



DCG Student Assignment 2021

Exam no. 106603

Output 1.1: Design Research

Technology Development

- The earliest documented use of CCTV was designed by engineer Walter Bruch in Germany in 1942. it was used to monitor V-2 rockets. The technology was released commercially in 1949. (pcr-online.biz 2020)
- The earliest found use of dashcams were used in United States Texas police vehicles in the 1980s (wiredsmart.com 2020)
- Original dashcams needed physical tapes in order to record footage. Devices were battery powered and only operable by hand.
- It wasn't until 1995 that the first digital video camera, the Sony MiniDV, was invented and the evolution of digital film began.

Physical Form and Shape

Small and slim
Not noticeable
Variety of shapes

Mounting Systems

Clamps
Adhesive
Screws
Suction cup

Dashboard/windscreen

Should not obstruct drivers view but should still give clear view of the road or vehicle interior. Compatibility with windscreen/dashboard means dash cams are not limited to a small range of vehicles.

Continuously Record

Constant power supply/battery. Many dash cams delete the recorded footage every 15 mins (for example) to maintain storage and continuously record. The camera will either auto save (THINKWARE) after crashes or the user will have to save.



Adjustment/Removal

Convenient
Suction mechanisms
Ball and socket joints

Connectivity

Convenient and quick. Smart devices allow video playback on larger screens. USB cable

View of Road/Interior

High frame rate for movement
Stable footage
Insurance purposes

Memory Card Slot

Memory card allows the user to store footage and transfer it to other devices.

Wide Angle Camera Lens

Convex lens
Fisheye lens
Video quality (1080p, 4k)

Ease of Use

Buttons
Touchscreen
Voice control

Power Supply Port

Cigarette lighter plug
Power bank
Solar powered

Safety Features

Voice Activation
Parking mode
GPS (location tracking)

Built-in Microphone/Speaker

Speakers can be used for playback of footage. Microphones can be used for voice control or to record sound as well as video.

Screen/wi-fi/Bluetooth

Field of view display
Transferable footage
Touchscreen can allow for simple navigation of system

Materials

Lightweight
Durable
Gloss/matte texture
Cost

Ergonomics

Grip features (rubber)
Adjustable fittings

Output 1.2: Design Research

What is a dash cam?

A video camera mounted on the dashboard or wind-screen of a vehicle used to continuously record the view of the road, traffic, etc., through the wind-screen. (Oxford Dictionary 2021).

The average dimensions (WxHxD) for a dashcam is 5.62cm x 4.05cm x 2.14cm. The dash cam is small in size as to not distract the driver. Screen display generally ranges from 2-3.5 inches. Footage can be played back in greater size and detail because of connectivity with smart devices. Many new models have removed the screen entirely because of smart devices.



Mounting System

The vast majority of dash cams are fixed to the wind-screen with either a suction or adhesive mount. Both methods are easy to install. Suction cups can be easily placed, removed and repositioned on the wind-screen. Permanent mounts affix to the wind-screen with adhesive pads which offer less flexibility but are usually more discreet brackets that the car camera fixes to. The adhesive pads are more secure than the suction cups.



Most mounts would include a ball and socket joint to adjust the field of view of the camera. Cameras may offer parking protection but most mounts still provide a feature to remove the camera from the mount and take it with you.



Bluetooth/connectivity

Bluetooth is a wireless short-range communications technology that uses radio waves instead of wires. Smart dash cams usually have built-in 4G LTE connectivity along with the more common wi-fi and Bluetooth. 4G LTE allows the cam to work independent of any phone or hotspot and be online continuously. 4G LTE (long term evolution) allows the dash cam to be connected to the internet anytime, anywhere.

Wide-angle Camera Lens

A convex lens provides wide angle footage for the dash cam. Most wide-angle lenses have a field of view between 120 and 170 degrees. It is desirable to have a large field of view for a consumer as the more coverage a camera has the more likely it is to catch the road accidents. Standard quality of video for dash cams is 1080p however some models on the market today have as high a video quality as 4k. Many cameras have adjustments for exposure compensation, white balance, sharpness, and WDR (wide dynamic range) in order to capture details in shadows and adverse lighting conditions. 4K HD fisheye lenses are increasingly popular and are improving the quality of recorded footage.



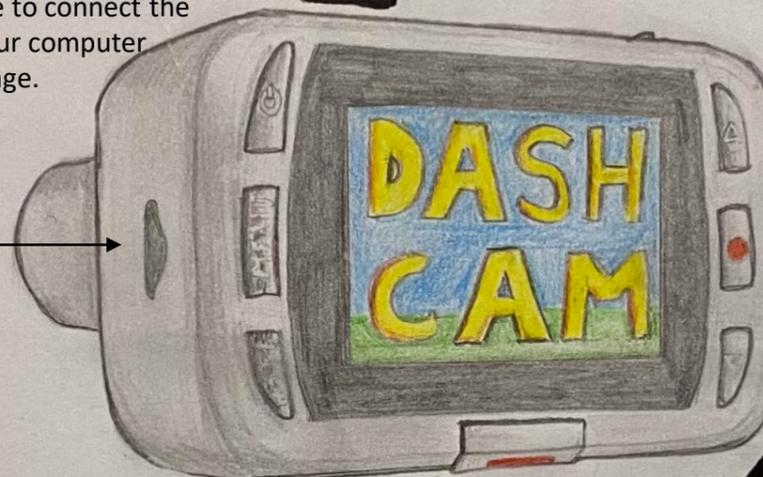
Memory Card Slot

Most dash cams come equipped with microSD card slot. The removable card allows you to check footage easily. Some models have a cable to connect the camera directly to your computer in order to view footage.



Screen

The screen can be used to see if the camera has a clear view of the road/interior and can also be used for playback of recorded video. Average size of dash cam screen is 2.5 inches



Materials

The camera body and back cover are often made of a polycarbonate compound, containing 10-20% glass fiber. This material is very durable, lightweight, and shock-resistant as well as tolerant to humidity and temperature changes. Its major disadvantage is that it is not resistant to chemicals. Optical glass is supplied to lens manufacturers and shaped to convex and concave lenses. They are then coated to protect the material from oxidation and to prevent reflections. Some types of coatings include metal oxides, light-alloy fluorides, and layers of quartz. Several layers of coating may be applied for the best colour and light transmission. Suction cups are made of a static free rubber.



Power Supply Port

The charging cable with a cigarette lighter adaptor is the most commonly seen form of power supply for dash cams. Dash cams can also be battery powered or removed from the car and charged overnight. For long term dash cam systems the dash cam is hardwired to the cars battery. You can hide wires running from the fuse box to the camera in the trim along the pillar by the door and then under the edge of the roof.



Safety Features

A lot of the dash cams on the market at the moment have a GPS feature which is useful for showing the location of the crash and some can even show at what speed the car was travelling. Some dash cams have parking mode which means the camera is not using full power when it senses the car has stopped but it will still record in case someone crashes into the car. Parking mode can be motion sensor so the camera is activated by movement.



Physical Form and Shape

The majority of dashcams tend to come in square, rectangular, cylindrical and pill shapes with circular lenses of different size and capacity protruding cylindrically in most cases. There are three main types of dash cams; Hanging, Wedge and Mirror.



1). The most common type is the "Hanging" style. This style is a windshield suction cup or adhesive-mounted model that is most often square, rectangular, cylindrical (or some variation), which hangs down and can be rotated in different angles often with the use of a ball and socket joint). This style can be removed and adjusted easily which makes it the commonly produced dash cam.

2). The "wedge" style is more compact than either the "hanging" or "mirror" style. This dash cam is fixed to the windshield with adhesive tape and sometimes a simple mount. This is generally the best option for a low-key placement on the windshield. Navigation through the menu can be difficult with smaller and fewer buttons.



3). The "mirror" style has a screen imbedded in the rear-view mirror which clips over the stock mirror. The camera usually hangs on the back side of the mirror the camera can be rotated around to get the correct FOV, however there is often a skewed perspective since the camera is not on-centre. This style can be the most discrete style of dash cam.

Output 1.3 Design Feature Comparison

	Nextbase (A)	Itek slimline (B)
Mounting systems	✓□	
Ease of use	✓□	
Physical form and shape	✓□	
Power	✓□	
Price		✓□

The dashcam that is better in the stated category receives a ✓□

Similarities

- Both the nextbase and the itek are attached to the windscreen and not the dashboard.
- The two dash cams store their footage on micro SD memory cards with the itek supporting a max of 32GB and the nextbase supporting a max of 128GB.
- They are both small in size as to not be distracting to the driver. The two models also take from the same colour palette of dark greys and black. This is also to make them seem sleeker and less noticeable.

