



# Robert Veitch

- Emergency Torch
- Group A4
- Ben Payani
- BA Product Design Year 1

# Emergency Torch Project Introduction

Unit 3 of my course was based around end-to-end user-centred design. In this project we were required to design a torch in one of four categories:

- Emergency Torch
- Premium Quality Torch
- Task (work) Torch
- Personal Torch

I was in the 'Emergency Torch' group. The brief was deliberately vague with few constraints defined per category. While not hard constraints, the general definitions were as follows:

## Premium Quality Torch

This torch was defined as being for more premium markets with few constraints on manufacturing costs with consideration to be given to branding / marketing.

## Task (work) Torch

This torch was intended for utilitarian work or a specific task such as being used in manufacturing / resource extracting industries or DIY / craft use. This torch was intended to fulfil a specific function that is difficult or impossible with a 'regular' torch.

## Personal Torch

This torch and the next were less defined in terms of constraints. This torch was intended to somehow be personalised over other mass-produced torches.

## Emergency Torch

Similarly, this torch was defined as being for an 'emergency' the nature of which can be defined as anything we saw fit. This could be a hypothetical scenario like a natural disaster or could be interpreted as 'cannot find the light switch at night' or something more mundane or common.

Please note that this folio has been largely unchanged since its hand in (7th March 2016) in order to accurately represent personal development. However minor changes such as the addition of this page have been placed in.

Shown here is are excerpts from brief giving context for the directions given to us.

Design deals with everything from the mundane to the sublime and from the everyday to the extraordinary. In this project you will explore an everyday product from a particular functional (and emotional) perspective ***with particular reference to the understanding and manipulation of three-dimensional form and visual language.***

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## Design a Torch (*\*a portable light source*)

The Brief is to propose new product forms for one of the following:

- Personal torch
- Emergency torch
- Task (Work) torch
- Premium Quality torch

You will explore a number of directions inspired by your contextual research, for example:

- New visual languages based on associations & user context
- New functionality based on observation of rituals & use
- New product format
- Identification of a gap in the market

You will only focus on **ONE** of the torch formats, as allocated to your forum group. Your research and design proposals will need to reflect this:





## Circular style and key ring torches



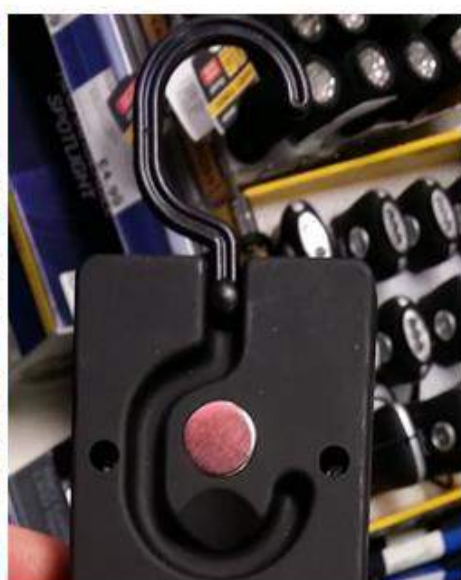




Lantern style, Large / spotlight and Traditional style Torches







Side projecting and 'bar' torches as well as winding and waterproof torches







Multi -  
functional  
torches



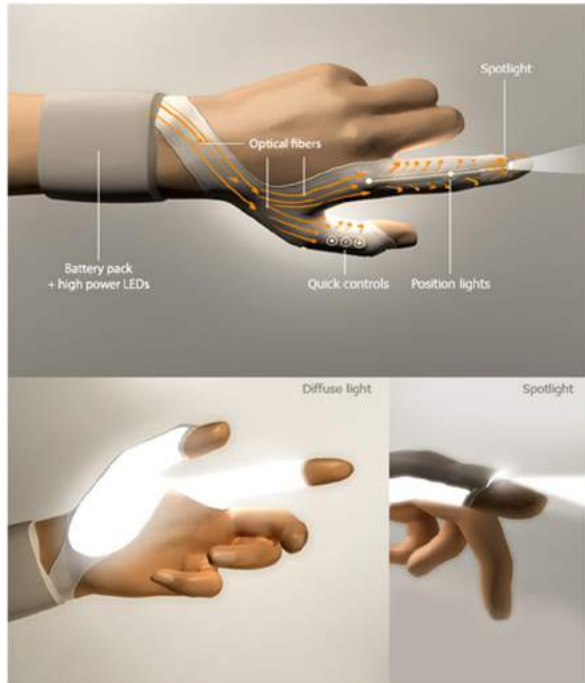


# Product Research: Emergency Lighting



**LuminAID:** A portable, solar powered lighting solution which, once inflated, can diffuse light acting as a lantern.

I found this interesting because it is a small, self-sustaining device which also functions in the capacity for diffused light without the need for a bulky lantern.



**Hand / Glove Torches:** Various instances can be found of gloves or torches designed to be worn on the hand or wrist which direct light to where the user points or onto an object being handled.

Useful for hands free work an intricate object manipulation in a low light situation.



## Glowsticks, Candles, Chemical Lights ect:

There are a great variety of products available which use a chemical light source, such as glow sticks, which provide light via a chemical reaction, requiring no power.

Additionally, non-powered light sources which burn fuel include candles, gas burners and durable, waterproof, windproof matches.





# Product Research: Emergency Lighting



**Power Cut Torches:** Torches and lights designed to activate when there is a power cut to allow the user to easily locate them. Torches such as this one can be detached to function as a regular stick torch, charging passively in the dock.

## Vehicle and Hotel Torches:

Regulations often dictate that commercial airlines, vehicles, hotels have emergency torches available.

These torches are usually simple, large and stored in a case to be pulled off when needed.

Hotels are required to have one in every room while vehicles usually have one for the conductor or driver.



**Signalling Lights:** Small lights designed to be seen from very far away, often with built in strobe or SOS functionality to allow the user to be spotted by rescuers.

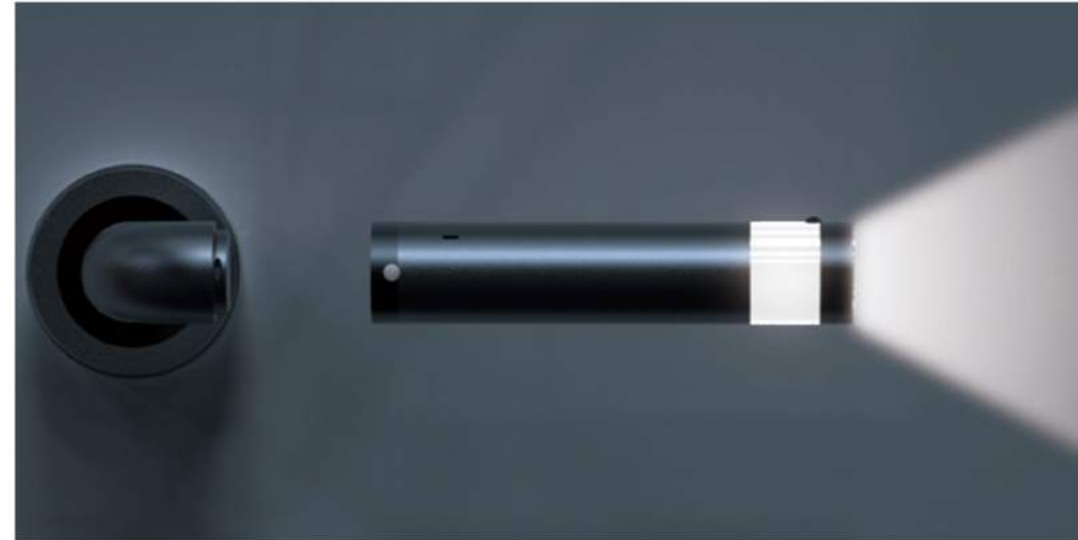
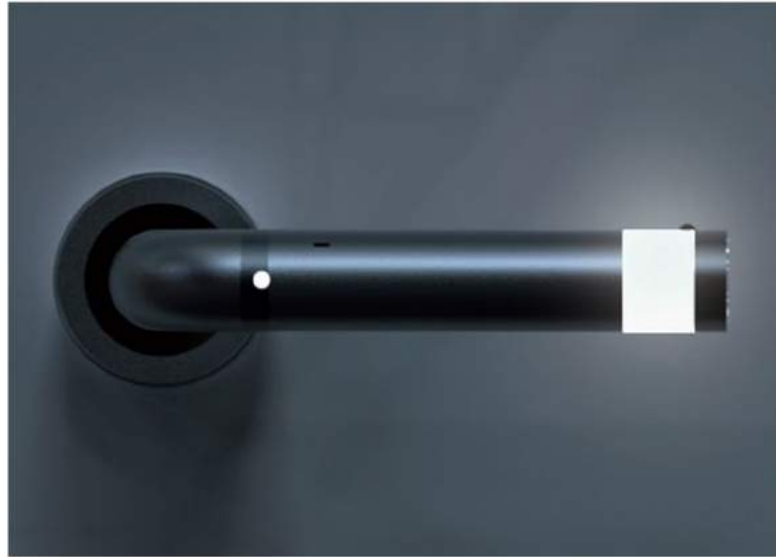
Many of the torches I found during my market research incorporated a similar functionality.





# Product Research: Emergency Lighting

In addition I found many individual products fulfilling a niche function such as these examples.



## Door Handle Torch: Yanko Design

This door handle, charged via the latch of the door, can be detached in case of an emergency to be used as a torch for navigation.

The idea is that, in the dark it is usually still possible to navigate around if you are familiar with the environment, meaning doors, tables, surfaces can be easily located. In addition the ambient glow guides the user to the door in the event of a power cut.

The main issue with this product is the lack of door handle functionality once removed in addition to the plain and monolithic style which people may find does not suit their interiors.



## Bag Light: Unknown designer

This product is designed to be kept in the users bag to illuminate the contents in the dark and to find items.

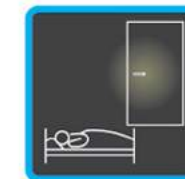
This product is interesting because its distinctive shape makes it easy to locate and identify by feeling around the contents of the bag.

Its size means that it can disperse light over a large area but is not too big to be intrusive and a waste of space.

It solves a common problem of item location in bags which can occur in light or dark environments yet is simple and cost effective to produce and sell.



User scenario



Mood light



Lead light



Flash light



Daily



Night

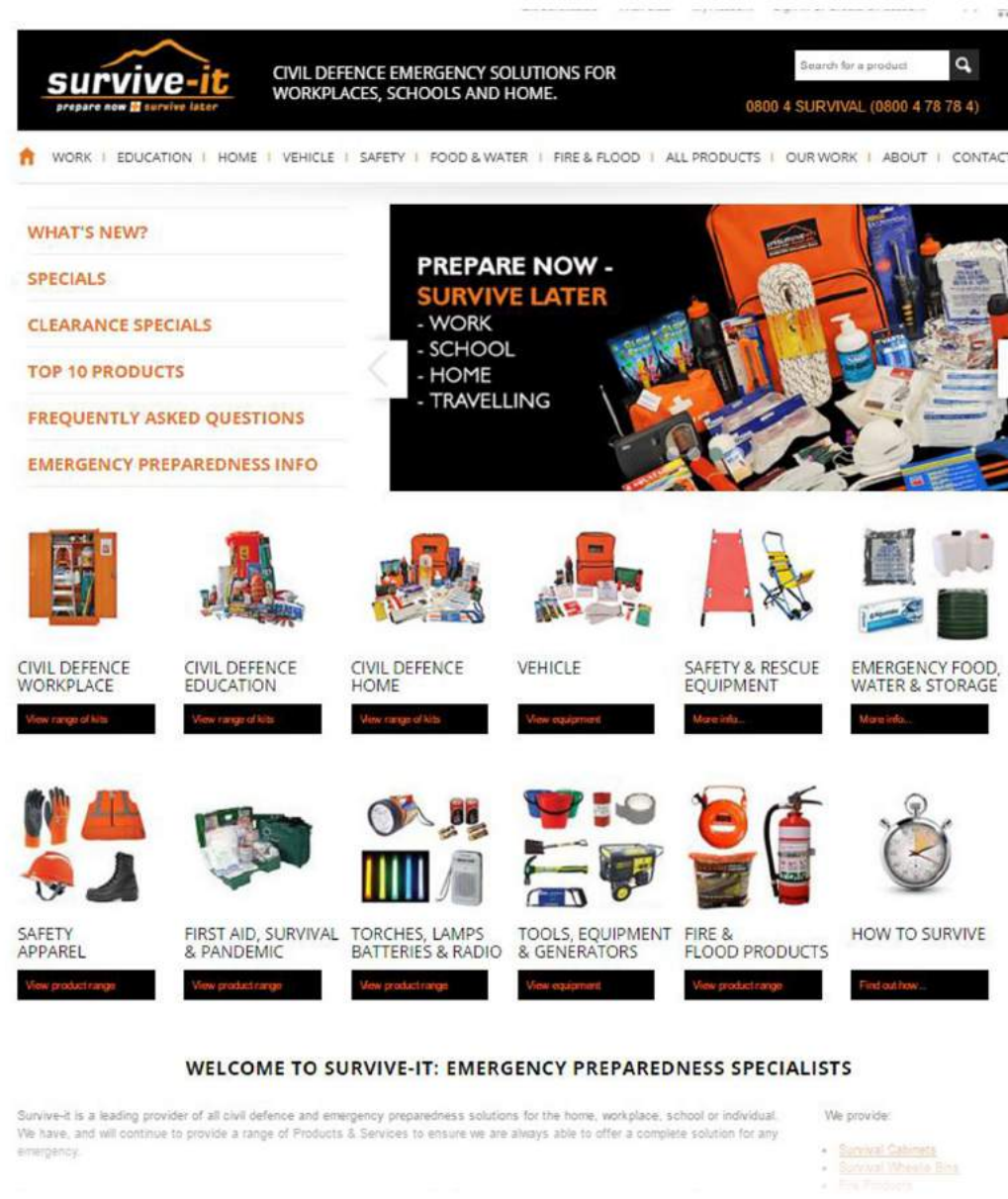


# Product Research: Emergency Products

I researched the product category of 'Emergency Products' and discovered a wide range of results, mostly due to the ubiquitous definition of what an 'Emergency' is.

I discovered places selling kits for emergencies, ranging from disaster relief to personal situations to hypothetical apocalypse survival tools.

This site is one such example, specialising in these 'survival kits'. The screenshot here shows their main product categories.



I found this interesting because a vast range of the products in these survival kits are common objects or unspecific tools such as plasters, shovels, fire extinguishers, torches, food, water storage, bags and so on.

What made these kits emergency kits' was the combination of products and the situations to which they were most suitable.

In other words, what made these ubiquitous products 'emergency products' was their context and how they relate to each other.



**GPS Beacons:** Products designed to be used in the case of injury or critical illness when hiking. These are usually small with limited functionality which, when activated, transmit a distress call to local rescue centres.



**Collapsing Traffic cones:**

Designed to be kept in your car in case of a breakdown. These can be used to warn drivers of your broken down car in dark rural situations.

There are a number of other products which exist for this same scenario.



**Water purification:** Tablets and filters are available to purify natural water.



**Heat Packs:** Bags or packets which function like glow sticks; once 'broken' a chemical reaction produces heat.



# Product Research: Emergency Products

From my experience in the Scouting organisation, I was particularly interested in the issue of power generation and emergency survival products.



Naturally, when I discovered 'water powered' clocks online I was intrigued by the idea of batteries free power generation.

As it turns out, the clocks function by using the water (or any liquid) as a conductor between two plates of zinc.

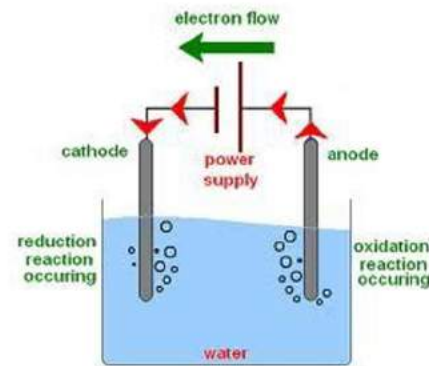
The water dissolves the zinc and produces a current from the electrode potentials of the two plates.

In essence, these are nothing more than 'do it yourself batteries' attached to a clock.

## Thermo-Electric Power

I then found out about thermo-electric power generation with this product, the Tegstove.

Tegstove is a cooking stove which burns regular butane gas but incorporates a thermo-electric power generation system to charge internal batteries and mobile devices.



Fire Starters: These are particularly useful as they provide a quick and easy way to start fires and are usually very small.

Magnesium strikers such as the one on the right are particularly useful as they do not require fuel and can work when wet.



On this same note, I remembered a discussion with a family friend when he made a case that:

"The most useful object you can have if you're lost in the wild is a knife. Without a knife you can't catch and cut food, manipulate material for shelters, defend yourself, or carve tools. If you have nothing else you should have a knife."

The two pictured here are from the product category of 'survival knives'.



## **Design Directions:**

- >A light source which users would feel compelled to have with them at all times
- >Alternative methods of power accumulation and light emission
- >Additional functionality for extreme conditions
- >A form of domestic torch which can more easily be located in the event of a black-out
- >Torches designed for child safety in the dark
- >A torch with the ability to act as a relaxer or to have a soothing effect
- >Torch designed for hands free use



## Research Insights:

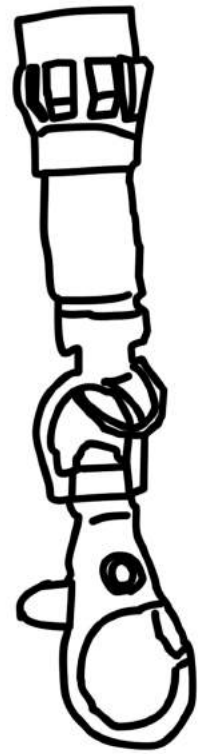
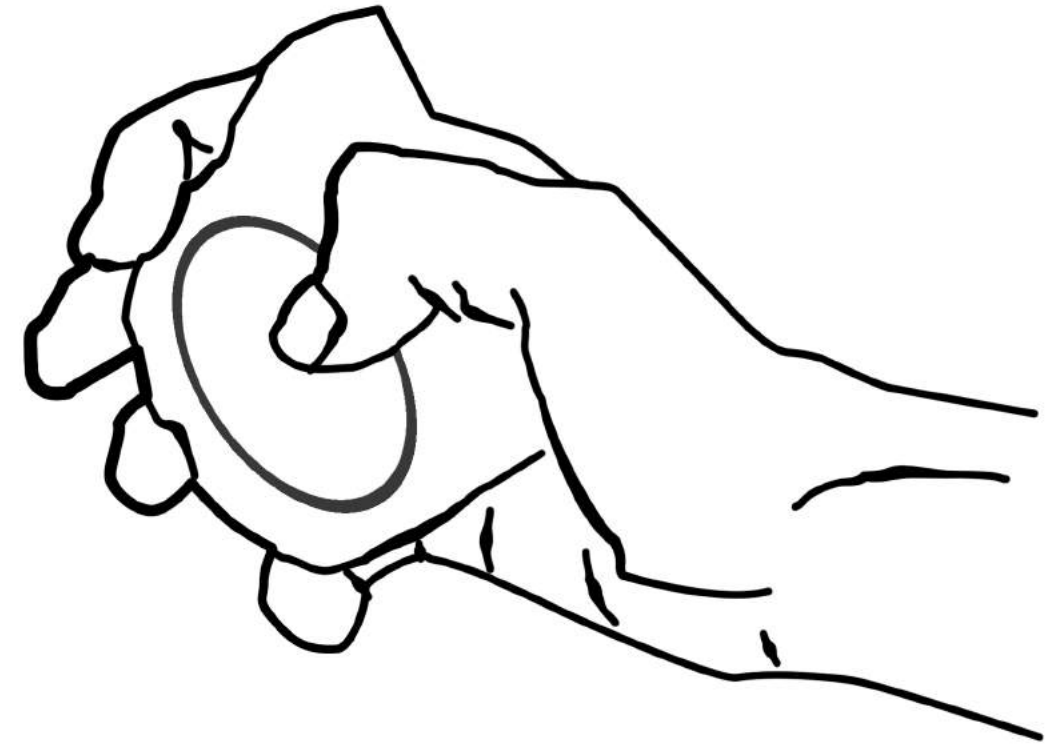
- >There exists a multitude of survival and disaster kits on the market across a number of product sectors
- >There exists products which incorporate multiple tools into one for use in specific situations e.g. Wilderness survival
- >During a blackout, the main lighting issue is locating alternative light sources
- >Products exist to detect a blackout and provide automatic light
- >Many people no longer carry torches due to the ability to use a smartphone instead
- >Power sources range from different types of alkaline batteries to Lithium-ion batteries to chemical lights.
- >Torches have limited use in day to day life so are not normally prioritised by consumers as a must have item
- >Dynamo style charging methods are the most common, aside from solar power, method of having a battery-independent torch however some people find that such torches are stressful and not suitable for use in an emergency.
- >Temperature differentials and other factors can greatly affect battery efficiency
- >There are limited products available for children to be used in the event of an emergency, most are bulky and designed for short term use or for their entertainment value



## Palm and Circular Torches:

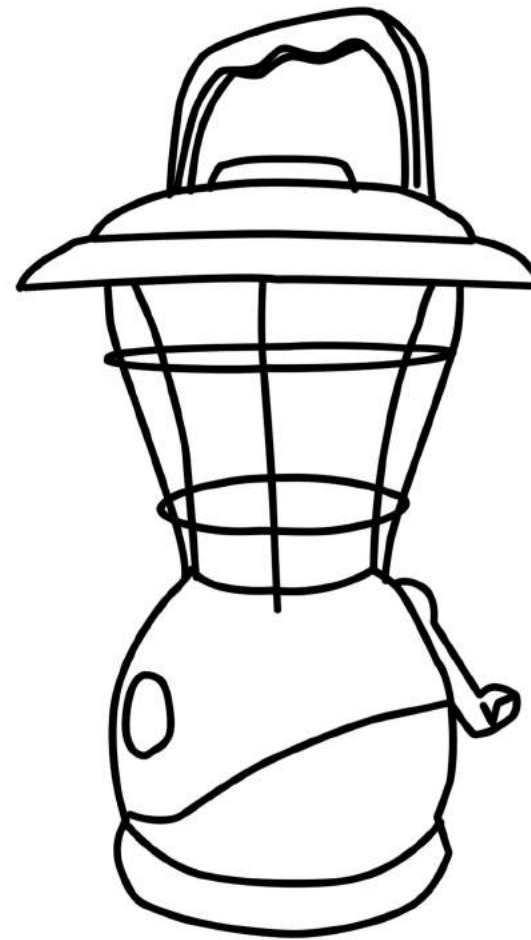
Usually small torches, circular or ellipsoidal in form designed to be used to disperse light across a large area.

