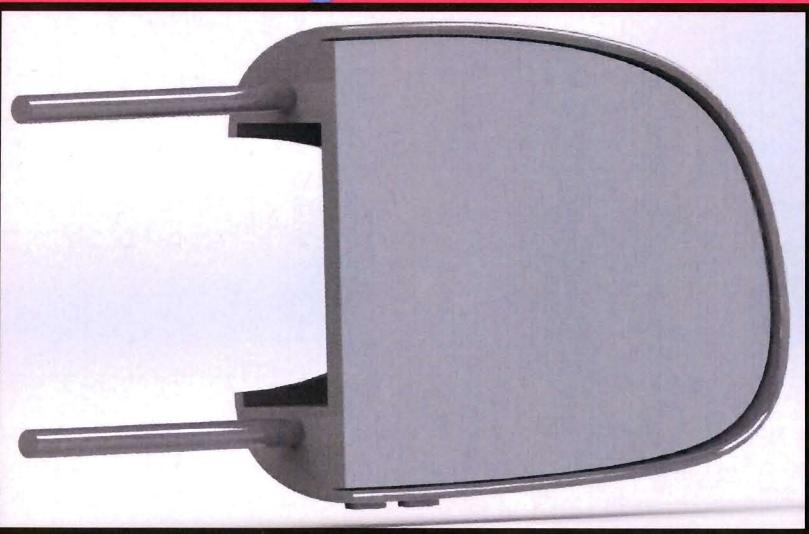
Arm



Left Shell



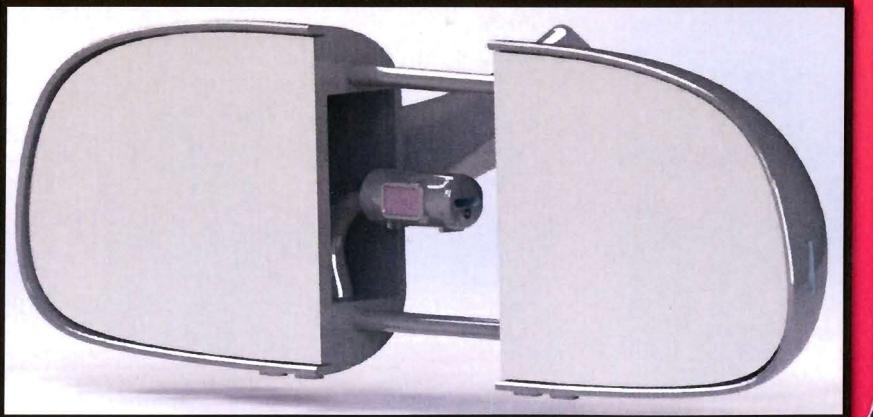
Right Shell



Sphere & Spring



Assembly Open



Assembly Closed



**Reflection®**

I am thrilled with how well these renders turned out. Solidworks is excellent at creating photorealistic representations of my dash camera. I believe it looks very professional in the environment, displaying all its features.

# References

## Research

<https://www.automoblog.net/2015/05/20/dashcam-infographic/>

<https://ims.tech/opinion/dash-cams-their-growth-effectiveness-and-future-in-a-rapidly-evolving-automotive-world/>

<https://dashcam.rocks/history-of-the-dash-cam/>

<https://digmyride.com/best-rear-view-mirror/>

[https://www.researchgate.net/figure/Computation-of-different-shapes-of-Rear-view-mirror-when-users-select-the-red-distance\\_fig2\\_328741974](https://www.researchgate.net/figure/Computation-of-different-shapes-of-Rear-view-mirror-when-users-select-the-red-distance_fig2_328741974)

## Images

[Google](#)

[Harvey Normans](#)

[Amazon](#)

## Amazon

<https://www.amazon.com/dp/B07YDN993T>tag=millionstore10-20&linkCode=ogi&th=1&psc=1>

<https://www.amazon.co.uk/Nextbase-122-Recording-Polarising-Compatible/dp/B07PTTFR16>

## Materials

[www.Solidworks.com](http://www.Solidworks.com)

[My School](#)

## Knowledge

[A Guide To The Student Assignment By T4](#)

[My Teacher](#)

<https://www.engineersrule.com/my-top-15-solidworks-tips-for-engineering-managers/>

<https://www.camera.ie/camera-lenses>

[www.harveynorman.ie](http://www.harveynorman.ie)

[www.argos.ie](http://www.argos.ie)