Mounting Systems

The itek dash cam uses a suction cup mount with a clamp lock seal to keep it securely attached to the windscreen of the vehicle. The field of view of the camera can be changed as the suction cup allows for removal and adjustment. The mount is also connected to the camera by a ball and socket joint to allow for further, more precise adjustments. The nextbase dash cam design comes with two mount variations. There is a suction cup mount which provides the user with the option of removing the model easily. The nextbase also has an adhesive attachment for the mounting system. The adhesive mount is smaller than the suction cup and therefore less noticeable but it requires a permanent fixing to the windscreen. The camera is easily removed from the mount because of the nextbase click and go PRO mount. There is a panel on the front of the model that can be removed to attach the click and go PRO mount directly into the camera. The nextbase mount includes a ball and socket joint as well as the itek however, the range of motion is greater on the itek. Although it is harder to adjust the nextbase field of view it has a more convenient mounting system set up than the itek and it is also smaller in size.



Features (Nextbase)

120 degree wide angle lens
 2 inch LED HD IPS screen
 Weight=78g
 Auto ignition start
 Click and go PRO mount
 Polarising filter compatible
 In-car charger or 30 min battery life
 Auto overwrite
 Microphone
 Parking mode
 720p resolution @ 30 fps
 G sensor to measure impact (in case of an accident G sensor automatically protects video file from being overwritten)

Features (Itek)

120 degree wide angle lens
 2.4 inch LCD screen
 Weight=358g
 Auto ignition start
 Suction mount
 IR lights for night mode
 In-car charger
 Motion detection
 Loop recording
 32 GB memory card



Physical Form and Shape

The nextbase design is very smooth and has no sharp or jagged edges. The camera itself at its most simplified is made up of two shapes, its rectangular body and a cylindrical lens. The itek has more edges to it and has a slightly curved face. The lens protrudes with a series of cylinders and another curved element that protrudes over the lens. Although the two designs have ball and socket joints the itek's joint is directed directly upwards whereas the nextbase design protrudes horizontally. The ergonomics of the dash cams are also very important to the design. Ergonomics is the study of how people interact with their environment, in particular the ease with which products are used. Both devices are designed to fit in the palm of an average hand. The dashcams can be connected and disconnected with physical ease because of their weight and size. The nextbase dashcam is 280 grams lighter than the itek slimline and is also smaller at a size of 52mm x 80mm x 45mm (HxWxD). The nextbase also has a matte finish to improve grip. The itek has grooves to help with removal of the suction cup mount.



Screen and Ease of Use

The itek has a 2.4 inch screen giving it a larger view of the road than the screen of the nextbase which only has a 2 inch screen. The reason the itek slimline can have a bigger screen is because the designers have moved the buttons of the dash cam to the underside of the model. I find that the chosen placement of these buttons makes it more difficult for the user to navigate the dash cam's system. The nextbase however, has its buttons located on either side of its screen. I would opt in for the more intuitive button placement on the nextbase over the extra screen size as many models can show the view of the camera on smart phones for a larger and more detailed image of the camera's view.



Power

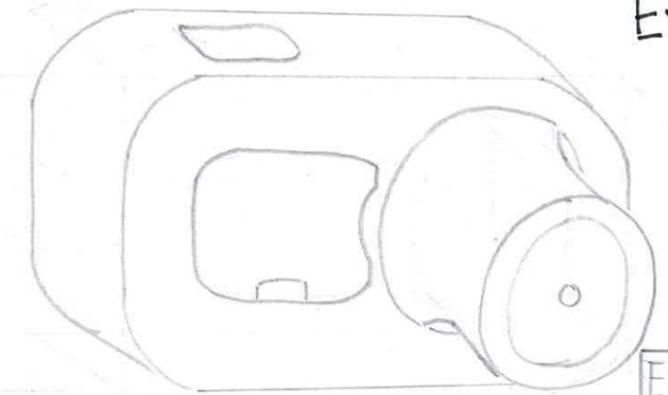
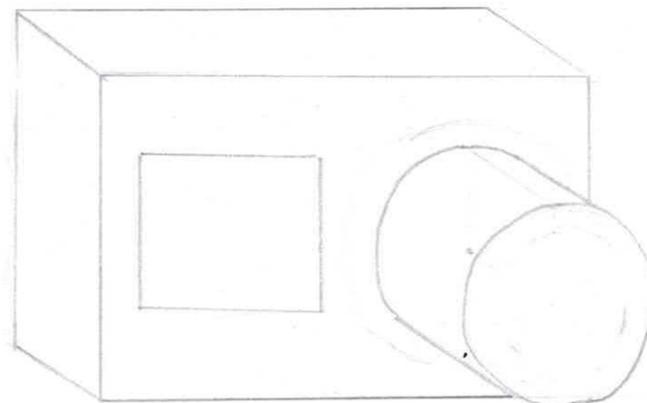
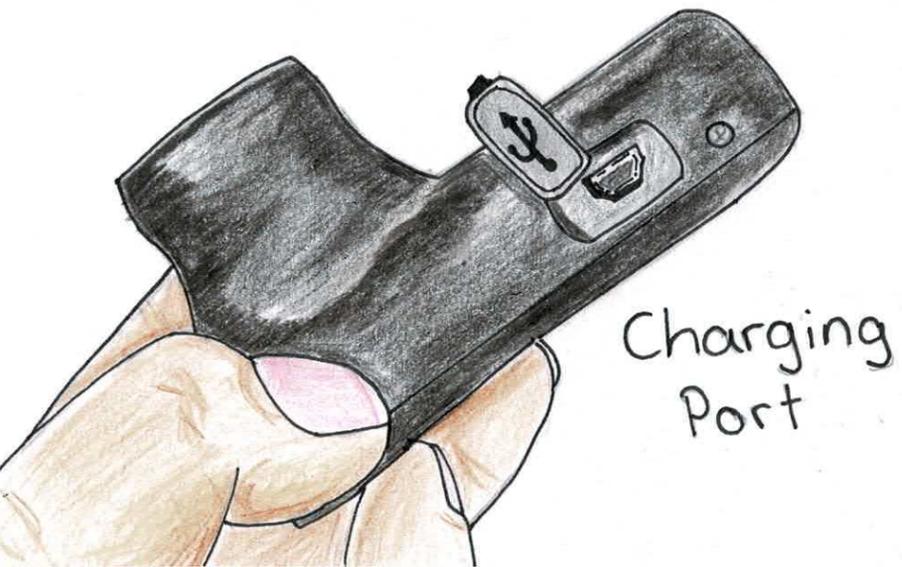
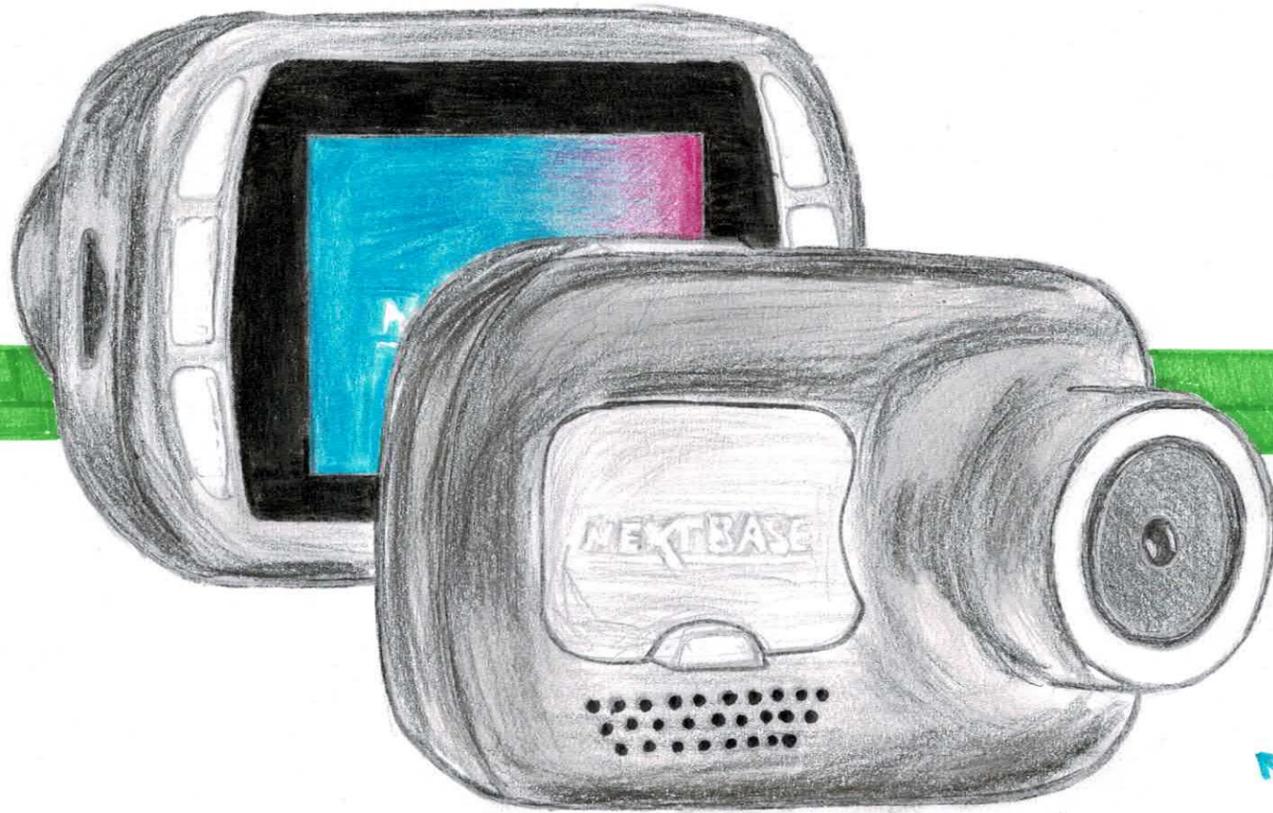
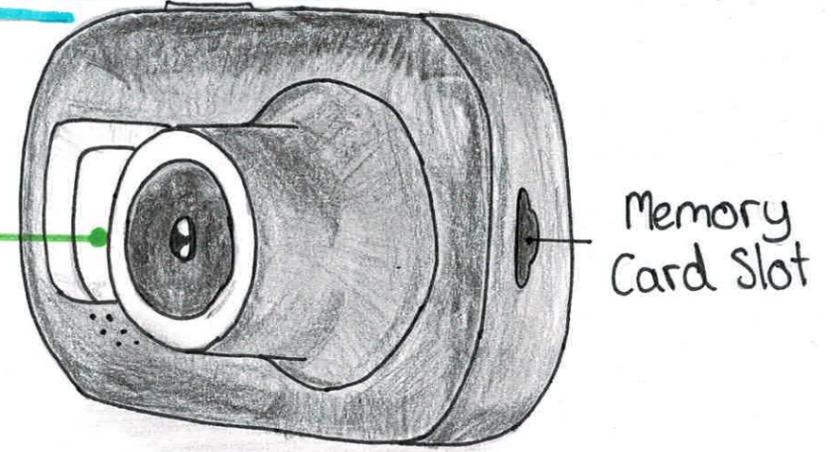
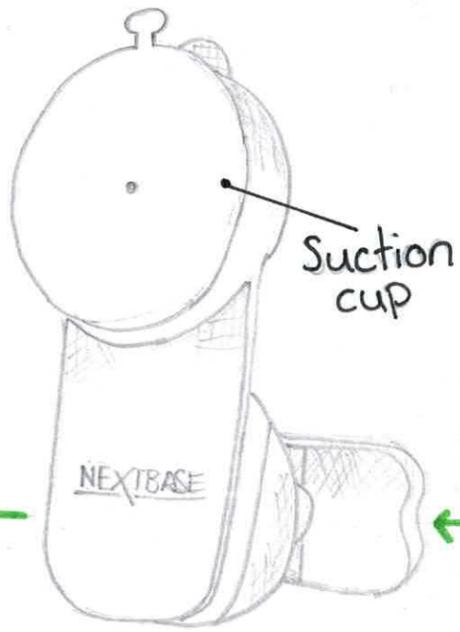
Both models have in-car chargers. These chargers have a cigarette plug adapter at one end that begin powering the dash cam when the car is running. Using this charger is what allows both models to have auto ignition start. The two models have similar battery lives but reviews suggest that the nextbase is more reliable. The nextbase has two charging ports. The camera itself has a charging port for when it is removed from the car and charged by other means. The mount of the nextbase also has a charging port which keeps the charging cable out of the way of the screen and is more discrete to the driver. The itek charger port is located next to the ball and socket joint of the mount.