These can be mounted on walls and surfaces for discreet lighting or held in the palm of the hand.



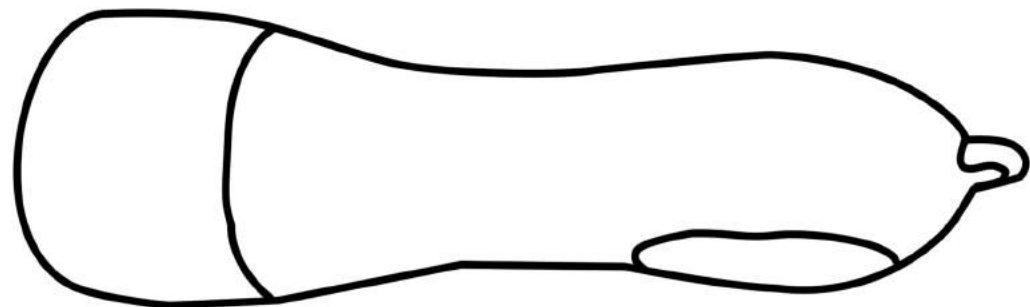
## Key-Chain Torches:

Small, low power torches designed to be kept on the user's keychain or attached to a bag or piece of clothing in case of emergency.



## Lanterns:

Portable light sources designed to disperse light longitudinally to illuminate an area. These come in a range of sizes and are usually designed to be hung or to stand independently on a surface.



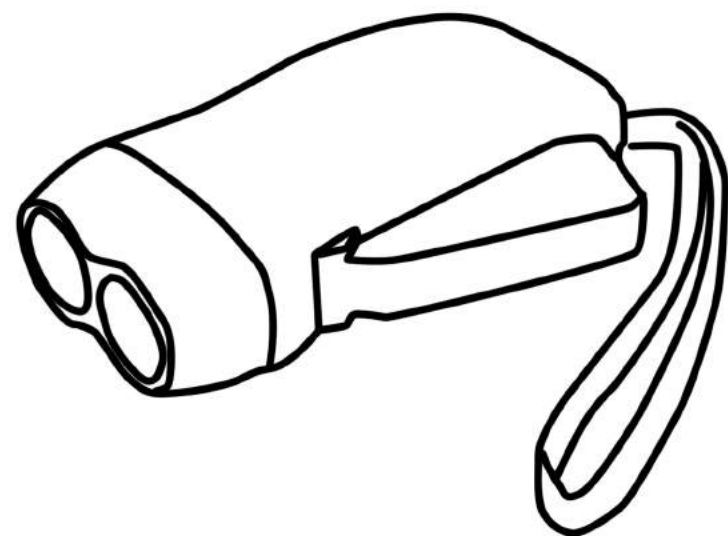
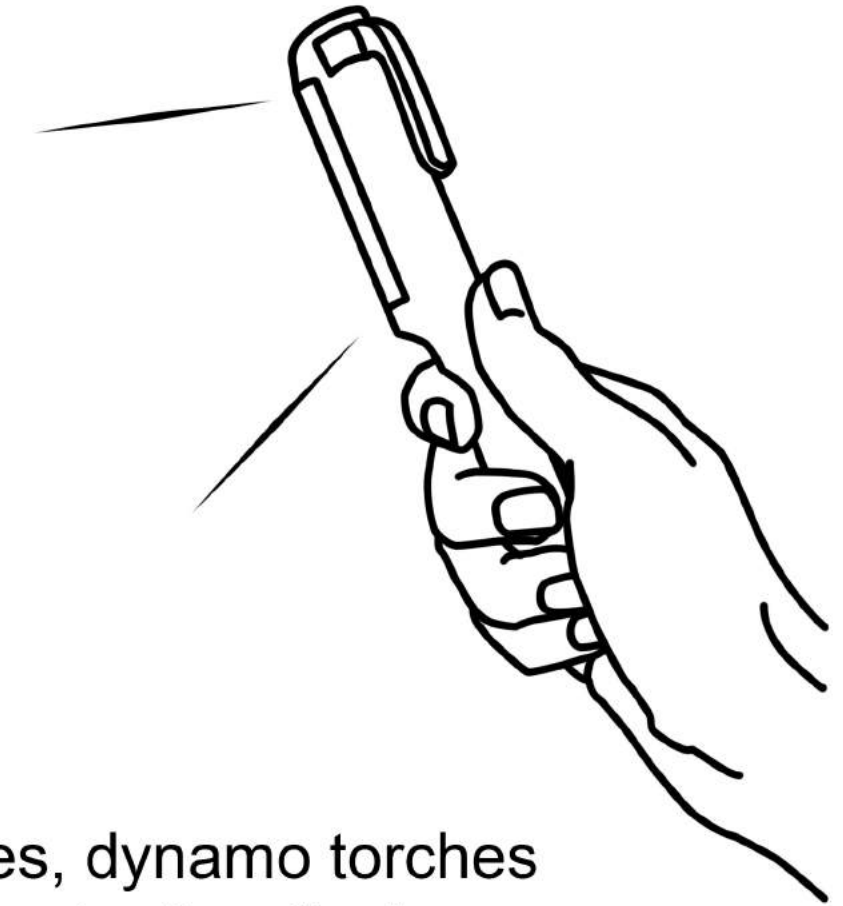
## Traditional 'Stick' Torches:

Multi-use torches designed to point a directed beam of light. These are the most common type of torch and come in a vast range of sizes, powers, specifications and functions, many incorporating functions of other product types.



# Side Projection Torches:

There exists a multitude of torches and bar lights on the market which project light along the side of a cylindrical handle. This provides some interesting ergonomic functionality and possibility for secondary uses.



## Dynamo Torches:

By far one of the most popular torch categories, dynamo torches employ some kind of integrated dynamo generator functioning on rotary or linear movement to charge an array of capacitors or rechargeable batteries.

These have a great deal of appeal to consumers as they promise free, unlimited power without the need for batteries.

However, due to the low power output of the dynamo mechanism and the fact capacitors discharge over time, such torches often prove to be ineffective as a torch.

In addition, I talked to some assistants in camping stores who believe that in an emergency situation, users would struggle to concentrate on winding the torch due to disorientation and panic.





### Wearable Snap Strip:

A Light strip concealed within a bag to be attached to the body for hands free use.

### Portable Power Generation:

A system for on the go power generation for life or death situations.

### Domestic Power Cut:

A concealed light to be easily located in the dark in the event of a power cut.

### Wilderness Survival:

A knife, torch and Firestarter rolled into one for absolute emergencies and wilderness survival.

### Crowd Panic:

A cheap, small light to be distributed on mass to large crowds to prevent panic

### Tether:

A Torch with built in tethering capabilities to chain users together in low visibility situations such as smoke from a fire.

### Light Sticker Strip:

Combining the functionality of the wearable lights and domestic power cut.

A product designed to be easily located in the event of a sudden power cut but can also be attached to a user.

This can be achieved by designing a thin product which utilises the ability to attach to easy to find objects while using a similar or the same method to attach to the user.

### Wilderness Survival:

A device to be used in the event of being stranded in a wilderness situation, for example, after a plane crash, car breakdown or accident while walking, hiking or camping.

The device should function as a tool to help the user survive with nothing else, incorporating the most useful tools.

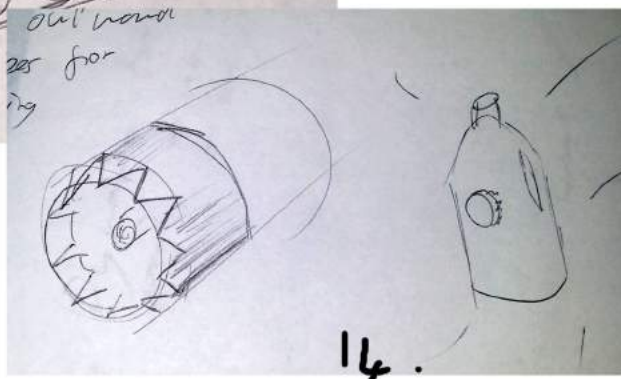
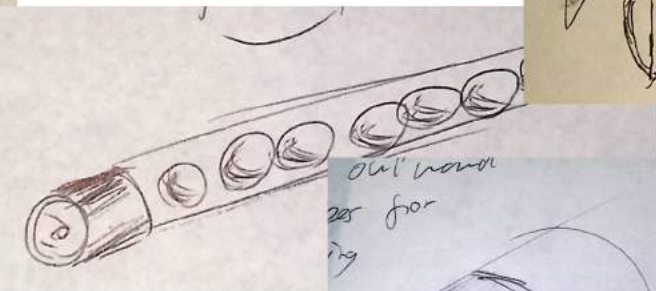
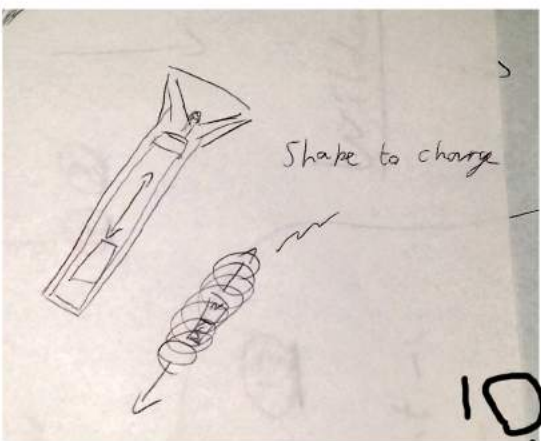
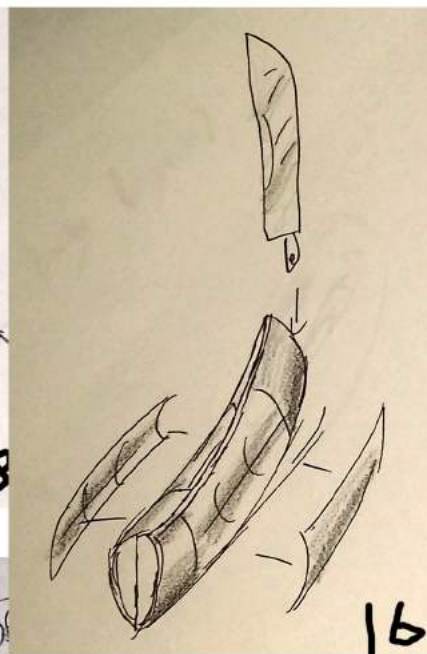
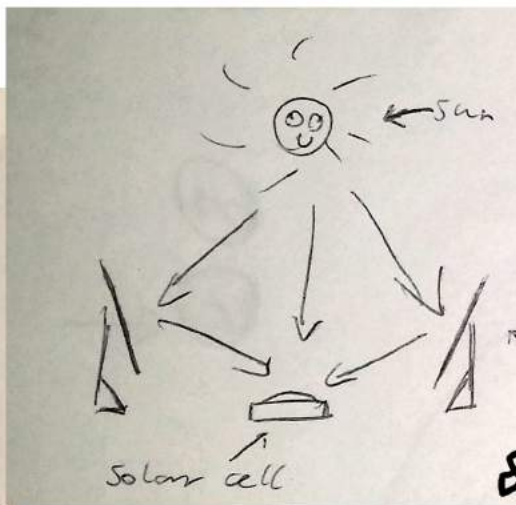
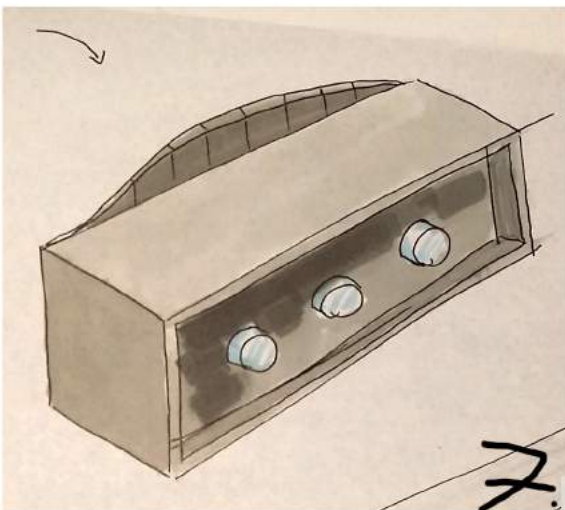
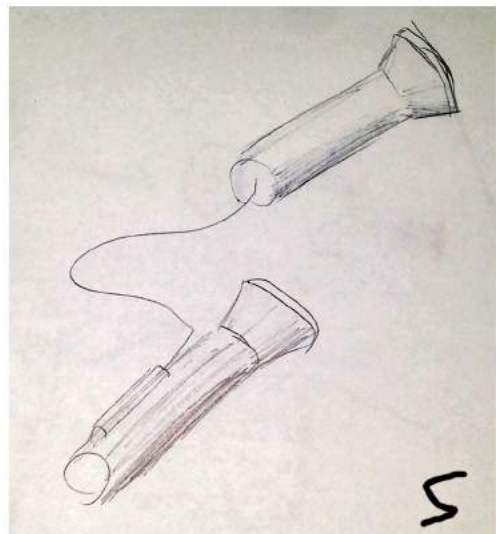
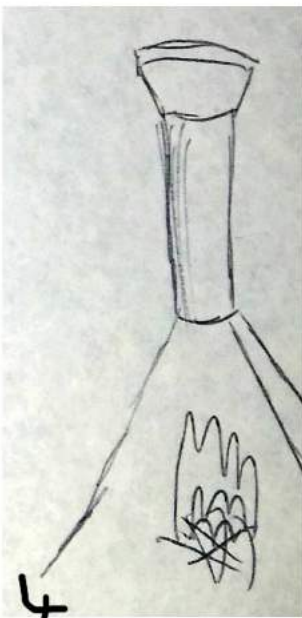
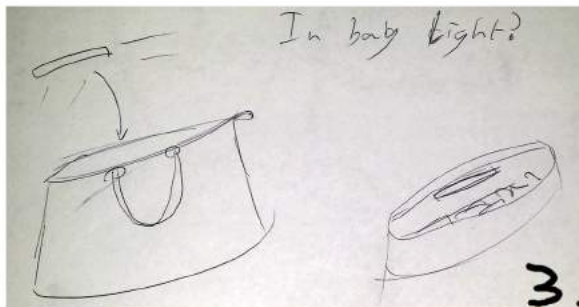
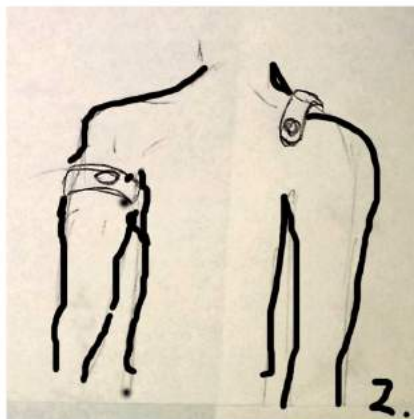
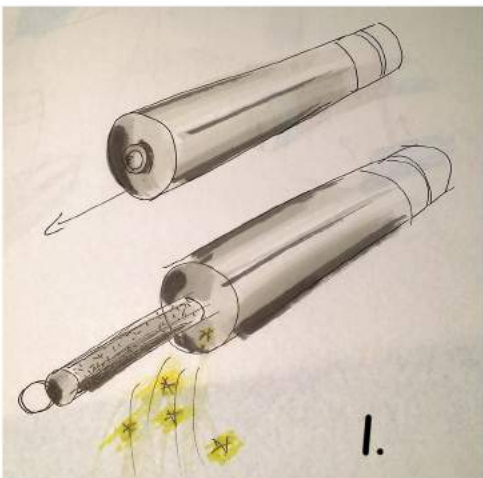
The tool should be durable and self-contained, with off-the-grid power.

### Crowd:

Unchanged from week two. A small, stackable device to be stored in places such as shopping centres, schools, cinemas, vehicles ect with large amounts of people for distribution in the event of a sudden loss of light.

The torch should be compact enough to be stored in large numbers but simple to use and easy to manufacture.





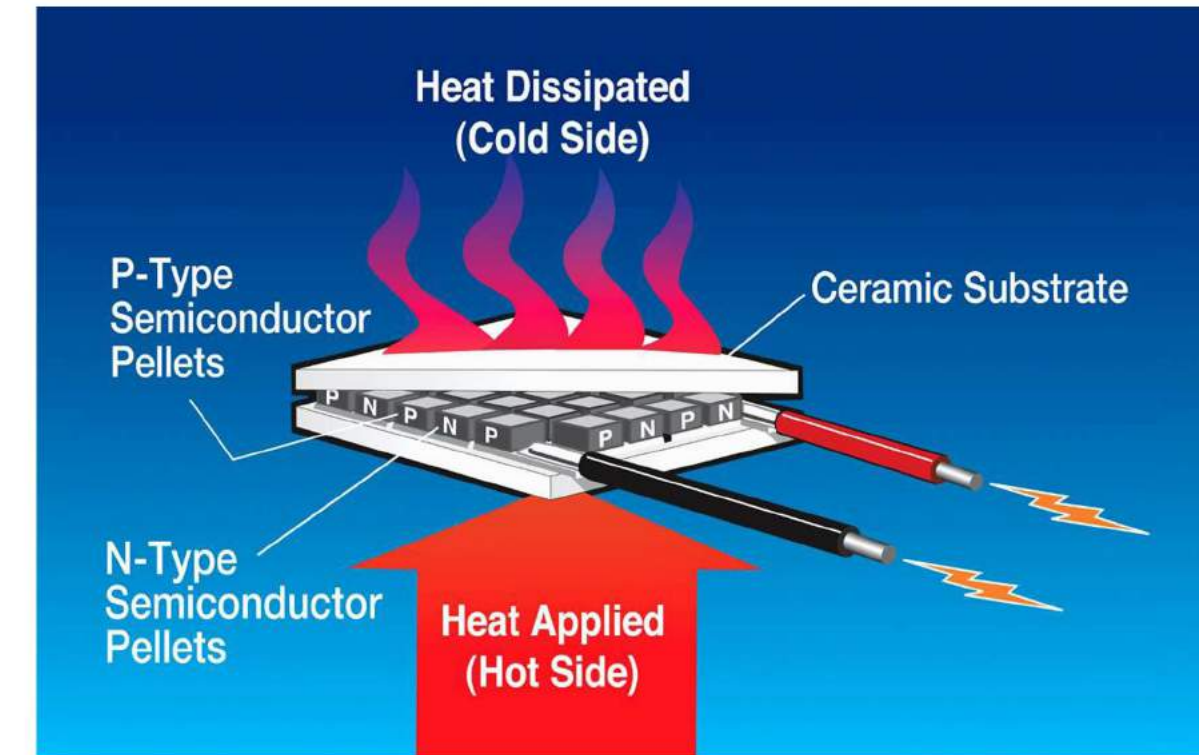


# Product Research: Thermo-Electric Power

From I focused on the concept of thermo-electric power generation such as the type used in the Tegstove.

Thermo-electric generators are solid state devices which utilises P-N semiconductors to create a current from a heat differential.

Such devices can be bought in electronics shops and are only used for small-scale power generation due to their inefficiency for mass power generation.

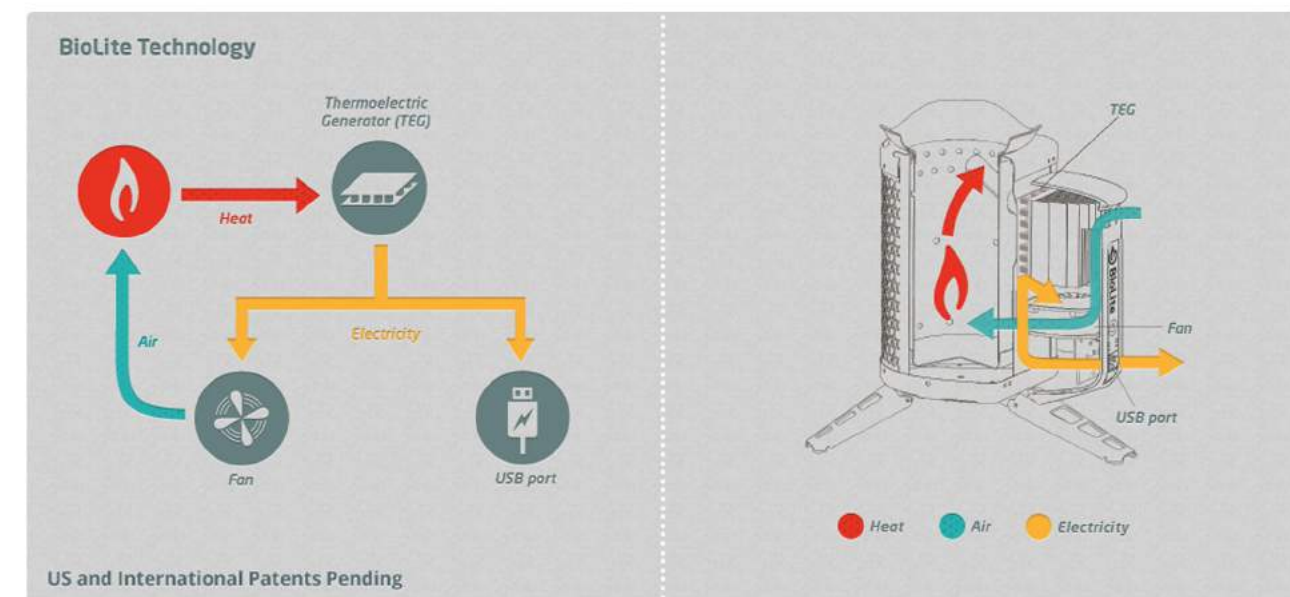


Products such as this one and home-made variants of this can be found. Designed to attach to the top of a gas cylinder to generate power for mobile devices in the same way Tegstove does.

This led me to the BioLite stove pictured here. BioLite is also a stove / generator but runs on organic matter such as twigs, leaves, branches etc.

The thermo-electric generator produces power when a fire is lit inside the stove. This then powers a fan to blow air into the fire helping it heat up very quickly to a quoted 1400 degrees.

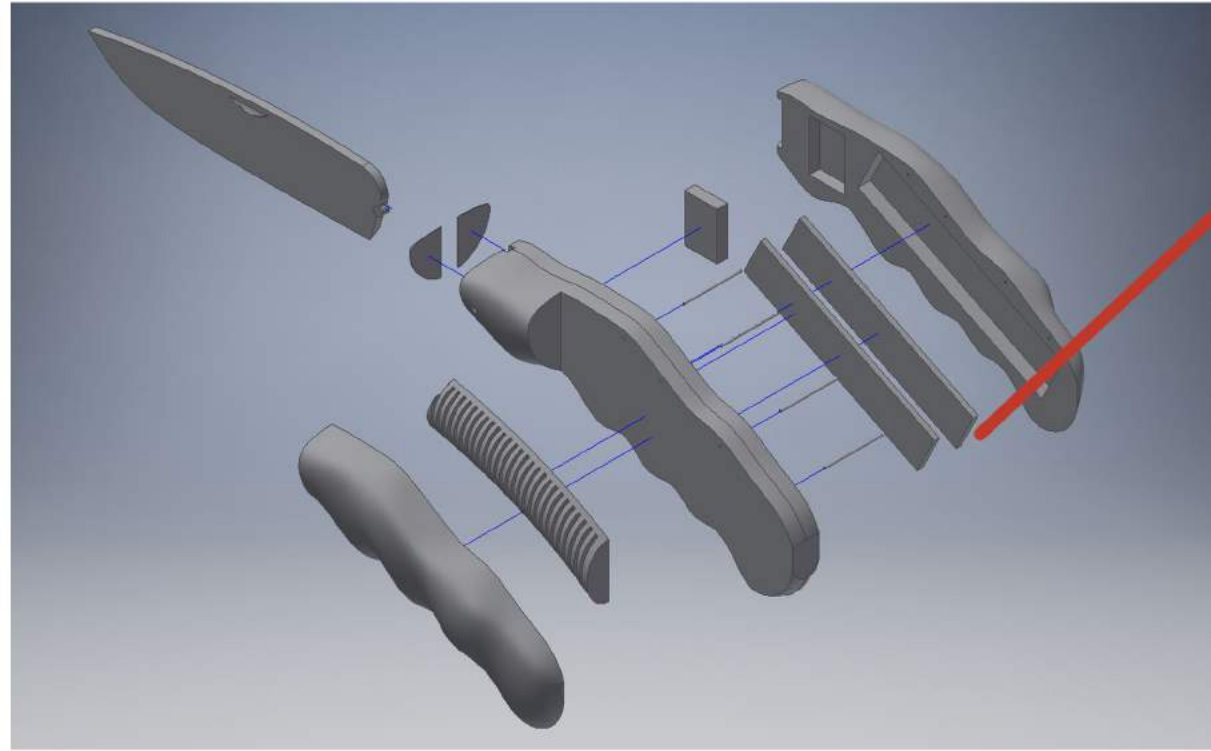
The more heat produced, the faster the fan runs and thus the hotter the fire. Excess energy can be output to the USB for charging mobile devices.





# Chosen Idea: Development One

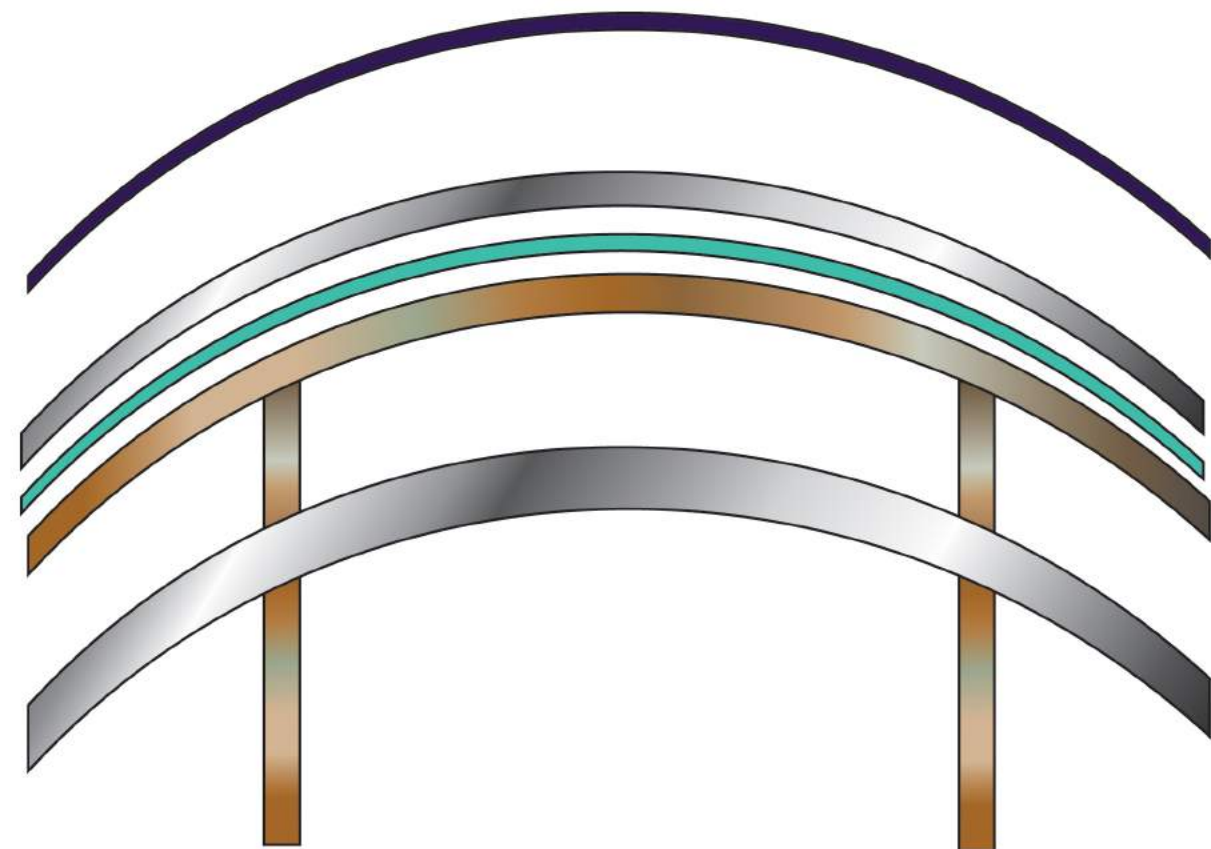
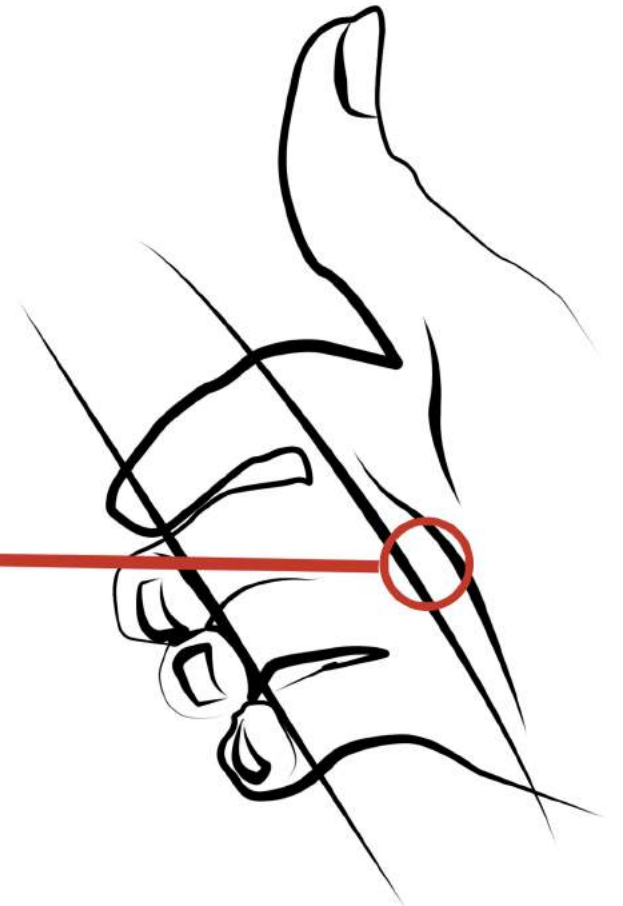
With a rough handle shape decided on, I decided to look at the internal configuration of the components I stated were involved in powering and using the torch, for example, how the batteries and thermo-electric generator are encased.



I first decided that the right side of the casing should be removable (via screws) to access the batteries and to house the control circuitry for the LED's.

I realised that, depending on the hand the torch is held in, one side will receive more heat from being in contact with the palm of the user's hand.

For this reason, despite the design being symmetrical, it would be advisable to market a 'Left-handed' and 'Right-Handed' version. However the designed would be the same for both but inverted to put the large side in the user's palm.



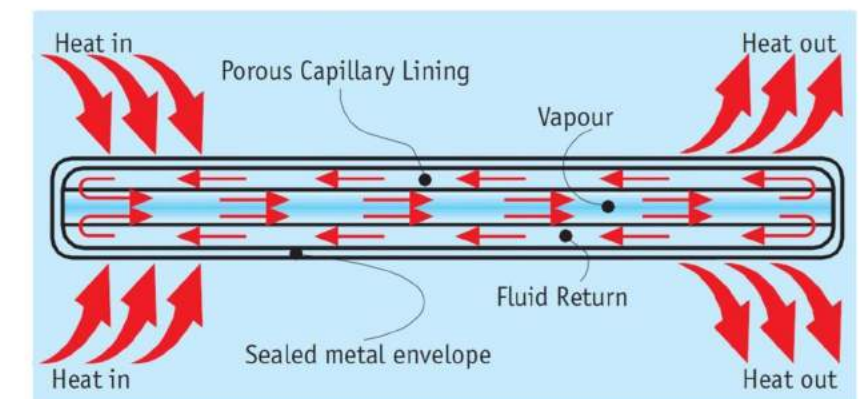
Silicone rubber layer for grip and magnesium where applicable

A layer of stainless steel protects the components.

Thermal conductive paste

A conductive thermal layer gathers heat for the thermo-electric effect

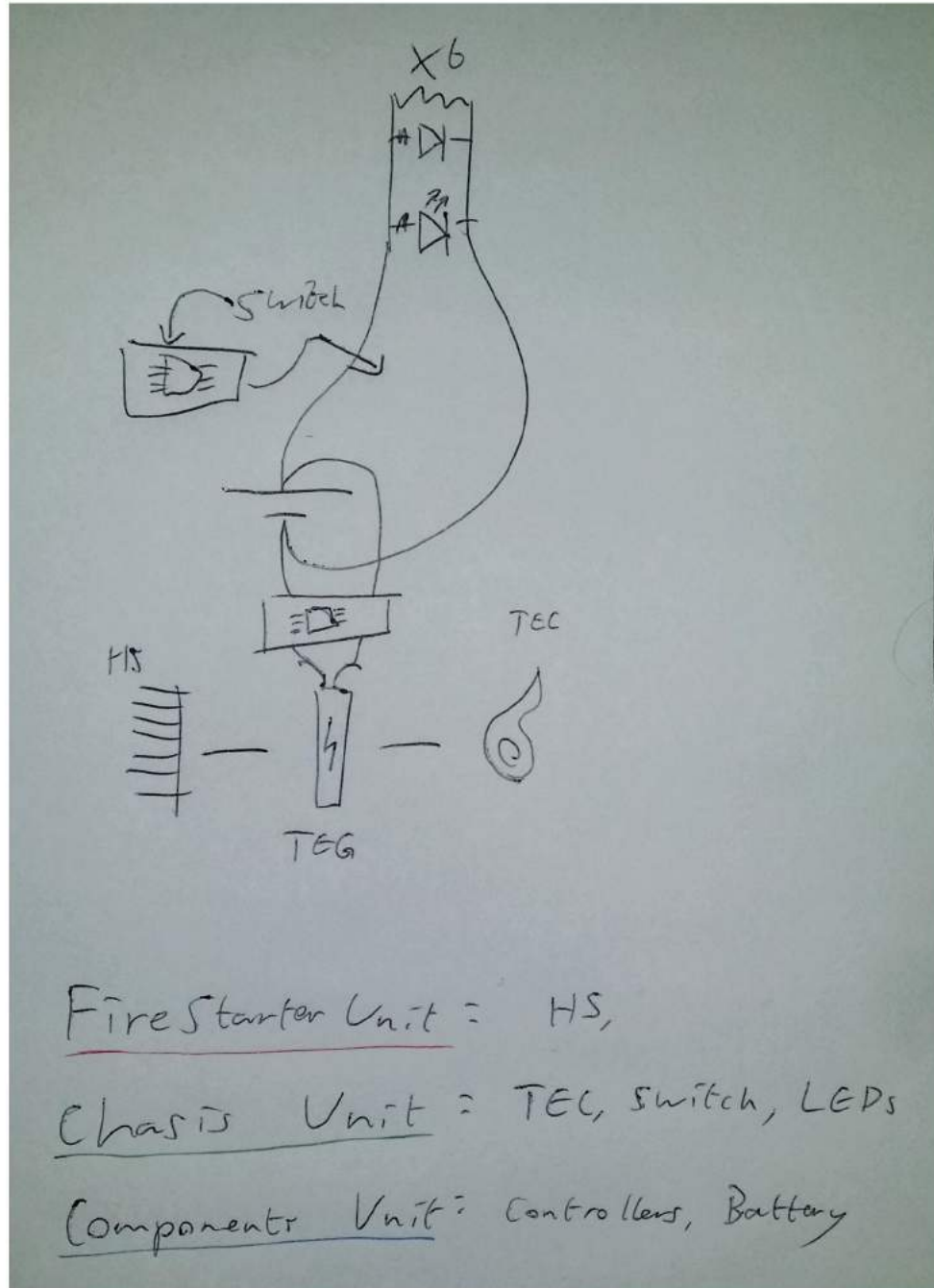
Aluminium chassis forms the main structure of the torch. Aluminium was chosen for its strength and weight properties.



To transfer the heat from the exterior of the handle to the thermo-electric generator inside, I decided on using 'Heatpipes' from DAU. Heatpipes transfer heat with almost no loss and can vary in length and shape.