Mounting Systems

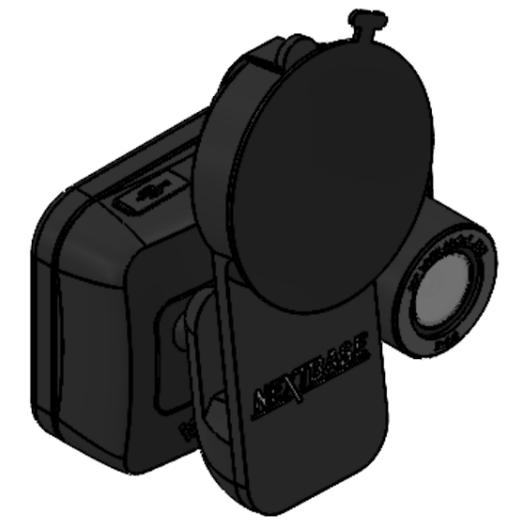
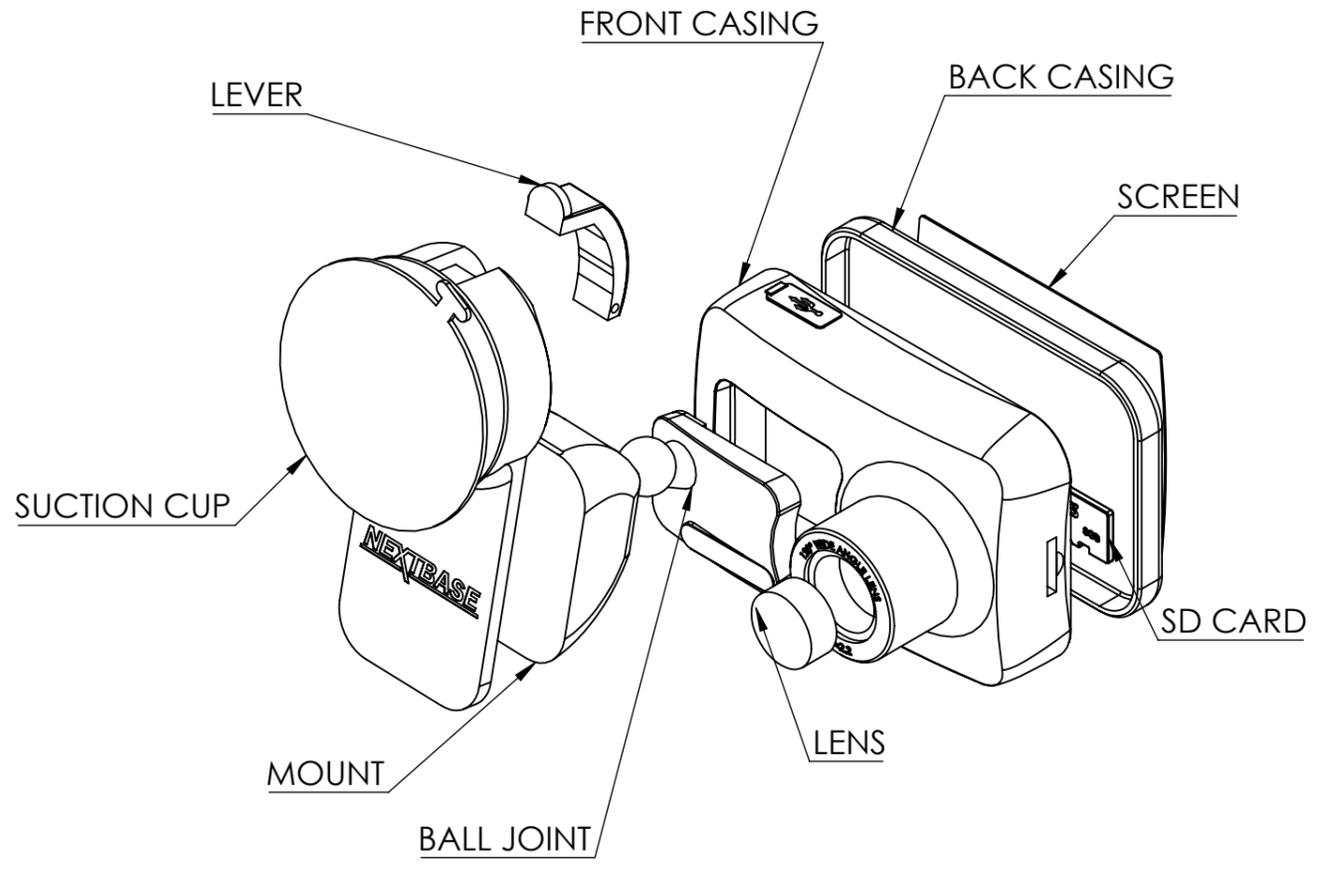
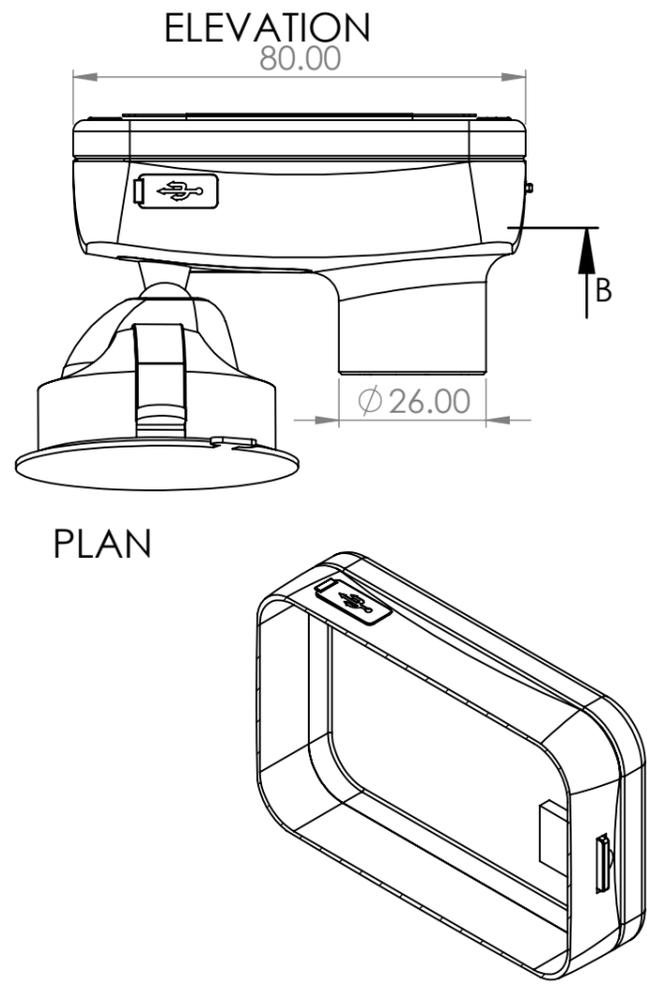
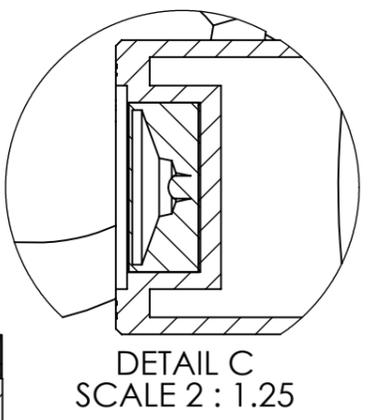
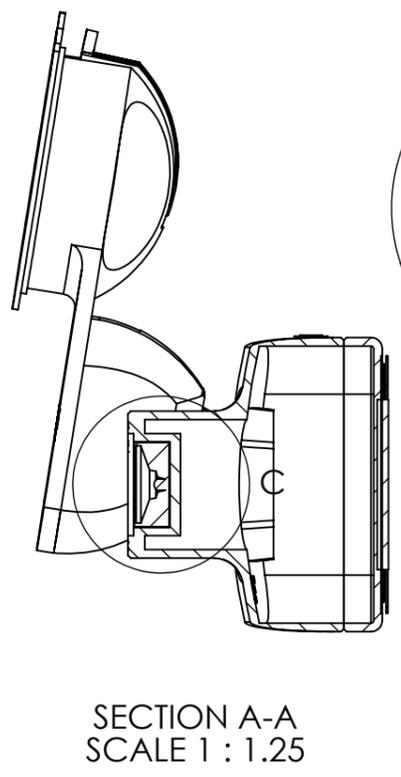
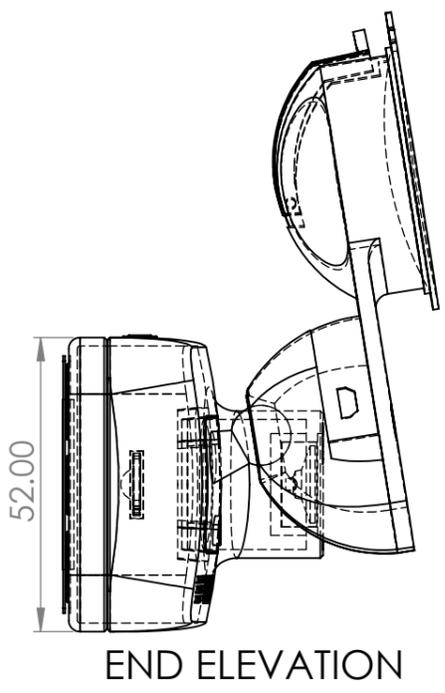
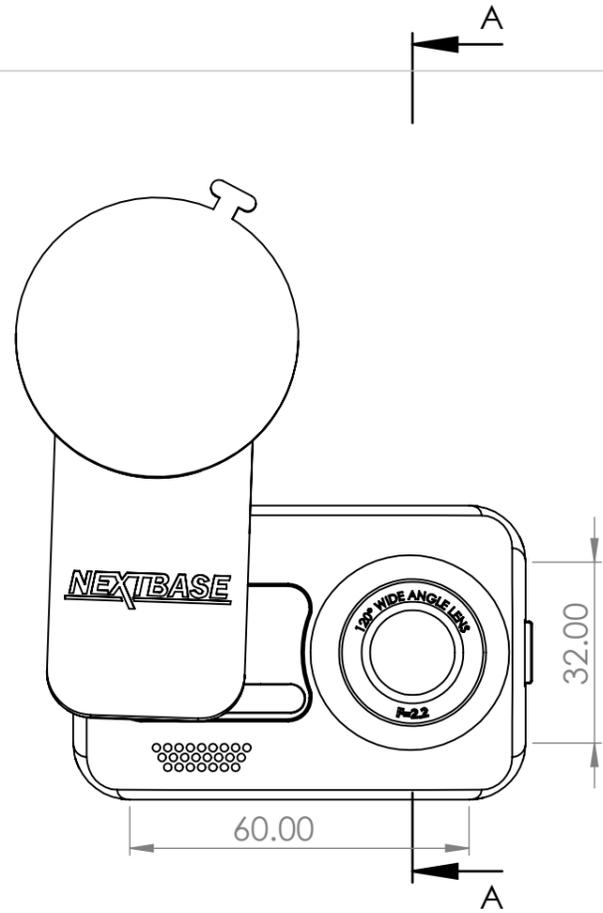
Output 2

NEXTBASE



Sketch Evolution

EXAM NUMBER
106603





Mood Board

Theme
 My dashcam was themed around rally driving and extreme motorsports. I wanted to choose a theme that had a market that wasn't being exploited as much as it could be. When you look at the success of the GoPro action camera it is clear to see that with the evolution of common technology it is not only the major film studios that can record high quality video.

Concept
 When designing this dash-cam I wanted to see to what extremes the model could be pushed. Given that dash cams and vehicles go hand in hand I wanted to see how I could design the dash cam with the vehicle in mind. That is why I have designed my dash cam with all terrain racing as my main theme. The main goal of this design was to create a rugged and durable dashcam that could record stable footage in all conditions.

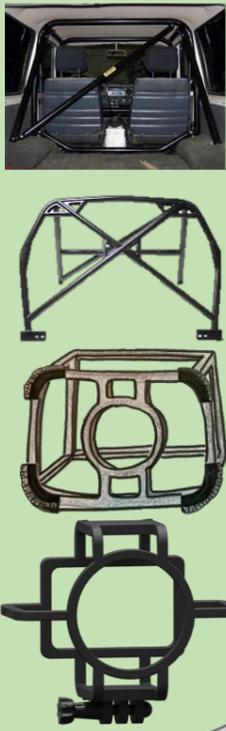
Target market

- Extreme motorsports
- Rally driving
- Car TV shows
- Thrill-seekers
- Emergency services (police, mountain rescue, etc.)
- Target age demographic= 18-35

Tyre
 When I wanted to incorporate the tyre concept into my design, my first idea was to have rubber bumpers on each corner of the camera with the texture of the off road tyre. I found the first design looked to clunky and I wanted a sleeker look as to not be distracting for the driver and to also be more aesthetically pleasing. I added grooves to the outer lens casing of the camera to make it look like the wheel of a car and to also add a grip feature for adjusting the camera.



Roll Cage
 The protective cage that connects the camera to the mounting system was designed with the roll cage of extreme sports vehicles in mind. The roll cage is the framework of reinforcements protecting the cars passenger cabin in the event that it should roll onto its roof. The dash cam's roll cage surrounds the camera to add protection from falls and knocks. The cage is also used to securely attach the the gimbal mount to the camera itself.



Gimbal
 The most important aspect of my design was having stable footage. I knew that for the conditions the dash cam would experience in these vehicles it would need a mounting system that could account for the increased motion. I had wanted to design a gimbal mount from very early on but wasn't sure how to get the biggest range of motion. I got inspiration for my gimbal design from a number of products including the dji osmo 3 and the GoPro karma grip.



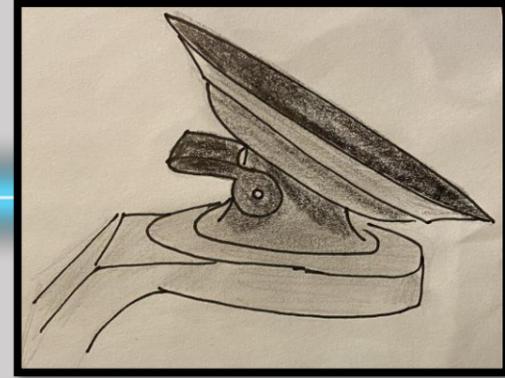
Physical Form and Shape

I tried to find a balance between the sleek/slim look and the durable/sturdy look. I stuck to a simple rectangular base that consisted of a front and back casing. I then filleted the corners and added a curved front face to make the model sleeker. The camera cage then neatly surrounds the dash cam. The gimbal consists of three main components. By using as few parts possible the gimbal can be strong and sturdy.