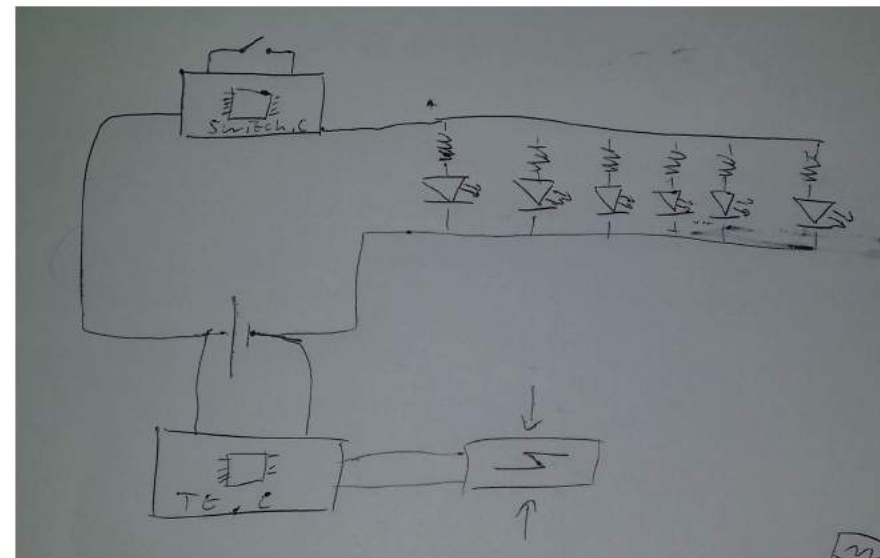


# Engineering Development: Circuitry



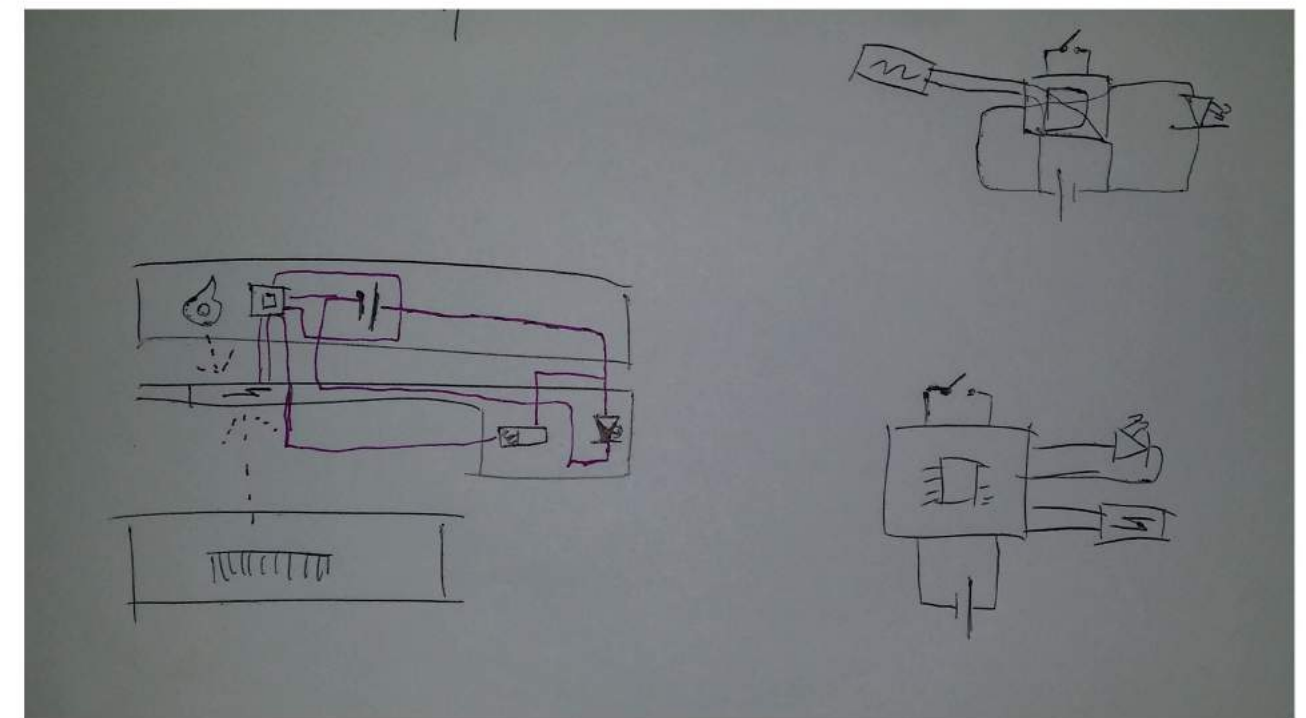
To help with the development of the way in which the torch is manufactured, I decided to design the internal electrics and how they would relate to their components.

Initially this is how I envisioned the configuration. The thermo-electric generator would be controlled by an Atmel chip and simple circuit, this would charge the batteries which would power the LED's in parallel.



This drawing shows the same configuration but laid out more logically. A second Atmel chip was added to allow the switch to be a button and incorporate different settings.

Expanding on this, I began to apply the circuit to where I currently had the components positioned inside the torch.



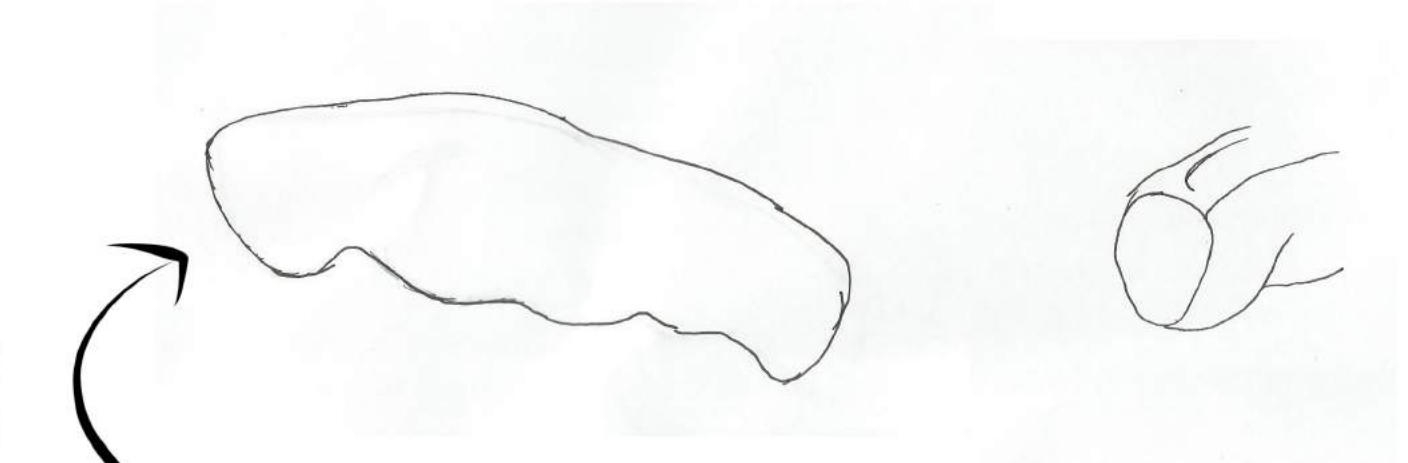
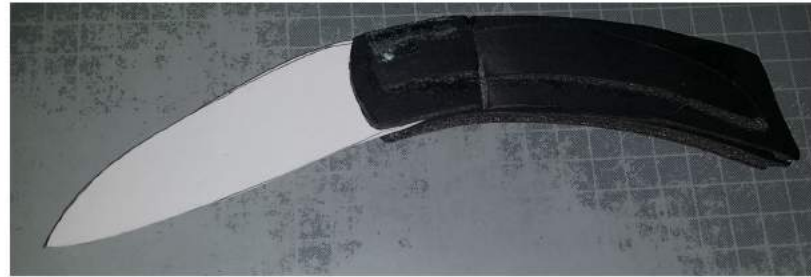


# Chosen Idea: Ergonomic Development One

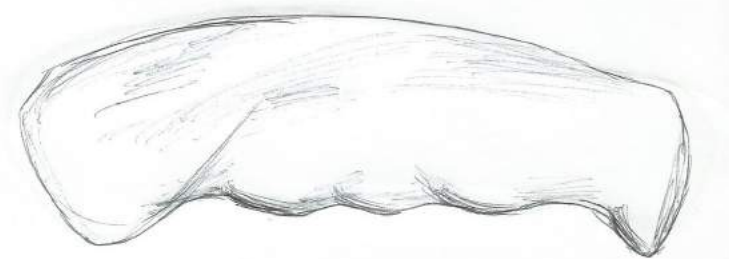
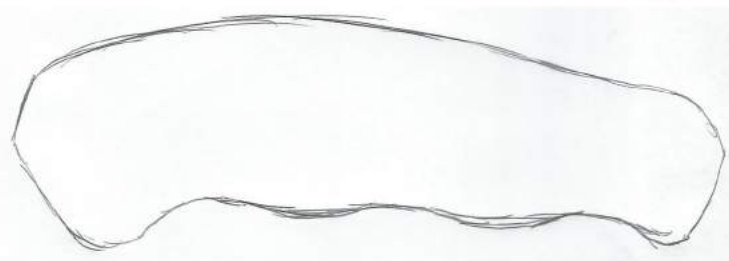
After the third meeting, we decided that the idea with the most potential was 'Longevity', the wilderness survival torch. The first stage in product development was to decide on the ergonomics of the handle as this would dictate much of the internal components and manufacturing methods.

I started by looking at how to make the handle more ergonomically comfortable and functional. I built on the original curved handle shape from my initial sketch model using polymorph plastic to produce this result.

The model gave me useful information which I used to guide my two-dimensional idea sketches.



I found the shape comfortable but it occurred to me that, because I had developed the form via a hand moulding process, it was therefore perfectly sculpted to my hand and would need to be less specific and more suited to a range of hand sizes and shapes.

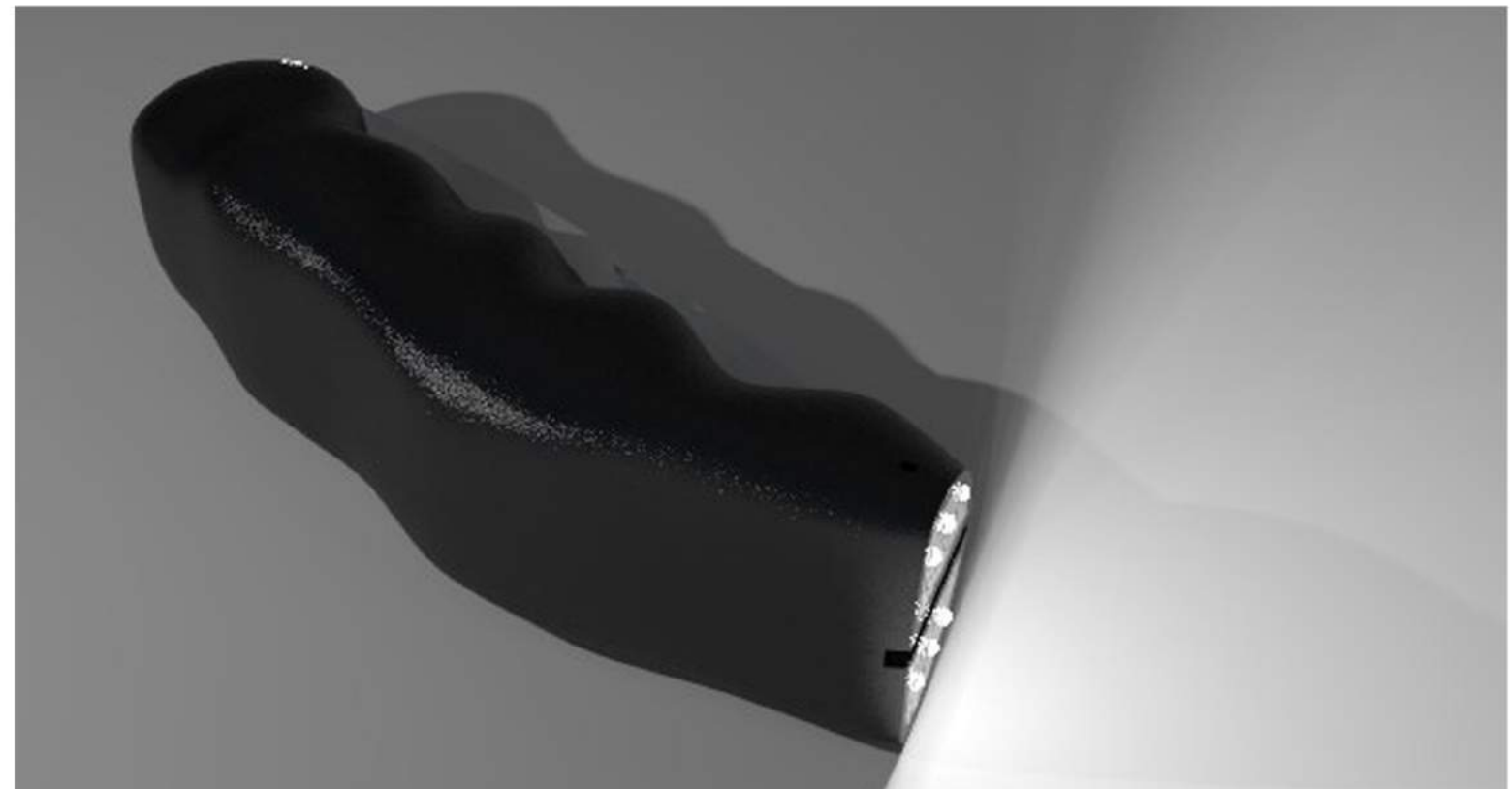
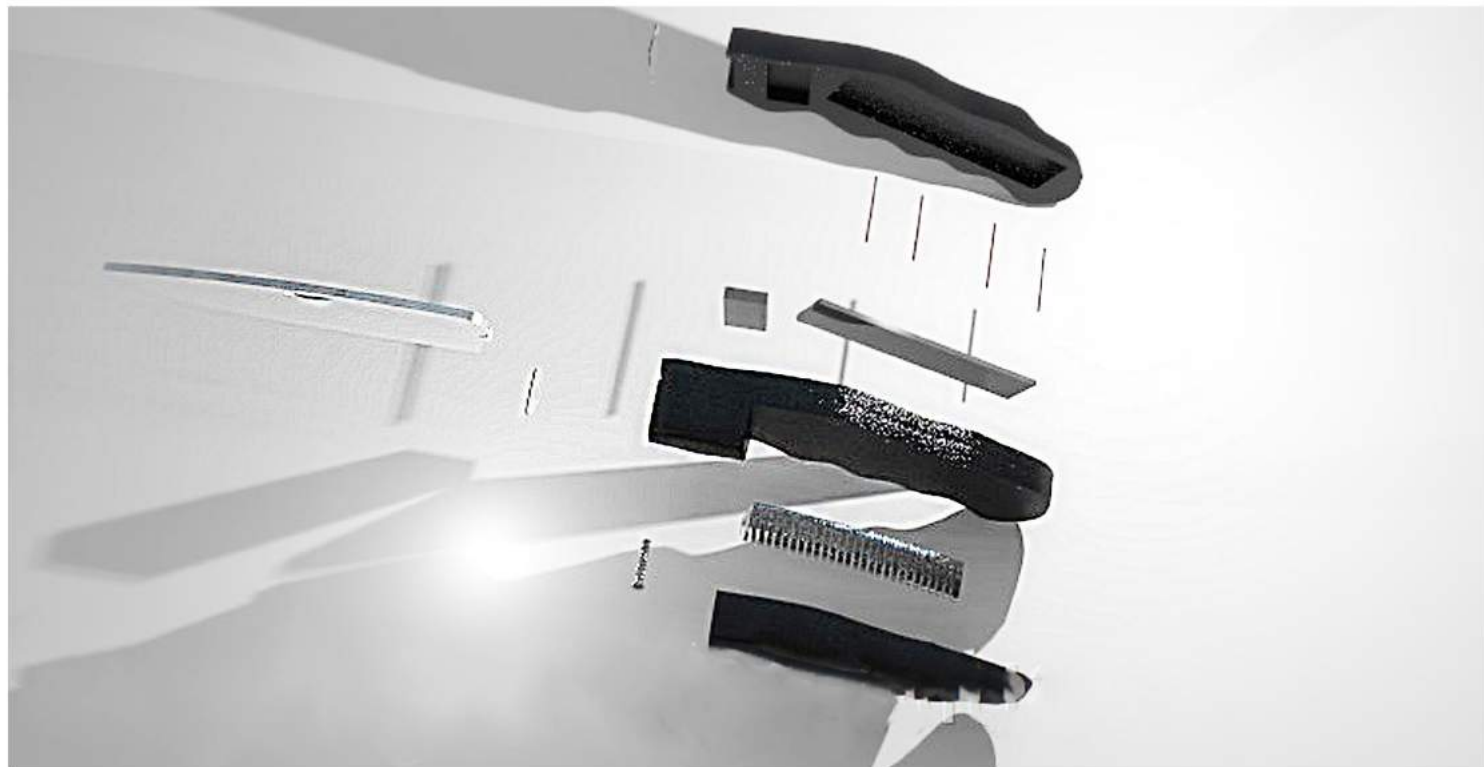
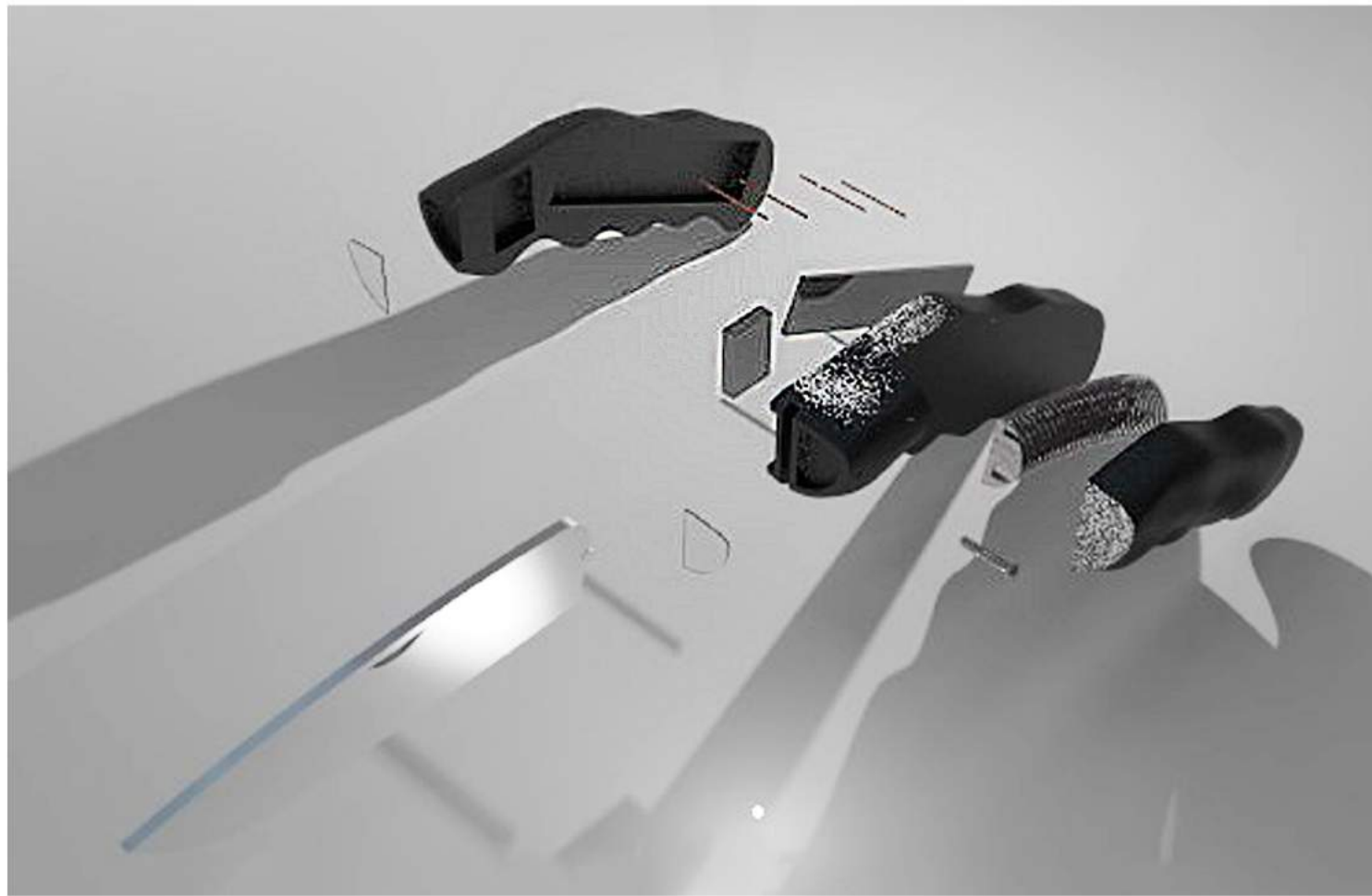


I made iterative adjustments by sketching, adding features such as this indentation on top to allow the user better grip with their thumb.

I then created another polymorph model based on these changes.





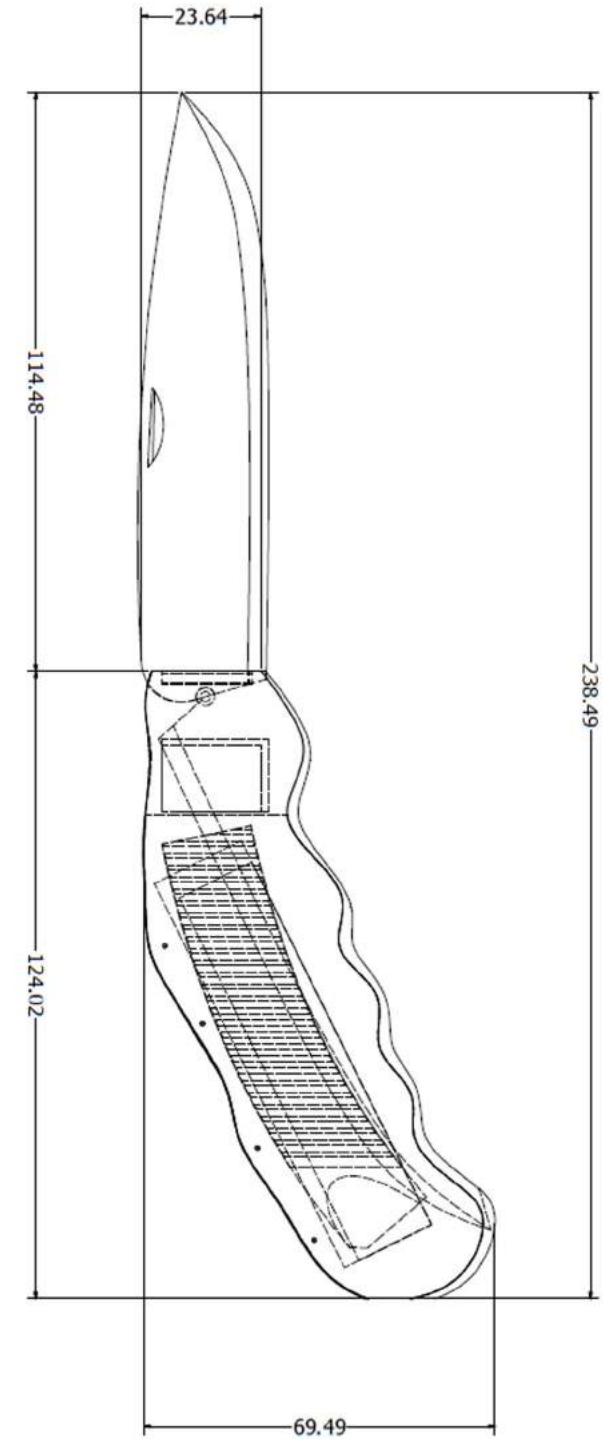
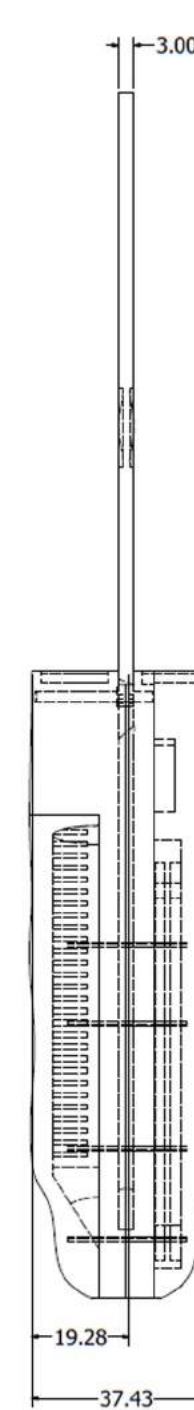
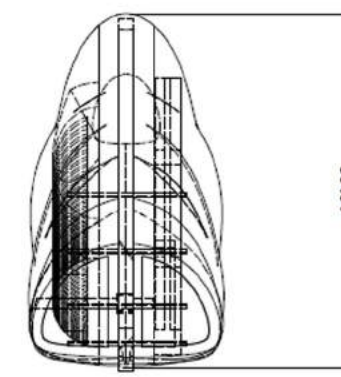
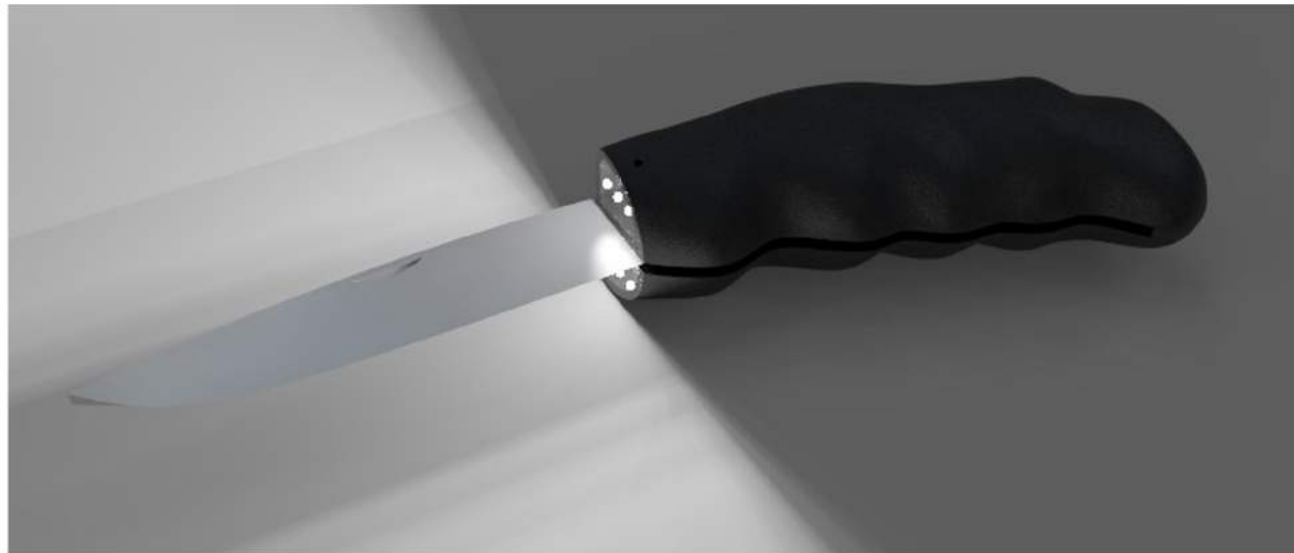


This was the stage the project was at by the first meeting of part 2.

The handle shape based off of the polymorph model and most of the internal components worked out but with minor work to still be done. For example, there is currently no locking mechanism for the blade.

The feedback from this meeting focused on minor manufacturing details and on the ergonomics of the handle which we agreed could use more development.



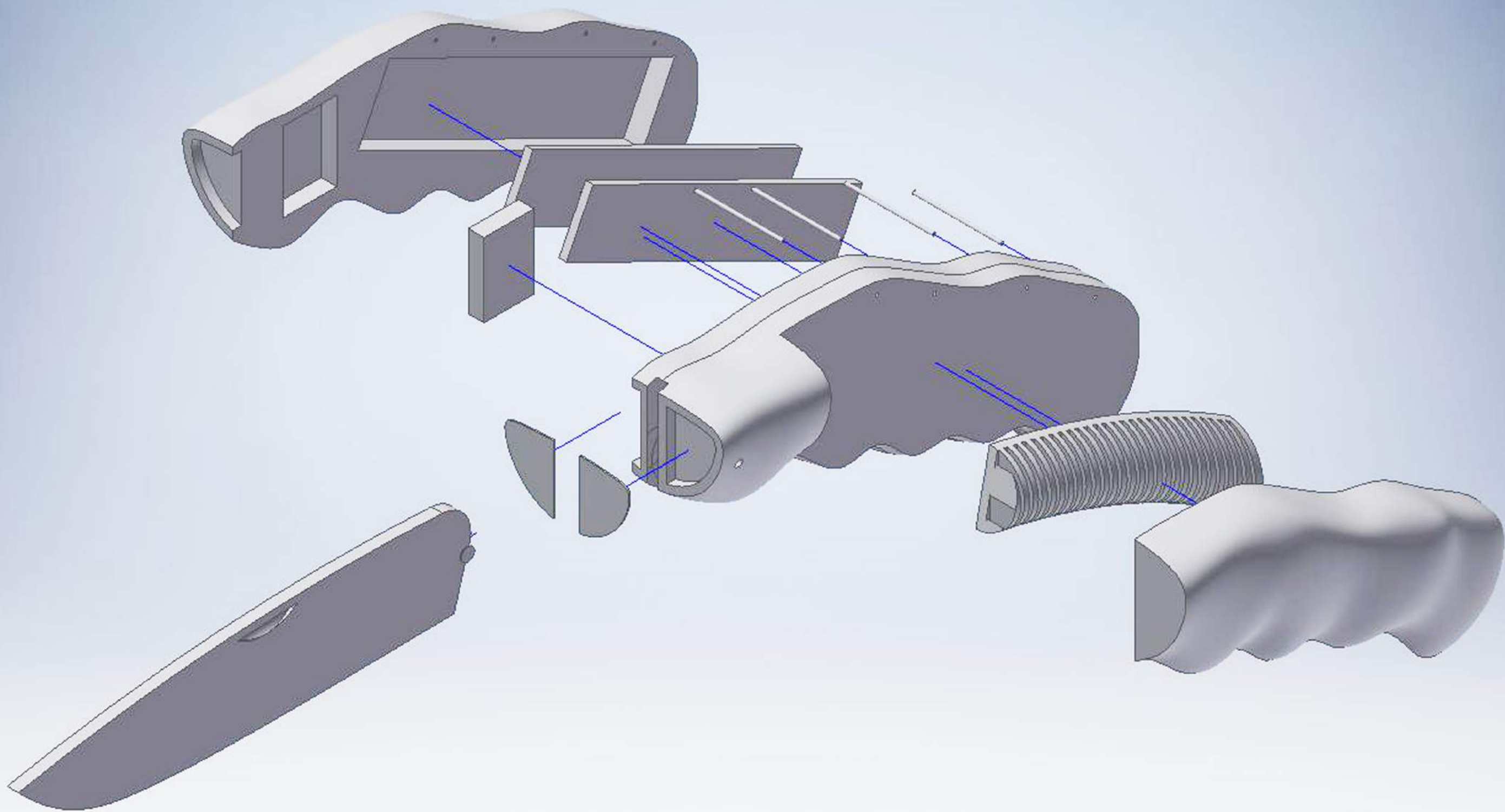


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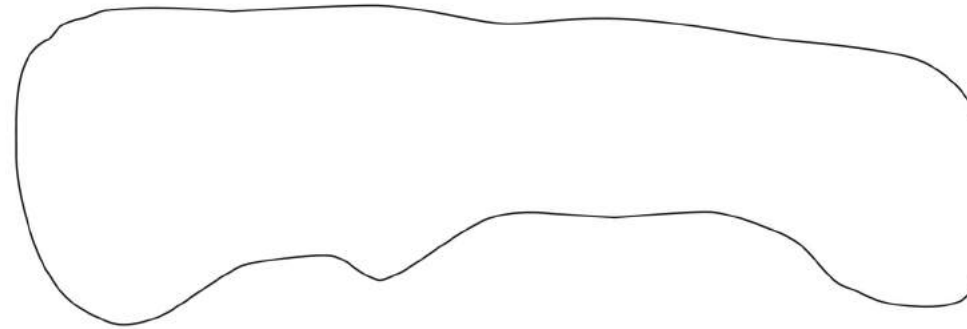
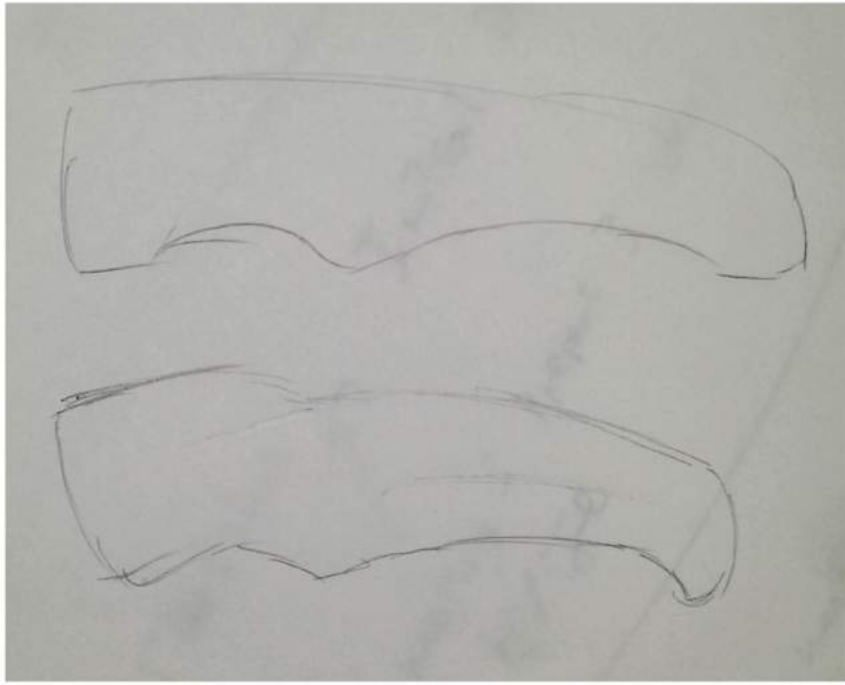
The feedback from this meeting focused on minor manufacturing details and on the ergonomics of the handle which we agreed could use more development.



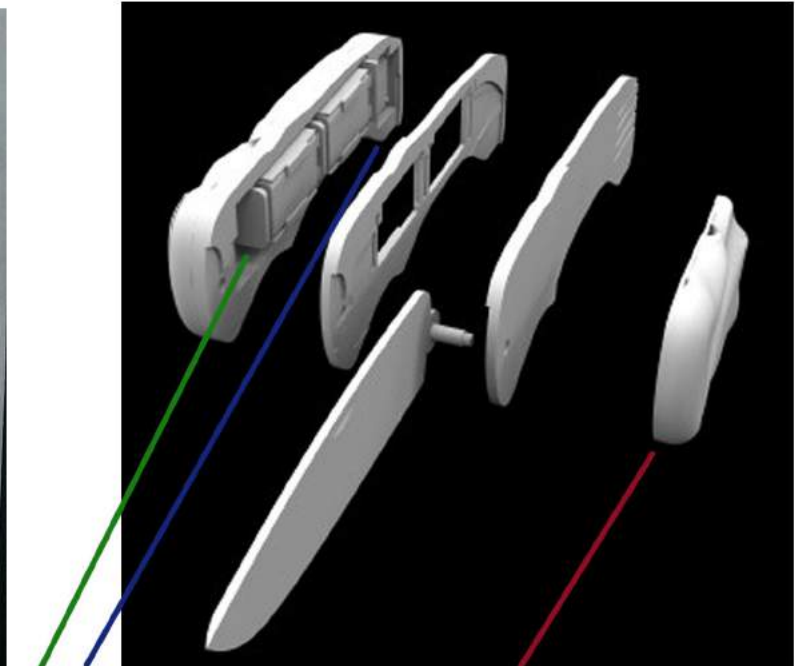
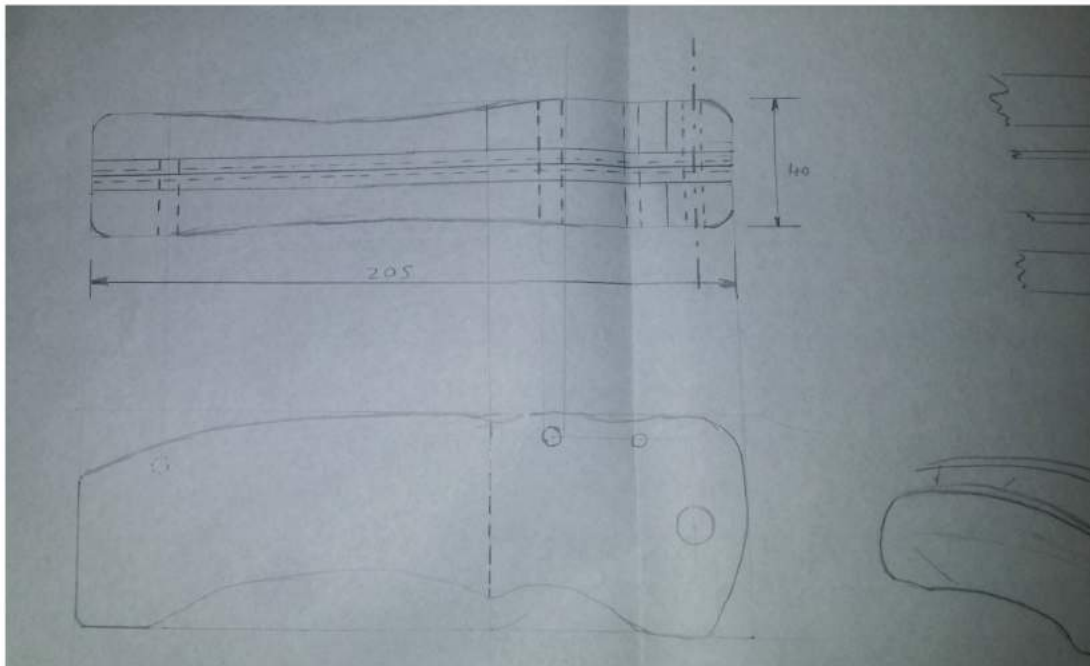




# Engineering Development



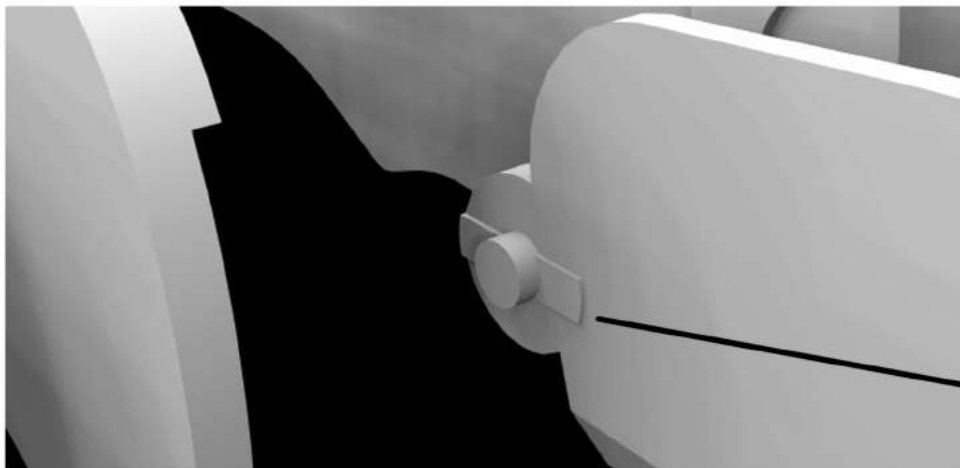
This outline shows the final cross-sectional shape I decided on based on an amalgamation of the two 3D models shown above.



I decided on a method of assembly which utilised two plates to 'sandwich' the blade.