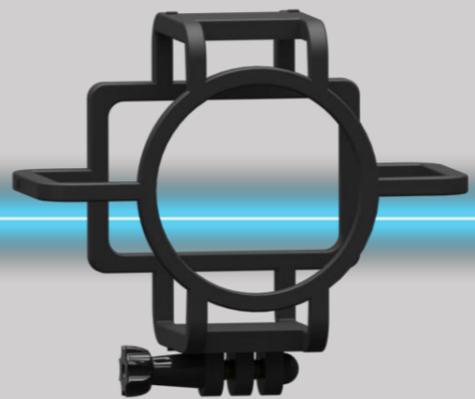
Memory Card Slot

My model does not have a memory card slot. Given the conditions this model would experience I did not add a memory card slot. Instead, the dash cam will have an internal memory of 16GB that can be accessed with a smartphone. The data can be transferred through Bluetooth.



Mounting System

The dash cam is attached to the wind-screen by suction cup made of static free rubber. The mount has a clamp lock seal that keeps the camera secure on the window. The gimbal is a part of the mounting system and is connected to the cage of the camera using a screw and threaded joint.



Materials

The main body of my dash cam design will be made of a matt plastic (polytherene ttrate-PET). The outer lens is made of a burnished steel. The suction cup is a static free rubber and the lens optical glass coated in metal oxides for the best colour and light transmission.

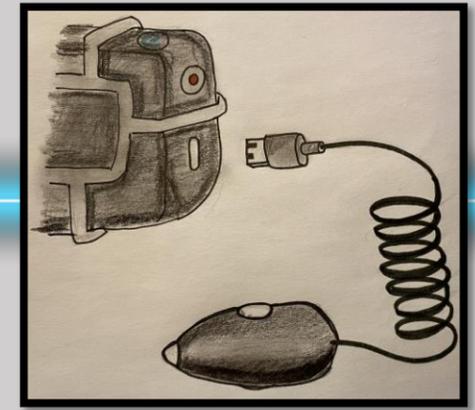
Ease of Use

With the intense atmosphere in extreme motorsports I wanted to make the dash cam as simple to use as possible. The model has only two buttons; a power button and a record button. You can hold the power button for 3 seconds to enter Bluetooth pairing mode.



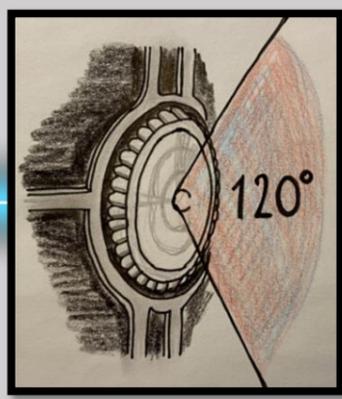
Power Supply Port

The model is powered by a power supply cable with a cigarette lighter adapter so that it is able to continuously record footage. The camera can also be charged by a USB charger. If the vehicle has not got a cigarette lighter the camera once fully charged the to the maximum battery the dash cam will be able to continuously record for up to 60 minutes.



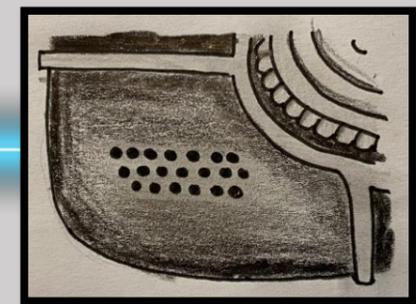
Wide-Angle Camera Lens

The camera has a convex inner lens to give it a 120 degree field of view. The off-road wheel inspired outer lens can be used as a grip feature for adjustment of the model.



Built-in Speaker

The model has built-in speakers located at the front of the camera on either side of the lens. These speakers are used to indicate that:
1) The camera is on
2) The camera is recording
3) The camera is in Bluetooth pairing mode

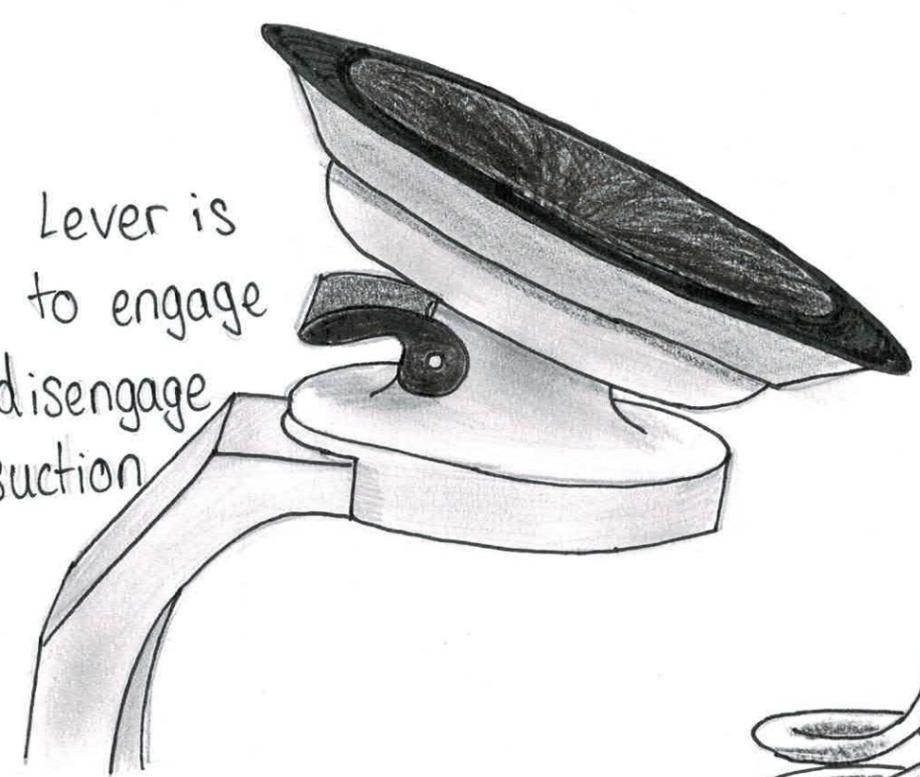


Screen

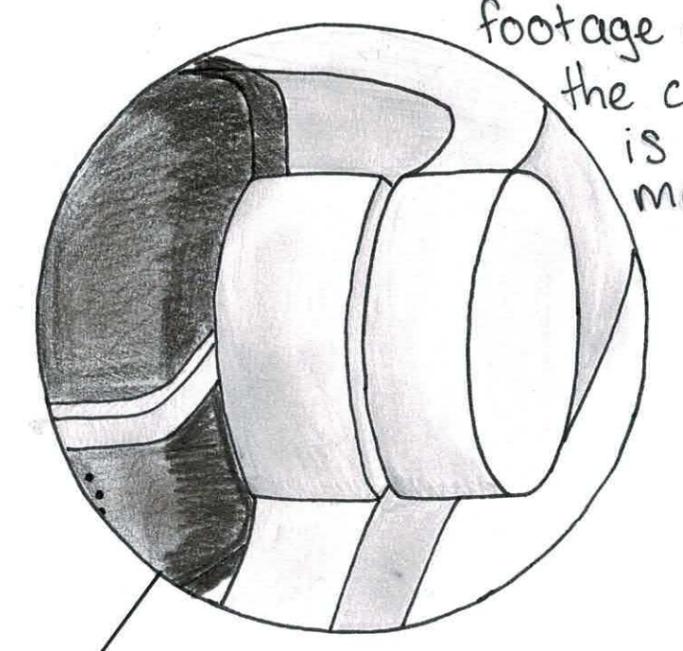
The design does not have a screen as to accommodate for the gimbal mount. Footage from the camera can be played on smart devices through Bluetooth. The model is less susceptible to a break with the removal of the screen.