The external casings and detachable unit attach onto the side. The detachable unit now attaches by sliding along a rail and clicking into place.

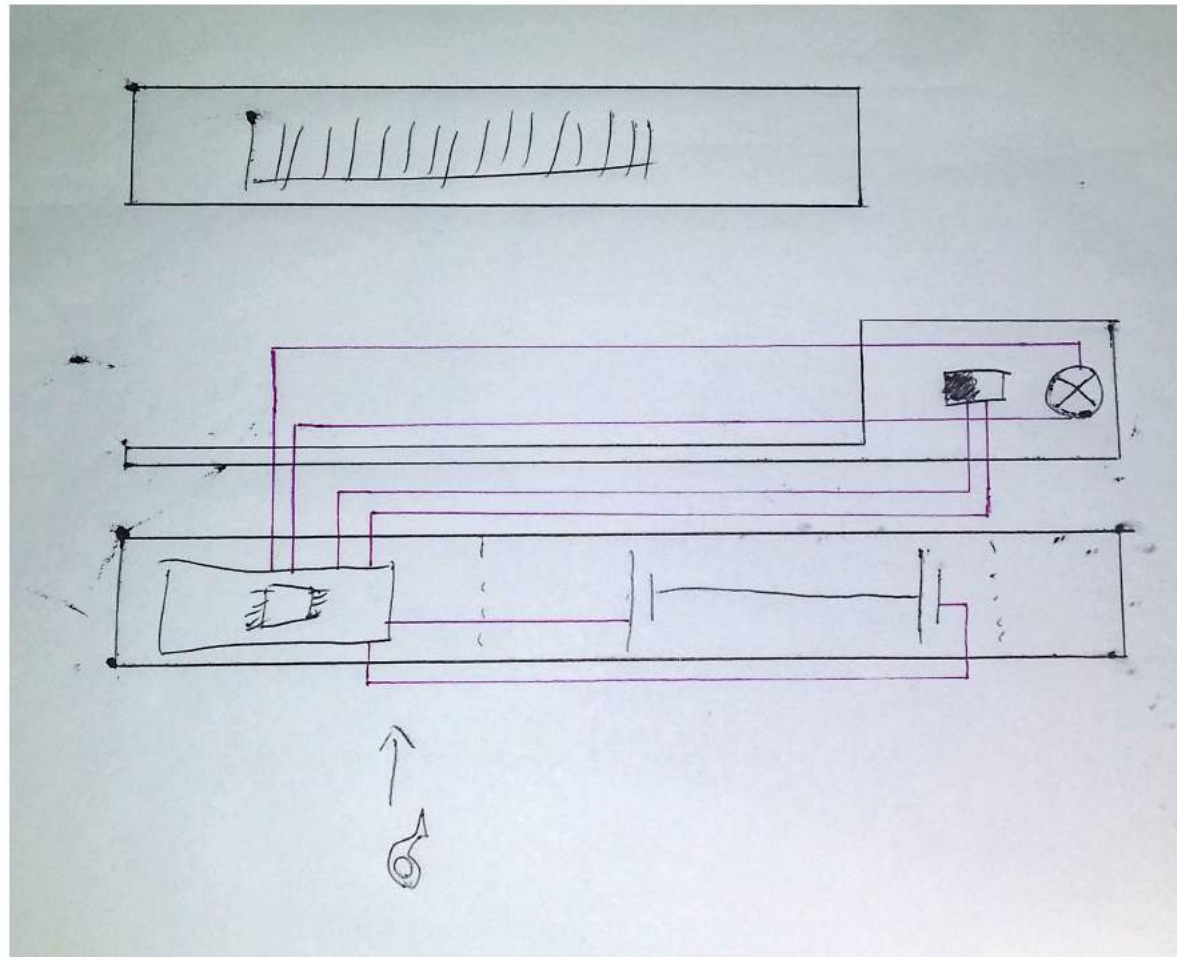
I also decided to move the **control circuitry** to the back, the **thermo-electric unit** to the right casing and change the **batteries** to standard d-size Cadmium batteries for use in cold conditions.



The blade has extrusions to fit the casing in both the open and closed positions. A spring causes tension to keep it in place



# Engineering Development: Circuitry



Following on from the initial sketches, I realised that, using an atmel chip, all of the control could be handled by one circuit.

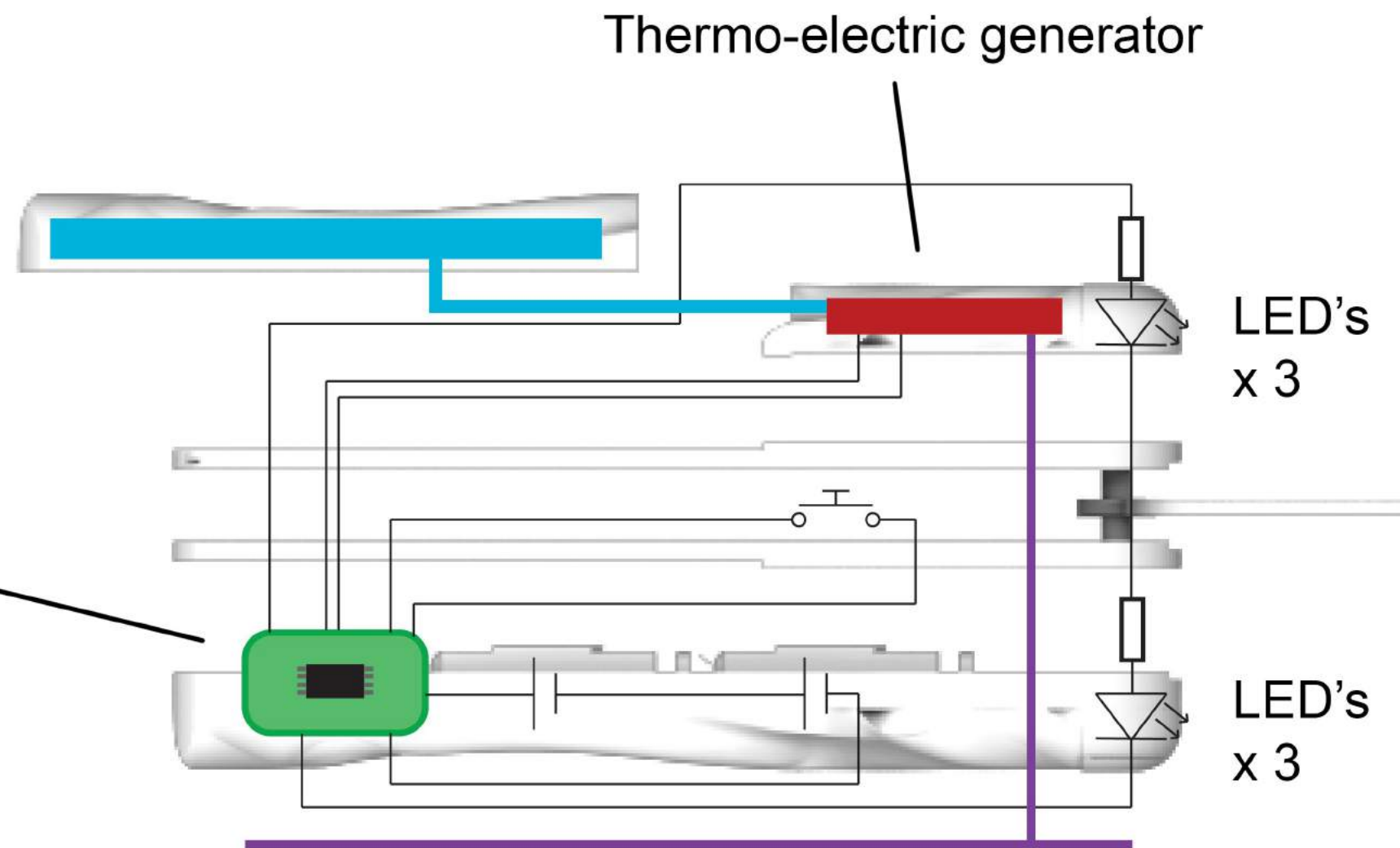
The diagram to the left shows the revived circuit design I decided on, the diagram bellow showing this more clearly.

Heat Sync contained in detachable unit

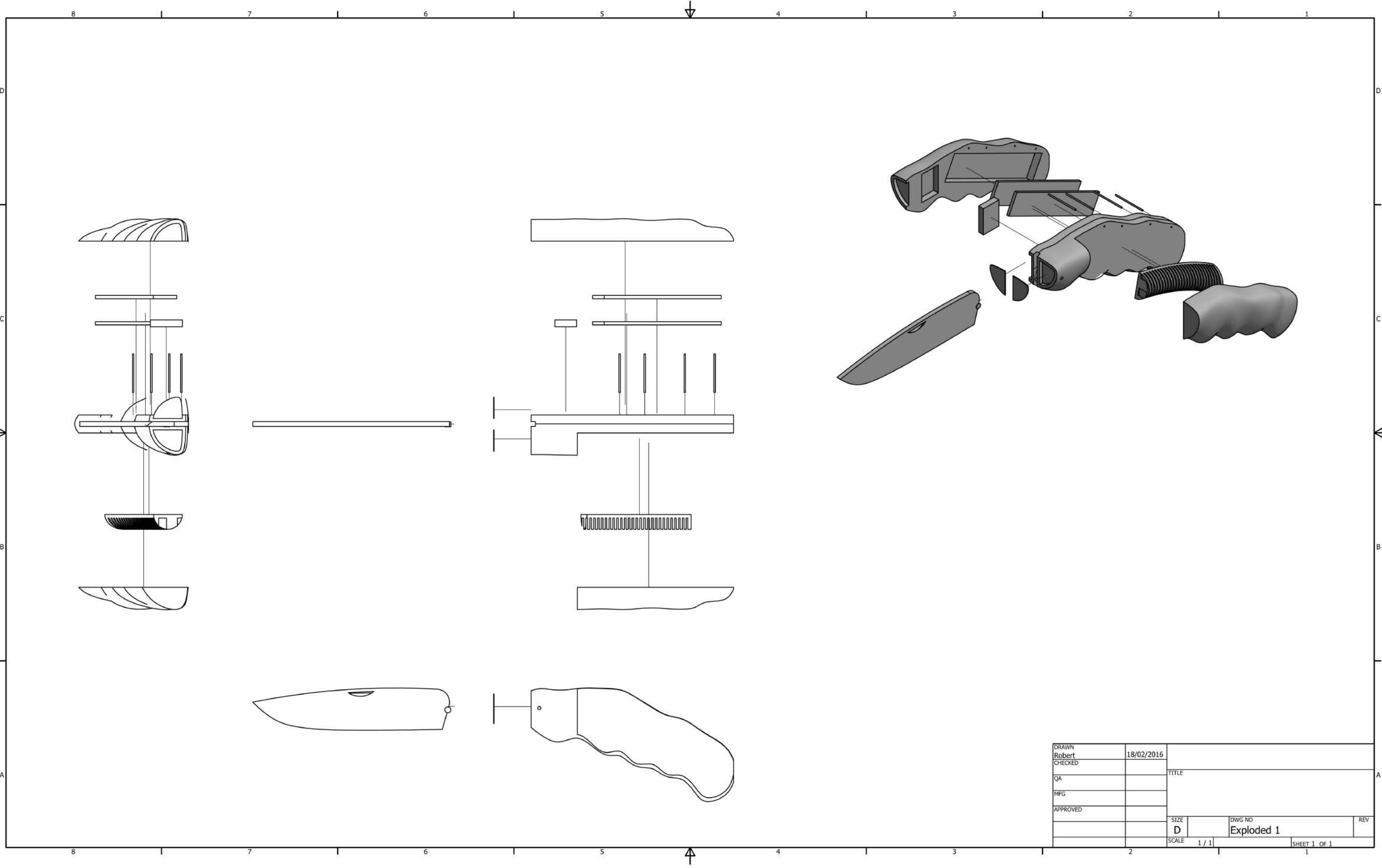
Control circuit draws power from the batteries and can output power to them from the thermo-electric generator. It also controls the distribution of current to the LED's

The button acts as a toggle to cycle through the LED's functions.

Heat absorbing plating underneath outer casing.



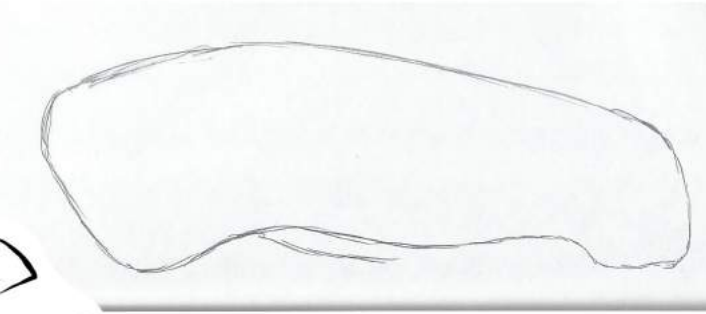
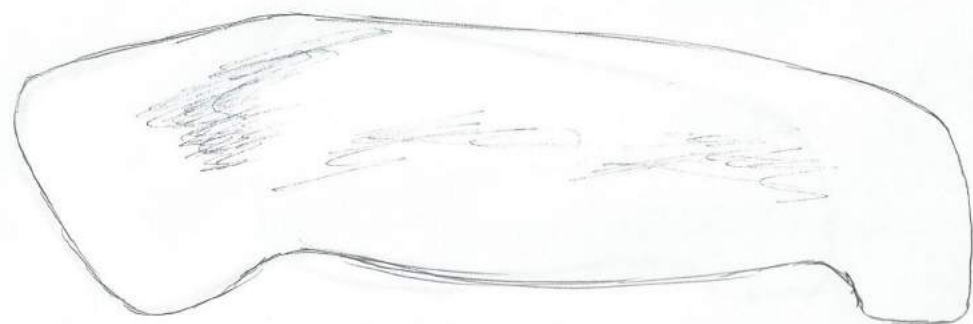
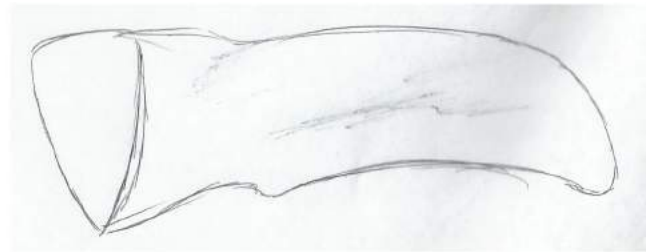
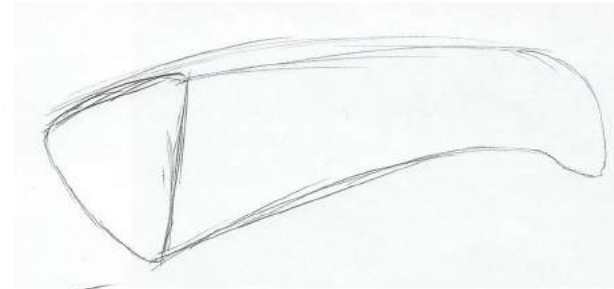
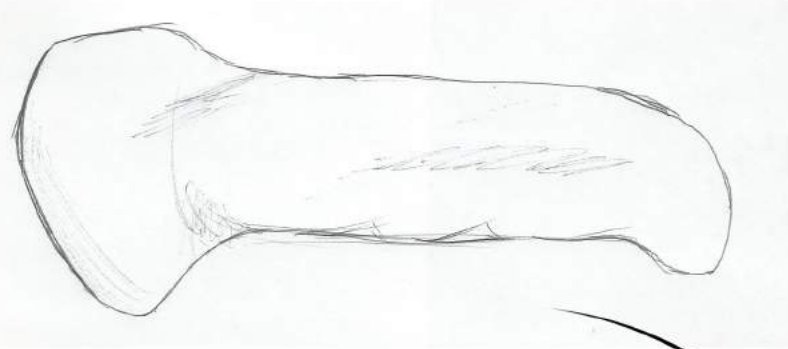




DRAWN Robert	18/02/2016			
CHECKED		TITLE		
QA				
MFG				
APPROVED				
		SIZE D	DWG NO Exploded 1	REV
		SCALE 1 / 1	SHEET 1 OF 1	



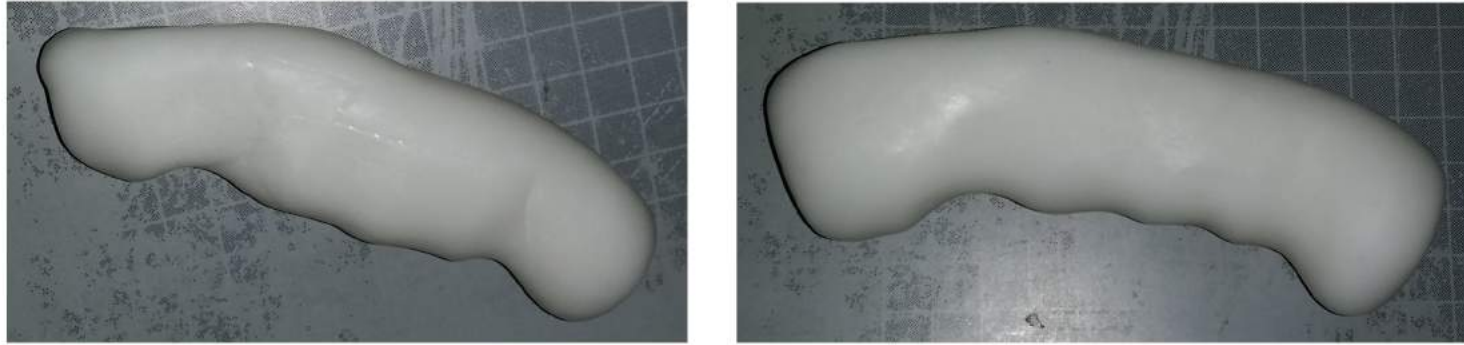
# Handle Development 4





# Handle Development 1

Following the first meeting in Part Two of the project, most of the feedback I received from my group concerned the ergonomics of the handle section of the torch.

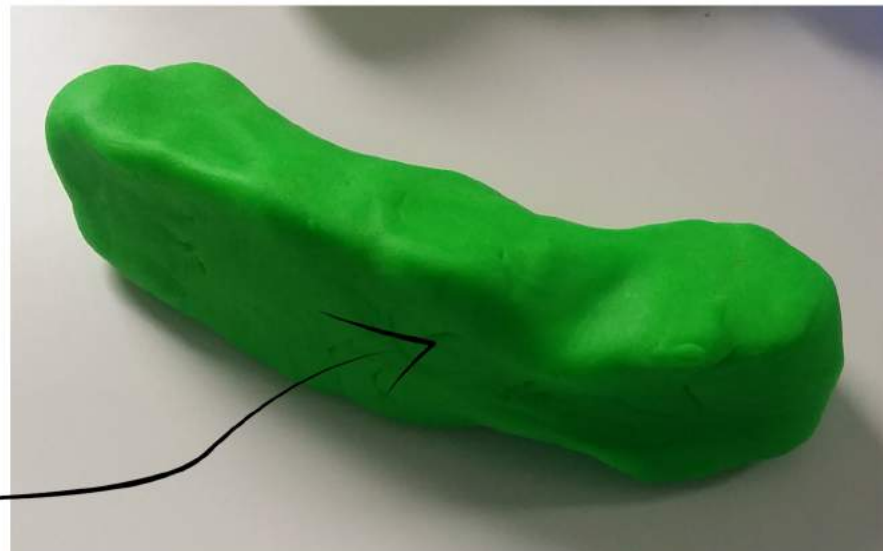


These two models, made of polymorph plastic, were what I proposed as the main form for the torch handle. Comments included that it was too small and sculpted to a particular hand shape, limiting its potential uses and users.



I rounded off the sharp corners and the finger grips to make them less geometric and straightened the overall shape to be less arched.

Notched on both sides allow the user to grip the torch better for thrusting movements by resting the side of the thumb against them.



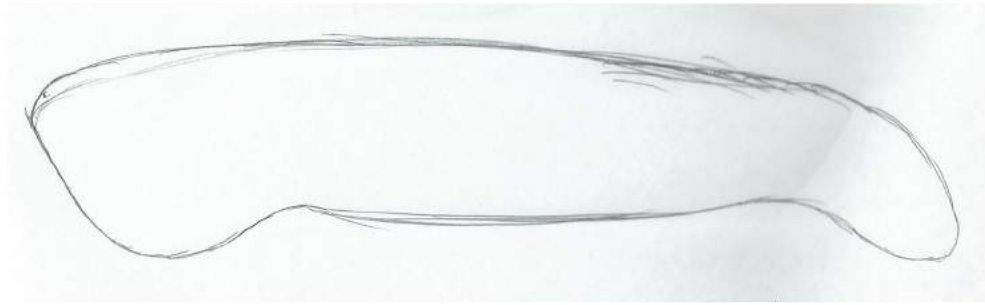
Play Doh provided a more versatile modelling material for quick sketch models and testing.

I increased the total size and made the handle section uniform diameter to the end sections to increase usability.

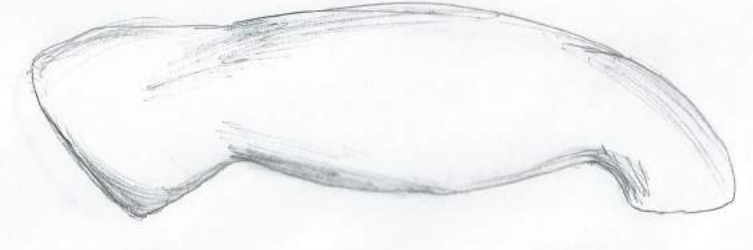
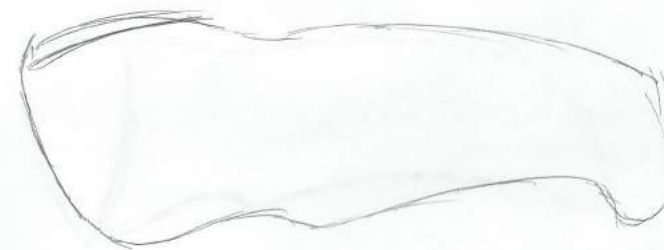
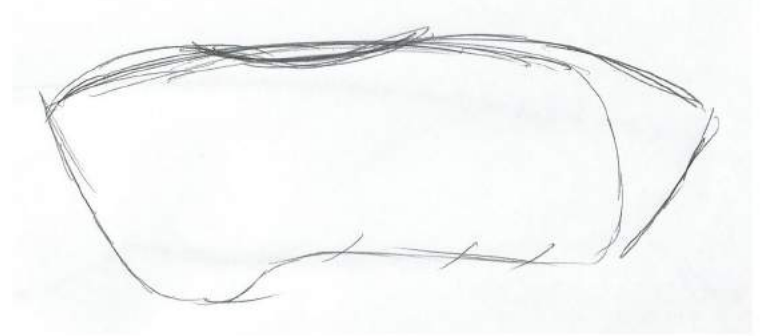
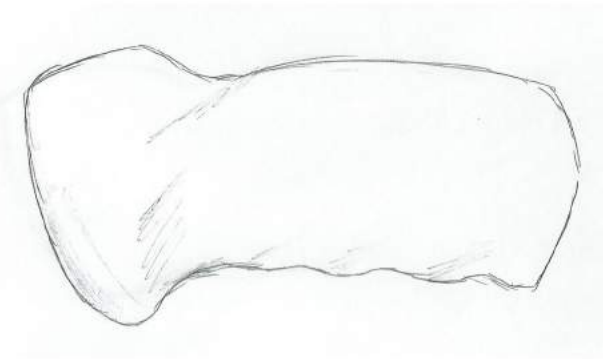
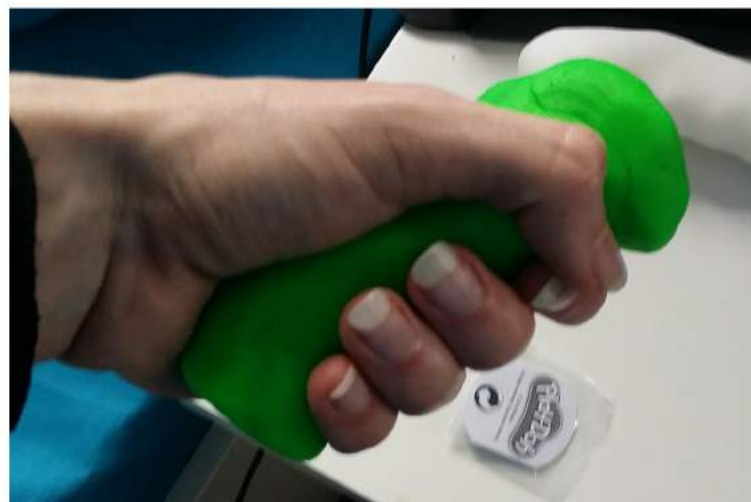
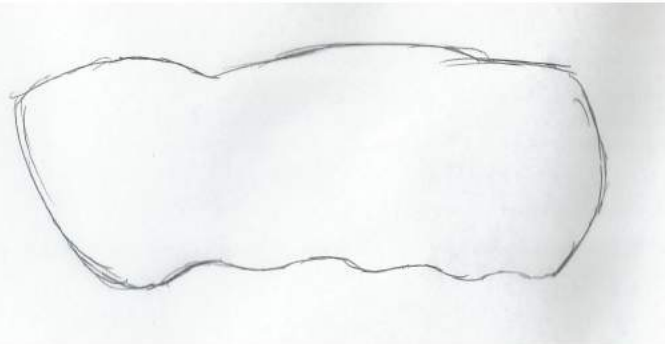




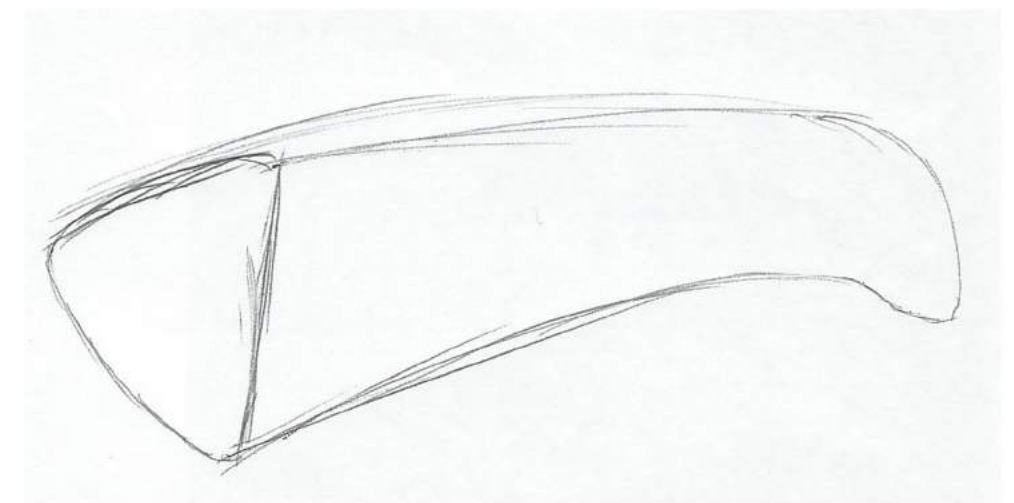
# Handle Development 3



At this juncture I decided that the design was going in the right direction but to gain more insight I should explore some very different shapes.

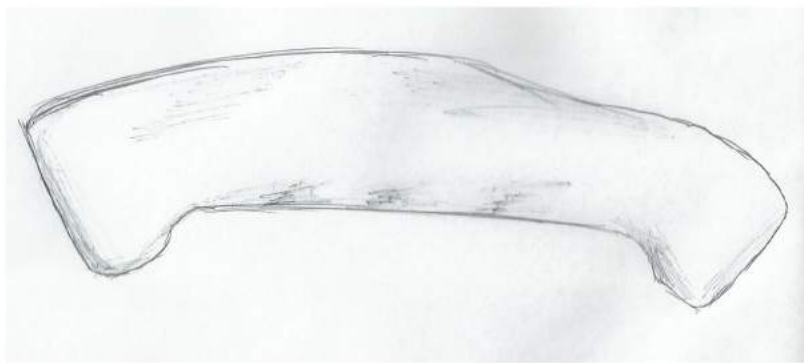
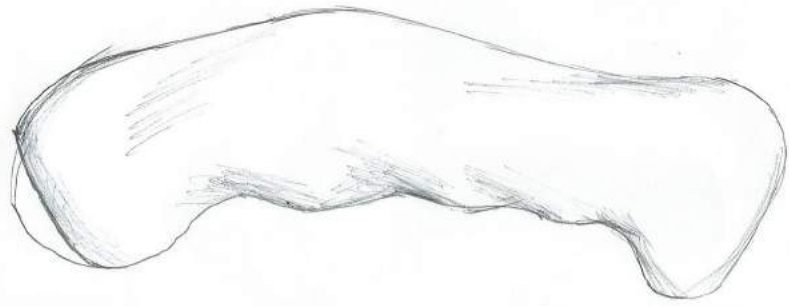


It was suggested to me to look at the 2012 Olympic torch design by Edward Barber and Jay Osgerby. I took the idea of a tapered triangular extrusion to develop the previous form.

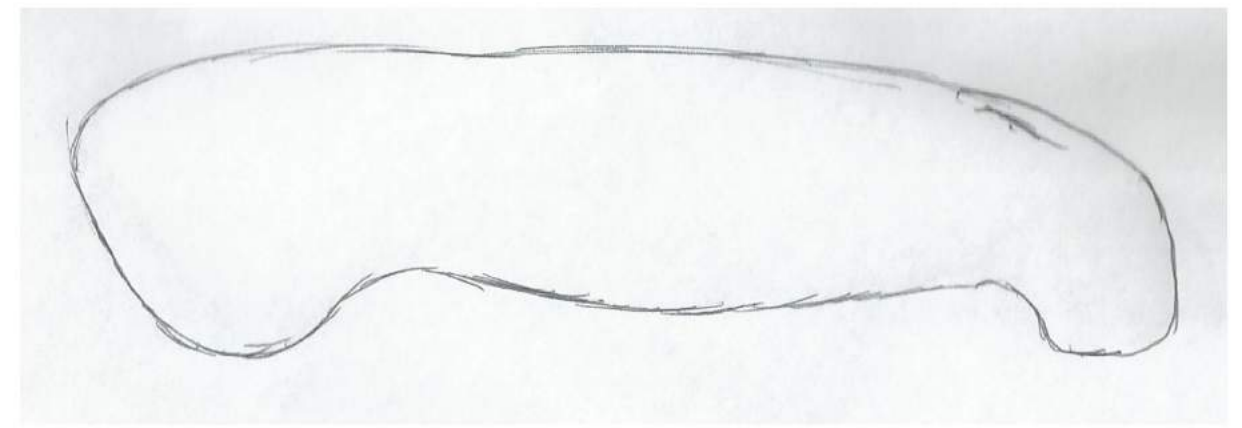
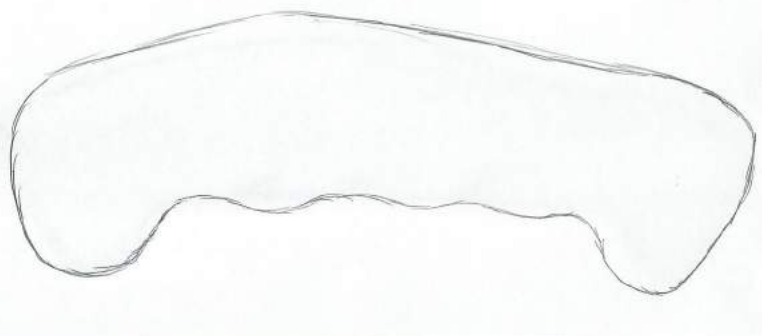




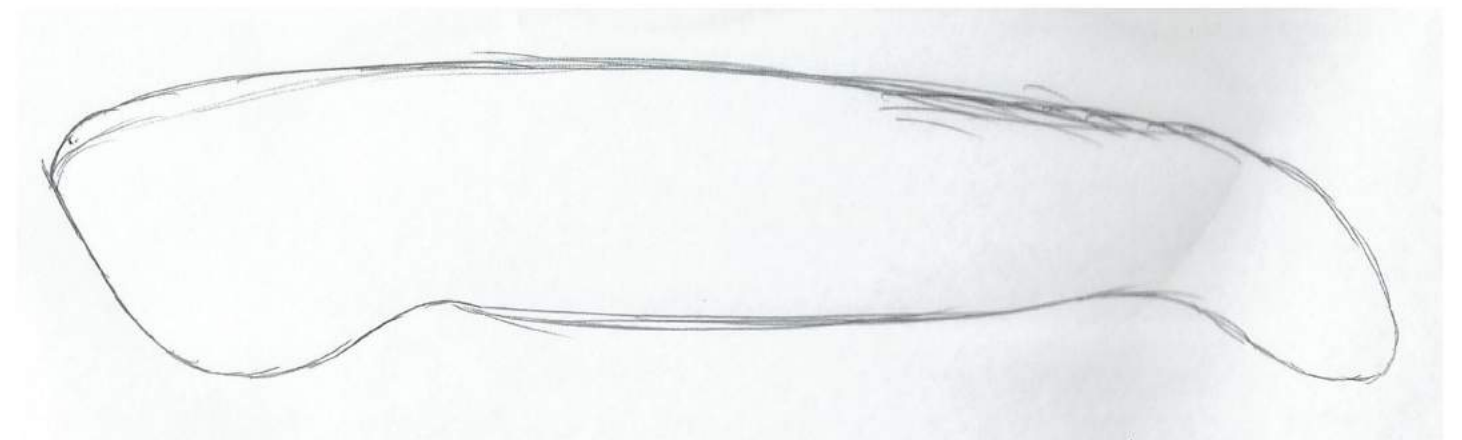
# Handle Development 2



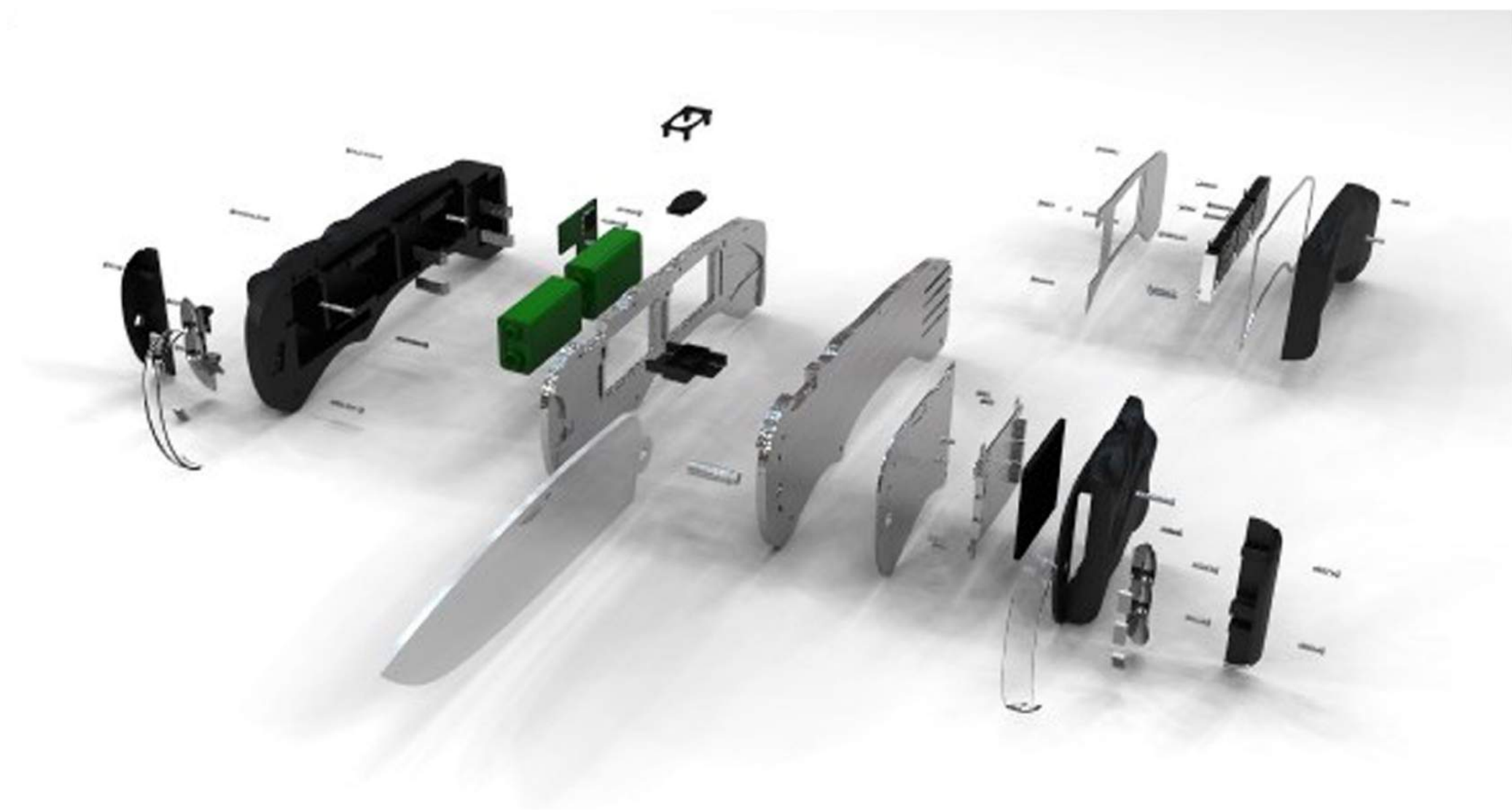
The lipped end points help with grip and sliding but were too angular and sharp.



Lengthened shape and tilted front for more directed light dispersal while maintaining the straight form.