Output 6

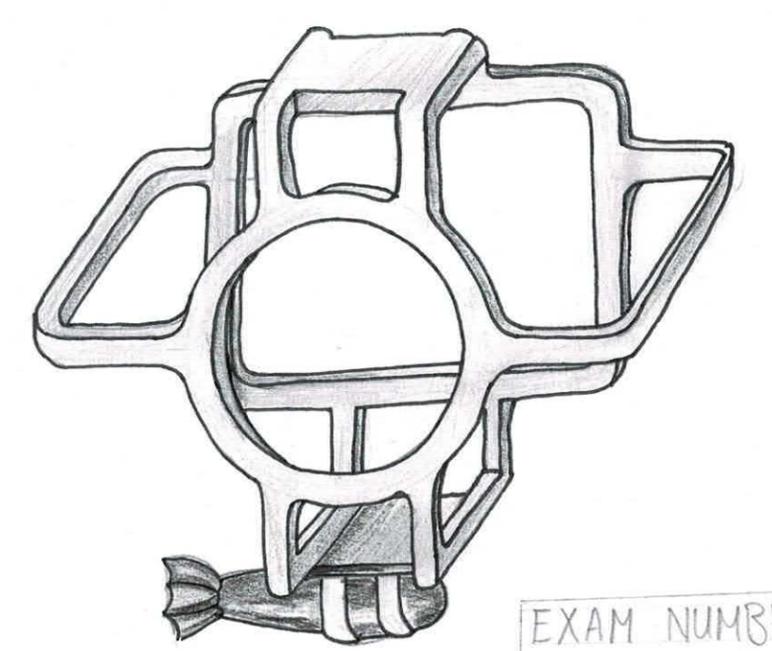
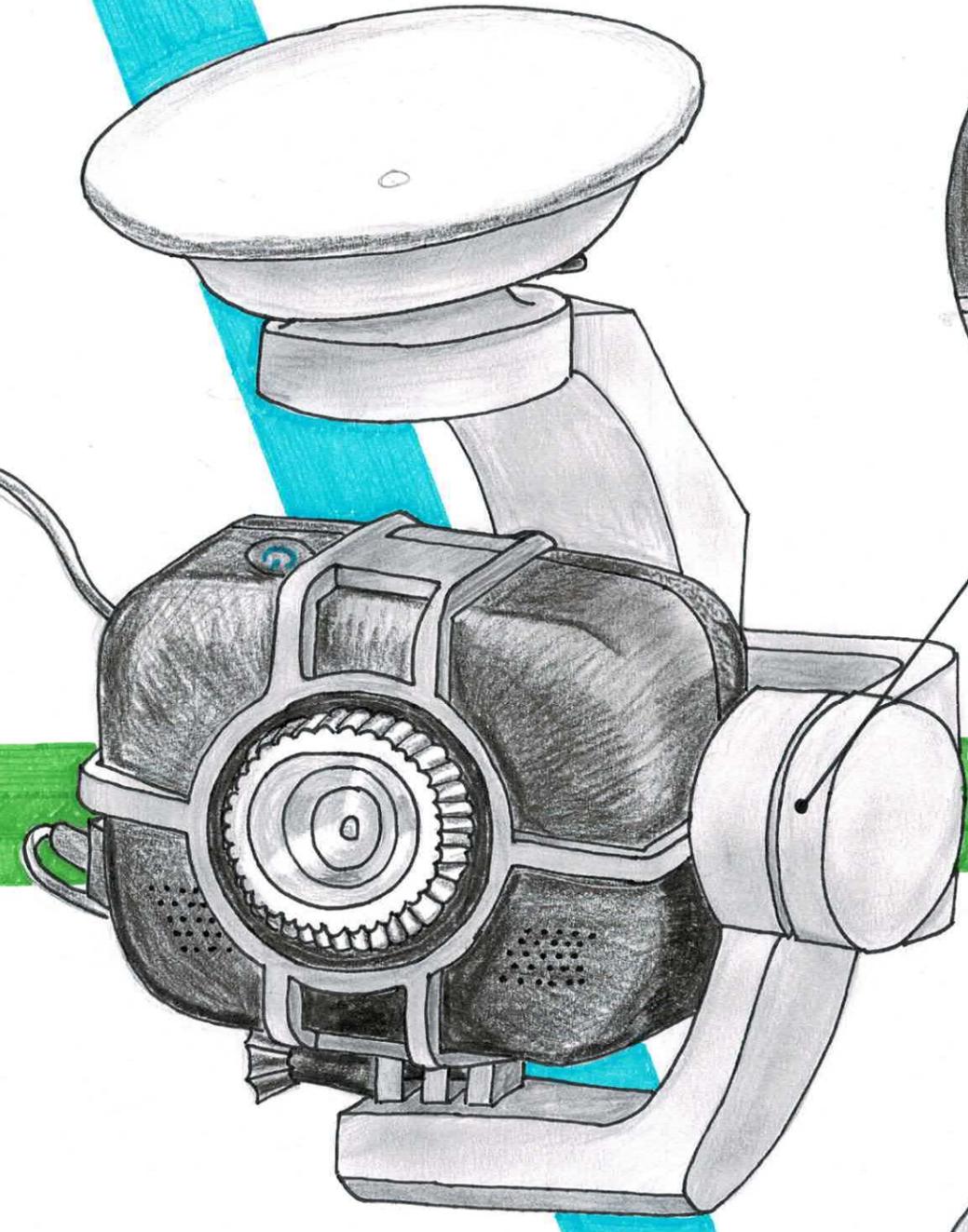
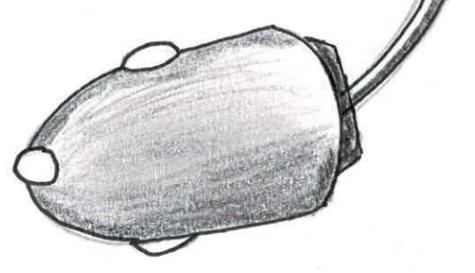
This Lever is used to engage and disengage the suction cup

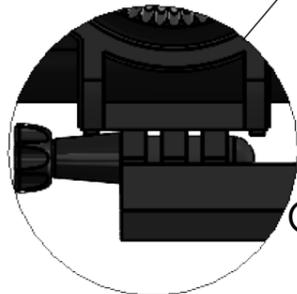
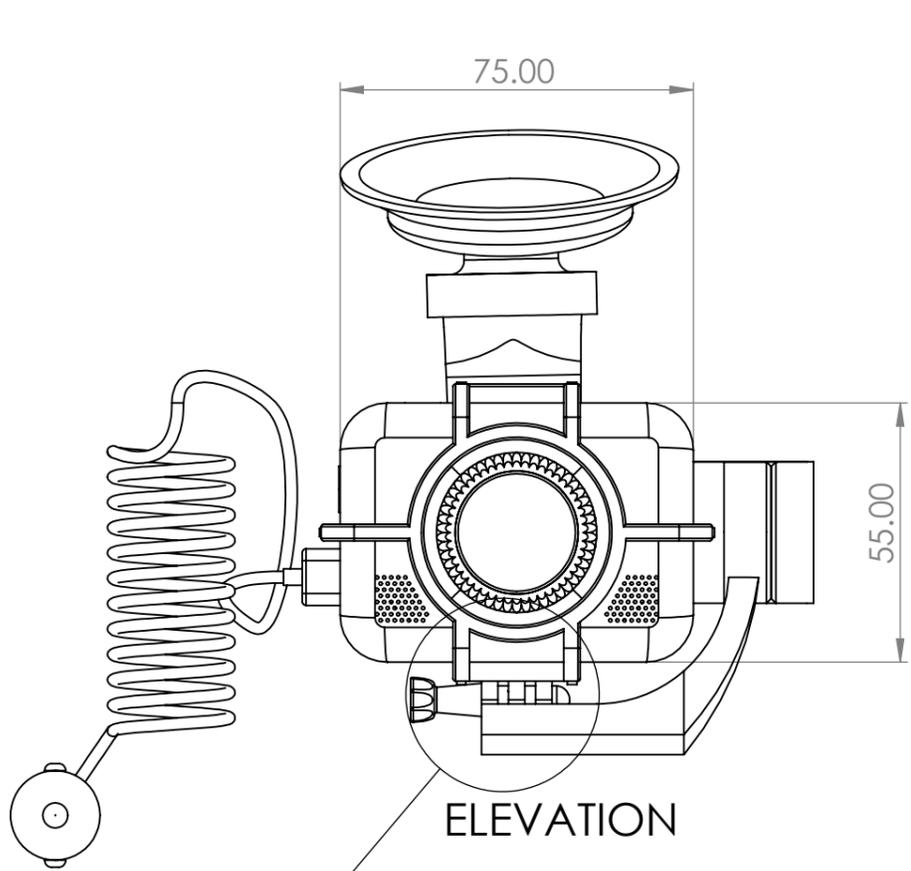


This section of the gimbal can rotate to steady the footage when the camera is moving