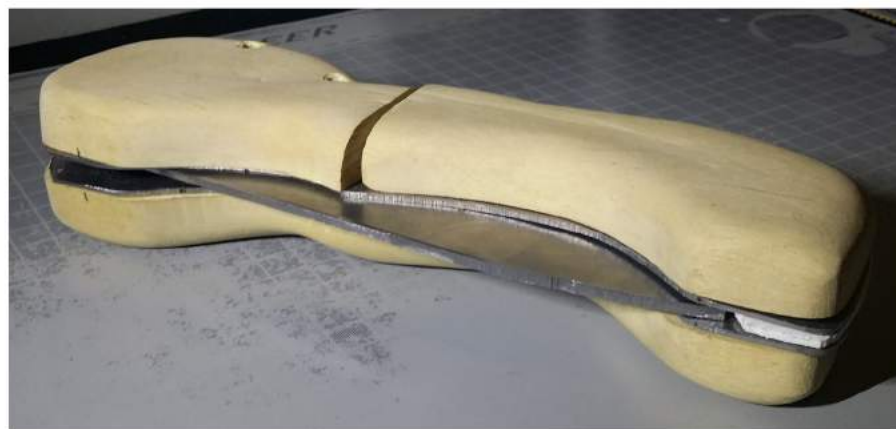




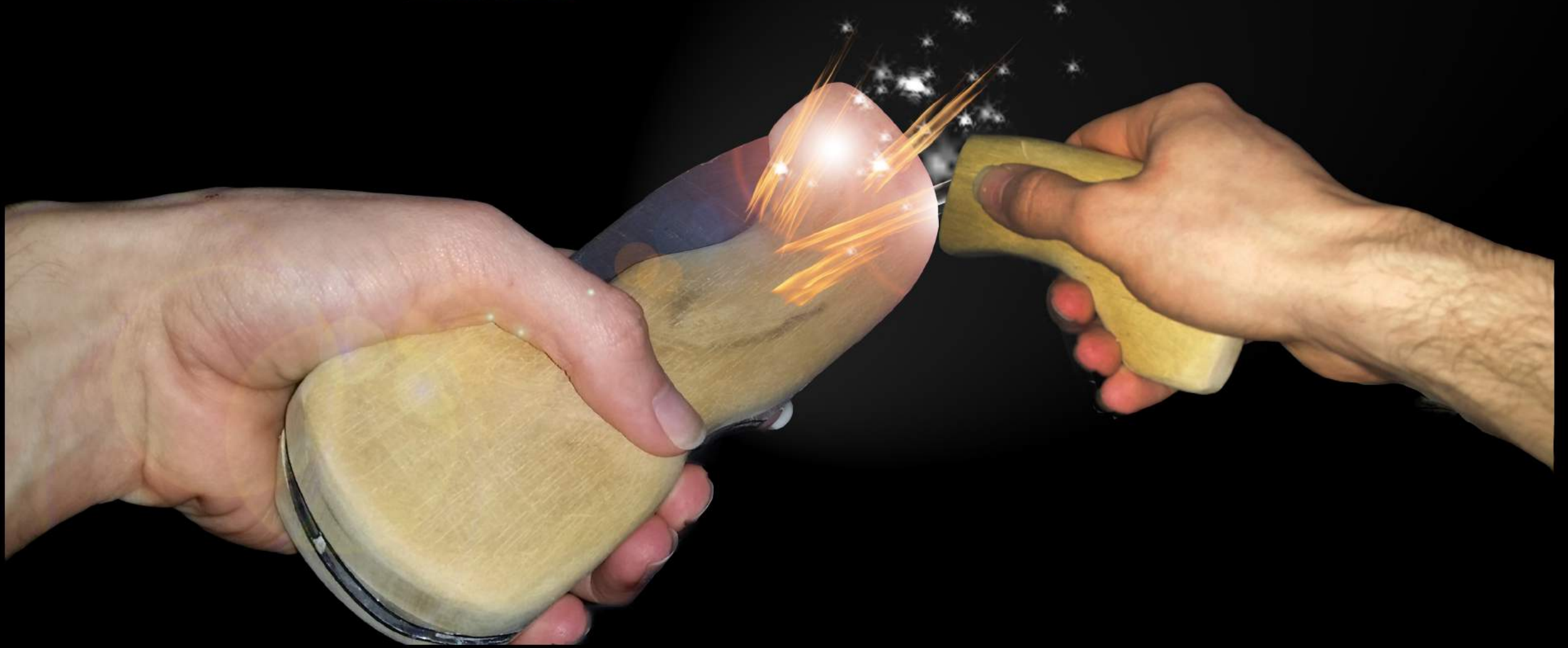




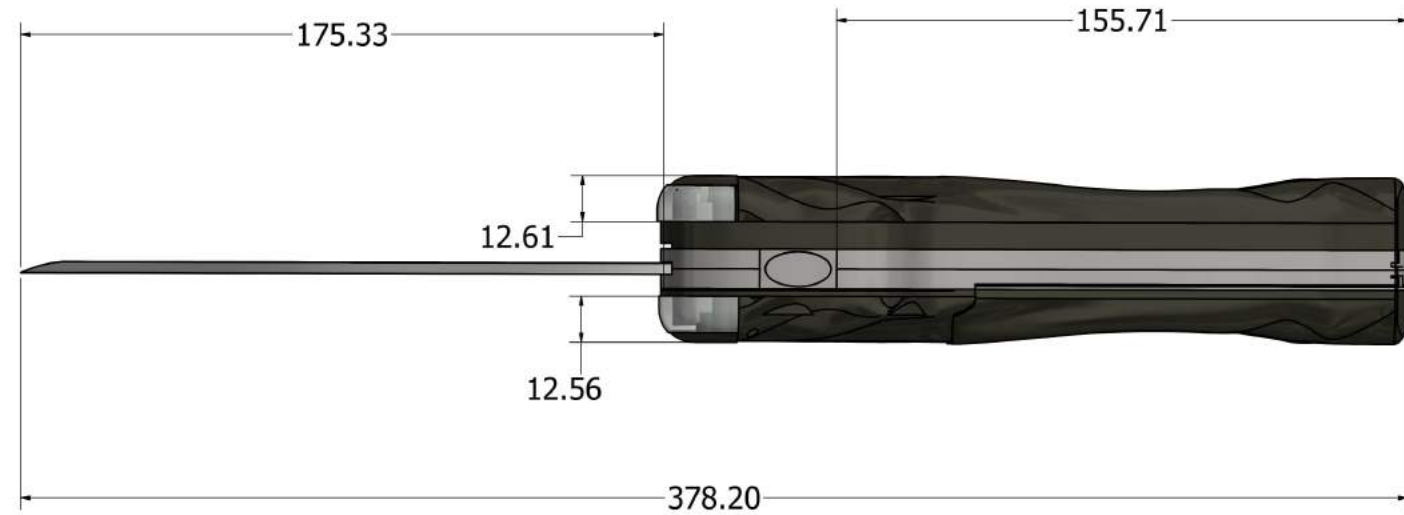
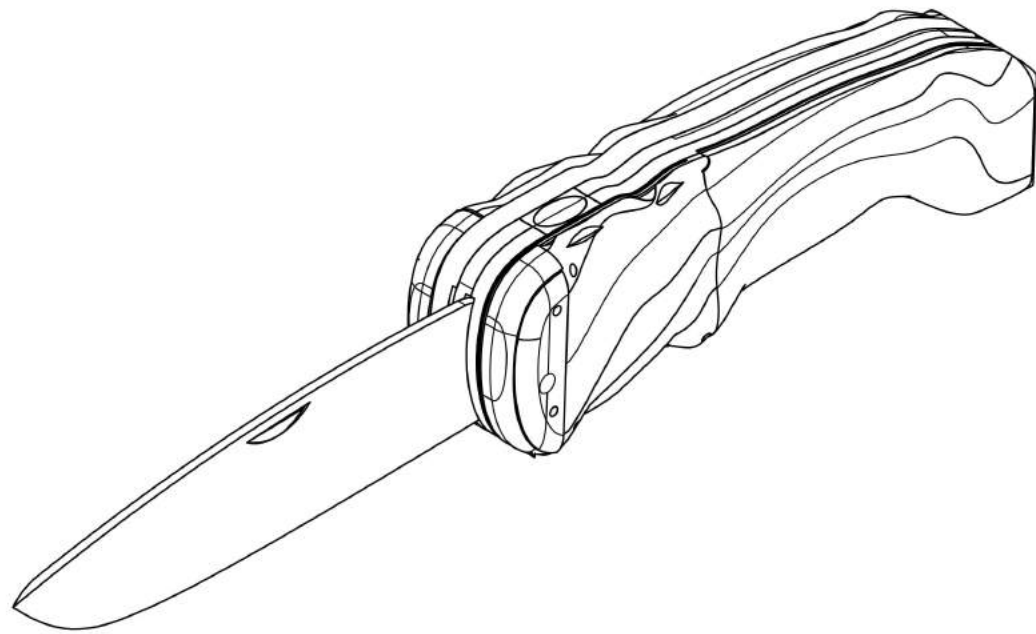
# Final Block Model







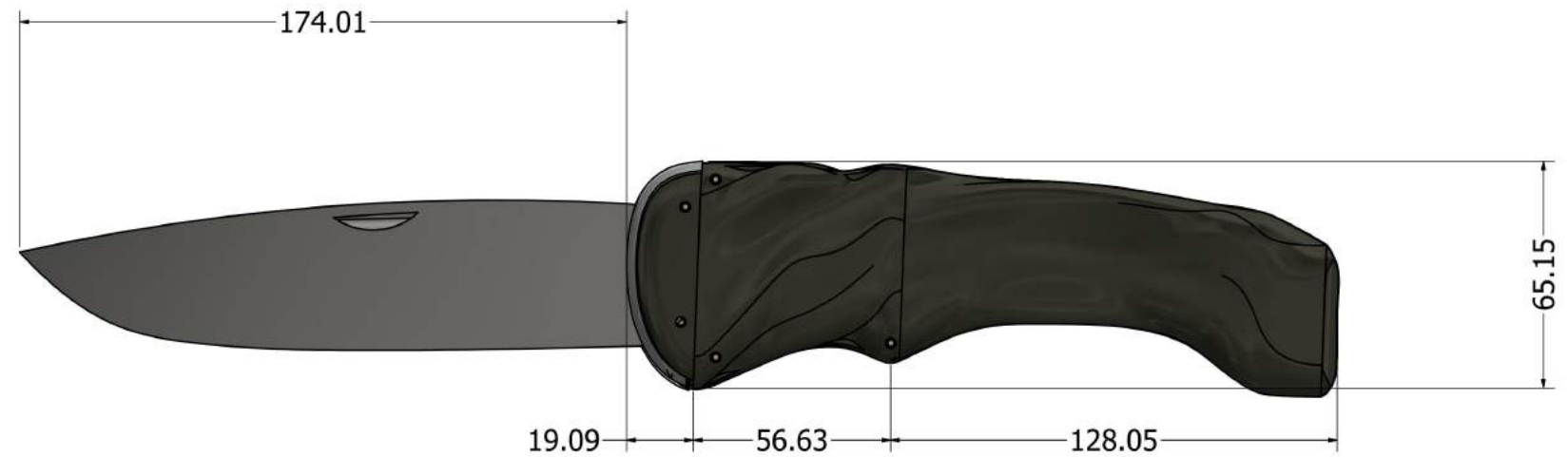




Plan



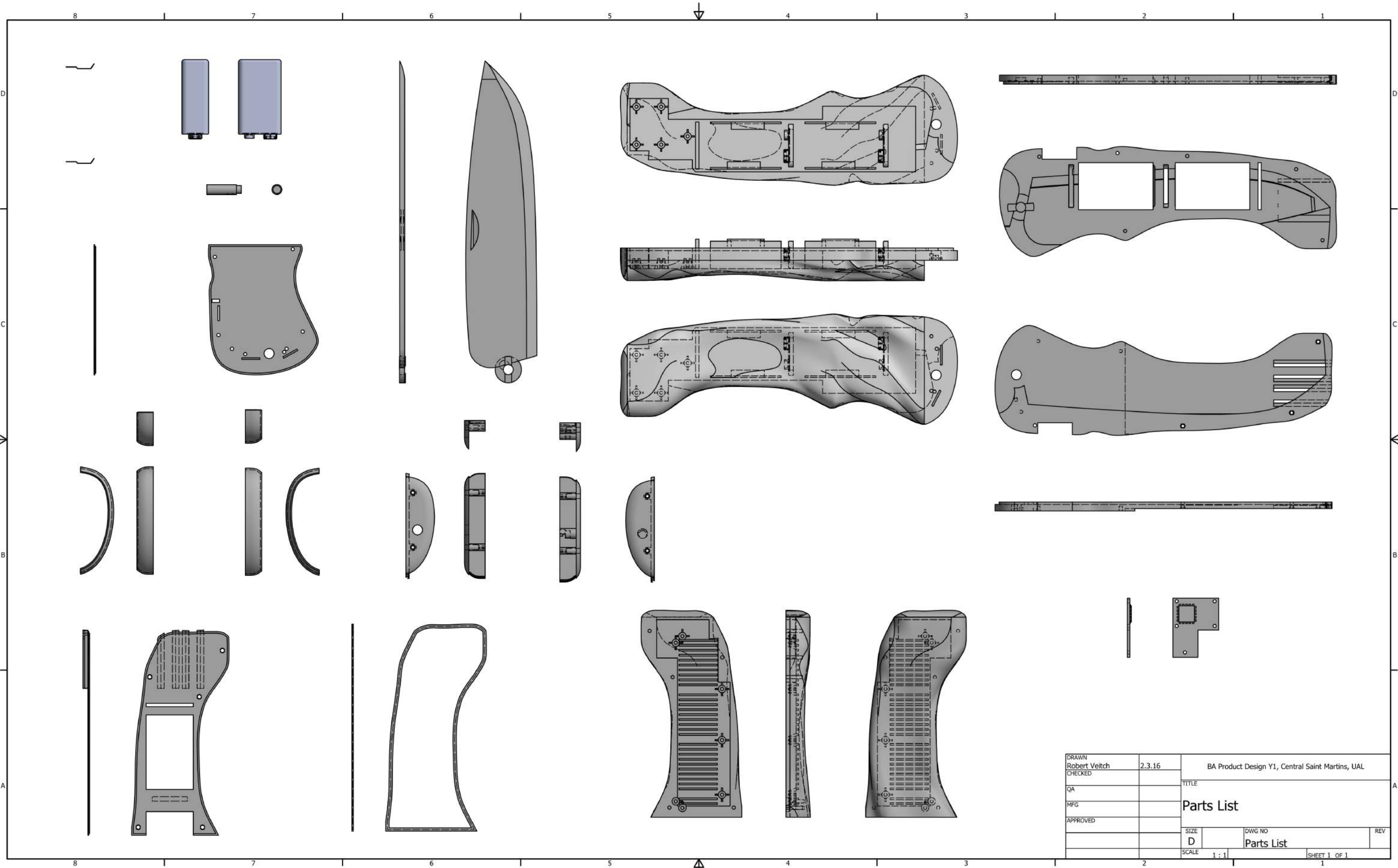
End-Elevation



Elevation

DRAWN	2.3.16	BA Product Design Y1, Central Saint Martins, UAL		
Robert Veitch		TITLE		
CHECKED		Longevity Final Outcome		
QA		SIZE		
MFG		D		
APPROVED		DWG NO		
		Final Dimensions		
		SCALE		
		1 : 1		
		SHEET 1 OF 1		

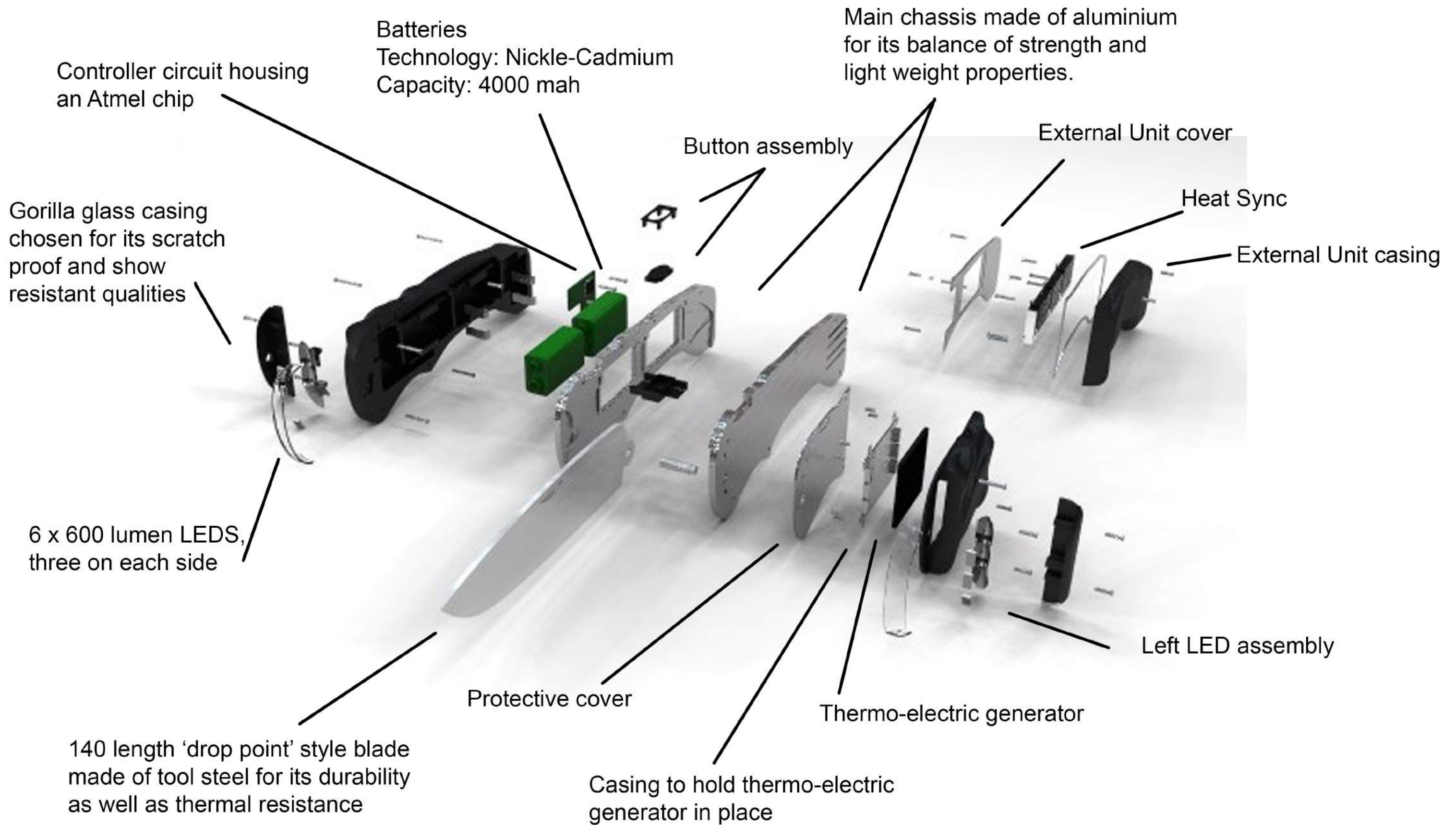




DRAWN	Robert Veitch	2.3.16	BA Product Design Y1, Central Saint Martins, UAL		
CHECKED			TITLE		
QA			Parts List		
MFG					
APPROVED			SIZE	DWG NO	REV
			D	Parts List	
			SCALE	1 : 1	SHEET 1 OF 1



# Specifications





# Longevity

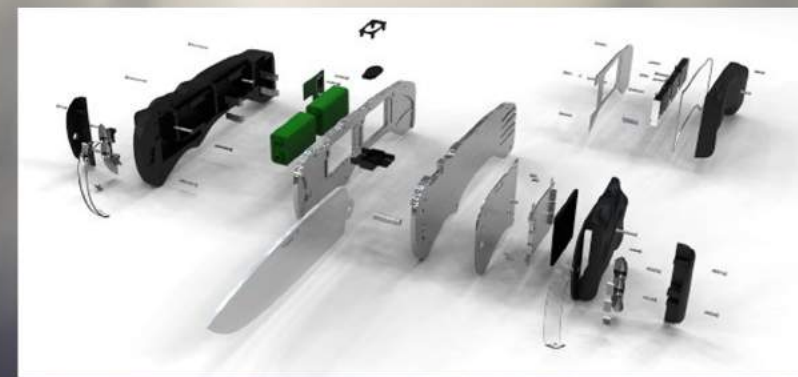


Longevity is designed for emergencies which strand the user in a wilderness with a high chance of injury or fatality.

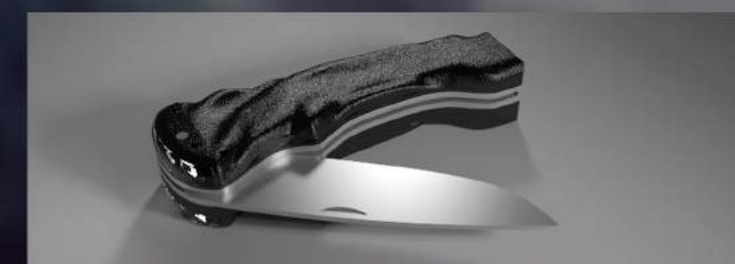
In such a situation, essentials become the difference between life or death. This torch aims to tackle such issues.

The torch functions as a fold out utility knife, the most useful tool one can have in a wilderness survival situation.

Separated, one half of the handle can be struck against the magnesium coated other side to start fires to keep warm, ward off wildlife, cook food or signal for rescue.



Longevity uses a heat differential from the exterior shell of the torch to generate power via a small thermo-electric generator.



The blade and detachable unit can also transfer heat allowing one to be used in a heat source while the other is cooled to maximize power generation.