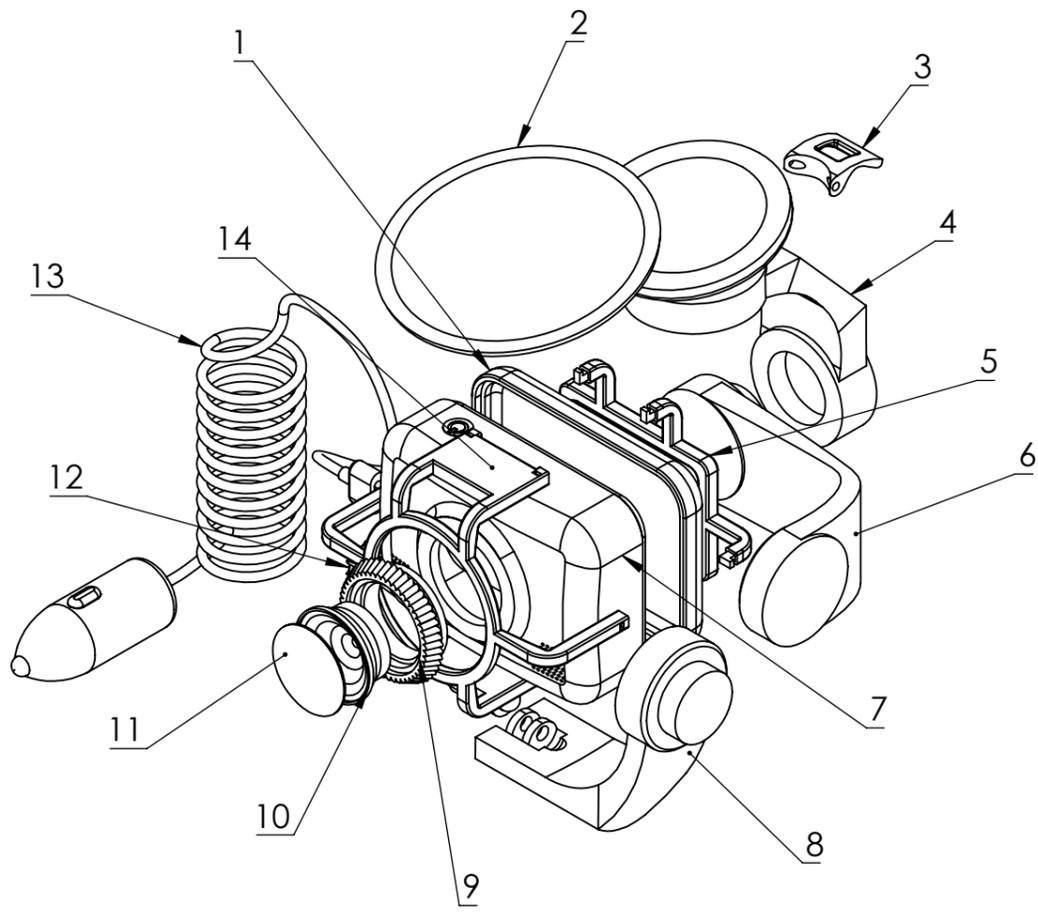
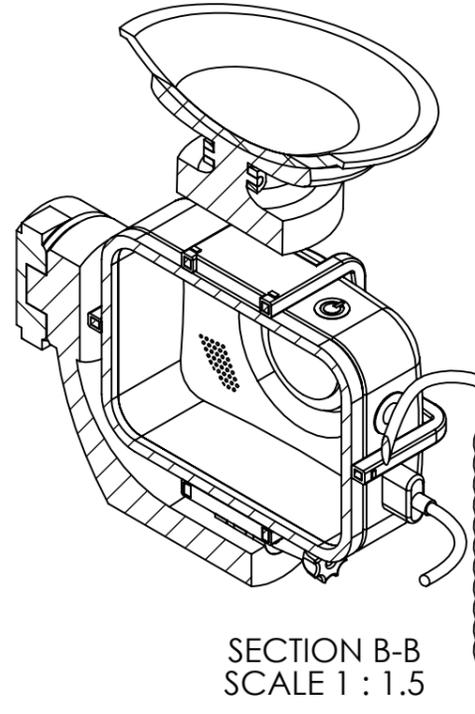
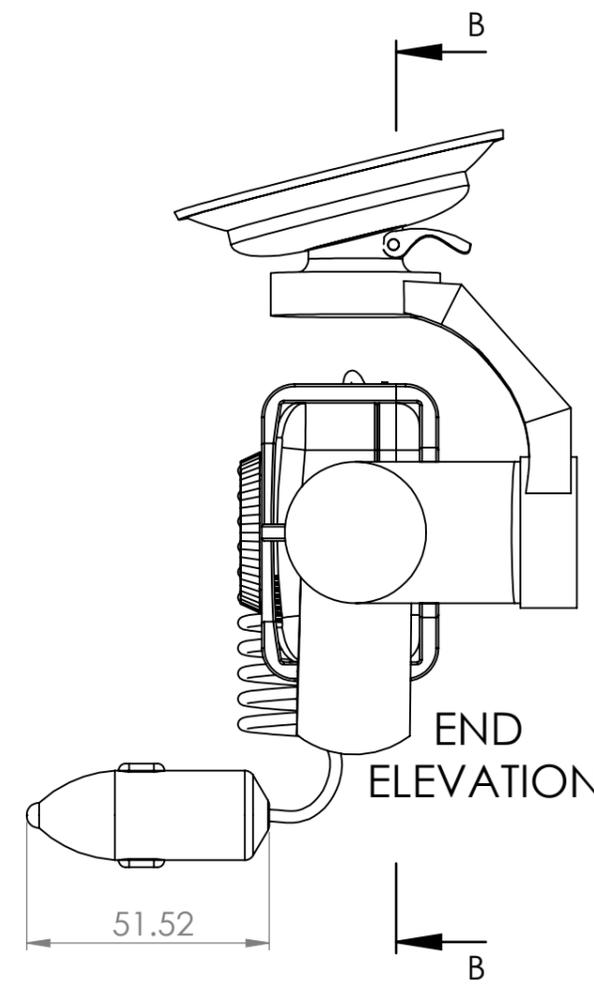
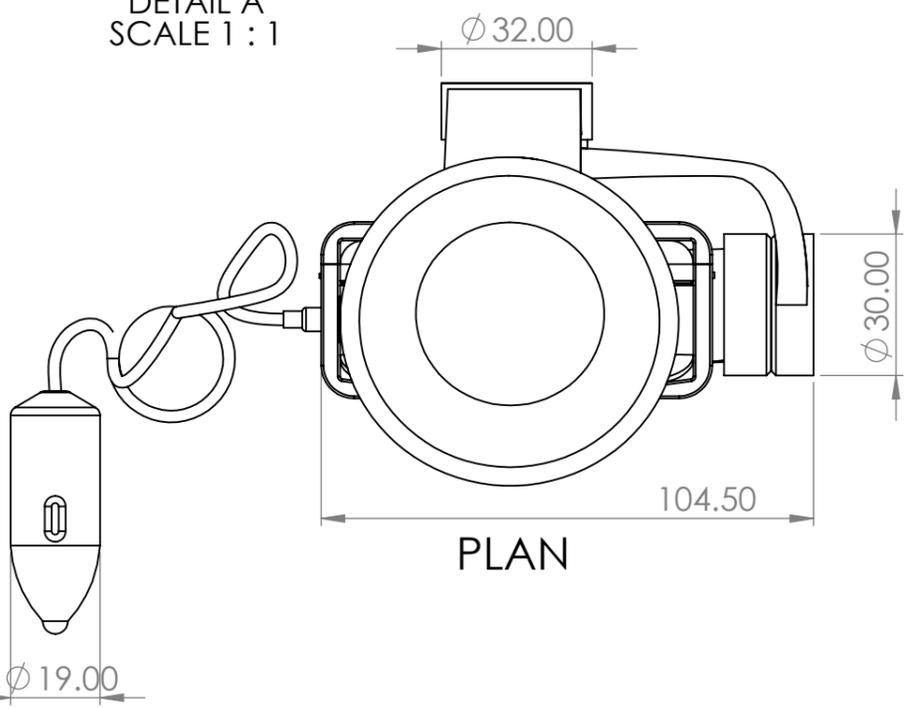
Cigarette lighter adapter allows the dash-cam to be charged while in vehicle



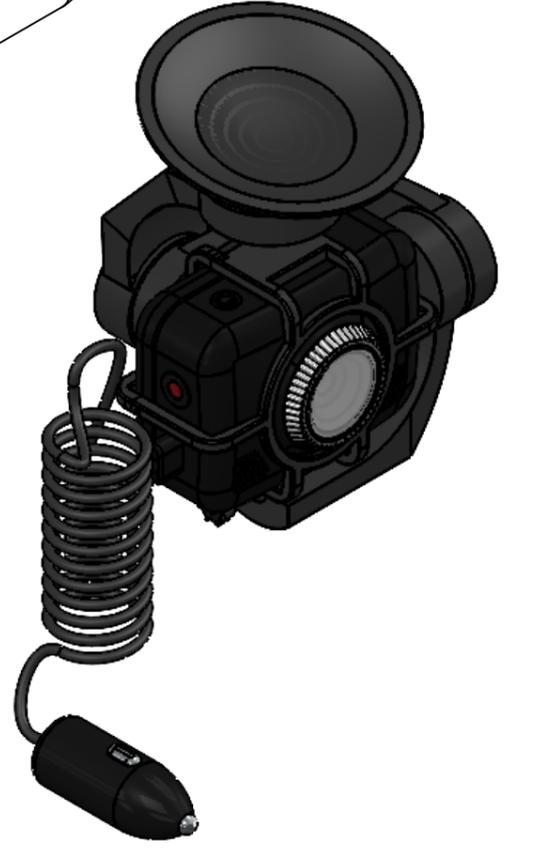


DETAIL A
SCALE 1 : 1

CAMERA TO
GIMBAL
CONNECTION

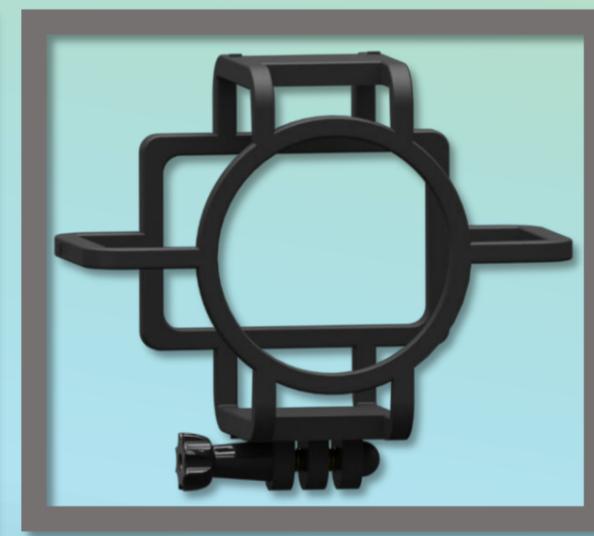
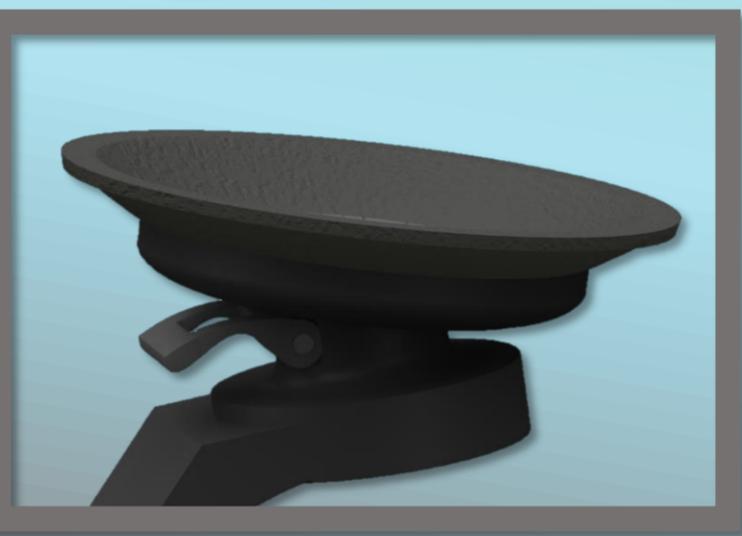
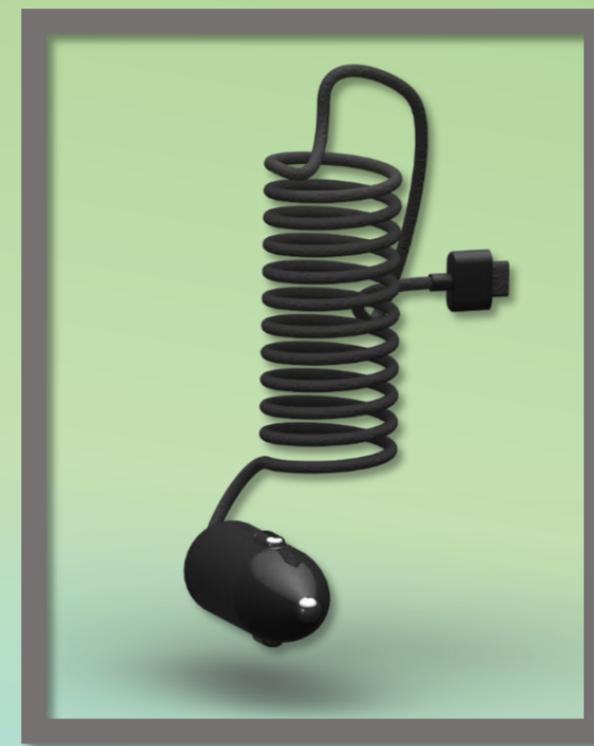
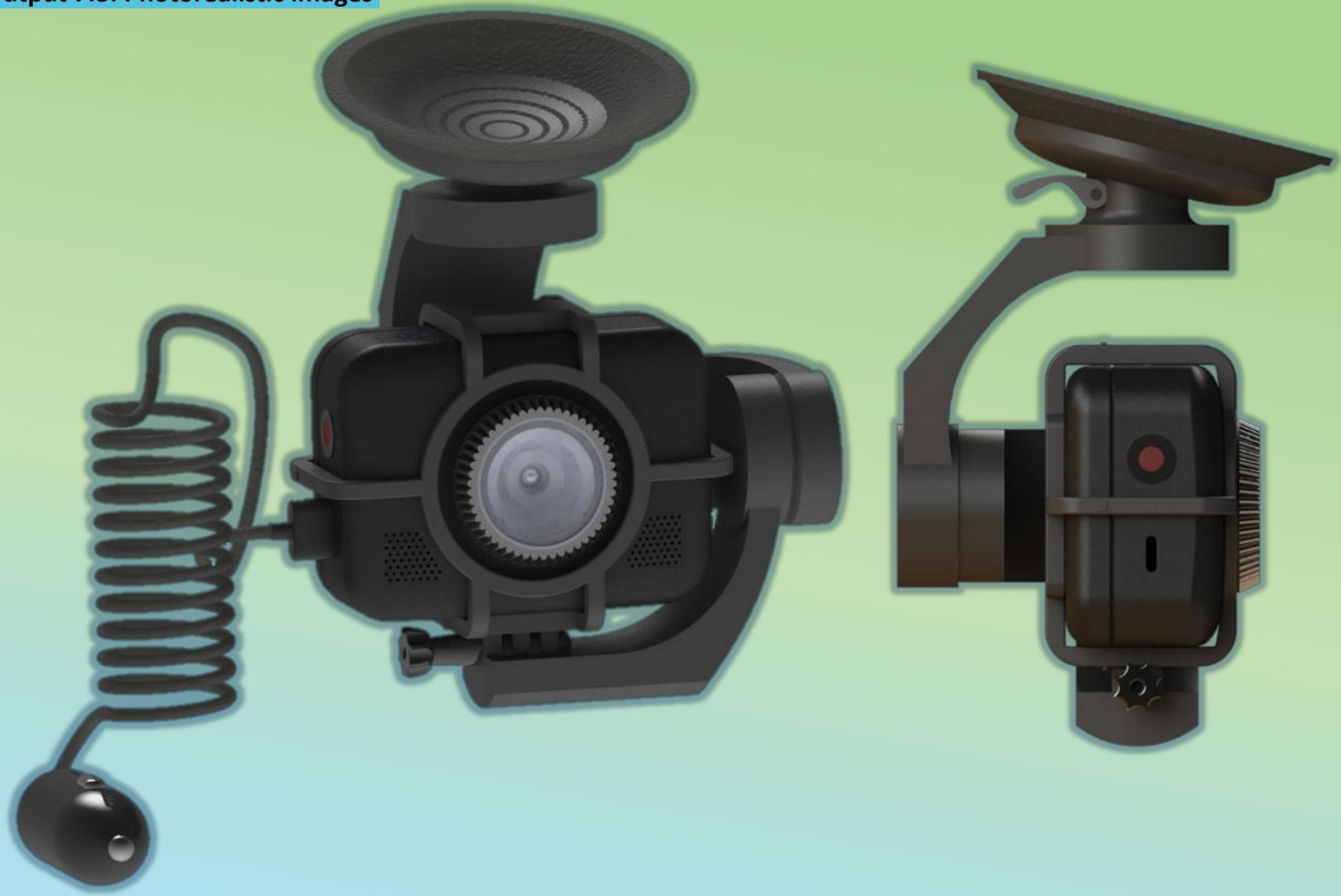


ITEM NO.	PART NUMBER	QTY.
1	Back casing	1
2	Suction cup	1
3	Lever	1
4	Gimbal 3	1
5	Cage back	1
6	Gimbal 2	1
7	Front casing	1
8	Gimbal 1	1
9	Outer lens	1
10	Inner lens	1
11	Glass lens	1
12	Screw	1
13	Charger	1
14	Cage front	1



DCG STUDENT ASSIGNMENT 2021	
TITLE:	OUTPUT 7
EXAM NUMBER:	106603
DATE:	13/01/2021

Output 7.3: Photorealistic images



Reference page

- <https://www.newegg.com/insider/dash-camera-mega-roundup-buying-guide/>
- <https://www.nextbase.com/en-gb/hub/what-is-a-dash-cam/>
- <https://blackvue.com/5-essential-features-to-look-for-in-a-dashcam/>
- <https://carcamerashop.co.uk/car-camera-mounts>
-  =Primary Research